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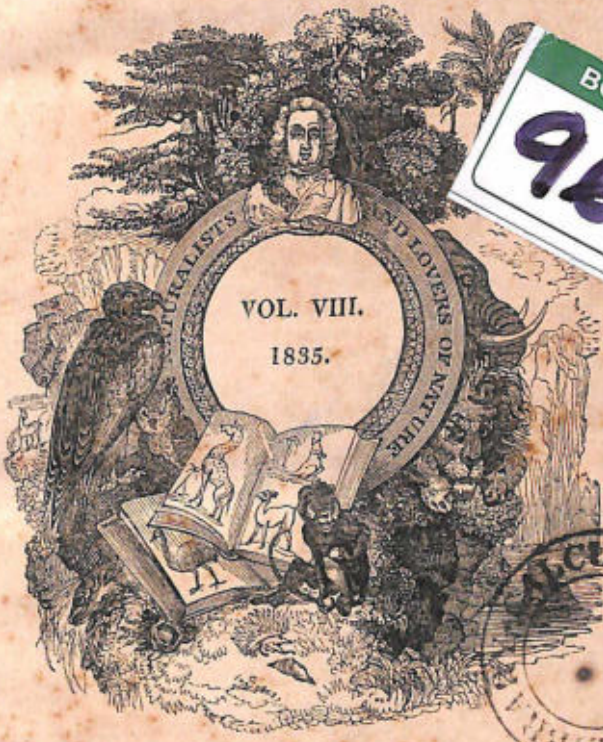
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OF

ZOOLOGY, BOTANY, MINERALOGY, GEOLOGY, AND METEOROLOGY.

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PREFACE.

THE frequent and interesting communications from the Rev. W. B. Clarke, which will be found in the present Volume, remind us that, from the commencement of this Magazine, some of the principal contributors to it have been Clergymen.

It would be altogether superfluous to insist on the suitableness of the study of Natural History for a Clergyman residing in the country; or to draw a comparison between the effects which this taste, and that for sporting which was formerly prevalent among this class, are likely to have on the happiness of the parishioners. Compared even with a taste for classical studies, for drawing, painting, or any other branch of the Fine Arts; or for amateur turning, or any other kind of mechanical employment; a taste for Natural History in a clergyman has great advantages, both as respects himself and others. It is superior, in a social point of view, even to a taste for gardening. The sportsman often follows his amusements to the great annoyance of his parishioners; the horticulturist exercises his gentler pursuit within his garden; and the classical or indoor student of any kind secludes himself in his closet or his laboratory; but the naturalist is abroad in the fields, investigating the habits and searching out the habitats of birds, insects, or plants, not only invigorating his health, but affording ample opportunity for frequent intercourse with his parishioners. In this way their reciprocal acquaintance is cultivated, and the clergyman at last becomes an adviser and friend, as well as a spiritual teacher.

But if Natural History is particularly suited for a country clergyman, it is still more so for females residing in the country. Of this, mothers are now becoming aware; and it is highly gratifying to observe the change that has taken place in female education within the last twenty or thirty years. Daughters are now no longer educated for the purpose of becoming mere domestic managers, or household ornaments, but for being the rational companions of rational men; and the influence that this change will have on their own happiness, on that of their husbands, and on that of their children, and every one connected with them, cannot fail to show itself conspicuously in the next generation.*

* In the *Scotsman* newspaper of Nov. 4. 1835, there is a notice by the Editor of a visit which he paid to the Ladies' Institution in Great Stuart Street, Edinburgh. This Institution was opened in 1834, and may be described as a day-school for ladies, in which the circle of instruction is so complete, that it embraces almost every thing usually taught to men. We shall quote the account, as appropriate to the sentiments expressed in our Preface, and most interesting in itself: —

"*Female Education.* — We bestowed our hearty commendations on the plan of the Institution in Great Stuart Street, when it was opened last year; but we never had an opportunity of inspecting it till some days ago. We witnessed the proceedings only in one class, Dr. Reid's; but these were so novel and interesting, that we cannot forbear offering a few remarks upon them. We found forty or fifty young ladies performing chemical experiments at three long tables. Fifty jets

In renewing our thanks to our various contributors at the end of our annual volume, we cannot deny ourselves the pleasure of reminding them that all the good the *Magazine of Natural History* has done, and continues to do, is mainly owing to their exertions. Our merit is chiefly limited to that of affording them a vehicle, we hope a safe and agreeable one, for conveying their information to the reading public.

J. C. L.

Bayswater, Nov. 16. 1835.

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of gas, issuing through the tables, served them in lieu of furnaces. Near each jet was a common wine glass, an assortment of broad and narrow slips of window glass, bits of white paper, and, at regular intervals, a few bottles containing acids, alkalies, infusions of vegetable blue, or other chemical substances. The lecture was just concluded, and the experiments had a reference to the subjects discussed in it. After each experiment, questions were put by the teacher as to the nature of the substances used, and the change ensuing; and they were answered by the fifty voices simultaneously. This practical chemistry lasted half an hour. The ladies seem to be generally from fifteen to eighteen years of age: some were probably about twelve, and others about twenty. Though young, however, they were neither timorous nor awkward; but went through the manipulations with an alacrity and zest, which showed that there was much of pleasure, and nothing of task-work, in the exercise. The object, of course, is not to qualify ladies for the business of the laboratory, but to give them clearer conceptions of the facts and principles of the science, and to fix them better in the memory. The novelty of the thing; the sight of so many happy young females, whose faces were beaming with beauty, health, and vivacity, so employed; gave no small degree of interest to the spectacle. We could not help feeling that it was one of the "signs" which prognosticate that the coming age will not be exactly the "double" of the present. We see, moreover, from the Report lately published by the directors, that forty young ladies last year studied mathematics, and not only got safely over the *pons asinorum*, but, marvel of marvels, went through five books of Euclid, and passed so far over the threshold of Algebra as to solve quadratic equations! It is easy for witlings to ridicule all this, and to ask whether a lady is to neglect the care of her children, and the concerns of the kitchen and laundry, for the study of acids and triangles? Generally, the sagacious persons who put these queries, think it a most judicious employment of a boy's time to make him spend years upon such improving and inspiring themes as *hic, hæc, hoc*, and the other lumber of declensions, conjugations, and syntax rules of Latin and Greek! When Lord Chesterfield called women "children of a larger growth," his scorn was misdirected. He should have libelled the other sex, who have curtailed the female mind of its fair proportions by a frivolous and enervating education. Nature, in bestowing the same faculties on both sexes, clearly indicated that they were to be employed on the same objects. Women require special training for the duties of a mother, and men for those of a profession. Beyond this, it is nature's dictate, that the whole field of intellectual study (with some small and obvious exceptions) should be open to both. Each sex has, indeed, its peculiar aptitudes; but all the sublime truths of physical science, all the instructive themes of morals, politics, and religion, are within the capacity of either. Considered as a source of pure enjoyment, it is unjust and tyrannical to shut out the female sex from scientific pursuits. Two thirds of the happiness of married life ought to lie in *companionship*; and does any one doubt that an enlightened man will prefer a companion who can exchange ideas with him on all the most profound and interesting subjects of cogitation, to one whose thoughts are incapable of rising above frivolous gossip? Then, as to the maternal relations, whether will a son reap more improvement from, or feel greater respect for, an intellectual woman, or a mere notable housewife?" (*Scotsman*, Nov. 14. 1835.)

CONTENTS.

ORIGINAL COMMUNICATIONS.

GENERAL SUBJECT.

On certain recent Meteoric Phenomena, Vicissitudes in the Seasons, prevalent Disorders, &c., contemporaneous, and in supposed connexion, with Volcanic Emanations. Nos. 5, 6, & 7. By the Rev. W. B. Clarke, A.M. F.G.S. 1. 129. 417

Some Account of Walton Hall, the Seat of Charles Waterton, Esq. By James Stuart Menteath, Esq. - - - - 28

On the arbitrary Alteration of established Terms in Natural History. By Hugh E. Strickland, Esq. - - - - 36

Notes of a Natural History Tour in Norway. By Edward Forbes, Esq. - 65. 249. 306

An Attempt to ascertain the Animals designated in the Scriptures by the Names Leviathan and Behemoth. By Thomas Thompson, Esq., one of the Vice-Presidents of the Hull Literary and Philosophical Society; being the Substance of a Paper read at a Meeting of that Society on January 17. 1835 193. 307

A few Remarks on Hybrids, in reference to Mr. Berry's Communication in VII. 599. By Mr. Edward Blyth - - - 198

Instances of the Effects of Forest Vegetation on Climate. By the Rev. W. B. Clarke, A.M. F.G.S. &c. - - - - 473

On the Geology and Natural History of the North-Eastern Extremity of the Alleghany Mountain Range, in Pennsylvania, United States. By Richard C. Taylor, Esq. F.G.S., Member of the Geological Society of Pennsylvania; of the Academy of Natural Sciences, Philadelphia; and of the Albany Institute, New York - - - - 529

Conclusions on the Results on the Vegetation of Nova Scotia, and on Vegetation in general, and on Man in general, of certain Natural and Artificial Causes deemed to actuate and affect them. By Mr. Titus Smith. Communicated by R. G. - - - 641

ZOOLOGY.

An Attempt to classify the "Varieties" of Animals, with Observations on the marked Seasonal and other Changes which naturally take place in various British Species, and which do not constitute Varieties. By Mr. Edward Blyth - - - - 40

Facts on the Gravelling of the Taw, which is deemed the Young of the Salmon; and incidental Information on the Skegger Trout of the Thames. By O. - - - - 54

Remarks on some Barnacles of the Species *Lèpas anatifera* found floating off St. Adhelm's Head, on the Coast of Dorset, on February 7. 1834. By the Rev. W. B. Clarke, M.A. - - - - - 55

Illustrations in British Zoology. By George Johnston, M.D., Fellow of the Royal College of Surgeons of Edinburgh - 59. 81. 179. 202. 258. 341. 376. 465. 494. 565. 594. 668

Records of the Results of Dredging. By Edward Forbes, Esq. - - - 68. 591

An Introduction to the Natural History of Molluscous Animals. In a Series of Letters. By G. J. - - - - - 71

Notes of a Visit to the Haunts of the Guillemot, and Facts on its Habits. By Charles Waterton, Esq. - - - - 162

Notes of a Visit to the Haunts of the Cormorant, and Facts on its Habits. By Charles Waterton, Esq. - - - - 166

Notice of the Ravages of Insects upon Barley, and Turnips; by J. C. Farmer, Esq.: with Observations thereon, and Descriptions and Figures of the Insects; by J. O. Westwood, Esq. F.L.S., &c. - - - - 171

A List of Species of Diurnal Lepidóptera known to occur in Switzerland, with Notices of the Localities in which they have been observed. By P. J. Brown, Esq. - - - 205

Notes on the Habits of the Kingfisher. By Charles Waterton, Esq. - - - 251

Remarks on the Habits of the Canada Goose (*Anser canadénsis Willughby*). By S. D. W. 255

Descriptions of some Species of Crustaceous Animals; by S. Hailstone, jun., Esq.: with Illustrations and Remarks, by J. O. Westwood, Esq. F.L.S. &c. - - - 261

Notes on the Habits of the Tawny Owl. By Charles Waterton, Esq. - - - 322

Observations on the Cuckoo. By Edward Blyth, Esq. - - - - - 325

Notes on the Habits of the Wigeon. By Charles Waterton, Esq. - - - 361

A Notice of a very remarkable Individual of the Common Shrike (*Lanius Collùrio Lin.*), with some Observations on this Species of Shrike. By Edward Blyth, Esq. - 364

Particulars on a caged Pair of Siskins', or Aberdevines', building Nests and rearing a Pair of young Siskins in Confinement; and a Statement of the Fact that the Siskin, wild, has bred about Dundee. By William Gardiner, jun., Esq. - - - - 372

Notices of the Affinities, Habits, and certain Localities of the Dipper (*Cinclus aquáticus*). By the Rev. Francis Orpen Morris, B.A. 374

Notes on the Habits of the Heron. By Charles Waterton, Esq. - - - - 453

Illustrations of a Species of ? Phyllosóma *Leach and Latreille*, or of an undescribed Genus allied to Phyllosóma; and of *Squilla Desmarésii* Risso; as observed in a living Individual of each, taken on the Coast of Guernsey. By F. C. Lukis, Esq. - - - 459

Description of the Young of the Common Lobster, with Observations relative to the Questions of the Occurrence and Non-Occurrence of Transformations in Crustaceous Animals. By T. Brightwell, Esq. F.L.S. - - 482

A Descriptive Catalogue of the Insécta Myriápoda found in Berwickshire. By George Johnston, M.D., Fellow of the Royal College of Surgeons of Edinburgh - - - 486

Notes on the Habits of the Mallard. By Charles Waterton, Esq. - - - - 541

Sketches of the Natural History of my Neighbourhood. No. 3. Fragments of Ornithology. By C. Conway, Esq., of Pontnewydd Works, Monmouthshire - - 545

An illustrated Description of a Species of Eurynome, supposed to be hitherto undescribed; and Notices of some Instances of some Change of Form which occurs in certain cited Species of Crustaceous Animals. By S. Hailstone, jun., Esq. - - - 549
A List of Species of Crepuscular Lepidopterous Insects, and of some of the Species of Nocturnal ones, known to occur in Switzerland; with Notices of the Localities in which they have been observed. By P. J. Brown, Esq. 553
Descriptions and Figures of Panopæa Glycymeris, a rare, and Anòmia coronàta, a newly ascertained, Species of British Shell. By Mr. William Bean - - - 562
Biography of the Gold-crested Kinglet (*Régulus auricapillus*). By S. D. W. - - - 585
On Snakes, their Fangs, and their Mode of procuring Food. By Charles Waterton, Esq. 663

BOTANY.

Observations concerning the Indigenousness and Distinctness of certain Species of Plants included in the British Floras. By the Rev. J. S. Henslow, M.A., Professor of Botany in the University of Cambridge - - 84
Facts and Opinions in question of the Distinctness, as Species, of certain Plants reputed to be Species, which inhabit Britain. By W. A. Bromfield, M.D. - - - 89
Some Particulars on the Fact of two Horses dying shortly after eating of the living Leaves and Branches of the Yew Tree; and others on the Fact of two young Guinea Fowls dying not long after feeding on withered Leaves of the Yew Tree. By James G. Tatem, Esq. 91
Directions for producing Skeletons of the Leaves, Calyxes, and Seed-Vessels, or other Parts, of Plants. By G. Francis, Esq. - 221
On *Viola imbérbis* [*Leighton*], a ? Species of Violet supposed to be new to the British Flora; with Brief Observations on some Peculiarities of *Viola láctea*, *Viola canina*, *Ranúnculus Ficária*, and *Gálium cruciátum*. By W. A. Leighton, Esq. B.A. - - 277
Observations on the Construction of Maps in Geographical Botany. By Richard Brinsley Hinds, Esq. R.N. - - - 498
On the specific Distinction of Rhynchóspora álba and Rhynchóspora fúsca. By W. A. Leighton, Esq. B.A. - - - 675

GEOLOGY.

On the Maidstone Fossil Skeleton, in the Museum of Gideon Mantell, LL.D. F.R.S., Brighton. By R. B. - - - 99
Remarks on the Deposition of Salt in the Mediterranean Sea. By the Rev. W. B. Clarke, A.M. F.G.S. &c. - - - 225
A Synoptical Table of some of the Mineral Substances, and of the Organic Remains found in the Gravel at Stanway, Essex, and the neighbouring Localities, within a Radius of Fifteen Miles. By John Brown, Esq. 349
A Notice of a new Locality of specified Fossil Bones of the Elephant and Deer, and of the Geological Conditions of this Locality. By John Brown, Esq. - - - 363
A short Account of an interesting Deposit of Fossil Shells at Burlington Quay. By Mr. William Bean - - - - 365
Observations on the Strata near Woolwich. By John Morris, Esq. - - - 366
Some Account of the Limestone Quarries and Petrifying Spring at Pounceford in Sussex; with Preliminary Remarks on the Wealden Rocks. By William Perceval Hunter, Esq. Member of the Geological Society of France 597

METEOROLOGY.

Observations on Aurora Borealis, as affecting Atmospheric Phenomena. By C. Conway, Esq. - - - - 92
A Notice of Instances of the Appearing of the Aurora Borealis, seen from Dundee, Forfarshire, in 1833 and 1834; and of the State of the Weather subsequent to the several Instances. By William Gardiner, jun., Esq. 94
Remarks contributive to the Elucidation of Meteoric and Atmospheric Phenomena. By W. H. White, Esq. - - - 97
A Notice of a Proposition that the Explosion of large Quantities of Gunpowder, in Battles, effects extensive Changes in the Condition of the Atmosphere. By Thomas Lee, Esq. 223
Notices of 184 Observations on Aurora Borealis, made during a Period of Thirteen Years, with the State of the Weather immediately subsequent; being contributive to the further Elucidation of their Effects on the Atmosphere. By W. H. White, Esq. - 343
A Report on the Quantity of Rain which has fallen at Kendal, in Westmoreland, during the last Thirteen Years; and a Notice of some local Circumstances deemed Influential on the Quantity, and on the Climate. By Samuel Marshall, Esq., and J. S. M. - 345
Particulars on the State of the Weather at Columbus, in Franklin County, Ohio, United States of America, in January and February, 1835; with a Notice of the State of Temperature on January 5, 1835, in various Places in the United States. By Mr. George E. Hartwell, of the Firm of Lazell and Hartwell, Nurserymen, at Columbus - - 347
Notices of Solar and Lunar Haloes, Parhelia, Paraselenæ, and Meteors, as Harbingers of falling Weather. By W. H. White, Esq. 501

Short Communications - 103. 183. 226. 283. 380. 467. 504. 569. 609

MISCELLANEOUS INTELLIGENCE.

Retrospective Criticism - 236. 301. 394. 637
Queries and Answers - - - 395
Some Instances of the State of Natural History in Britain - - - - 400
Man's Progress in the Extension of the Knowledge of Natural Objects - - - 673
Obituary - - - - - 410

REVIEWS.

Notices of Works on Subjects of Natural History - 62. 120. 184. 238. 303. 367. 411. 471. 519. 580. 639. 680
Literary Notices - 64. 127. 248. 370. 415. 527. 584

GENERAL INDEX - - - - - 681
INDEX to Works noticed - - - - 687

LIST OF SUBJECTS OF ENGRAVINGS.

Page

MAN.

20. Man's riding of the crocodile - - 197

BIRD.

34. Prionops Geoffroyii Vieillot - - 372

FISH.

1. The gravelling of the river Taw in Devonshire, a state of the common salmon (Sálmo Sálar *L.*) - - 55. 470

MOLLUSCOUS ANIMALS.

4. Tritônia pinnatífida *Cuvier* - - 61
6. The jaws of a species of Tritônia - 75
5. The tongue and jaws of the common limpet (Patélla vulgàta) - - 75
9. The digestive viscera of the common limpet - - - - 77
7. The digestive viscera of Tèthys leporina 77
8. The digestive viscera of a species of Pleurobránchus - - - 77
35. *a, b, c, d,* Eolídia papillósa *Fleming* - 376
35. *e,* Eolídia despécta *Johnston* - - 376
36. Eolídia Embletôni Johnston - - 379
37. Eolídia rufibranchiàlis *Johnston* - - 380
2. Lèpas anatífera - - - 56

SHELLS.

50, 51. Panopæ'a Glycymeris *Turton* - 563
52. Anòmia coronàta *Bean* - - 564
63. Lima, ? species *Forbes* - - 593
64. Lima, another ? species *Forbes* - 594
65. Lima ? frágilis - - - 594
61. Patélla pulchélla *Forbes* - - 591
62. Búccinum zetlándicum *Forbes* - 593

WORMS.

23. Lumbrícus capitàtus *Fabricius* - - 258
24. Lumbrícus lineàtus *Müller* - - 259
33. Néphtys margaritácea *Johnston* - 342
45. Arenícola ecaudàta *Johnston* - - 566
19. Othônia Fabrícii Johnston - - 181

LEECH.

45. Udonélla *Johnston* caligbrum *Johnston* 497

CRUSTACEOUS ANIMALS.

21. Pándarus alàtus *Edwards*, male - 202
22. Pándarus lámmæ *Johnston* - - 204
32. The common edible crab (Cáncer Pagúrus *Leach*) in a very young state, as published by Mr. J. V. Thompson - 275
48. The carapace of ? Pilúmnus hirtéllus in a very young state - - - 550
47. Eurynome ?spinòsa *Hailstone*, female; ?áspera *Leach* in a young state - 549
26. Hyas serrátus *Hailstone*, male; ? coarctàtus in a young state - - 262
27. Macropòdia ?Phalángium in a young state: the individual was a male - 263
28, 29. Porcellàna ?Lámnedna Leach; fig. 28. is that of a female; 265. 270. 395. 551, 552
38. Phyllosôma sarniénse *Lukis* - - 459
39, 40. Squílla Desmarésti Risso - 462, 463

No. Page

25. Pontóphilus trispinòsus *Hailstone*, female - - - 261. 394, 395
30. Pontóphilus bispinòsus - 271. 394, 395
31. 49. Dienèdcia *Westwood*, species, typus 272. 552, 553.; ?Hippólyte macrochèles *Hailstone* - 272. 394, 395. 553
72. Prôto pedátus var. 1. - - - 673
73. Prôto pedátus var. 2. - - - 674
69. Caprélla Phásma *Lamarck* - - 669
70. Caprélla acanthífera *Leach* - - 671
71. Caprélla linearis *Latreille*, female - 672
44. Astacílla longicórnis *Fleming* - - 495
53. Lernæ'a uncinàta *Müller* - - 565

MANY-FOOTED (MYRIAPODOUS) ANIMALS.

43. *a*, The anal segment of Júlus punctàtus *Leach* - - - - 488
43. *b*, The anal segment of Júlus niger *Leach* - - - - 488

SPIDER AND SPIDERS' EGG-CASES.

55. Epeira diadèma *Walckenäer* - - 575
56, 57; 58. *a, b, c, d*; 59. *a, b, c, d, e, f*; 60, Egg-cases of species of spider - 576—579

INSECTS.

16. Chæ'non nigricans *Westwood* - - 174
17. *e, f,* Eucoila rápæ *Westwood* - - 175
17. *a, b, c, d,* Rudimentary parts of an insect of a species not determinable from these parts - - - - 175
18. Campóntia cruciformis *Johnston*. It is not well known that this is a species of insect - - - - 180

RAYED ANIMALS.

10, 11. Astèrias ? pappòsa, the young of - 78
41. Ophiùra bracteàta *Fleming* - - 466
42. Ophiùra neglécta *Johnston* - - 467
66. Ophiùra bèllis *Fleming* - - 595
67. Ophiùra granulàta *Fleming* - - 596
12. Actínia mesembryánthemum *Solander* 82
13. Actínia viduàta *Müller* - - 83
3. Lucernária convólvulus *Johnston* - 59

BOTANY.

Acer tatáricum *L.* - - - 64*a*
68. Cúscuta europæ'a *L.* - - - 634
74. Rhynchóspora álba *Vahl* - - 676
75. Rhynchóspora fúsca *Smith* - - 677
46. and others. Diagrams in illustration of propositions for cognisance in the construction of maps on geographical botany - - - 499, 500

METEOROLOGY.

14. A display of aurora borealis witnessed in the south of England, on Dec. 22-23. 1835. - - - 144
15. A diagram illustrative of principles proposed to explain the phenomena of hurricanes - - - - 160

LIST OF CONTRIBUTORS.

A Botanist - 247
A Constant Reader - 613
A Correspondent - 397
Adam, William - 513
Arden, Lady - 636
Ashley, M. - 618
A Subscriber - 574. 627
B. - 190. 245
Babington, Charles C., M.A., F.L.S. - 183
Backhouse, Thomas - 512
Bakewell, Robert, F. G. S. - 396
Baxter, Wm., Curator of the Botanic Garden, Oxford - 634
Bean, Wm. - 355. 562
Blyth, Edward - 40. 198. 228. 325. 364. 512
Bree, Rev. W. T., M.A. - 118. 388. 469. 612. 626
Brightwell, T., F.L.S. - 482
Bromfield, W. A., M.D. - 89. 118. 400
Brown, John - 349. 353
Brown, P. J. - 205. 353. 570
B. T. G. - 283
C. B. - 507
Chamberlain, R. Dyneley - 513
Clarke, Rev. W. B., A.M., F.G.S., &c. - 1. 55. 129. 225. 301. 382. 417. 473
Conway, C. - 92. 545
Cooper, Daniel - 637
Couch, Jonathan, F.L.S. - 106
Dale, J. C., M.A., F.L.S., &c. - 395. 571
Dennes, G. E. - 390
Don, D. - 470
Doubleday, Henry - 617
E. - 238
E. N. D. - 625
Farmer, J. C. - 171
Fennell, James - 610. 625, 626
Forbes, Edward - 65. 68. 249. 305. 591
Fowler, William - 284
Francis, G. - 221. 402. 472
Gardiner, Wm., jun. - 94. 282. 372. 390. 410. 575. 614. 629, 630
Gilbertson, Wm. - 120
G. J. - 71
Glossop, F. H. N. - 622
Grubb, J. - 511
Guilding, Rev. Lansdown, B.A., F.L.S., deceased - 70, 71. 108. 205. 276. 299. 390. 392. 398, 399. 480, 481, 482. 518. 579. 612. 614. 619. 622. 631. 667
Hailstone, S., jun. - 261. 394, 395. 549. 638
H. B. - 393
Henslow, Rev. J. S., M.A., Professor of Botany in the University of Cambridge - 84
Hill, Walter Henry - 458. 468. 574
Hinds, Richard Brinsley, R.N. - 498
H. N. - 514
Hunter, Wm. Perceval, Fellow of the Geological Society of France - 572. 597
Jardine, Sir Wm., F.R.S., F.L.S., &c. - 509
J. C. - 107
J. D., sen. - 108, 109. 115. 242. 570
Jesse, Edward - 114
J. M. - 119
Johnston, George, M.D., F.R.C.S.E. - 59. 81. 179. 202. 258. 341. 376. 465. 478 note *. 486. 494. 565. 594. 621. 668
Jones, J. - 117
J. S. M. - 346
Lee, Thomas - 223
Leighton, W. A., B.A. - 277. 633, 634. 675
Lindley, John, Ph. Dr., Professor of Botany in the London University - 385
Lukis, F. C. - 459
Mascall, Francis - 232
Marshall, Samuel - 345
M. C. S. - 410
Menteath, James Stuart - 28
Morris, John - 356. 391
Morris, Beverley R. - 572
Morris, Rev. Francis Orpen, B.A. - 374. 511. 630. 637, 638
Murray, J. - 470. 620
Neill, Patrick, LL.D. - 508
O. - 54. 470, 471. 510. 570
Palliser, F. - 612
Patrick, William - 285
Pelerin, W. G. - 380
P. J. T. - 504
P. M. - 626, 627
R. B. - 99
R. G. - 641
Rowe, John Reynolds - 124. 388. 628. 632
S. - 243
Salmon, J. D. - 113. 358. 381. 507
S. D. W. - 112. 255. 358. 414. 471. 508. 517, 518. 523. 581. 585. 618. 638
Strickland, Arthur - 510
Strickland, Hugh Edwin, F.G.S. - 36
Swainson, William, F.R.S., L.S., &c. - 120
Taylor, Richard C., F.G.S., &c. - 529
Tatem, James G. - 91
T. G. - 614
T. L. - 580
Trevelyan, W. C., F.L.S. - 393. 509. 512. 632. 635, 636
Thompson, Thomas - 193. 307
Tulk, A. - 514
Turner, Henry, Curator of the Botanic Garden, Bury St. Edmund's - 288. 511. 630
Waterton, Charles - 162. 166. 288. 251. 303. 322. 361. 453. 470. 516. 541. 663
W. B. B. W. - 621, 622
W. B. C. - 640
W. C. - 230
Westwood, J. O., F.L.S. - 171. 261. 398. 552
White, W. H. - 97. 343. 383. 501. 609, 610. 625
W. L. - 228. 236

XIII U.51

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ORIGINAL COMMUNICATIONS.

ART. I. *On certain recent Meteoric Phenomena, Vicissitudes in the Seasons, prevalent Disorders, &c., contemporaneous, and in supposed connection, with Volcanic Emanations.* No. 5. By the Rev. W. B. CLARKE, A.M. F.G.S. &c. [Continued from VII. 630.]

"Quid sit, unde sit, quare sit. . . . . quod ipsum explorare et eruere sine universitatis inquisitione non possumus, cum ita cohærentia, connexa, concatenata sint." — M. MINUTIUS FELIX, xvii.

To reply, satisfactorily, to the question, "What caused the prevalence of the violent westerly gales of the autumn and winter of 1833?"* we must now pursue another line of argument: and, I think, if it can be shown that these gales have had their parallels in other years, and that, during *those* years, the earth was *volcanically* affected at the time in question, we may legitimately infer that, *cæteris paribus*, as they are, the same conclusion holds good for the present enquiry.

It is on the testimony of many old and experienced sailors (and, among others, pilots of Portsmouth) that the year 1809 is said to have afforded an exact resemblance to what occurred in 1833.† A fleet was detained there, *three months*, by *violent westerly* winds. In 1764, also, the wind was westerly for

* By recorded observations of many years, and calculations, it appears that south-west winds blow at London, Bristol, Lancaster, Glasgow, and all over the west of Scotland and Ireland; and on the western coasts of France, Spain, the Netherlands, and Holland as far as Rotterdam. Mr. Kirwan has suggested (*Irish Trans.*, viii.) that the prevalence of our south-westerly winds, in the winter, arises from the opposite current between the coast of Malabar and the Moluccas. Of eighty-four observations on the winds at Villiers, in France, in Feb. 1833, there were only seven *not* westerly or south-westerly. (*Annales d'Horticulture de Paris*, xii. 139.)

† By a reference to what has gone before, it will be seen that 1809 was a *close* year in the Arctic seas; but 1808 an *open* year. In the latter year, the weather was so hot in London, that, in the summer, the thermometer rose to 93½°. See, also, what is said above (VII. 628.) of New Granada.

seven months. A writer in the *Philosophical Transactions*, speaking of Ireland more than 150 years ago, says, that there, "for *three quarters of a year*, the wind is *westerly;*" and adds, "we have sometimes known passengers wait, at Chester and Holyhead, *three months* for a fair wind to come hither." (*P. T.*, 1676.)

Now, in 1809, Vesuvius and Etna were both in eruption; and there was an earthquake at the Cape of Good Hope (*Phil. M.*, 1830); besides many other convulsions of the elements *: and the year 1764 was distinguished by earthquakes in India, the Azores, and England; and by tempests, meteors, and other atmospherical phenomena, in America, Holland, and Great Britain: a year, too, of famine, pestilence, and plague. As something more than a hasty allusion is here made, I may instance some of the occurrences of 1764 which the year 1833 has paralleled. On

Jan. 14th occurred a violent tempest, doing universal damage all over England. 18th, Meteor at St. Neotts, Hunts, with lunar rainbow. 19th, Rocks split, and inundations, at Naples. 31st, Gale in the North Sea. Meteor at St. Neotts: crossed meridian at 50° inclination to west; 39 seconds falling to the earth.

Feb. 12th, Tide flowed 1¾ h. before time; ebbed and reflowed at Bristol. In the Severn, half an hour before time; second tide at true time.

April 2d, Earthquake at Dacca. Ganges rose 20 ft.; violently agitated. At Lockepoer, a tract of country fifteen miles in circumference, with the inhabitants, swallowed up.

June 18th, Dreadful thunder storm in London.

July 20th, Fiery meteor, large as the sun, seen at Philadelphia, in N.E. to N.W., 50° high; opened and divided, and exploded like a cannon.

Sept. 16th, Violent winds in England. 28th, Highest tide in the Thames known for years.

Oct. 3d, Lowest ebb known in London for years. Highest flood at Ostend ever known; town overflowed. 9th, Rain of blood (?) in Duchy of Clèves, and at Utrecht. 9th and 10th, Unceasing rains in Holland. 12th, Earthquake in Azores, from S.W.

Nov. 6th, Earthquake in Oxford, Gloucester, Berks, and Wilts. Calm; *but tempestuous immediately after:* the air, previously, dull and gloomy, and filled with a reddish vapour. 18th, Great fire at Königsberg, caused by lightning.

There is not one of the particulars above mentioned to which something corresponding may not be found in the years 1833 or 1834. Even the *last*-mentioned incident has its fellow; for it was observed that, at the time when the earthquake occurred at Littlehampton and Chichester, on Jan. 23. 1834, the wind, which had been previously calm, rushed in violently from the south-west. A similar circumstance is related

* On Nov. 6. 1809, a most frightful hurricane, from the *north*, desolated Iceland. It blew for twenty-four hours; and carried *salt spray*, like rain, all over the island. (*Mackenzie's Travels.*)

of the earthquakes in Calabria, on March 28. 1783. Count Hippolito states that the sky was covered with clouds, and *westerly gales* blew very fresh. These were stilled one minute before the horrid crash; but, in a moment, they blew again, and were still. Different winds blew all night; but they all came from between south and west. These earthquakes were preceded by great and extraordinary frosts in 1782; by an *insufferable drought and heat in the spring;* and by copious and continued *rains*, which *began in autumn and continued to the end of January.* Rains came without thunder and lightning. Where winds used to blow, at that time there were none: but, at the beginning of the earthquake, *all seemed let loose together*, accompanied by *hail* and rain. The sea was agitated before the earth, without any visible cause. Etna erupted during the first shock; Stromboli during the last. The shocks were all from the south-west. (*P. T.*, App. to vol. lxxiii.)

The most apt illustration of a hurricane which I have met with is that given by Aristotle, in the passage where he speaks of the destruction of Helice by the earthquakes of the year B. C. 372 or 373. (See *M. N. H.*, vii. 298. note †.) He says that the *north* wind and the *south* wind *both blew at the same time*, while the shocks were destroying the city. (*Meteor.*, ii. 8.)

The above examples furnish some illustration of one class of winds, and appear to disprove the assertion of Sir J. Herschel, that "by the *heat* of the *sun* are produced *all* winds." (*Astronomy, Lardner's Cyclopædia*, p. 211. § 336.)* The *westerly* gales, probably, are to be referred to the action of the sun "*ultimately:*" but their intensity and frequent hurricane character, in 1833, point to some great modifying cause. Certain of those gales can, I think, be traced to a connection with volcanic influence; as those of Aug. 30. and 31., considered above. (VII. 303.) But, before entering upon them minutely, it may be as well to offer

Some Remarks respecting violent Winds in general, and the Ideas which occur of the Propelling Causes of our prevalent

* Mr. Lyell (*Princip. Geol.*, ii. 232.) says: — "Many of the storms termed hurricanes have evidently been connected with submarine earthquakes; as is shown by the atmospheric phenomena attendant on them, and by the sounds heard in the ground, and the *odours* emitted." He quotes hereon the smell of the sea, in Jamaica, in 1780.

Mr. Poulett Scrope (*Considerations on Volcanoes*, p. 61.) mentions three *phenomena* produced frequently by volcanic agency: — 1. Hurricanes; 2. Rain in torrents; 3. Electrical phenomena. He mentions, also (p. 59.), that "the inhabitants of Stromboli positively make use of the volcano as a weather-glass:" since its phenomena increase "in turbulence as the weather thickens;" and return "to a state of comparative tranquillity with the serenity of the sky." (See *M. N. H.*, vii. 296. note †.)

Westerly Gales. — It has been observed that westerly winds prevail, for two thirds of the year, both north and south of the equator, beyond the latitude of 30° (*Redfield*); that an almost constant westerly wind blows from the Pacific into the Atlantic; and that, on the Peak of Teneriffe, the wind is generally from the west (*Redfield*); and that westerly winds blow in America a great part of the year.* Mr. Redfield, whom I have quoted above (VII. 617.), considers these latter winds part of the circuit of the *trades*, deflected by the high lands at the back of Canada. There is little doubt that, as they are a resolution of two motions, of which the earth's is one, anything which would tend to increase that motion which corresponds with the earth's (namely, the *westerly*) would cause the wind to assume a more than usually westerly character. Now, if the continent of Europe should be heated unusually, so as to produce an induction of wind from the Atlantic by the rarefaction of the atmosphere, the effect would be what has occurred in 1809 and in 1833, and on former occasions, a constant set of the wind from the west; the intensity of which, in these longitudes, would be proportionate to the temperature of our atmosphere.† This, certainly, will account for the strength as well as rare occurrence of gales in a westerly or south-westerly direction for any continued period, without interfering with the forests of America, the distance between the earth and the sun, or the power of ice to reflect cold winds in a given direction. On this supposition, however, it is not surprising that westerly winds, passing over melting ice, should produce sudden, but *temporary*, changes of the atmosphere from warm to cold, or from dry to moist. Now, it certainly proves this to be no haphazard calculation, that the years 1833 and 1834 answer the conditions required: since, independently of actual volcanic outbreaks, the whole of the old world has been visited by a drought of long continuance, which has dried up rivers, set fire to the earth, heated the atmosphere, and sealed up springs which had never before been known to fail; while the set of the wind has been almost constantly from the snow-bound shores of Newfoundland, and the iced waters of the ocean;

* In Hudson's Bay, westerly winds blow for three quarters of the year. In Kamtschatka, the prevailing winds are from the westward. (*Pennant.*) Westerly winds are most frequent over the whole eastern coast of North America; in the southern provinces, south-west winds predominate. (*Thomson.*)

† Mr. Scoresby says, in the Arctic regions, generally, winds from the ice towards the open sea are the most frequent. (*Arctic Regions*, i. 411.)

yet, withal, accompanied by intense warmth, and electrical rains, and meteoric phenomena. It may suffice to illustrate this assertion with but few examples, since the recollection of the past season is too fresh in our minds to require much allusion; yet the following may not be unacceptable, especially as they will show that the new world, as well as the old, participated in the general fever; and that, through nearly three fourths of the globe, the same phenomena have occurred. Up to March, 1833, there was drought in New South Wales; in April, at Buenos Ayres, Manilla, and the Cape of Good Hope, where no rain had fallen since Aug. 1832.* (See *M.N.H.*, vii. 389.) The crops failed, and the cattle died for want of grass and water. In Jamaica, the drought was such, that the cattle died for want of water, which was brought more than five miles for the use of the negroes; only one third of the usual crop was harvested. In New South Wales, the drought was so destructive, that, when a little rain fell in April, it was too late to be of service. In May, England, Holland, Prussia, France, &c., were affected by drought. (See *M. N. H.*, vi. 307.) In July, the Scilly Isles were also much distressed by the same cause; but, as is well known, this part of Europe has been more or less visited by drought till 1834. In South Russia †, such a drought continued in August, that the ports were opened, by command of the emperor, to permit importations of corn. In the Cape de Verd Islands, 20,000 persons perished from starvation, occasioned by drought. New Orleans was also visited by drought in August. In September, the drought was so great at Berbice, that only half a crop of coffee was gathered in. In India, this visitation was most awful. In Madras, 70,000 suffered from scarcity, many of whom perished; and the upper provinces were desolated past description: the birds dropped lifeless, cattle perished, and the plains of Allahabad were strewed with bones, and with the bodies of the dead

* See *M. N. H.*, vi. 306. A singular testimony is offered to my reasoning, in the following extract from Mr. Howison's recent work on the *European Colonies*, i. 211. He says, that when, in the spring of 1830, he visited Beaufort (a spot *chosen, in* 1818, *for its fertility and water*), he found the neighbourhood so dry and barren, that the cattle were dying for want of food; and the inhabitants assured him that they had enjoyed *no regular rains for six years;* and pointed out the unmoistened channel of the Gamka river in corroboration of their statements. In the district of Albany, an *increasing drought* has been long experienced; and many of them anticipate a period when they will be obliged to abandon their farms on that account.

† No snow fell at Odessa in 1832–3.

and dying. China was, before that date, affected in the same way.

In consequence of the heat in France, and on the Rhine, the vintage was better than in any year since 1811.

From India, accounts, later than the above, furnish the most horrid details of women eating, and burning, and selling their children; and, from Sept. 1833 to May 1834, these revolting occurrences took place, as the famine consequent on the long drought arrived: witness Ellore, Ahmedabad, Bundelcund, and Cashmere. (*Asiatic Journ.*, Aug. and Dec. 1834.)

In Sept. 1833, the wells in the Isle of Wight were all dry. One man is said to have realised a considerable sum of money by selling water, brought from a distance.

In Gloucestershire, Lincolnshire, &c., the same inconvenience arose; and it is stated on good authority that, notwithstanding late rains and inundations, many of the springs in the centre of the kingdom remained closed so late as January of the present year; and some of them have continued so till the present date. The rivers have been lower than were ever known; and springs have failed, in 1833 and 1834, never remembered to have failed before.* In Demerara, the heat was so great in Sept. 1833, that the woods took fire, and sea water was obliged to be let into the fields. In Dominica, St. Lucia, Antigua, &c., the coffee was so burnt up as to be without leaves. Bahia and Rio Janeiro were affected in October, as well as the Crimea. Egypt and Abyssinia were also included in this catalogue; for the Nile, on which the fertility of Egypt depends, did not rise at all in 1833.† In December, the Baltic was so open, that only nine English ships wintered at Cronstadt. The mildness of the last winter was proverbial: on Jan. 15. 1834, the thermometer, in Paris,

* In February, March, and April, 1833, as much rain fell, within half an inch, as in the next six months: the evaporation in the second period was four times that of the former. (*Mr. Bassett*, in *Bury and Norwich Post.*) The month of October, 1834, has been the driest for many years: scarcely five days' rain. Dust flew as in summer; and mills have stopped for want of water. The springs, up to the date of this paper, are still lower than almost ever known: complaints, at Winchelsea, are made that the wells are dry. In Dorsetshire it is the same: the water in a pond, in my orchard, which is filled by infiltration, stands lower by 2 ft. than it did in 1833, previously to the rains of the spring.

† The inundation of the Nile is caused by rains in Abyssinia from April to September; and the usual period of the river's rising is about the 18th of June: we may, therefore, conclude that there was little or no rain, and, consequently, unusual drought, in Abyssinia for the six hot months of 1833.

stood at 14°—15° Reaum. (64°—67° Fahr.) * The European journals teem with accounts of summer flowers in blossom in January: forty-seven gathered in one place, fifty-three in another. Fruit trees were also in blossom at that time. Thunder storms occurred in Kent and elsewhere.

During the spring, summer, and autumn, of the present year, a similar drought has visited Europe and America. Up to May 15., drought and want of water were painfully felt in Van Diemen's Land. On July 13. the thermometer in the *shade* marked 93° in New York. On July 29. Canada experienced a similar heat.† At Miramichi the heat in July and August was insufferable, owing to the warmth of the air and the fires in the woods. ‡ In England the weather has been warmer than since 1829, and the temperature of the earth and wells higher than since 1822. In Hungary, Austria, Siberia, Bohemia, Prussia, Poland, the heat has been dreadful; higher by 6° and 8° than the average heat of summer.§ The following deserves minute consideration, as showing

* There was a peach tree in blossom at Stourton Castle, looking to the N.E., on January 26., of a species which seldom blooms till May. Gooseberries, the growth of the winter, were sold, at Bury St. Edmunds, on January 22. See, also, *Gard. Mag.*, x. 165–6.

† At Quebec, the cholera came with the heat, and varied with the changes of temperature. The effect of the absence of snow in America during the last winter, and of rain subsequently, has been to dry up the rivers that bring down the timber from the interior; and the "lumber merchants," as well as the shipping interest, have sustained the greatest inconvenience in consequence. This is one of the instances of the *indirect* effect of the seasons on *commerce*. In Italy, Sicily, Africa, the Ionian Islands, Candia, Turkey, Malaga, and Alicant, the olive crop has entirely failed, in consequence of the long drought: this has a *direct* effect on commerce. On the other hand, oranges arrived in England this year in October, two months earlier than usual. In more northern countries, where heat is less usual, the effect has been in some respects striking. Potatoes and apples in England, and in other neighbouring states, have exhibited a wonderful crop. The want of snow last winter in Belgium preventing the chase, was favourable to the *wolves*, who are now added to my catalogue of examples from the *animal* world. In Liege, Luxembourg, Namur, and Hainault, great damage has been done by them, as they attacked cattle in the middle of the day. A *chasse générale* was ordered by the government, in September, which probably afforded the *braves Belges* more sport than a GENERAL CHASSE'!

‡ May we not attribute to subaqueous heat the retreat of the fish from the fishing-grounds of the Gulf of St. Lawrence, as has been generally the case there, in 1834? See VII. 200.

§ The harvest on the shores of the Baltic, as in England, has been a month earlier than usual. The Vistula has been dried up with drought. In various parts of Switzerland the roads have been blocked up with avalanches. The heat of the summer has so altered the glaciers in the canton of Uri, and on the Simplon route, that great damage has been done. The body of a hunter, who was lost thirteen years since, was exposed on the Huffirm Peak, and found with his knife, weapons, &c.

a more intimate correspondence between the present period and that of the Black Death, than many of the foregoing illustrations. In Silesia, in July, the wells and rivers were dry; trees and grass faded. "*For three weeks the air was filled with haze, preventing the sight of mountains at a distance.* The air was filled with dust; the wind constantly S.E., and the temperature in the *shade* at noon, in a *north* aspect, from 24° to 27° Reaumur (86° to 93° Fahr.)." A letter dated August 2. states, "there is no appearance of rain. *The sun rises and sets like a ball of fire*, so that the timid and superstitious are filled with terror, and prophesy all sorts of calamities." (*German Papers.*) Russia has also suffered extremely. At Tula* the heat was insupportable; whilst, near Petersburg, the forests took fire, and were extensively destroyed. The same occurrences took place in Esthonia and Livonia.† Gallicia, Moravia, and all Eastern Europe have suffered intensely. All May was without rain: at Revel, the thermometer stood at 28° Reaum. (95° Fahr.); farther south, at 45 Reaum. (134° Fahr.). Slight stormy showers fell in June, but the heat continued unabated, *with the exception of two or three nights' frost.*‡ July was a disastrous month: rivers, brooks, and springs were dried up: the leaves of the trees became yellow: mills were stopped for want of water: potatoes failed also: cattle were obliged to be sold: hay and straw were beyond all price: horses fetched only from ten to sixteen dollars. § (*Allgemeine Zeitung*, Aug. 13.) Spain has suffered also from the drought. The earthquake which occurred at Cadiz, and for eighty miles round, on April 13. (half-past eight A.M.), was attributed to the drought, which had lasted through the winter, and had dried up all the springs. The vintage has been unusually good in France, along the Rhine, and in Austria, and the wine richer and better than since 1802; and there are scarcely casks enough in the country to contain it. (*Mayence News*, Aug. 4. to Sept. 26.) As a proof of the extraordinary character of the present season, we may refer to apple trees in blossom, catkins on the

* Tula was ruined by fire, on July 11. 1834, during a violent storm. Nine churches and 670 houses were consumed.

† See *M. N. H.*, vii. 616. In Carinthia, during September and October, whole forests were ravaged by these fires for sixteen days: 170 square miles were smoking together, and emitting a brilliant flame. A heavy rain extinguished the fire.

‡ On May 30. 1834, the frost was so intense, that a cluster of bees were completely frozen, at Flimpton, in Norfolk, and many were destroyed. (*Bury and Norwich Post*, June 11. 1834.)

§ The thermometer stood, at Alexandria, Aug. 29. 1831, at 144° Fahr., in the shade; and, in the sun, at 160° Fahr. (*Voyage du Luxor.*)

hazel, young shoots on currant bushes in England, and five or six chestnut trees in full blossom in the garden of the Luxembourg in Paris, in the month of September.*

The above extracts are enough to satisfy our position. Nor can any one deny that, such being the case, it should be extraordinary that *westerly* winds should prevail in 1833 and 1834. It has been remarked in the *Enc. Brit.* (art. *Electricity*, p. 616.), and by Schubler, that the greatest number of electrical precipitations take place during *west* winds. Accordingly, we find that rain, hail†, and thunder storms, of unusual intensity, together with inundations of tremendous character, have accompanied these winds, and occurred amidst the drought. And how far the present period, in these respects, agrees with that of 1816, may be seen in the *Annual Register* for that year. One fact has made a forcible impression upon me. The drought has been attended by hurricanes and inundations in a certain order, and the line of march which they have taken has corresponded with the progress of the cholera. On referring to what is said above, the following facts will show that the whole globe has partaken of a universal movement. Hurricanes and rain commenced in New South Wales at the end of April, 1833; in Bengal, in June, when they ceased till September; in China, in July; at the Cape of Good Hope in August‡; whilst in Europe, they commenced in October, corresponding in each case with the season. In August, the rains in India were dreadful; the cantonment at Meerut was injured; at Dhoola, they had

* This fact is stated in the *Globe* of Sept. 16. 1834. In my garden there is a chestnut tree the leaves of which turned yellow and began to fall so soon as August 12. A similar thing occurred in France, in 1822, in July. (Vide *Forster's Calendar*, in his work *On the Atmosphere*, p. 426.) The same tree is now (Dec. 4.) budding. The grapes in Germany ripened, in 1834, so early as June; and it is said that one district in Austria, which is reputed prolific, and the annual produce of which is about 7000 or 8000 casks, has this year produced 18,000; the wine being better than was ever known. The honeysuckle was in bloom, Nov. 3. 1834, in the lanes of Longfleet, near Poole; and summer fruits and flowers (a second crop) are gathering at various places over the country. Similar phenomena occurred after drought, in Nov. 1826.

† On April 12. 1834, a violent hail storm, about 5½ P.M., in the neighbourhood of Pubna, in India: one hailstone measured 1 ft. in circumference; another weighed 11 oz. (*Bengal Hurkaru*, *Asiatic Journ.* xv. 132.) On March 28. 1834., incessant lightning preceded a violent hail storm, at Jackson, Louisiana; some of the hailstones were 4 in. in diameter. Though it lasted only ten minutes, buildings were destroyed, and cattle killed. (*Silliman's American Journal*, xxvii. 171.) In April, 1832, hailstones as large as musket balls fell at Peshawur, in Bokhara, thermometer at 87°. (*Burnes*, i. 110.)

‡ The gales lasted twenty-four days without intermission, and the inundations destroyed much cattle.

continued rains for twenty days. In China, the rains, which subsided on July 24., were still more dangerous; the rivers were overflowed, and thousands of lives lost: the crops were ruined; villages carried away, and trade suspended.* (*Indian Journals.*) In November, great inundations occurred at Rio Grande. The wet was so destructive, also, in Hayti, as to prevent the coffee harvest. In December, 1833, and January, 1834, dreadful floods occurred in the Maine, the Moselle, the Rhine, in Holland, and France. On Jan. 2. the Seine was higher than known since 1740. On the 4th, the Severn was also overflowed from the melting of snow in Montgomeryshire. On Jan. 10. the Maes rose so high, that the water was 5 ft. deep before the houses in Gaermaes, and remained so for three weeks. To the end of the month, there were great floods all over England and Ireland. There were many houses near Limerick of which only the chimneys could be seen. There was no such flood for ten years near London, as happened at Chertsey, on Jan. 28. On Jan. 25. the

* In the spring of 1831, owing to the extraordinary melting of snow in Armenia (pointing out the presence of *heat*), the Tigris and Euphrates were unusually swoln, and the country flooded to such a degree that Bagdad was nearly ruined. (See *Penny Magazine*, Nov. 30. 1833, p. 458.) In Nov. 1826, a similar flooding occurred in the Indus. (*Burnes*, iii. 315.) The Indus, although variable in the height of its "swell," did not attain its *usual* height in 1831 and 1832 (*Burnes*, iii. 278.); which, like the low state of the Nile, must have been occasioned by the heat of the preceding *winters*; for the increased heat of the summers would have produced a *greater* rise than usual, had the accumulation of ice and snow on the mountains been as great as usual. It is certain, from various passages in Mr. Burnes's work, that some temporary changes of climate occurred in the East, in 1831 and 1832. He had, at the mouth of the Indus, terrible storms in January, and February; heavy showers, and a severe hail storm, with thermometer at 86°, in April, at Tatta, though there is sometimes a dearth of rain there for *three years at a time*. Hot tornadoes, with lightning, and without rain, occurred, also, at Toolumba, on the Hydaspes, and at Moultan, for nine nights; and at Lahore, &c. The Oxus was also frozen from shore to shore, in the winter of 1831–2; which is not usually the case, though that river is generally frozen in part. The natives attributed the *winds* which Mr. Burnes met with in his voyage up the rivers to his "good fortune," evidently surprised at their occurrence. The Caspian has, he says, since 1820, retreated more than 300 yards on the southern shore (*Burnes*, ii. 121.); which must be attributed to greater evaporation by heat. Now, the shores of the Caspian, and the adjacent countries, have been of late shaken by earthquakes. In Lahore, and all up the Oxus, there was a great earthquake, on Jan. 22. 1832, at midnight; and shocks have been frequent there. (*Burnes*, i. 17.) My brother writes me word, from Khoi, in Armenia, that there have been unusual earthquakes in Persia, of late; at Khoi, on July 6, 7. and 10. 1834: and at Tabreez on the 18th: and, from another private source, I learn that, about the same time, Jerusalem, Bethlehem, and almost all the cities of Palestine, were shaken by more violent earthquakes, for *ten days*, than were ever remembered. The earthquakes in Lahore and Persia had the same direction.

Danube suddenly and unexpectedly rose in Hungary. Czalleskos, Esieg-Nena, &c. &c., were all under water. The Waag being forced back by the Danube, also overflowed. The damage was incalculable. (*Austrian Observer.*) In Baden there were also great floods in January. It has been asserted, that much of the water occasioning some of these inundations actually issued from the earth, as in the earthquake of the year 1040, in Scotland, when, according to Holingshed (p. 238.), the ground poured forth torrents; in which year there were unusually high tides and inundations, and a frost at midsummer that destroyed the vegetation. It is a fact, that an earthquake occurred in Baden during the inundations there. It is stated on indubitable evidence, that such was the case in the Runn of Cutch, during the destructive earthquake of 1819, when water bubbled up from the wells, and from the tracts on each side of the Runn, "overwhelming the country in some places with *six* and even *ten* feet of water." (*Burnes's Travels into Bokhara*, iii. 324.) Such events as these certainly go far to establish the idea of vast subterranean reservoirs ("the waters *under* the earth"); and Sir H. Davy's discovery of living creatures in the deep underground lakes of Austria, and some recent experiments on Artesian wells, confirm it. The fluctuations in the well at Rochelle, from August, 1833, to February, 1834, led M. Fleurian de Bellevue to suppose this must be the case. (See M. Fleurian's notice before the Geological Society of France, *Bulletin de la Société Geologique de France*, iv. 424.) The fluctuations, as suggested by M. Lefebvre, were probably connected with atmospherical influence. (p. 431.) There is a good treatise on Artesian wells, by M. Marin Darbel, in the *Mémoires de la Société Impériale des Naturalistes de Moscou*, 1834, iii. 313. Various atmospherical phenomena have also marked the present year, in conjunction with violent storms and floods. In various parts of Germany, especially in Saxony, thunder storms have been unusually frequent, and the number of persons killed by lightning enormously great. On July 18. there was a frightful storm in London, when *ice* in jagged morsels fell in abundance, and an extraordinary agitation in the clouds, like a *water-spout*, was seen. The same storm, accompanied by a *much more furious wind*, was felt in Belgium, Holland, and Germany. In the north of Spain there have been terrible storms, with the bursting of water-spouts, and the consequent swelling of rivers, by which whole villages have been carried away. Similar occurrences took place in France, in June, July, and August, as at Montdidier (Somme), in the end of August. I am indebted to the

kindness of H. E. Lloyd, Esq. (whose name is so honourably mentioned in the preface to Dr. Babington's translation of Hecker's *Black Death*), for the assurance that the Loire and the Rhone, Switzerland, the Tyrol, and Lombardy, were also affected by violent floods, on August 27. and 28. On the former day, at half-past ten P.M., an earthquake occurred at Portsmouth, Chichester, Arundel, &c. It was preceded by lightning and thunder in London, Hants, &c., and succeeded, in Dorset, by fog, which hung about the hills, and eventually became rain from the S.E. At the time of the shock, rain fell in torrents in London: there had been a violent storm on the 26th, from three to five, P.M., the *barometer not* affected. This shock was immediately succeeded by the aurora. On Aug. 19. a column of air of an immeasurable height alarmed the inhabitants of Bancourt (France): its summit was surmounted with a halo, and from it proceeded terrible explosions: the tornado which accompanied it did dreadful damage.* (*Courrier du Pas de Calais.*) A similar tornado, with thunder and lightning, occurred at Kilroot, near Carrickfergus on June 12. (so also on Sept. 2. 1775, at the same place): some persons were carried by it over the fields. (*Belfast News Letter.*) On Aug. 25. H. M. S. Thetis had a heavy gale from N.E. in the Irish Channel, with squalls and rain, and at half-past four A.M. 26. she saw a *water-spout*, followed by wind from S.E. and foggy weather. This phenomenon is most unusual in these latitudes, though there is a record of one in Lancashire, on June 3. 1718. (*Philosophical Transactions*, 1719.) The month of August, 1834, seems, from the preceding statements, memorable in the annals of meteorology. It will be seen above, that there was a dreadful storm in London on July 18.; now on that day two gentlemen from Savoy ascended Mont Blanc. The thermometer fell 12° below the freezing point, Reaum. (27° below freezing, Fahr.): at half past four P.M. occurred the most dreadful hurricane on the mountain ever known in that country. (*Constitutionnel.*) The coincidence of these storms is not more remarkable than many of the previously mentioned coincidences; but it serves to connect the arguments I have advanced, and shows that the derangements of the atmosphere have not been partial only, but general. But to connect them and the other named phenomena with earthquake or volcano is my chief object. Vesuvius commenced a most violent eruption at the very time alluded to: from July 18. to 24.

* Lord Lovell relates a similar account of a fiery whirlwind, at Holkham, Norfolk, in Aug. 1741. (*P. T.*, 1742.)

lava flowed from twenty-two new openings. On July 3. occurred an earthquake at Milan, with a hissing noise, from w. to S.E., at three quarters past one, A.M., and in the same month a tornado and earthquake in Jamaica. Contemporaneous, also, with the earthquake at Chichester was the tremendous eruption of Vesuvius (the greatest ever recorded), on August 27, 28, 29., which was preceded by smaller eruptions, at the beginning of the month, and by the drying up of wells and fountains, and which, till September 3., threw out cinders and ashes. The earthquake at Chichester, on Aug. 27., was preceded by a shock at Melton Mowbray, on Aug. 4., at half past six P.M., which was accompanied by a *meteor* and great noise: a shock was also experienced at Monica, Galway, in August, when a quarter of an acre of land sunk 75 feet. The floating island on Derwentwater appeared on August 8. above water, its last rising being from June 10. to July 19. 1831. It disappeared after heavy rains on Sept. 14. On June 5. there were a very heavy gale and rain from s.w. in England.* On that day occurred an earthquake at Cephalonia, at four P.M., preceded by dreadfully hot weather; the shocks were more severe than ever remembered there. Carthagena, Rio Hache, and Maracaibo were also shaken, on the same day, by renewed earthquakes. On June 19. there was a sinking of the earth at Ripon: Vesuvius was in eruption on the same day; and on the 26th occurred an earthquake at Guadaloupe. On May 31. occurred a hurricane, in lat. 32° s., long. 21° E. On April 21—23. Greenland† was visited by a dreadful storm of wind. On March 13. to 15., Mexico was shaken by earthquakes; and on the 3d, St. Vincent was similarly visited; the sea rose, and there was a great swell in the harbour.

On Feb. 21. there was a hurricane in 17° s., 17° w. On the 22d to the 24th, Santa Martha, in New Grenada, was visited by forty shocks of earthquake. On the 10th, Malta was visited by one of those dangerous gales, called *gregalii*, from the N.E., doing great damage to the shipping, succeeded by an earthquake, on the 14th, at Parma and Genoa, Borgatoro, Pontremoli, &c. Barbadoes was visited by violent gales on the 6th and 7th. Mayence was visited by a dreadful storm on Jan. 4.; Algiers on the 7th, 8th, and 9th‡; the

* On the preceding day, 13 cwt. of mullets were taken in Poole harbour, said to be chased in by porpoises; but, on enquiry, I think there was some less visible cause for this movement among the mullets. (See *M. N. H.*, vii. 637.)

† Altona shipping news, May 2., known by arrival of damaged vessels.

‡ Sudden and furious storms off the coast of Africa have been always frequent. Livy says (xxx. 24.), Cneius Octavius was wrecked off Car-

Isle of Man, on the 7th; Lisbon the same day; Barbadoes, on the 16th to the 18th; and Dominica, on the 19th, preceded by an earthquake at Jamaica, on the 14th; and the Mauritius, by a more dreadful hurricane than any since 1818, on the 20th; the wind, in this case, not blowing all round the compass, but from S. E. to N., carrying away the largest buildings. On Jan. 20. and 22., Pasto and Popayan, in New Grenada, were so desolated by earthquakes that scarcely three houses were left standing. The heat of the preceding day, and the moisture of the night, were unprecedented. The month of January was also most stormy in the Atlantic (a dreadful gale occurred, on Jan. 21., in lat. 47° 25′ N., and long. 13° 43′ w.), and in England and France; thunder and lightning being frequent, and the barometer continually rising and falling. Several harbours, as at St. Valery and Dieppe, were completely blocked up by the shingle brought in by the set of the sea (*Echo de Rouen*); great masses of the cliffs on the west coasts of Ireland and England were undermined; and, in America, greater damage was done than ever remembered. During the storms in America, in this month, and December, 1833, a natural canal was cut through Long Point, on Lake Erie, 400 yards wide, and from 8 ft. to 10 ft. deep, by the gales. It was here that the government had begun a cut; but the storm saved them all further trouble, and an expense of 12,000*l.* (the estimated cost), by converting the peninsula into an island; and all that was required was to put a pier at the west side, to preserve the channel. (*Kingston Herald and York Courier.*) *

In December, 1833, on the 31st, there was a most violent hurricane in London, Liverpool, &c., from W.N.W.; on the 29th, at the Mauritius; on the 26th, from N.W., at Trieste, where the fury of the storm lasted about two hours, and was so confined, that, though many ships in the harbour were destroyed, a mile beyond it was smooth water and calm; and, on the same day, in the Bosphorus. On the 23d, the coast of St. Andrew's, New Brunswick; and, on the 17th and 18th, England, experienced a hurricane; on the 14th, Constantinople was ravaged, from the north, by a most dreadful hur-

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thage, owing to a *lull* of the wind, and then a furious gale from the S.W., in the year of Rome 549. (B.C. 204.) Charles V., also, as is well known, lost his fleet off Algiers, in November, 1541, by a dreadful hurricane. On Dec. 30. 1832, and, again, from April 2. to 6. 1833, there were hurricanes off the coast of Egypt. (*Voyage du Luxor.*)

* At Havre de Grace the gales of October, 1834, have accumulated an immense and dangerous shingle bank. In 1832, a similar accumulation off the mouth of the Nile was cleared by a violent storm on Dec. 30.

ricane, which was felt at Paros on the next and following day; while the Dardanelles, on the 11th, and the lat. 40° to 46° N., and long. 13° to 43° W., were visited, on the 10th and 11th, by a similar occurrence.

On November 26th, a most furious gale blew off the Scilly Isles; the wind being dreadfully high all over the kingdom, from the 21st to the 28th, attended with lightning.* On the 18th, there was a hurricane off Cape de Gatte, on the south coast of Spain (a volcanic locality). On the 2d and 3d, the coasts of France, England, Scotland, Norway, and the Baltic, together with North Germany, experienced a dreadful series of violent gales of true hurricane character: so intense were these winds, that they actually blew the corn out of the ground in Cumberland. October was a month of storms: on the 26th, there was a dreadful storm off the north coast of Candia, wherein nineteen vessels were lost; and also at Montreal. H. M. S. Rattlesnake experienced a hurricane from s. w., the same day, off Scilly. At the same time occurred an extraordinary interchange of tides at Leith; it was high water when it should have been low, and *vice versâ*, contrary to the experience of the oldest navigator. On the same day, also, *the tide rose in Poole harbour* (where there is no bore to account for it) *two feet in about as many minutes.* On the 22d, an extraordinary gust of wind passed over a portion of Cornwall and Devon, doing great damage at Plymouth and other places, in a compass of not more than 100 yards.† On the 20th, there were tempestuous gales at Vera Cruz, and, during the month, at Singapore. The gales of the 12th to the 14th have been already mentioned. (*M. N. H.*, vii. 297.) On the 11th, occurred a hurricane off the Isle of Amsterdam; on the 9th, at the Mauritius; and, on the 5th, in lat. 56° s., long. 23° E.

On Sept. 26th, occurred most violent gales at Odessa, lasting ten days, and preceded by the drought. On the 14th, there was a hurricane in lat. 45° N., long. 17° W.

* On Nov. 27. 1833, there was a most unusual display of phosphoric light in Weymouth Bay, which may, perhaps, assist in establishing the peculiar nature of that season, even if, as recently surmised, the phosphorescence of the sea be not electrical, nor owing to animalcula, but to the decomposition of animal matter, which is said to be the cause of the excessive phosphorescence of the *warm* Indian Ocean. (See *Howison, On the Colonies*, vol. i. p. 386.)

† A similar gale occurred at Lisbon, wrecking thirty-three vessels, on Nov. 7. 1816. Ten minutes before, it was perfectly calm. The rapidity of the storm was very remarkable. In Scoresby's *Arctic Regions* are mentioned many similar occurrences. (vol. i. p. 408.) The tide rose and fell at Portsmouth on Jan. 12., 1828, as at Poole, two feet, during a violent storm.

The hurricanes of August 30th and 31st, I intend to consider in detail by and by: for the present, we may observe, that, on the 20th, there was a hurricane off the coast of Finland; and in lat. 35° s., long. 21° E.; on the 17th, at Guadaloupe; on the 14th and 15th, at Antigua; on the 14th, violent gales at Bermuda, Quebec, and Lancaster Sound; on the 4th, off the Cape of Good Hope; and on the 1st, off Cuttack.

The gales of June 11. and 12. have already been alluded to (*M. N. H.*, vi. 307.), and attributed to volcanic influence (*M. N. H.*, vii. 201.).

May 21. 1833, was celebrated by a most furious hurricane, from the N. E., at Calcutta *, destroying thousands of lives †; and also at New Orleans, of almost equal intensity, from the N.W. These hurricanes, occurring simultaneously, and in such a violent manner, at a distance of 178° longitude, are also especially remarkable. Some time in May, there occurred a most furious hurricane in Nova Zembla, which blew three days from the north so tremendously, that Lieut. Pechtussoff, of the Russian navy, who experienced it (he being on a journey of exploration there), was compelled to lie on his face the whole time in the snow. (*Galignani's Messenger.*)

The hurricane of April 17., in lat. 28° s., 52° E., brings up our account for 1833 to the hurricane of Feb. 19., alluded to before (*M. N. H.*, vi. 307.); and closes our calendar of gales.

In commenting upon them, I may observe that the word *hurricane* has been indiscriminately used for want of more specific terms; and because, as I shall show, all violent storms of wind partake the character of a real hurricane, so far as their *motion* is concerned. ‡ On comparing the accounts of violent gales, in different authors, it appears, that they most frequently range round a great part of the compass during their continuance; often beginning in the quarter towards which they finally blow.

* The wind blows, at Calcutta, generally from the south during May. (*Asiatic Researches.*) It is the season of the S.W. monsoon.

† A writer in the *Indian Gazette* states that many thousands of men, women, and children "are to be found wandering about, in a state of nudity and starvation, in bands of one or two hundred, existing on the grasses and herbs of the field," the "*consequence of the gale that occurred in May, last year.*" (*Asiatic Journal*, xv. 141.) The ship Duke of York was only floated in the spring of 1834 from the place she was driven to on the sands during the hurricane.

‡ "The tempest is, both in cause and effect, the same as a hurricane. The storm, or what English seamen call a hard gale, is, I believe, nearly the same. I shall, therefore, use these words synonymously." (*Capper, On Winds.*)

A recent writer * on winds has laid down some general positions respecting them which may serve to exemplify what is here asserted. He says that the storms off the American coast, south of 30° N., drift to N., till they reach 30°, and then go to the N. and E., increasing their velocity from twelve to thirty miles per hour; that light storms travel faster than heavy ones, and that their strength is not in their direction; that, in storms going to the westward, the wind is from N.E. to N., and that the latter part of the gale blows from a southern point. Hurricanes, he observes, are proved to move in a horizontal circuit around a vertical inclined axis, which is carried onwards, the diameter being commensurate with the width of the track affected, the course being from right to left (p. 117.), the circuit being first with the sun's, and then in an opposite direction. As a proof of this, he quotes the hurricane at Barbadoes, on August 10, 11. 1831: the trees in the north of the island lay from N.N.W. to S.S.E.; in other parts, they lay from S. to N. St. Croix and Porto Rico had not the storm at first; but it was afterwards felt there.† There is a heavy swell on each side of the track of a hurricane; and, in the one under notice, a tremendous swell was thrown upon the north side of Jamaica.‡

Mr. Redfield supposes that the course of the trade winds is a wide circuit, like that of the hurricane; and that, in the southern hemisphere, the storms are in a counter direction to those north of the equator. In another paper §, the same intelligent observer states, that, in the West Indies, hurricanes commence from the northern quarter; and, on the American coast, from the eastern; and that *rotation*, caused by unequally opposing forces, produces hurricanes; a fact exemplified by fires in a circle, which will cause a whirlwind with *electrical* explosions; that eddies accompany great storms; and that it is owing to the *circular* form of winds, that the air is sometimes colder or warmer than the direction of the

* Observations on the Hurricanes and Storms of the West Indies and the Coast of the United States; by W. C. Redfield. (*American Journal of Science and Arts*, vol. xxv. part 1. p. 114.)

† Capt. Langford, whose paper on hurricanes was published in *P. T.*, 1698, has some remarks of precisely similar nature to Mr. Redfield's; and says, in his time, "the hurricane was never known to go farther westward than Porto Rico." Moreover, "I could never call any of the former storms at Barbadoes hurricanes, till that last year, in 1675." Has there been any change, then, since then?

‡ Mr. De la Beche says, also, the swell was so great on the coast of Cuba as to throw every vessel ashore at St. Jago de Cuba. (*Geol. Man.*, p. 137.)

§ Summary Statement of some of the leading Facts in Meteorology; by W. C. Redfield. (*Amer. Journ.*, xxv. p. 122.)

wind. Thus, in the winter of 1831, during six weeks, at London, a N. and N.E. wind *thawed*, while a s.s.w. wind *froze*. That there are various currents of air frequently travelling in counter directions to each other, has been often remarked.* On Sept. 18. 1834, I had a singular proof of this: the surface wind blew lightly from the *south-east*, as shown by the smoke of a cottage seen from a window. Behind the cottage rises the hill called Lytchet Beacon (about 540 ft. above the level of Poole harbour); a smoke from fires on it travelled due *south*; above the hill, and at a considerable height in the air, there were streaks of sea-fog rapidly moving to the *north*; while, over all, the light specks of clouds, in the lofty sky, were quietly stealing along from the *west*. On the 19th, at daybreak, the fog occupied the whole landscape, and was so thick as to hide all objects a few yards off. The south wind, therefore, descended in level. Winds high up in the atmosphere often transport matters in a direction totally contrary to what may be, *primâ facie*, imagined. Ashes from Vesuvius, on Dec. 6. 1631, fell in Greece and 100 leagues from the coast of Syria† (*Redfield*), when there was no wind at the time. In 1812, St. Vincent threw ashes to Barbadoes, sixty or seventy miles to the east, and 100 miles beyond, directly in the teeth of the trade-wind, which then blew from the west. (*Id.* See also Dr. Hancock's Paper, *Phil. Mag.*, 3d series, iv. 343.) In the same year ashes fell on the deck of a packet bound to Brazil, when 1000 miles from any land. (*Redfield.*) A friend of mine informs me, that, when sailing through the Cape de Verd Islands, in June, 1822, the rigging was suddenly covered with a brownish dust, which appeared like triturated pumice, and had a sulphuric smell. As the wind was N.E., I am inclined to consider this dust not volcanic, but transported sand from the African desert, attracted, possibly, by heat from Fogo (one of the Cape de Verds), or by some eruption at sea to the southward, as in the case of Etna, May, 1830. (VI. 298.) Now, it can make little difference in the effects, whether a current of *cold* air *descends* to the surface of the earth, or a *heated column ascends*‡; nor can it

* Mr. Forster speaks of four currents of air on Oct. 25. 1809. (*Researches on Atmospheric Phenomena*, p. 343.)

† Dr. Daubeny gives the date of the eruption in 1631, December 16. The date of the shower of ashes I take from Badily's account of it. (*Polehampton*, iv. 161.) Vesuvius was, therefore, in eruption before December 16. Ashes, also, from Hecla, fell on a vessel seventy-five miles north of Shetland, and all over Norway, in 1783.

‡ Young, in his *Lectures* (i. 704.), considers hurricanes as caused by portions of the upper currents of the air prematurely diverted down; and says their course is contrary to the regular trades. Sir J. Herschel, com-

alter the case, whatever be the cause of the rarefaction. In countries lying near the sun, it is doubtless true that the heat of that luminary is the chief cause of the set of the wind; yet it sometimes occurs that, even there, a hurricane travels against the course of the regular storm winds. And thus the hurricane at Calcutta, lat. 22° 30′ N., on May 21. 1833, blew almost uninterruptedly from the N.E., which is the point opposite to that of the monsoon then blowing, though it afterwards came all round the compass. This leads me to believe that the cause of that hurricane was a disengagement of heat in the eastern volcanic band of the Moluccas; which I consider somewhat established by the contemporaneousness of the hurricane at New Orleans, from N.W., within a few miles of the same distance from the volcanic band of the West Indies, that Calcutta is from the Moluccas. There are, however, volcanic foci nearer. The valley of the Mississippi is subject to frequent earthquakes. The circular course of the hurricanes in the West Indies has been observed elsewhere. Mr. Orme (*History of Hindostan*) relating the effects of the hurricanes off the Indian coast, on October 2. 1746; October 31. 1753; December 30. 1760; October 20. 1763; mentions that the storms blew from all points, ranging round the compass; and that the effects were not felt a few miles either way from the locality of the principal mischief. Mr. Capper (*On Winds and Monsoons*), therefore, considers these hurricanes as whirlwinds whose diameter cannot be more than 120 miles. The hurricane of March 10. 1770 illustrates this most admirably. The Britannia Indiaman was taken by it from the N.E., and much injured. The

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menting on this (*Astronomy*, p. 132.), says, "a rapid transfer, either way, in latitude, of any mass of air," carried any how "*above the reach of the friction* of the earth," would be "sufficient for a hurricane; and two, for a tornado."

This heat (of the sun) is communicated to the "air near the surface of the torrid zone, which being thereby rarefied ascends; and its place is supplied by colder air, which rushes in from the north and south." (*Thomson.*) It is obvious how the powerful *ascending draught of air* which *constitutes a hurricane*, and which acts so strongly in depressing the barometer, will have an equal effect in setting loose the imprisoned winds of the earth. (*Poulett Scrope, On Volcanoes*, p. 60.)

To show the effect of aerial convulsion, however produced, the following fact is advanced:— The roof of a quarry, at Parnay, near Saumer, in France, fell in, in the last week of December, 1833, at two o'clock, A.M. The depth of the displaced materials was twenty yards, and the width about 400 yards. Now, the concussion of the air thus produced drove a heavy waggon and a barrel of lees full fifty yards; it blew down, also, a thick wall, and carried many lighter articles at least 130 yards. (*French Journals.*)

wind, it is said, blew so completely equally from all points of the compass, "that, at the end of ten hours, when the hurricane subsided, *the sea bore very little appearance of having been violently agitated.*" The next day, a few leagues to the westward, they were met by a French vessel that had not felt the storm; and they were also overtaken by another ship, following the Britannia's track, which had not suffered the least inconvenience. This hurricane, therefore, did not extend more than thirty leagues.*

Mr. Scoresby (*Arctic Regions*, i. 409.) observes, that, in the Greenland seas, "storms, in the spring of the year, blowing from the S.E., generally change, before they abate, to E., N.E., N., and N.W.; but storms commencing at S.W. or S. usually veer, before they subside, in the contrary direction, towards the N.W.; and sometimes continue changing until their strength is spent in the N. or N.E. quarter." He mentions, also, several gales which exactly parallel what is related above of the Britannia. "Two ships," he says, "bearing N.E. from us, had the wind at N.E.; two, bearing E., at E. and E.N.E.; two, bearing S.E., had the wind at S.E.; while, with us, it blew from the N.W." (vol. i. p. 404.) The date of this was April 30. 1810. Again, in April, 1813, he says: — "In the course of the day, we had winds from every point of the compass, and with every degree of force from storm to calm."— "Though we were nearly becalmed, we observed several ships a few miles to the south-eastward, under close-reefed topsails, having evidently a gale of wind blowing in the direction (S.S.E.) of the swell. About two hours afterwards the southerly wind reached us; and, as we stood to the eastward, gradually increased to a gale." To this succeeded a calm, at 5 P.M. "From the clear atmosphere to the northward and westward, and the dense sky to the southward and eastward, with the heavy swell from the S.S.E., it was evident that we were between two winds, a southerly storm to the southward of us, and a northerly breeze to the northward. At 7 P.M. of the same day, a north-east wind commenced, and soon blew a tremendous storm." This last was a general storm, extending over "several degrees of latitude to the southward;" and was "particularly predicted by the barometer and thermometer, the former having fallen from 29·74 to 28·98, and the latter from 30° to 12°, in about twelve hours." (p. 406.) Agreeably, also, to what Mr. Redfield has stated respecting the *swell* which attends the

* On March 1. 1818 occurred a dreadful hurricane at Mauritius, blowing from S.E., N.E., to N.N.W.

hurricanes of the West Indies, Mr. Scoresby says, "Swells in the polar seas are often the harbingers of storms." * (vol. i. p. 223.) "It is a very usual circumstance, in traversing the ocean, to meet with various swells, the evident results of powerful winds, indicating the prevalence of storms in the immediate neighbourhood, without ever being reached by the storms by which such swells are produced." He experienced, in lat. 68°, in July, 1813, heavy swells from the E.N.E. and W.S.W., distinctly visible at the same time, while the wind was from the south. In April, 1815, he had swells both on the north and south, and before they had disappeared from the east, indicating storms in those directions; and, in July, 1816 †, "while crossing the North Sea, swells from the N.E., S.W., and E. occurred together; and, in April, 1817, heavy distinct swells from the W., N.W., and S.S.E., prevailed at the same time." (p. 222–3.)

We thus perceive that the circular form, and other peculiarities, of the true hurricane have been witnessed in the east and the north; and, perhaps, the above examples may explain how gales in England have occurred from different points of the compass, according to the different places of observation. The dreadful hurricane of Oct. 23. 1834, preceded by violent gales from the 16th of that month, commenced in Holland and on the Baltic from the S.W., but gradually veered to the W. and N.W.; from which latter quarter it burst with fury on the British Islands, doing immense damage along their shores and those of the Continent. This gale was attended with many electrical phenomena. Lightning was seen at its commencement, in the evening, near Winchester, in a *perfectly cloudless sky* ‡, by Mr. Beaumont of that place; and, in Scotland, the aurora was most brilliant at the same time: cold

* An unusually high tide in Poole harbour is, on the testimony of old observers, considered indicative of a coming gale, at the interval, perhaps, of some days. I have myself noticed this. On Sept. 13. and 14. 1834, there was a tremendous swell from the S.W., in lat. 42° 31′ N., 13° 40′ W. long., as a friend writes from Madeira, just six days before the hurricane of Dominica.

† During July, 1816, occurred inundations in Holland, Saxony, Switzerland, Hungary; and thunder storms in Temeswar; a fall of aerolites at Bonn; waterspouts, thunder storms, &c., in England; while, in the north-eastern parts of Europe, there was a drought of long continuance. Prayers for rain were offered up in Riga, Petersburgh, &c.

‡ On *silent* lightning, see Dr. Hancock, in *Phil. Mag.*, 3d Series, iv. 340. A friend tells me, that, in the middle of November, 1830, there was lightning all night for a week, 600 miles eastward of the Caribbee islands; and that, during the day, the same small clouds were seen all round the horizon, though the lightning was not then seen: there was no thunder during the whole time.

followed, ice near London, and snow on the Welsh and Cumberland mountains.

Aug. 31., 1816, was as remarkable as Aug. 31., 1833. * On that day occurred a dreadful hurricane along the eastern and southern coasts of England, occasioning many awful wrecks. At Ramsgate, it blew from N.N.W., with a *very high sea;* at Margate, from N.E.; while, at Dover, the wind was west. It may be here again noticed that Vesuvius was in eruption on Aug. 7.; and, on the 13th, earthquakes were felt all over Scotland.* (See *M. N. H.*, vii. 303.)

The gales of Aug. 1833, amongst the severest ever known in these latitudes, commenced in the same manner on Aug. 20., in the S.W.; and gradually came round to W.N.W. and N.E., till the end of the first week in September, occasioning, by their violence, the loss of no less than 106 British vessels, besides foreigners.

The gales of Aug. 30–31. offer two other characters corresponding with those of the hurricane. "All hurricanes," it is said, in the West Indies, "happen on the day of the *full*, change, or quarters of the moon;" "the sea smelling stronger than at other times." †

Now, it happened that the moon was *full* on Aug. 30. 1833; and the fishermen of Boulogne predicted the storm ten hours before its arrival, because they perceived an *odd smell* from the sea, and an unusual agitation on its surface, though there was then no gale to disturb it. They conceived that a dreadful storm raged 40 leagues to the westward, and would be with them in the evening. ‡ The loss of the Amphitrite will long make the remembrance of this hurricane a painful one. Off Shetland, the gale varied from N. by E. to S. by W. Between 12 and 8 A.M. of Aug. 26., the barometer, off Shetland, rose; but sank 1½ in. before noon of the 27th. The sea was tremendously high; ships from Archangel were driven into the harbours for shelter. § On the 31st, at Limerick, Captain Kater observed the southern end of the diurnal

* A similar hurricane occurred in some places, extending to Scotland, varying from S.E. to S.W., with lightning, thunder, &c., on March 5. 1818, during an eruption of Vesuvius.

† Letter from Captain Langford to Mr. Bonavert. (*P. T.*, 1698.)

‡ The agitation of the sea, together with the setting of the sun in a red haze, are prognostics of a gale of wind.

§ The effects of this hurricane, on the woods along the coast, have been frequently noticed: I was surprised, however, recently, to see the trees, in the deep and sheltered valley of Rodborough, near Stroudwater, without their tops, which were snapped off by the wind during this hurricane. With what violence must it have rushed up through the indentations in the Cotteswoldes!

variation-needle to make an extraordinary deviation, to the westward, of nearly half a degree. This occurred at seven minutes before 4 P.M.: at 3 h. 50 m. P.M. it was 15′ 10″ w. of zero; at 3 h. 55 m., between 40′ and 50′ w. of zero. * The gale was scarcely felt at all at Limerick. (*Naut. Mag.*, ii. 680.) This fact is very valuable.

Before the storm, the barometer fell suddenly and very remarkably throughout the extent of its course; immediately after, it suddenly rose; the thermometer falling, from Aug. 31. to Sept. 1., to 43°. Rain, to the amount of 1¾ in., fell in the two days of the hurricane. During the whole month of August, the *mean* height of the barometer was more than in any August since 1827; the *maximum* more than since 1823, in August. The heat was below that of Aug. 1831 and 1832; and the extremes below any, in August, since 1823. The rain in August was less than the usual quantity, though so much fell on the last two days. It has been remarked that numerous birds were destroyed by this hurricane, so great was its intensity. On the 31st, there were found 700 or 800 sparrows dead under a tree at Mr. Hairden's, at Nedingworth, near St. Ives; and 14 sparrows and 14 swallows at Spalding. Similar destruction occurred elsewhere; numbers being driven, by the force of the wind, against buildings, and killed by the concussion.† Mr. Yarrell (as I learn, by the kindness of the editor) has already alluded to this

* See note in VII. 613. On May 17. 1833, and July 10. 1833, there were great disturbances in the direction of the needle, during displays of the aurora, in Pennsylvania. (*Professor Bache*, in *Silliman's American Journal*, xxvii. 113.)

† Birds have frequently fallen victims to the elements under similar circumstances. During heavy gales, many sea fowl, attracted by the light, are found dead about the lanterns of the lighthouses on the coast; as I was informed at Flamborough, when visiting the lighthouses there in 1823. [See V. 502.] The town of Dieppe was visited by many North American birds on Oct. 23. 1834, blown thither by the hurricanes of that and the previous days. During the hurricane of Oct. 24. and 25. 1822, alluded to below, multitudes of birds were blown over to the Durham and Northumberland coasts, and killed by the wind. (*Sir W. Jardine.*) The same thing occurred on April 4. 1799, when lapwings, grey plovers, woodcocks, &c., were cast on shore, in hundreds, on the coast of Holderness; many of them starved, with their bills under their wings. On April 6., crows dropped dead from cold; and others were killed by the wind. (*A. R.*)

A Mr. Templer, describing the hurricane of Oct. 13. 1690, at Braybrook, Northamptonshire, tells of an accident of the kind, in these quaint terms: — "It (the wind) beat down a *jackdaw* from the rick, *with that violence, as forced the guts out of the body*, and made it bleed plentifully at the mouth." (*P. T.*, 1671.)

Mr. Fuller, speaking of the hurricane in Huntingdonshire, on Sept. 8. 1741, says: — "The poor *pigeons* that were caught in it were blown to the ground, and dashed in pieces." (*P. T.*)

fact, as connected with Cambridgeshire, on the cover of the May (1834) Number of this Magazine. In a private letter to the editor, that gentleman observes: — "The gales swept the whole surface of that level country with a force that was never known before."

During the 31st, the Thames was so low, that persons walked dryshod over the river below London and Waterloo bridges; but the tide instantaneously returned a foot high, rolling in like a wave; and, in less than three minutes, the water was deep enough to float the steamers that were aground. This agitation was traced down the river to Ramsgate and other places in the Channel; and it was, therefore, probably owing to the wind alone. The same thing occurred on June 10–11. 1833.

That storm I have connected with Vesuvius; and the hurricanes of August with earthquakes and eruptions in Asia, Europe, and America. (*M. N. H.*, vii. 303.) The great objection to this connection is, perhaps, the distance of the locality of the volcanic outburst from the spot affected by the storm. Now, it will be sufficient to show the possibility of this by well-established facts; and, for that purpose, I shall content myself with stating instances where storms have been traced much farther than the distances supposed in the above examples.

It is an ascertained fact, that the hurricane of Aug. 1830 was traced from the Caribbee Islands to Florida, and thence to Newfoundland: 3000 miles in six days; having a duration of about twelve hours in each place. Another hurricane of the same month passed from the Windward Islands, and was traced 2500 miles. The Russian ship Kensington suffered in this. The famous hurricane of Aug. 10–11. 1831 travelled 2300 miles in six days, from Barbadoes to the northern shores of the Mexican Gulf and New Orleans.*

A storm was observed, by Dr. Mitchell, in 1802. It began at Charlestown, on Feb. 21., at 2 P.M., and reached Albany on the 22d, at daybreak; performing 1100 miles in eleven hours. (*Phil. Mag.*, xiii. 272.) These three facts are worth a world of conjecture; but there are others which also serve to connect the argument by almost positive induction. Mr. Forster (*On the Atmosphere*, p. 72.) states that thunder storms, on July 30. 1822, occurred simultaneously at Lausanne and Vevai, in France, along the Rhine, through Holland, and in England, as far as Bridgenorth in Shropshire. The journal of that gentleman shows that, in this respect, 1822 paralleled 1829, as well as in others.

* Redfield, in *Amer. Jour.*, vol. xxvi. p. 1.

Two or three other examples may suffice. On Oct. 24. and 25. 1822, a most furious gale from the N.E., accompanied by a fog, blew towards the shores of Durham and Northumberland. On the 24th, also, occurred a dreadful hurricane at Genoa, attended with torrents of rain; which swelled the rivers, and did incalculable damage. When the rain ceased on the 25th, a lake was seen, with the tops of the houses and trees only visible. (*N. E. M.*, i. 470.) Now, on this day, Vesuvius was in violent eruption: and it is scarcely possible to separate that phenomenon from the hurricane at Genoa, whatever may be said for the gale in England.

The hurricane which occurred at Nevis on Aug. 17. 1827 (the severest for more than forty years) was preceded, a few days before, by numerous shocks of earthquake; seven and nine being felt at a time in that island. Surely this is positive proof.

In the year 1827, there was, in Ireland, on Jan. 9-10.*, and on the 16th also, a severe hurricane; the latter accompanied by hail, rain, westerly wind, and noises in the air resembling explosions of artillery. (*A. R.*) From the 13th to the 15th, also, there were tremendous gales off Holland.

Now, on the 2d, a severe earthquake was felt in the department of Orne, in France; and, on the 15th, there was an earthquake at Hohen Memmingen, from N.W. to S.E.; on the 29th, an earthquake at Ohnastetten; and again, on Feb. 8., from S.W. to N.E. The two last set out from the Jura Alps, where there are basalts. (*Schubler.*)† On Feb. 10., there was an earthquake in Caernarvon and Bangor, &c.; and, on the 23d, along the Rhine and in Belgium. (*Schubler.*)† On the 17th occurred sudden and violent gales, from the S.E., in Scotland; while, on March 3. and 7., tremendous hurricanes, with most extraordinary accumulations of snow, also did great damage over the whole of Scotland.

Since the preceding particulars were enumerated, accounts have been published of a very sudden and frightful tornado off the Island of Arran, on Sept. 4. 1834, which blew away houses, and did incalculable damage. On the same day, at 8 A.M., an earthquake shook the mountains of Norway, and was strongly felt at Christiania; the distance of these localities being scarcely 500 miles. Vesuvius was also still in eruption. This case will, therefore, without difficulty, be allowed to bear on my argument.

Persons who have been frequently exposed to hurricanes, in

* Avalanches were numerous in Switzerland on the 11th; and a dreadful snow storm occurred, the same day, in Yorkshire.

† Correspondentz-blatt Wirtemberg Landwirths, &c., Sept. 1829, p. 131.

the West Indies, assure me that they are *invariably* accompanied by shocks of earthquake; but that the confusion occasioned prevents many from remarking or distinguishing the shock during the awful noise and convulsions of the elements.*

What, indeed, can satisfy so well as intense heat suddenly developed the fury of a gale, which, by the power of the wind alone, has driven a tenpenny nail more than three fourths of its own length through a thick plank†; and has forced a deal board more than a foot into a solid wall of masonry? both which circumstances were recently related to me by a gentleman who witnessed them at Barbadoes, during the hurricane of 1831. My informant told me other facts equally striking; remarking, that he would not bear testimony to what he had seen of the force of the wind in that and the other islands, except to an intimate friend, lest ignorant persons, who knew not his estimate of truth, should doubt occurrences so wonderfully contrasted with what is known here in cases of elemental commotion.

There were various instances in 1833, and in the beginning of the present year, of storms which traversed an extent of sea and land almost incredible under any other supposition than that of induction towards a spot heated from below. The hurricanes of Calcutta and New Orleans (the one 88° E., the other 90° W., from the meridian of London) occurring on the same day, and blowing towards a central point, from the N.E. and the N.W., might lead to the idea of a whole hemisphere contemporaneously affected by some such cause as produces the regular trade-winds and monsoons: but the propelling cause of the winds, in these simultaneous hurricanes, could not be the sun; and, therefore, considering the principles above stated, reason would point to some cause operating, at different points, upon the surface of the earth or sea; and, as the distance of a volcanic locality, in either case, is but a few miles more or less than the extremes of 1000 and 1600 (and it is very likely that volcanic action did occur, at the same moment, at the extremities of the arch of 180°‡), it

* The great evidence as to the fact of the earthquake is, the perpendicular rent, from below, of walls and buildings.

† Professor Winthrop, relating an account of the whirlwind at Cambridge, in New England, on July 10. 1761, says:—"Some *nails*, that were in a cask in the east chamber, were driven, in great numbers, into the trees on the eastern side of the house." This whirlwind commenced with clouds from the S.W. and N.W., in the junction of which the *circular* motion began; the storm going to the N.W., and scattering beams and trees to S., N.N.E., and E. (*P. T.*, 1761.)

‡ June 5. 1834 witnessed earthquakes at Cartagena, in 80° W. long., and Cephalonia, in 20° E. long., at the same time; the difference in latitude being more than 27°. Earthquakes occurred simultaneously at Fez in Africa; and in New York, Boston, &c., in America; on Nov. 18. 1755.

appears, after the instances mentioned above, where storms were traced 2300 and 3000 miles, more probable to assume the hurricanes in question connected with some exciting heat in the volcanic regions so near at hand. Nor, if this argument holds good, can we refuse a like probability to the action of Vesuvius or Graham's Island as producing a rarefaction sufficient to attract a current of air from England; which is much less removed from the Mediterranean chimneys than is Calcutta from the Moluccas, or New Orleans from the Caribbees. The hurricanes of June and August, 1833, were felt over France, Germany, Holland, Russia, Spain, Italy, as well as England: the power, therefore, which set the winds in motion, over such an extent of surface, must have been not only universal, but, as observation has proved, one which commenced from the point to which the hurricanes were successively directed. If the time were to be calculated at the places visited by those hurricanes, it would be found that the supposition is far from hypothetical; especially if due regard be had to the evidence afforded by meteors, &c., as previously stated.

The writers in the *American Journal* (see *M. N. H.*, vii. 291.) mention the occurrence of terrible gales of wind, on Nov. 13. 1833, between the latitudes 40° and 50° N., and long. 30° and 50° W.; and these gales I have, on the supposition of the meteors being of the same kind as the aurora, connected with previous branches of my disquisition. When considered, however, in connection with the facts previously stated respecting hurricanes, about the same period, in other parts of the globe, and the examples of terrestrial heat, it would seem to be unphilosophical to suppose that one cause did not operate in the exhibition of so many concurrent phenomena. Two very recent occurrences seem to strengthen the principles above developed. On Sept. 21. 1834, at 11 A.M., occurred a sixth severe earthquake at Chichester. On Sept. 30. the aurora was visible for a considerable period, and was succeeded by meteors; its character, especially as seen from the southern coasts of England, being well defined. (See VII. 615.) The earthquake was probably connected with some volcanic phenomenon at a distance, as, in the other instances, such has been the case; and, if it should hereafter appear that this is not solely conjectural, the occurrence of the aurora will be still stronger evidence. But I do not rely much on *this* coincidence, for reasons which I shall show in my next.

On Sept. 16. *, about 11 P.M., *a sudden gust of hot wind*,

* Five days previously (Sept. 11.), a smart shock of earthquake was felt at Hainau in Lower Silesia.

from the *east*, fierce as if from a furnace, was felt in Dublin; the wind continuing to blow at intervals of *a minute*. (*Dublin Evening Packet.*) About two hours later on the same night, two persons, walking between Mount Pleasant and Nieuydd, near Caernarvon, perceived a similar phenomenon: the hot gust came from the N.W.; and it is described as having the same effect upon the face as if it had been exposed to the escape-plate of a stove for heating air. It lasted *a minute*. (*Caernarvon Herald.*) In neither case was there any mistake as to a limekiln or furnace. Now, the winds, in these examples (for they appear but continuations of one current), must have moved in a circular form, from E. to N.W., at about the rate of thirty-five miles an hour; the difference in latitude of the two localities being twelve miles, and in long. 2° 7′. If it be supposed that these gusts of hot air were not parts of the same current, then it may be apprehended that, on the line between Dublin and Caernarvon (the latter frequently subject to earthquakes), there was some emanation of terrestrial heat. Almost coincident with this were a terrific thunder storm at Dover, on the 17th; and a tornado, doing great mischief (literally blowing away houses and barns), which took place, in Buckinghamshire (at Ivinghoe, &c.), on the 18th: and, on comparing all the localities, it will be perceived that the line of connection between Dublin and Dover passes through the localities of the tornado in Bucks, and of the hot wind at Caernarvon. Moreover, this is a line not unmarked by shocks of earthquake at previous times; and, on this supposition, the tornado on the 18th is properly accounted for as the result of a disengagement of electrical or terrestrial heat.

Stanley Green, Nov. 1834.

[*Errata in Mr. Clarke's Essay*, No. 4. (VII. 609—630.) — In p. 614., the last line but three of the text, for "latter" read "former." In p. 627. line 11. from the bottom, for "42° E." read "42° N."]

ART. II. *Some Account of Walton Hall, the Seat of Charles Waterton, Esq.* By JAMES STUART MENTEATH, Esq.

——— "The birds, . . .
Securely there they build, and there
Securely hatch their young."

HAVING often wished to visit Walton Hall, my wish was not long ago gratified. In consequence of an invitation from

its kind-hearted owner, Mr. Waterton, I lately partook of his hospitality.

A few observations, hastily made, that occurred during my visit, may perhaps not be uninteresting to the readers of the *Magazine of Natural History*.

Walton Hall, a place that must, like Selborne, be ever dear to the lover of ornithology, from the many attractive objects it presents in the way of that engaging pursuit, is situated in the parish of Sandal-Magna, about four miles from Wakefield, in the county of York. This district of country forms part of the great coal formation of Yorkshire. The soil usually overlying the coal stratification is a clay, which, being of a stiff tenacious texture, is unfriendly to the better kinds of herbage, unless it be extensively drained, and well mixed with calcined limestone; but the clayey soil of the park of Walton rests immediately upon a thick stratum of the coal sandstone, which, mouldering down, yields it a due proportion of siliceous earth, and makes it an excellent soil for the growth of the richer species of grasses. Trees of nearly all kinds flourish luxuriantly upon it. Among these, especially, the sweet Spanish chestnut, one of our most valuable trees, and in the present day far too little encouraged as forest timber, is this year profusely laden with fruit, not much inferior to that which is imported from the south of Europe.

The climate is equally favourable with the soil for the growth of the delicate kinds of vegetation. The vine grows on walls in the open air, and scarcely ever fails to bear each season tolerable grapes; this year there has been an abundant crop of as fine grapes as those raised under glass. The sweet-water and black Hamburgh vines are the only varieties that have been cultivated.

Walton Hall stands upon an island included in a small lake well stocked with fish, and has been the residence of the Watertons time out of mind. The present elegant Grecian mansion occupies the site of an ancient castellated house, which, encircled by water, and accessible only by a drawbridge, must have been, before the use of cannon, an impregnable strong-hold. During the civil wars of Cromwell and Charles I. this family, staunch adherents to the house of Stuart, defied old Noll's vengeance, and gallantly kept his forces for some time at bay, though the venerable castle was reduced almost to a heap of ruins.

All that now remains to tell the tale of its former chivalry is an ivy-clad tower. This tower will be visited with no small interest and curiosity by the ornithologist. The days of rapine and violence having happily passed away, never, we

hope, to return, this tower, by many ingenious devices and contrivances, has been made a commodious and undisturbed habitation for many a family of the feathered race. In a snug corner, thickly grown over with ivy, can be seen in any day of the year, a pair of common white owls taking their nap; and, at night, the ears of the admirer of such music may enjoy their nocturnal serenades.

——— "From yonder ivy-mantled tower,
The moping owl does to the moon complain
Of such as, wandering near her secret bower,
Molest her ancient solitary reign."

During the breeding season, every movement of this industrious couple may be overlooked from the windows of the hall, as they flit to and fro to cater for their hungry young family. Though the owl finds in this tower an unmolested haunt, the pretty starling, the blackbird, the thrush, the wild duck, the wood pigeon, "sweet sequestered bird," and several others, reposing a confidence in the humane owner which is never abused, resort to this delightful retreat, either to enjoy the shelter or to bring up their young.

Leaving the venerable tower and its inhabitants to enjoy that quiet which nothing disturbs, let us enter the hospitable mansion. Its doors are ever open to the poorest visiter who craves a view of its rare and curious collection of objects of natural history; and nothing is allowed to be offered to any domestic who attends: in this Mr. Waterton sets a noble example to others, who suffer their servants to receive money.

Among the most choice of the rarities of this collection none are more interesting than the birds.

"Their plumage, neither dashing shower,
Nor blasts that shake the dripping bower,
Shall drench again or decompose;
But, screen'd from every storm that blows,
It boasts a splendour ever new,
Safe with"

the amiable wanderer, who, often at the hazard of his life, and suffering dangers by land and water, while exploring the wilds of South America, got them together.

It would be idle to attempt a description of these treasures. That delightful book, the *Wanderings*, which, like White's *Natural History of Selborne*, is in almost every hand, has already rendered the reader familiar with them all; and it has also acquainted us with many a hairbreadth escape of its author, that one ignorant of the daring resolute character of Mr. Waterton almost hesitates to believe: but those who have known him from his early youth to manhood can bear

testimony to the strict veracity that has ever characterised him, and can recount not a few of his dangerous feats of prowess and of daring. Few at his time of life are his equals in climbing a rope or a tree: this activity of body and steadiness of nerve give him infinite advantage over most of our modern naturalists in examining the nests of many birds, placed in almost inaccessible situations, and in thereby ascertaining important facts relative to their habits and character.

During the present summer, no less than eleven times this dauntless naturalist was let down the frightful beetling precipice of Flamborough Head, whence

> "The fishermen, that walk upon the beach,
> Appear like mice; and yon tall anchoring bark,
> Diminish'd to the cock; her cock, a buoy
> Almost too small for sight;"

in order that he might collect the eggs of the guillemot, the puffin, and the cormorant, and likewise examine their mode of hatching and other habits. I was informed by Mr. Waterton, that he has ascertained several interesting circumstances touching these sea fowl, and it is to be hoped that he will send the results of these curious observations to the *Magazine of Natural History*, whose pages are already much indebted to his pen, for contributing some of the most delightfully composed and valuable papers for which it is distinguished; every one must regret he does not appear oftener as a contributor in it.

To return to the objects in the museum. The fierce ill-looking cayman or crocodile, on whose back Mr. Waterton fearlessly mounted, while his men were dragging the monster of the deep from his native element; the snake of gigantic size, which nearly cost the intrepid traveller his life, when he grappled with it; splendidly beautiful plumaged species of birds; and numerous other animals, are seen, preserved in such a manner as to give them an appearance of life, which one can see in no other museum of natural history. The art of preserving birds and animals is amply detailed in the *Wanderings*, a detail that I should recommend all bird-stuffers and keepers of museums to study and follow; and, above all, I would call upon them to visit Walton Hall, and see the art carried to the highest perfection.

Among these interesting objects, none interests more the observer than the "nondescript" animal, concerning which so much has been affirmed only from conjecture. Under what genus it is to be classed, Mr. Waterton best knows; as yet he has not disclosed it: only one individual, we believe, has been intrusted with its habits, manners, and character.

On leaving the house, and its island, and its old ivied tower, we next enter upon the park. This piece of ground embraces almost 300 acres, surrounded by a high wall to keep out the poacher and other intruder. As no gun is ever fired within its precincts, that

> ——— "clamour of rooks, daws, and kites,
> The explosion of the levell'd tube excites,"

is never heard, nor any dog suffered to disturb its peace, it may easily be supposed it will be the favourite resort of many kinds of birds. Abounding in extensive woods and groves, and an ample space of water, every fowl can suit its own taste for a sheltering-place, for a haunt to build its nest, and rear its little brood; all those birds which elsewhere suffer from the gamekeeper's ruthless gun and trap, and from those whom the bird-stuffer employs to take them prisoners, receive protection within the walls of Walton Park. The owl is an especial favourite. Besides our slumbering two friends, whom we left in the old ivied tower in the island, eleven pairs of others occupy holes in trees, and other comfortable dormitories, purposely contrived and fitted up for their dwelling-places. It is not a little curious to observe, that, if these "wanderers" of the night be offered an unmolested habitation, a pair are not long in finding it out, and taking possession of it. Mr. Waterton, from his careful and accurate examination of the habits of the owl, has clearly exculpated it from the false charges and foul calumnies, aspersing its spotless reputation, of being the destroyer of young pigeons and their eggs. The same friendly turn he has done for the starling. Both these birds often are indwellers of the pigeon cote, not from a preference of it to any other harbour, but because the destroying hand of man has left them scarce another spot to retire to, and to breed up their young.

Many other calumnies, heaped upon others of the unoffending birds and animals, when closely scrutinised, will no doubt be found to rest on equally untenable grounds as those affecting the character of the poor owl and starling.

No animal is more wronged and sinned against, than the harmless but much slandered hedgehog. The rook equally comes in for his share: though we verily believe that both will be found most useful servants of man. The former has often been unjustly criminated by the gamekeeper, as being a depredator of his game; and by the farmer, as milking his cow: the gardener, who joins in the hue and cry against this inoffensive animal, will find the hedgehog a valuable assistant in clearing his garden of many insects, noxious to his plants

and interests. The rook will be found equally useful to the husbandman, as the destroyer of the eggs, the worms or larvæ, and the caterpillars, of insects hurtful to his root and grain crops.

The rapacious birds also find a home in Walton Park, and a friend in its proprietor. The raven is now and then seen, though but rarely, as the hand of the enemy has fallen heavily upon this noble bird. Great flights of the carrion crow, every evening of the year, may be seen repairing from all directions for their roosting-place in its woods; magpies in equal numbers may likewise be seen taking up in them their sleeping-quarters; different varieties of hawks resort for the same purpose, and here their "aeries build."

Some might suppose, from the presence of so many birds of prey, that no game would be found in the park: it is quite the reverse; game abounds in it. In 1833, a wood pigeon built in a tree four feet below that of a magpie; both lived in the greatest harmony, hatched their eggs, and reared their young. Many similar instances of the rapacious birds and the others living here peaceably together might be adduced. The pheasant, the partridge, the woodcock, in their season, and the hare, are very numerous. Were it not for the shelter they meet within the walls of the park, Mr. Waterton believes that they would have been ere this rooted out of his district of country, as some species of birds, such as the larger variety of woodpecker and others, have been.

The pheasant receives every attention. Except for about four months of the year, he can provide himself with food by living upon the beech mast, the sweet chestnut, acorns, and other sorts of food. To provide him with winter provisions, Mr. Waterton plants a quarter of an acre with the thousand-headed cabbage, which is sown in April, and transplanted in June. This cabbage the pheasant eats voraciously in the winter time. Beans are preferred to any kind of grain, as being less pilfered by the smaller birds.

The grasshopper,

> ——— "saltitans per herbas,
> Æstatis est chorista,"

whose sweet summer song was unceasingly heard, is now silent and scarce ever heard; this insect is a dainty repast of the pheasant.

Besides the hedgehog and the rook, the jay and the woodpecker come in for their share of proscription by the gamekeeper, to swell his murderous calendar to produce to his squire. Those last two birds, he affirms, on no just grounds, prey upon his game, by pilfering eggs, and by other acts of

villany. It may be truly asserted of the beautiful woodpecker, that he is never seen to alight on a tree, unless it be in a state of decay: in that condition, the decayed wood abounding in insects, which are rapidly hastening its final decomposition, the woodpecker is attracted to it to prey upon them, and pick them out from the rotten wood. While a tree is sound, he is, we firmly believe, never seen to settle upon it.

Though the park has not been above two or three years quite enclosed by high walls, its complete privacy and security have attracted a small family of herons to form a colony on some of the aged oaks that overhang the lake: this year there have been four nests, all of which have been hatched, and some able-bodied youngsters have been sent out to swell the rising population of the heronry. The herons repay their kind landlord's assiduous care of them by destroying numbers of the water-rat, that infests all our waters, and even houses.

Being on the verge of that range of country which the nightingale visits in its annual migrations, Walton Park has generally the enjoyment of the mellifluous notes of one or two of these heavenly musicians, who, each

> ——— "in his evening bow'r,
> Makes woodland echoes ring.
> . . . . . .
> And sings the drowsy day to rest."

When the season of the sere and yellow leaf draws on, the migratory birds, all knowing the moment when to forsake for a time their loved homes, flock into Walton Park, as a place of refuge after their long voyage. Among this assemblage are seen the woodcock, the fieldfare with its inseparable dear fellow traveller the redstart, and several others, emigrants from distant lands. Such are a few of the daily and occasional inhabitants of the woods and groves of Walton Park.

Notwithstanding several pairs of wood pigeons breed in the confines of the park, when winter sets in, immense numbers flock in to feed on the beech mast. These appear to have come from foreign countries.

If the land birds of all kinds and dispositions receive an invitation, and find a true friend in Mr. Waterton, no less so do the water birds; and that most beautiful of all the British birds, the kingfisher, which may be considered as the link which unites these two classes together.

The lake, abounding in a variety of fish, which we have described as encircling the hall of Walton, is the continual and occasional resort of many of our waterfowl. The wild duck, the wigeon, the teal, the coot, are seen on its pleasant waters in great numbers. The wild duck is a continual

inhabitant of the lake. Several pairs hatch and bring up their young. But during the winter season great flocks of them migrating from the frozen north, as well as of the wigeon and of the teal, pass their inclement season here.

Though the wild ducks are seen on the waters during the daytime, at nightfall they repair to the sea-side, the shores of which are distant nearly a hundred miles, for their supper; and, by return of dawn, these active travellers, far surpassing, in speed of wing, the rapidly moving locomotive steam-engine, are seen on the bosom of the lake, quietly pruning and careening their plumage. The wigeon, feeding like geese on the grasses and aquatic plants, does not go so far for his nightly meal. If, however, he be undisturbed, he will feed during the daytime.

Not unfrequently the wild goose and the wild swan take up their abode in severe weather in the lake.

The seamew is also not an unfrequent visiter: the abundance of eels and other fish tempts the voracious cormorant to leave the stormy ocean, and pass his winter pleasantly at Walton. This bird usually travels with his mate; and it is interesting to observe the loving couple, an example of conjugal affection to human kind, fishing and diving in company. Tired with the sports of the deep, and finding an unmolested landing-place on the island, they often rest themselves from their labours on its pretty shores, within a gunshot from the windows of the hall.

An instance of the humane and paternal care and solicitude Mr. Waterton evinces for the comfort of his feathered family, during winter, had nearly escaped me. He encourages the growth of ivy around the stems of his trees, which not only shelters many a poor starved benumbed bird, when the storm rages, but offers it an agreeable place for its nest in the spring.

From these few and hastily collected observations while visiting Walton Hall, it will appear that Mr. Waterton possesses the finest and most extensive zoological garden in the kingdom, or perhaps in Europe. Here roaming unconstrained and at free liberty, every bird and animal can be examined in its true character. In possession of a powerful telescope, which is often used, Mr. Waterton watches and examines the habits and movements of his varied feathered population. Almost constantly abroad, nothing escapes him.

The perfect seclusion of the park enables him to experiment harmlessly on his subjects. In the spring of 1833, he made a carrion crow hatch two rook's eggs, a magpie those of a jackdaw, and the daw those of the pie.

In concluding these very imperfect remarks on Walton Hall, I am sure that every one who, like myself, has shared the hospitality and enjoyments of a visit to this second White of Selborne, will join with me in these words of the Latin poet: —

——— " Hinc tibi copia
Manabit ad plenum benigno,
Ruris honorum opulenta cornu."

——— " Here to thee shall plenty flow,
And all her riches show,
To raise the honour of the quiet plain."

Closeburn Hall, Nov. 22. 1834.

[The following particulars have been derived from another source: —

" Walton Park consists of 260 acres. The wall around it is, for above a mile, 10 ft. high; the remainder of it, 9 ft. at the lowest part. There is no public road or footpath through this park, and no gun is ever allowed, upon any score, to be fired in it. The park abounds with fine timber; and Mr. Waterton, in laying out some new grounds about twenty-six years ago, did every thing that love for birds could suggest, to make them come and settle there. This protection to the birds enables them to perform their daily functions without fear and trembling.

" In the centre of the park is a sheet of water, of 24 acres in extent; upon which, in winter, from 2000 to 3000 wild fowl may sometimes be seen. In the lake is a rock, and on this rock stands Walton Hall; now a modern building, but, in times long gone by, a place of strength."]

Art. III. *On the arbitrary Alteration of established Terms in Natural History.* By Hugh E. Strickland, Esq.

" Trivial Names ought never to be changed without the most urgent necessity." — *Fabricius.*

I would offer a few remarks on a practice which appears to me to be highly detrimental to the progress of natural history. I allude to the custom, which seems to be daily gaining ground, of altering the established generic and specific names of natural objects, without any sufficient reason for so doing. I have frequently noticed the commission of this offence by writers both in this Magazine and in other modern periodicals; but I never met with a more barefaced instance of it

than in *M. N. H.*, vii. 593., where an anonymous correspondent (S. D. W.) has had the temerity to alter the long-established appellations, both generic, specific, and vernacular, of the common bullfinch; and that, too, on grounds the most vague and unsatisfactory. In protesting against such "wholesale changes" as this, I am far from discarding S. D. W.'s proposal, merely "because it is new;" and will, therefore, follow his advice, and endeavour to "state my reasons" for so doing.

In any systematic work on natural history, the parts which are essential to the elucidation of each species are, the *specific name*, *specific character*, and the *description*; to each of which a distinct object is assigned. The *description* of a species ought to contain every character and circumstance belonging to it, except those which apply to the whole genus. All the facts that appertain to a species are thus formed into a fund, which we may apply to any purpose we have in view. The *specific character* enables us to recognise any species which we may meet with for the first time, or to compare it with others of the same genus; and, to form this character, we select from the description certain characteristics, which, singly or combined, belong to that species alone. Lastly, the object of the *specific name* is precisely the same as that of all names whatever; which have been defined to be, "*arbitrary signs adopted to represent real things or conceptions.*" Hence, the use of names is, in fact, nothing more than a kind of *memoria technica* [artificial memory]: by means of which, in writing or speaking, the idea of an object is suggested, without the inconvenience of a lengthened description. The advantages of this principle are found to be so great, that mankind have, in all ages, applied it to every subject on which they have had occasion to discourse, as well as to every individual of their own species. It is remarkable, however, that Linnæus was the first to distinguish each species of natural object by a peculiar appellation. Before his time, naturalists were obliged to resort to the singularly inconvenient method of repeating the specific character every time that they wished to designate any species. Thus, in the time of Ray, our Lànius Collùrio, for instance, was known as the "*Lanius minor rufus;*" and Lànius rùfus of Temminck was designated "*Lanius minor cinerascens, cum maculâ in scapulis albâ.*" [See the inconvenience of this mode humorously shown, in I. 134, 135., by Miss Kent.] The *specific name* was introduced as a substitute and representative of the *specific character* in common discourse; that *character* itself being preserved, for purposes of reference, in systematic works.

Now, in order that the object of the specific name may be duly performed, it is essential that it be universally adopted, and, therefore, never, or very rarely, altered. But it is not, I think, essential that the meaning of the name should precisely designate the species; or, indeed, that it should have any *meaning* at all. [See VI. 232., VII. 636.] Proper names, in general, have either no meaning, or one not in any way referring to the persons they represent; and yet they are found fully to answer their object of defining individuals, in consequence of their being universally recognised, and never altered; and the peculiar names of species ought, I think, to be in the same way regarded as proper names, the end of which is defeated by repeated alterations. And, although viewed in the light of a *memoria technica*, the recognition of species, by means of their names, is certainly facilitated, if the meaning of those names has a reference to the objects which they represent, yet this is so far from being essential, that it is, in some cases, prejudicial, by blinding persons to the distinction between the *specific name* and the *specific character*, and causing them to regard the objects of the latter as belonging to the former. Surely, then, the evil of changing a name, which has once become current among naturalists, is much greater than any advantage supposed to result from substituting a term which is "more appropriate."

Some persons even maintain that the name of every species should have a meaning applying to it *exclusively*. The above arguments show that such a system of nomenclature, being founded on a mistaken view of the object of specific names, is therefore *unnecessary;* and it is easy to prove that it would, in many cases, be *impossible:* the *specific character* is supposed to represent, in the most condensed form, that combination of properties which distinguishes the species in question from all others. In a few cases, one word is sufficient for this purpose; but, in general, a whole sentence is necessary, before the species can be accurately defined. Therefore, *if the necessity existed* to express the exclusive characters of a species every time it is mentioned, it is plain that we must give up *specific names* altogether, and recur to the *long sentences* of Willughby and Ray. Nor should we mend the matter by attempting, in defiance of all rules of language and of euphony, to melt these sentences into such sesquipedalian words as those which Mr. Thomas Hawkins has adopted for the Ichthyosaúri. [VII. 478.]

In addition to the arguments above stated, there are several other strong objections to the arbitrary and unlicensed alteration of established names. If the species with which the

naturalist is concerned amounted only to a few hundreds, or a few thousands, then, indeed, the supposed improvement of the nomenclature might be in some measure excusable; but, since the profuse fecundity of Nature has overwhelmed her admirers with such myriads of forms, that their number alone constitutes the chief difficulty with which they have to contend, it is surely the height of folly to increase that difficulty, by bestowing a multiplicity of names on the same object. From the excess of this practice, the rectification of synonymes has become the most laborious part of the process of compiling systematic works on natural history; which are thus vastly increased in size and price, and rendered more repulsive to the general reader. There are, also, many other sources of inconvenience in this practice. Can S. D. W., for instance, expect that the whole republic of science will take the trouble of relabelling their cabinets, altering their catalogues, or making notes in their works of reference, because an anonymous writer fancies that he can improve *P*yrrhùla vulgàris by changing it to Densiróstra atricapílla? Again, if some adopt the alteration, a large number will not: and hence it is that we rarely find the same species labelled alike in two different museums. In short, if this practice be once given way to, there will soon be an end of all nomenclature, and, through it, of all science; for true it is, that,

"Nomina si pereunt, perit et cognitio rerum."

If names perish, the knowledge of things perishes with them.

The above arguments apply equally to the proper names of genera, or of larger groups, where such groups are retained unaltered, their appellations only being changed; as in the case of the genus *P*yrrhùla, which S. D. W. has altered to Densiróstra. Where an old genus is divided into several new ones, new appellations must, of course, be found for them; but, even then, the original name should be retained for that group which is the most typical of the whole.

A complete parallel seems to exist between the proper names of species and of men. The first discoverer of a species may be regarded as its parent or godfather; who bestows on it any name he thinks fit, and publishes it to the scientific world in some standard work, as in a parish register: and, as the laws of the land forbid men to change their names without due cause, so the laws of natural history ought to be equally severe against those who encumber species with a multitude of *aliases*. It would, I think, be highly desirable if an authorised body could be constituted, to frame a code of laws for naturalists, instead of the present anarchical state of

things, in which every one does that which is right in his own eyes.

With respect to established species, priority seems to be the universal law for the adoption of specific names (see some excellent remarks, by Mr. Westwood, in the *Zoological Journal*, iv. 3—9.); subject to the exception, that the same name be not repeated twice in a genus. And, if persons could be brought to view specific appellations purely in the light of proper names, this law need have no other exception; for, as we do not object to *William Whitehead's* name because his hair may happen to be *red*, so, if the *meaning* of a specific name be downrightly inapplicable to the object, this need not prevent its *sound* being adopted as the conventional sign of the species. But as, in practice, such a circumstance would produce confusion, we are compelled to admit the farther exception to the above law of priority, that if, as rarely happens, the specific name have a meaning contradictory to the species which it represents, that name should be changed for one that is not contradictory. For the same reason, in naming a new species, it is *desirable* that the name be as expressive as possible; but, if no term that is applicable should occur, the term fixed upon should, at least, be *not contradictory*.

I hope that S. D. W. and other correspondents will regard this subject with the attention which it deserves.

[Mr. Curtis has, in his *Illustrations of British Entomology*, t. 487. note *, disclaimed the exercise of the practice of altering names; under certain conditions, and for certain reasons, there expressed.]

ART. IV. *An Attempt to classify the "Varieties" of Animals, with Observations on the marked Seasonal and other Changes which naturally take place in various British Species, and which do not constitute Varieties.* By Mr. EDWARD BLYTH.

THE appellation "variety" being very commonly misapplied to individuals of a species, which are merely undergoing a regular natural change, either progressing from youth to maturity, or gradually shifting, according to fixed laws, their colours with the seasons, I conceive that it will be useful to some, to point out a few of the less generally known changes which naturally take place in various British animals; some few of which appear to have been hitherto overlooked, and others to have been described incorrectly.

The term "variety" is understood to signify a departure from the acknowledged type of a species, either in structure,

in size, or in colour; but is vague in the degree of being alike used to denote the slightest individual variation, and the most dissimilar breeds which have originated from one common stock. The term is, however, quite inapplicable to an animal in any state of periodical change natural to the species to which it belongs.

Varieties require some classification; and though I feel myself hardly adequate to the task, I shall here propose to arrange them under four principal heads; in the hope that this endeavour will induce some naturalists, more competent than myself, to follow out this intricate and complicated subject, into all its details.

I would distinguish, then, what are called varieties, into *simple variations*, *acquired variations*, *breeds*, and *true varieties*. These appear, in general, sufficiently distinct, although the exact limits of each are sometimes very difficult to be assigned. Indeed, in many cases they only differ in degree, and in others they may be all combined in one individual. Moreover, the varieties of either class have a much greater tendency to produce varieties of another class, than the typical animals of a species have to produce any sort of variety.

I. *Simple Variations.* — The first class, which I propose to style *simple or slight individual variations*, differs only in degree from the last, or *true varieties;* and consists of mere differences of colour or of stature, unaccompanied by any remarkable structural deviation; also of slight individual peculiarities of any kind, which are more or less observable in all animals, whether wild or tame, and which, having a tendency to perpetuate themselves by generation, may, under particular circumstances, become the origin of true *breeds* (which constitute my third class of varieties), but which, in a state of nature, are generally lost in the course of two or three generations. Albinoes belong to this first division, and also the other numerous anomalies mentioned in VII. 589—591. 593—598. These *simple variations* occur both in wild and in domestic animals, but are much more frequent in the latter, and are commonly observed in all *breeds* and *true varieties*.

Among the Mammàlia, total or partial absence of colour is always, I believe, continued through life; excepting, of course, the cases of mere seasonal change; and, in this class of animals generally, perfect albinoes are much more numerous than among birds. Perfect albinoes are peculiar to warm-blooded animals, and in them there is a total deficiency of colouring matter in the rete mucosum, and, consequently, in the fur, and even the pigmentum nigrum of the eye is entirely wanting. In birds, these *perfect* albinoes are extremely rare,

although several instances have been recorded in VII. 593. — 598. There are three sorts, however, of true permanent albinoes, which may be thus designated: — 1. *Perfect Albinoes;* which are entirely white, and in which the eyes appear crimson, from the total want of colouring matter, rendering the minute bloodvessels visible: 2. *Semi-Albinoes;* which are either white or of a pale colour all over, and in which the irides are always paler than usual, and not unfrequently blue [I. 66. 178.]: and, 3. *Partial Albinoes;* which are partly of the natural colour, but are more or less mottled *permanently* with white; and in which, if a white patch surrounds the eye, the pigmentum of that organ is commonly wanting. I have thus observed a rabbit, one eye of which was red, and the other dark hazel; but such instances are of very rare occurrence, although (and it is a curious fact) rabbits are often seen wholly white, with the exception of a small patch around each eye; which organ, consequently, is of the usual dark colour. Albinoes, when paired together, as is well known, produce chiefly albino offspring, and a *breed* of them may thus be perpetuated; but, even in a domestic state, they not unfrequently produce young of the usual colour; and, if paired with an ordinary individual, they sometimes produce partial albinoes, or semi-albinoes [I. 178.], and occasionally, if the original colour be brown (as in the case of mice or rabbits*), a black, sandy, or slate-coloured offspring, or an individual with one of these colours more or less varied with white, is produced; but, in the majority of instances, the young wholly resemble one of their parents, and the *preponderance* is decidedly in favour of the natural hue. The coloured offspring of an albino, however, even if matched with another coloured individual, has still a tendency to produce albinoes†, and this fact has been noticed in the human species; but, as Mr. Lawrence observes on the subject (in his *Lectures on the Physiology, Zoology, and the Natural History of Man*), "the disposition to change is 'generally' exhausted in one individual, and the characters of the original stock return, unless the variety is kept up by the precaution above mentioned, of excluding from the breed all which have not the new characters. Thus, when African albinoes intermix with the common race, the offspring generally is black," &c. These observations apply alike to all *simple* or individual *variations*, and to most other varieties, and afford one of many reasons why marked

* These observations are chiefly deduced from the results of some experiments with mice and rabbits.

† Of seven young rabbits thus produced, two were albinoes, one black, and the remainder of the usual colour.

breeds are in a state of nature so rarely perpetuated. There is yet, however, before quitting this subject, another sort of albino to be considered, which, I believe, is peculiar to the feathered race, and which is not, like the others, permanent; these, therefore, I shall denominate *temporary* albinoes. Most of the pale, white, and pied varieties of birds, which are produced in a state of nature, are of this kind. A friend informs me that a perfectly white lark in his possession moulted, and became of the ordinary hue. I lately shot a sparrow which was all over of a very pale brown, or cream colour; it was moulting, and some of the new feathers that were coming were of the usual colour, and others were of a pure white: on the next moult, probably, no more white feathers would have appeared. Of a brood of young robins which frequented my garden, two were white, one partially so, and one of the usual mottled brown; these all moulted into the ordinary colour. I could add other instances to the list, especially amongst domestic poultry. But it does not hence follow that among wild birds there are *no* permanently white or pied varieties; or, in other words, no true partial and semi-albinoes. A blackbird with a white head has now inhabited a garden in this neighbourhood for three successive years; and if the cupidity of collectors did not mark out every white or pied bird for destruction, I doubt not that I should have been able to have furnished some other similar instances of *permanent* variation.

II. *Acquired Variations.* — The second class of varieties which I would designate thus, comprises the various changes which, in a single individual, or in the course of generations, are *gradually* brought about by the operation of known causes: such as the greater or less supply of *nutriment;* the influence of particular *sorts* of food; or, either of these combined with the various privations consequent upon *confinement;* which changes would as gradually and certainly disappear if these causes were removed.

Redundance or deficiency of nutriment affects chiefly the stature of animals. Those herbivorous quadrupeds which browse the scanty vegetation on mountains are invariably much smaller than their brethren which crop the luxuriant produce of the plains; and although the cattle usually kept in these different situations are of diverse breeds; yet either of the breeds gradually removed to the other's pasture, would, in two or three generations, acquire many of the characters of the other, would increase or degenerate in size, according to the supply of nutritious food; though, in either case, they would most probably soon give birth to *true varieties* adapted to the change. In this instance, *temperature*

appears only to exert a secondary influence. The Iceland breed of sheep, which feeds on the nutritious lichens of that island, is of large size; and, like the other ruminant animals which subsist on similar food, is remarkable for an extraordinary developement of horns. Another example of *acquired variation*, dependent solely on the supply of nutriment, may be observed in the deciduous horns of the deer family, which are well known to be large or small according to the quality of their food. That *temperature* also does exert an influence greater or less, according to the species of animal, is very evidently shown in the case of the donkey*, of which there are no breeds, nor true varieties, and but very few simple variations. [VII. 590.]: this animal is every where found large or small, according to the *climate* it inhabits.

The influence of particular *sorts* of food may be exemplified by the well-known property of madder (*Rubia tinctorum*), which colours the secretions, and tinges even the bones of the animals which feed on it of a blood-red colour; and, as another familiar instance, may be cited the fact, equally well known, of bullfinches, and one or two other small birds, becoming wholly black when fed entirely on hempseed. I have known, however, this change to take place in a bird (the small aberdevatt finch, so common in the shops), which had been wholly fed on canary seed; yet this by no means invalidates the fact, so often observed, of its being very frequently brought about by the direct influence of the former diet. In several instances which have fallen under my own observation, feeding only on hempseed has invariably superinduced the change.†

The most remarkable of acquired variations are those brought about in animals in a state of confinement or domestication: in which case an animal is supplied regularly with abundance of very nutritious, though often unnatural, food, without the trouble and exertion of having to seek for it, and it becomes, in consequence, bulky and lazy, and in a few generations often very large; while the muscles of the organs of locomotion, from being but little called into action, become rigid and comparatively powerless, or are not developed to their full size. The common domestic breeds of the rabbit, ferret, guinea-pig, turkey, goose, and duck, are thus probably only acquired variations, which, from the causes

* For some curious remarks on this subject, see the excellent article "Ass" in Partington's *Cyclopædia of Natural History*.

† I have not heard, however, that wild bullfinches, hawfinches, and other birds liable to be thus affected, are more commonly found black in localities where hemp is much grown. Amongst others, the skylark and woodlark are very susceptible of the influence of this food.

above-mentioned, have, in the course of generations, become much larger and heavier (excepting, however, in the case of the turkey) than their wild prototypes, and less fitted for locomotion; but which, if turned loose into their natural haunts, would most probably return, in a very few generations, to the form, size, and degree of locomotive ability proper to the species when naturally conditioned.* The crested varieties of domestic geese and ducks, and the hook-billed variety of the latter, are, however, in all probability, *true varieties;* and what are called "lob-eared" rabbits may be either a *true variety*, or a *breed.* The various slight diversities, which I call *simple variations*, are very common in the present class of varieties; and there is also in them a great tendency to produce what I call *true varieties*, as well as those slighter deviations, which, by particular management, may be increased into the sort of variety I denominate *breeds.*

III. *Breeds* are my third class of varieties; and though these may possibly be sometimes formed by accidental isolation in a state of nature, yet they are, for the most part, artificially brought about by the *direct* agency of *man.* It is a general law of nature for all creatures to propagate the like of themselves: and this extends even to the most trivial minutiæ, to the slightest individual peculiarities; and thus, among ourselves, we see a family likeness transmitted from generation to generation. When two animals are matched together, each remarkable for a certain given peculiarity, no matter how trivial, there is also a decided tendency in nature for that peculiarity to *increase;* and if the produce of these animals be set apart, and only those in which the same peculiarity is most apparent, be selected to breed from, the next

* [*A Tame Duck which flies with the same Power, and at the same Height, as a Crow.* (H. S., in I. 378.) — Was not this duck a wild one? I am led to ask this question from having myself witnessed a similar instance. I had often seen a duck, which I had taken to be a tame one, flying about, and always returning to the farm to which it belonged. On enquiry, I found that this duck had been taken, when a duckling, from the nest of a wild duck, and began to fly as soon as it was full grown. The case which H. S. mentions might probably be accounted for in the same manner, as it is by no means likely that so unwieldy a bird as the tame duck should think of trying its wings, after its ancestors had for so many successive generations been satisfied with walking and swimming, and fly "with the same power, and at the same height, as a crow." — *W. H. H. Postmark, Burton on Trent, Oct.* 8. 1834.

The late Rev. Lansdown Guilding had remarked as follows on the case stated by H. S.: —

Domestic birds, from flying little, have their muscles relaxed, or, perhaps, they never acquire their natural strength, for want of exercise. I have observed the geese in Worcestershire, in harvest time, to take very long flights; but, though they went on boldly, they never ascended very far into the air. — *Lansdown Guilding. St. Vincent, May* 1. 1830.]

generation will possess it in a still *more* remarkable degree; and so on, till at length the variety I designate a *breed*, is formed, which may be very unlike the original type.

The examples of this class of varieties must be too obvious to need specification: many of the varieties of cattle, and, in all probability, the greater number of those of domestic pigeons, have been generally brought about in this manner. It is worthy of remark, however, that the original and typical form of an animal is in great measure kept up by the same identical means by which a true *breed* is produced. The original form of a species is *unquestionably* better adapted to its *natural* habits than any modification of that form; and, as the sexual passions excite to rivalry and conflict, and the stronger must always prevail over the weaker, the latter, in a state of nature, is allowed but few opportunities of continuing its race. In a large herd of cattle, the strongest bull drives from him all the younger and weaker individuals of his own sex, and remains sole master of the herd; so that all the young which are produced must have had their origin from one which possessed the maximum of power and physical strength; and which, consequently, in the struggle for existence, was the best able to maintain his ground, and defend himself from every enemy. In like manner, among animals which procure their food by means of their agility, strength, or delicacy of sense, the one best organised must always obtain the greatest quantity; and must, therefore, become physically the strongest, and be thus enabled, by routing its opponents, to transmit its superior qualities to a greater number of offspring. The same law, therefore, which was intended by Providence to keep up the typical qualities of a species, can be easily converted by man into a means of raising different varieties; but it is also clear that, if man did not keep up these breeds by regulating the sexual intercourse, they would all naturally soon revert to the original type. Farther, it is only on this principle that we can satisfactorily account for the degenerating effects said to be produced by the much-censured practice of "breeding in and in."* There would almost seem, in some species, to be a tendency, in every separate family, to some particular kind of deviation; which is only counteracted by the various crossings which, in a state of nature, must take place, and by the above-mentioned law, which causes each race to be chiefly propagated by the most typical and perfect individuals.

V. *True Varieties.* — The last of these divisions to which

* See, however, a good practical article on this subject, entitled "Breeding," in one of the forthcoming numbers of the now publishing edition of Miller's *Dictionary of Gardening and Rural Economy*.

I more peculiarly restrict the term *variety*, consists of what are, in fact, a kind of deformities, or monstrous births, the peculiarities of which, from reasons already mentioned, would very rarely, if ever, be perpetuated in a state of nature; but which, by man's agency, often become the origin of a new race. Such, for example, is the breed of sheep, now common in North America, and known by the name of *ancons* *, or *otter* sheep. A ewe produced a male lamb of peculiar form, with a long body, and short and crooked limbs: the offspring of this animal, with ordinary females, was found sometimes to resemble the one parent, and sometimes the other; but did not usually blend the characters of each; and, in the cases of twins, the two lambs were often equally diverse with their parents. This variety was extensively propagated, in consequence of being less able to jump over fences than the ordinary breeds of sheep. The solidungular ["donkey-footed"] variety of swine, tailless cats, back-feathered, five-toed, and rumpless fowls, together with many sorts of dogs, and probably, also, the race of fan-tailed pigeons, are other striking examples of *true varieties*.

The deviations of this kind do not appear to have any tendency to revert to the original form: this, most probably, could only be restored, in a direct manner, by the way in which the variety was first produced.

To this class may be also referred, with more than probability, some of the more remarkable varieties of the human species. With regard to colour, we know that temperature exerts no *permanent* gradual influence whatever: white races remain unchanged at slight elevations within the tropics; and the natives of Boothia Felix are very dark; the swarthy inhabitants of Mauritania are a white race, and their sunburnt hue is merely an *acquired variation*, which is not transmissible by generation, and which does not extend to those parts which are not exposed to the sun. The colouring principle of black races is inherent in them, and is quite independent of external agency; is even darkest in some parts which are the least exposed, and *vice versâ*. The Ethiopian race is nowhere more black than in the vicinity of the Cape of Good Hope, where the crops are sometimes injured by the winter's frost. Strangely enough, this invariableness of colour constitutes about, perhaps, the most fixed character of these races.

There is one fact, however, here to be observed, which is very well worthy of attention; and this is, that coloured

* *Agkōn*, an elbow, from the crooked form of the forelegs. See Lawrence's *Lectures*, p. 447, 448.

varieties appear to have been chiefly produced in hot countries; which seems almost to induce the conclusion that they were originally efforts of nature, to enable the skin to withstand the scorching produced by exposure to the burning rays of a tropical sun.* How far the structural peculiarities of the negro and other races may not, in some cases, be the effects of *breed*, it would be impossible, perhaps, now to ascertain, and would be worse than presumption, in a novice like myself, to try to determine. Wherever a black individual was produced, especially among rude nations, if the breed was continued at all, the natural aversion it would certainly inspire would soon cause it to become isolated, and, before long, would, most probably, compel the race to seek for refuge in emigration. That no example, however, of the first production of a black variety has been recorded, may be ascribed to various causes; it may have only taken place once since the creation of the human race, and that once in a horde of tropical barbarians remote from the then centres of comparative civilisation, where no sort of record would have been preserved. But it is highly probable that analogous-born varieties may have given rise to the Mongolian, Malay, and certain others of the more diverse races of mankind; nay, we may even suppose that, in some cases, the difference, in the first instance, was much *greater*, and was considerably modified by the intermixture which must have taken place in the first generations. The mixed offspring of two different varieties of man thus generally blends the characters of each; though instances are not wanting of its *entirely* resembling (like the mixed produce of an ancon sheep) either one or the other of its parents; but in this case (as in the albino) the perfect characters of the other parent frequently show themselves in the next generation. I am entering, however, into a wide field, already well trodden by many philosophers; and the subject is already probably pretty well understood by the great majority of readers. Those who are not so familiar with it, will find it ably treated in various works; especially in Dr. Pritchard's work on man, and in the published *Lectures on the Natural History of Man*, by Lawrence: some sound and excellent remarks on *varieties* will also be found in the second volume of Lyell's *Principles of Geology*.

Still, however, it may not be impertinent to remark here, that, as in the brute creation, by a wise provision, the typical characters of a species are, in a state of nature, preserved by

* See Dr. Stark "on the influence of colour on heat and odours," in Jameson's *Edinburgh Journal* for July, 1834; also Professor Powell's reply to it, in the number for October, 184.

those individuals chiefly propagating, whose organisation is the most perfect, and which, consequently, by their superior energy and physical powers, are enabled to vanquish and drive away the weak and sickly, so in the human race degeneration is, in great measure, prevented by the innate and natural preference which is always given to the most comely; and this is the principal and main reason why the varieties which are produced in savage tribes, must generally either become extinct in the first generation, or, if propagated, would most likely be left to themselve, and so become the origin of a new race; and in this we see an adequate cause for the obscurity in which the origin of different races is involved. In a civilised state of society there are other inducements, besides personal attractions, and a new variety in this case, unless very *outré* indeed, would be gradually merged, and in a few generations would disappear entirely by intermixture with the common race. The inferior animals appear not to have the slightest predilection for superior personal appearance; the most dissimilar varieties of the same species mix as freely and readily together as the most typical individuals; the most powerful alone becomes the favourite. Instances of this are not rare in the breeds of dogs.

The above is confessedly a hasty and imperfect sketch, a mere approximation towards an apt classification of "varieties;" but if it chance to meet the eye, and be fortunate enough to engage the attention, of any experienced naturalist, who shall think it worth his while to follow up the subject, and produce a better arrangement of these diversities, my object in indicting the present article will be amply recompensed.

Here, however, I may observe, that the classification I have proposed for specific deviations in the animal creation, is equally applicable to those of the vegetable. The "varieties" in both are strictly analogous.

I come now to the second division of my subject, which is to point out

Some Periodical and other Changes of Appearance, which naturally take place in various British Animals, and which do not constitute Varieties. — Among our native Mammalia, I know of three principal modes whereby a change of colour is brought about; namely, an actual shedding of the coat; a partial shedding of the coat; and an actual change of colour in the coat itself.

I. As an example of change of appearance produced by actual shedding of the coat, may be instanced the fallow deer

(*Cèrvus Dàma*), whose white spots disappear with the annual casting of its coat in autumn.

II. Partial shedding of the coat takes place in those animals which acquire in autumn a covering of two different kinds: one long, downy, and warm, which is shed in spring; the other short and glossy, which is retained. This change of appearance is exemplified in the common water shrew (*Sòrex fòdiens*), the short summer coat of which is much blacker than the longer downy covering which conceals this in winter. In this little animal the additional winter coat is shed about the latter end of March, or beginning of April; and does not take place uniformly, but progressively, beginning on the head, and ceasing at the hinder extremities; and exhibiting in its progress, throughout, a well-defined line of separation. Animals which (as the British *Mustelinæ*) have two sorts of fur, the *shorter* of which is the more warm and downy, do not undergo this change, but retain both sorts throughout the year. In these the young have only one kind, which is close and woolly; as is well exemplified in the common polecat (Putòrius Fùro), the young of which are of a very uniform dark brown, and very unlike the old animals.

III. Actual change of colour in the coat itself is exhibited in the appearance of the fallow deer's white spots in spring, and in the case of the mountain hare (*Lèpus variábilis*), which is in summer grey, adapted to the hue of the lichens on which it squats; and in winter white, hardly to be discerned upon the snow. The same change also takes place in the stoat or ermine (Putòrius ermíneus), although this is doubted by Mr. Berry (VII. 591.).* In mild winters, such as we have of late experienced in the South of England, but few of the stoats become white, and some of these not until the latter part of the season. The change takes place quickly, but not uniformly, the animal assuming for a short time a pied appearance; but I have not succeeded in ascertaining whether it is accelerated by sudden cold, as the animals are not always to be seen exactly when we want them. One perfectly changed, however, was seen in this neighbourhood soon after the one or two days of very cold weather in the beginning of last

* This gentleman should have mentioned, in his account of the white stoats seen in summer, whether the tail was white or black. If the former, they were doubtless albinoes; if the latter, some constitutional debility may have prevented them from resuming their natural hues. I have seen white stoats late in March, but never after this. Both in these and in the white ferret (a domestic albino variation of the polecat) a decided tinge of yellow is always more or less noticeable.

October. In reference to Mr. Berry's communication, I may observe, that in many dozens of stoats which I have seen in summer, I have never yet seen a white one; whereas in winter, I have seen in the same neighbourhoods a considerable number of white stoats. Where the climate is more excessive, and the transitions of the seasons are more sudden, this change is much more likely to take place generally. In the fur countries, the ermine's change of hue is, I believe, most regular.

There has been, strangely enough, a difference of opinion among naturalists, as to whether these seasonal changes of colour were intended by Providence as an adaptation to change of temperature*, or as a means of preserving the various species from the observation of their foes, by adapting their hues to the colour of the surface; against which latter opinion it has been plausibly enough argued, that "nature provides for the preyer as well as for the prey." The fact is, they answer *both* purposes; and they are among those striking instances of *design*, which so clearly and forcibly attest the existence of an omniscient great First Cause. Experiment demonstrates the soundness of the first opinion; and sufficient proof can be adduced to show that the other is also sound. Some arctic species are white, which have no enemy to fear, as the polar bear, the gyrfalcon, the arctic eagle-owl, the snowy owl, and even the stoat; and therefore, in these, the whiteness can only be to preserve the temperature of their bodies [VI. 79.]; but when we perceive that the colour of nocturnal animals, and of those defenceless species whose habits lead them to be much exposed, especially to enemies from above, are *invariably* of the same colour with their respective natural haunts, we can only presume that this is because they should not appear too conspicuous to their enemies. Thus, in the eloquent language of Mr. Mudie†, who, however, advocates the first opinion, "the ptarmigan is lichen rock in summer, hoar frost in autumn, and snow in winter. Grouse are brown heather, black game are peat bank and shingle, and partridges are clods and withered stalks, all the year round." So, also, on the Continent, the common red-legged partridge (Erýthropus vulgàris) is of the colour of the gravelly and sandy soils on which it is found. So, also, are the different larks, the common quail, the various snipes, and all the other ground squatters, of the hue of their peculiar localities. So, also, are the numerous small Grallatòres which haunt the margin

* See Dr. Stark's paper, before cited, in Jameson's *Philosophical Journal* for July, 1834. [See *M. N. H.*, vi. 79.]

† See Mudie's *Feathered Tribes of the British Islands*, i. 50.

of the ocean, adapted to the colour of the sand. So, also, are those sylvan birds, which quit the dense umbrage of healthy growing trees, to seek their food and expose themselves on bare trunks and leafless decaying branches, of the hue of their particular haunts. "So exquisitely are they fitted for their office," says Mr. Mudie *, "that the several woodpeckers vary in tint with the general colours of the trees which they select. If it is an alternation of green moss, yellow lichen, and ruby tinted cups, with here and there a spot of black, then the green woodpecker comes in charge; but if it is the black and white lichens of the alpine forest or the harsh-juiced tree, then we may look for the spotted races upon the bark." The wryneck is the colour of the lichened branch; and the night swallow and the owls resemble their peculiar places of concealment. So, also, the gayer colours of nocturnal moths are always on the hinder wings†, and the anterior, which, when they rest, conceal these, are adapted to the hues of the various places where by day they are found: even the bright upper wings of the tiger moths (A'rctia Càj*a*, and A. víllica) are with difficulty recognised upon a lichened bank or paling.‡ It is curious, indeed, the resemblance which subsists between the colours of nocturnal birds and night Lepidóptera; the buff tip moth (Pygæ'ra bucéphala) thus reminds us of the barn owl (Strix vulgàris); and the goat moth (Cóssus Lignipérda), and a host of others, are similar in their tints to most of the Strígidæ: in both cases they are doubtless intended for the same purpose, that of concealment. It would indeed be easy to extend this list of examples considerably further; but I shall only now mention the common hare, which, when in form, would hardly ever be seen were it not for its brilliant eye; if its eye were closed, which it probably was before its quick sense of hearing had warned it of our approach, it would almost always, perhaps, wholly escape our observation. This ever continued watchfulness must have given rise to the supposition, that the hare always sleeps with its eyes open.

Seeing, therefore, so many most striking adaptations of colour to haunt, in cases where the concealment thus afforded can be the *only* purpose, I think it is not too much to infer, that the changes of colour in many arctic animals were intended

* See Mudie's *Feathered Tribes of the British Islands*, i. 190.

† Among day-flying Lepidóptera, the more gaudy colours are usually on the *fore* wings.

‡ Animals of bright and gaudy colours are generally very retiring in their habits: even the common robin mostly turns away his breast as you approach.

by Providence for the double purpose of preserving their bodily heat, and of enabling them to elude the observation of their enemies. Certain it is, that their *conspicuousness* would otherwise expose them to inevitable destruction. If I had here space, I could satisfactorily prove that the high-flying Falcónidæ can, in most cases, only perceive their prey when it is *moving;* just, as on the sea-shore, *we* can only distinguish sanderlings when they move. Small Mammàlia which frequent open situations are rarely much abroad, except in the twilight; and ground-feeding birds are ever on the watch, and even the smaller kinds (as I have repeatedly observed) can perceive a hovering falcon *long* before it comes within the sphere of human vision; and they instantly flee to shelter, or they crouch, and lying motionless, so exactly resemble a portion of the surface, that even a hawk's eye cannot distinguish them. Why should the falcon race be endowed with such wonderful powers of enduring hunger and fatigue, if, as is said, at the elevations at which they soar, they can clearly distinguish every living object scattered over the wide expanse beneath them? It is only on such animals as are *off their guard* that they descend; or otherwise, food being so abundant, they would soon multiply to the extirpation of their prey; which, of course, would be very speedily followed by that of the preyer.

How beautifully do we thus perceive, as in a thousand other instances, the balance of nature preserved: and even here we see another reason why sickly or degenerate animals (those, I mean, which are less able to maintain the necessary vigilance) must soon disappear; and why the slightest deviation from the natural hue must generally prove fatal to the animal. How different, thus, are even *simple variations* from the seasonal changes of colour which naturally take place! Properly followed up, this subject might lead to some highly interesting and important results. It certainly points to the conclusion, that every, even the slightest, tint and marking has some decided use, and is intimately connected with the habits and welfare of the animal; and it also furnishes a satisfactory reason, why closely allied animals (or, in other words, animals of very similar form and habits) should so very commonly nearly resemble each other in their colours and in the general character of their markings.

(*To be continued.*)

ART. V. *Facts on the Gravelling of the Taw, which is deemed the Young of the Salmon; and incidental Information on the Skegger Trout of the Thames.* By O.

THE fish represented in *fig.* 1. I caught, in April, 1834, in the river Taw, about four miles above Barnstaple, in the north of Devonshire; below which town that river, after uniting with the Torridge, enters the Bristol Channel at Barnstaple Bay. This fish, which is there called the gravelling, from its affecting the gravelly shallows, abounds in the Taw from March until the end of May, when the first high tides carry them to the sea; after which not one is to be found. At this time they are full of roe. The fishermen on the Taw are quite sure that they are correct in stating it to be the young salmon; and the fact, they say, has been ascertained by catching the fish, and returning it to the water with a piece of wire inserted in the back fin; and the same fish, the following year, grown to the size of a large salmon, has been taken with the wire still remaining in the fin. The drawing is of the natural size [The drawing was $7\frac{1}{2}$ in. long, from the tip of the snout to the tip of the longest rays of the tail; and $1\frac{1}{4}$ in. in breadth, measured opposite the dorsal fin.] of a fine gravelling, weighing about 2 oz. It is a beautiful fish, having the crimson spots of the trout; but is longer and more elegantly shaped, and the tail more forked than that of a trout of the same size. They die soon after being caught; and, as the moisture upon them dries, they become of a glossy blue colour. They are strong in proportion to their size; and afford the young angler excellent sport, taking the fly eagerly, particularly with a gentle [larva of the flesh fly] at the point of the hook. We (two of us), some days this last spring (1834), caught four or five dozen in a morning.

Many years ago, as we learn from Izaak Walton, a fish, which he calls the skegger trout, used to abound in the Thames: he speaks of catching them abundantly near Windsor. It is now but rarely seen; probably owing to the locks, and the impurities of the water attendant on the dense population residing on its banks. However, in May, 1830, when fishing between Taplow and Marlow, the fisherman who attended me in the punt caught a skegger, the first he had seen for many years. He was equally sure with the Barnstaple fishermen, that this was a young salmon; it certainly resembled the gravelling in some points, having the bright crimson spots; but it was rounder, and the tail less forked. Mr. Rennie, in a note to his edition of *Walton's Angler*, thinks the skegger is the same as the par of the northern



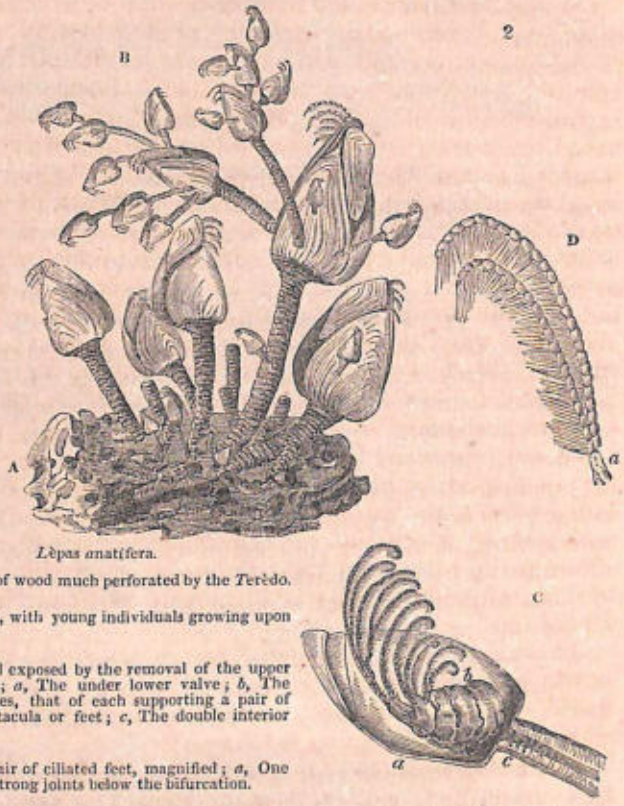
streams, and a peculiar species. Pennant (*British Zoology* iii. 405.) says that the par abounds in the Wye in September. Now, the gravelling and skegger disappear in the Taw and the Thames before that period; and Walton says that the latter sometimes grows as large as a herring: therefore the gravelling seems a different fish from the par and skegger; never attaining such a size, and disappearing, that is, migrating to the sea, long before September. I found the gravelling in two other rivers in Devonshire; namely, the Yeo, which empties itself into the Taw at Barnstaple; and the Exe, near Exeter.

The history of fish is, partly from the element in which they live, and partly from ichthyology having been less ardently pursued than other branches of natural history, very obscure: and I have communicated these remarks to add my mite to the elucidation of what has always been to me an interesting department.

Clapton, Nov. 7. 1834.

ART. VI. *Remarks on some Barnacles of the Species* Lèpas anatífera *found floating off St. Adhelm's Head, on the Coast of Dorset, on February* 7. 1834. By the Rev. W. B. CLARKE, M.A.

JAMES BLAGDEN, Esq., of Poole, brought me, on Feb. 7. 1834, a slice of wood, of about 6 in. by 5 in., with a species of *L*èpas (*fig.* 2. B.) attached to it; in such numbers, that they have defied calculation. The largest is not more than 3 in. long, including the pedicle, which takes up about two thirds of the length. The smallest are so minute as to be microscopic. It appears that the people of one of the Poole pilot-boats found two, of what they denominated "posts," floating off St. Adhelm's Head, in the morning of Feb. 7. 1834, just subsequent to the late tremendous west and south-west gales; and, perceiving them covered all over with barnacles, they towed them into Poole harbour; from which they were taken ashore at the Hamworthey quay, and there laid aside. Mr. Blagden seeing them, and being struck with the singularity of their appearance, stripped off two or three slices of the wood; which, being very soft, and almost pulpy, was not



Lèpas anatifera.

A, A portion of wood much perforated by the *Teredo*.

B, The *Lèpas*, with young individuals growing upon the older.

C, The animal exposed by the removal of the upper lower valve; *a*, The under lower valve; *b*, The body of lobes, that of each supporting a pair of ciliated tentacula or feet; *c*, The double interior tubes.

D, A single pair of ciliated feet, magnified; *a*, One of the two strong joints below the bifurcation.

difficult to remove, and gave me an opportunity of examining them here: but, owing to the carelessness of a servant, it was not till after they had been out of the water nearly seventy hours that I saw the creatures, when I found that they had been thrown away with the rubbish of the house. On their being obtained, I immediately put them into a basin of salt water; and was pleased to see, that, though many of them had been crushed, their native element almost immediately revived them; and not ten minutes after their immersion, the languid and reclining pedicles became erect, and the tentacula were seen protruding from the shell, even in the minutest individuals. So sensitive were several of the larger ones, that, on the approach of a candle suddenly, they instantly withdrew the tentacula, as if the light had offended them. This I consider a curious fact; as it is certain that they have no eyes, and live much in the dark, attached to the bottoms of ships, and to piles, far under the surface of the water.

On examination, I found that the portion of wood, to which these myriads were attached, is the rugged bark of a branch of the spruce fir; and several captains of vessels have pronounced it to come from Newfoundland, being drifted over in the current and gales. They and others conceive it to have been carried southward, towards the gulf stream, into a warmer latitude, where the *L*èpas adhered to it; and that the wood then set across from the Azores.* That this may have been the case, is likely, as well from the state as from the nature of the wood; for it is not only saturated with water, so as to render it near the bark like the pulp of a paper-mill, but, for an inch or two, it is pierced through in holes, of about half the size of the pedicles of the largest barnacles; which holes, however, have been formed by some *T*erèdo, before the *L*èpas took possession, as the shell of that creature is found in the thicker part of the branches: and, therefore, I conclude the wood has been very long in the water; drifting about, perhaps, for a year or two in the ocean, till driven hither to form the subject of a page of Mr. Loudon's equally far-voyaging miscellany. A naval officer, to whom I have shown them, recognised these creatures as having been seen by him, attached to logs of mahogany adrift in the Bay of Biscay.

There are two or three particulars in which the specimens before me differ from the species described by Dr. Weatherill, in V. 339—342. They agree in all the others; for which the best description is his own.

The pedicles are not so long as those of Dr. Weatherill's, but they are distinct; and yet have, in one or two instances, very

* That the wood in question set in from the Atlantic is likely; for the direction from Cape Finisterre to our coast would not be far from the parallel of that between the Norman Islands and Beachy Head: and the spices of a vessel wrecked near Jersey have, a week or two since, been picked up along the beach at Brighton, the air about which was perfumed with rich odours. Within a few days, fifty-four large casks of foreign brandy have been picked up off St. Adhelm's Head, and brought into Poole: the remains of the cargo of some vessel, probably from Charente, wrecked at sea, and brought hither by a current from the south-west. A horse and his accoutrements, doubtless the steed of a French coast-guardsman, was washed ashore, in the early part of the late November gales, at Dungeness. These facts are introduced here for the sake of registering them.— *W. B. C. Feb.* 10. 1834.

A similar mass of wood, so covered by *L*èpas, was found, at the same time, off Portsmouth.

To this date, the brandy has not been claimed. It is in *casks*, not in *tubs*; they appear to have been long in the water, and much damaged, as if the vessel they came from had been broken up at the bottom of the sea. My own opinion is, that they have floated from the West Indies. It would not be the first instance of the kind on record.— *W. B. C. Dec.* 4. 1834.

minute pedicles branching from the greater stems; which are not all transparent, but, through more than half their length, are of a very dark indigo or blackish-purple colour.

The great singularity of those under consideration is, that the shells serve as the ground of attachment for fresh pedicles; so that the specimens form a chain, of which the links are alternately pedicles and shells, as may be seen in *fig.* 2. B: and so numerous are these links, that there are, in some cases, a series of four, and even five, alternations; not occupying altogether, in many of the smaller ones, a space of more than 2 in. Nor are these alternations limited to the larger specimens, but even the most minute exhibit them; as if age was not required for their production. How the *ova*, of which Dr. Weatherill speaks (V. 341.), are detached and impregnated (if what he observed be *ova*), appears difficult to explain. The "*numerous very small round bodies, attached to one another by cellular tissue*," I have observed; but they appear to me to be *glandular*, and portions of the creature itself. It is a structure, I think, not dissimilar to certain peculiar parts of the human frame. In the specimens before me, the pedicle is evidently hollow, at least where it is inserted into the shell; and, towards that part, I observed the water in motion, and the small particles afloat therein attracted, as if drawn thither by the suction of the animal; which process was noticed by several persons. Dr. Weatherill speaks of joints in the tentacula. I dissected one of the largest of my specimens, and find that there are two strong joints (*fig.* 2. D *a*), distinct from those which, I imagine, he speaks of, which reminded me of what I have seen in insects having strongly contractile springs. The tentacula, also, act in pairs, each pair being inserted into a lobe; several of which lobes make up the body of the *L*èpas: the length of the tentacula being inversely to the size of the lobes and the nearness of them to the stem (c). On opening the shells, the animal looks, at first, something like a shrimp; but that arises from its curved, feathery, round appearance. On squeezing the lobes, two substances are immediately separated: the one of a perfectly milky white, and the other of a *true burnt-sienna* colour: the latter more consistent than the former, and both opaque; the former lining the cavities of the hollow tentacula as well as the lobes, from which it is extricated in *curd-like* particles. It is possible that a very high microscopic power would detect in these substances not merely a thick fluid, but some structure which would show them to be (if not excrement or aliment) endowed with functions necessary to the life and health of the animal. The tenacity with which it retains life has been exemplified by the

accident mentioned at the beginning of these remarks. *Fig.* 2. c. shows the animal in the shell, one of the lower-side valves being removed. The colour of the shell inside is blue, like that of the muscle; and the hollow, marked *c*, shows the part where the brown fluid was found.

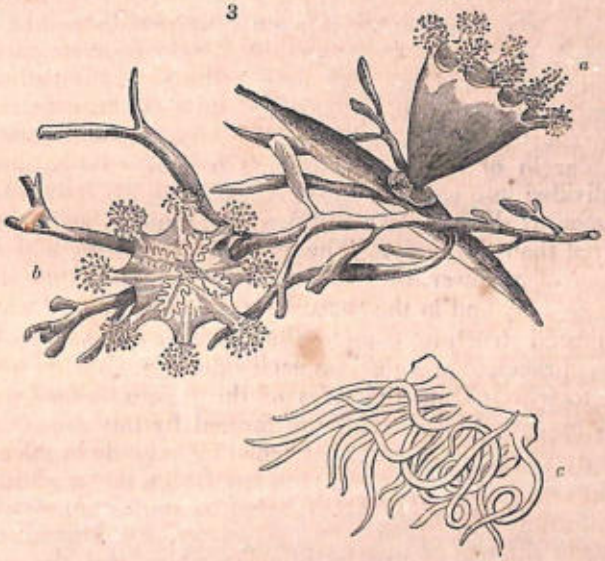
Should these observations (unscientific as they assuredly are) be not altogether useless, they may answer, in part, the concluding desire of your former correspondent on the genus *Lèpas* (V. 342.). Mr. Blagden is about to preserve a portion of the barnacles, in spirits, to present to some public institution.

Stanley Green, Poole, Feb. 10. 1834.

ART. VII. *Illustrations in British Zoology.* By GEORGE JOHNSTON, M.D., Fellow of the Royal College of Surgeons of Edinburgh.

27. LUCERNA'RIA CONVO'LVULUS. (*fig.* 3.)

3



Lucernària convólvulus. *a*, The natural size, side view; *b*, a view of the oral disk expanded, natural size; *c*, a few of the filaments in the stomach, magnified.

THIS species resembles the L. aurícula, which we have figured in this Magazine, V. 44.; but besides some minute differences in their external anatomy, which satisfactorily distinguish them, there are some discriminative peculiarities in their habits. Lucernària aurícula swims with ease, and is not greatly disinclined to the exercise; it expands the tentacula, and inflects them within the cup of its disk with a rapid con-

traction, and is altogether rather an active creature. It is not so with L. convólvulus, which will remain for days on one site; and when detached by force from its hold, a pellicle of skin is left on the spot, as if the connection had not been broken without injury to its structure. Its motions are all slow, and it is little susceptible of external impressions, so that it will continue expanded until one is weary of watching; and when it wills to contract, it does so lazily, and slowly again resumes its former position. Such is the result of observations made on two individuals taken in Berwick Bay; and they correspond with those of my friend Dr. Coldstream, who had previously taken this species on the shores of Devonshire. "I find," he says, "the animal very hardy. It is constantly in a state of expansion, and does not contract except when very rudely handled. One specimen has lived with me for three weeks, although the water has not been very often changed."

Lucernària convólvulus is about an inch in height, of a uniform liver-brown colour, smooth, adhering by a circular disk, above which there is a deep stricture; the disk even, strengthened by an internal cartilaginous lamina, which rises up the short peduncle, and forms a minute hollow firm centre. The margin of the oral expansion is somewhat thickened, and divided into eight equal arms, each furnished with a tuft of numerous short tentacula tipped with a gland, and brighter coloured than the body. The interior is hollowed like the blossom of a flower, the square extensible mouth projecting in the centre; and in the space between the arms there is a complicated structure, composed apparently of a series of foliaceous processes arranged on each side of a white line that seems to spring from the sides of the mouth. These processes, apparently branchial, are formed by the complicated foldings of a thin membrane, attached by one side in the manner of a mesentery: there are no vessels in the membrane; but some portions of it exhibit, when magnified, a kind of network of irregular cells, and the outer free edge is bounded by a thread-like line. The white central line which divides them is formed of small roundish bodies, arranged in two or three close series; and some of these ova can at times be traced along the margin of the circumference to the tentacula.* The latter are cylindrical, hollow, and terminated

* "When I first procured it, the 'two rows of spots' running from the mouth along each arm were prominent, and of a dark reddish-brown colour. Since that time they have increased in size, and have become studded with numerous white oval bodies, which I suppose to be ova. I see some of these have made their way into the web connecting the arms, but I have not observed any expelled from the body." (*Dr. Coldstream.*)

with a globular head, which is certainly imperforate. The stomach is a loose thin-plated extensible bag; to the inner surface of which are attached numerous filiform cæca, that, after removal from the body, retain their irritability for a long time, and writhe themselves like a knot of worms. (*fig.* 3. *c.*)

Both our specimens were found near low water-mark, adhering to the fronds of *Fùcus siliquòsus*.

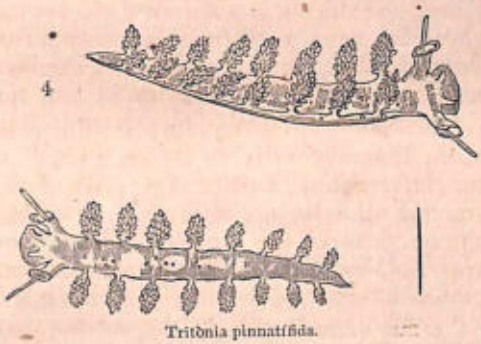
I may remark that in the figure which Montagu has given of Lucernària aurícula (*Lin. Trans.* ix. 113. tab. 7. fig. 5.), there is no appearance of marginal tubercles between the tufts of tentacula, whence it may be inferred that it has been drawn from a specimen of the present species with only seven arms.

28. TRITO'NIA PINNATI'FIDA. (*fig.* 4.)

Cl. Mollúsca, Ord. Nudibránchia, Fam. Tritoniadæ.

Synonymes.—Tritònia pinnatífida *Cuv.*, Reg Anim., iii. 53. note; *Fleming*, in Edin. Encycl., xiv. 619.; *Flem.* Brit. Anim., 284. Dòris pinnatífida *Montagu*, in Lin. Trans., vii. 78. pl. 7. fig. 2, 3; *Turt.*, Brit. Faun., 134; *Penn.*, Br. Zool., iv. 83., edit. 1812.

IN the works here quoted, except in *The Linnæan Transactions*, the reader will find nothing to reward the labour of referring to them, for the descriptions they contain of this singular mollusc are borrowed from Montagu, who discovered the species, and who alone seems as yet to have written any thing about it. On the shores of Devon T. pinnatífida is not uncommon, and I have often found it on corallines, shells, and rubbish, brought up on the hand-lines of the fishermen in Berwick Bay; but when out of water and contracted, the keenest eye may not detect such a small and shapeless creature, for before it will display itself, as delineated in our figures, it must be provided with fresh sea water and left undisturbed. It creeps slowly, and it is capable of swimming on the surface in a reversed position.



Tritònia pinnatífida.

The body is half an inch in length, linear-oblong, yellowish-brown, truncate anteriorly, tapered to the posterior end, the back plane, with the branchiæ in a single row along the

margins, eight or nine in a series, large, ovate, muricate, affixed by a narrow base, the three hinder pairs small: foot with plain margins: veil above the mouth enlarged, truncate, entire: tentacula dorsal, simple, long, filiform, exserted from a wide trumpet-shaped sheath uneven on the margin; immediately in front of them there are two very short processes or tentacula, without any sheath, and there is a small prominent orifice on one side between the first pair of branchiæ: a few minute tubercles are scattered over the back.

The remarkable branchiæ of this species, which Montagu has aptly compared to a pine tree in miniature, point it out as the type of a new genus, which the structure of the tentacula confirms.

Berwick-upon-Tweed, Nov. 7. 1834.

REVIEWS.

ART. I. *Titles of Works on Subjects of Natural History, published recently.*

Various Contributors: The Transactions of the Entomological Society of London, Vol. I. Part I. 8vo, 108 pages; 7 copperplates, filled with engravings of insects, some of them coloured. London, 1834. 7*s.* 6*d.*

MORE joy for the lovers of a knowledge of insects! an increase in the means of promoting it. As, however, the present part of the Society's *Transactions* is the first, a portion of its contents are necessarily constituted by that not over-interesting kind of matter, the laws, list of members, &c. For the public there are eighty-two pages, and seven copperplates filled with figures, some of them coloured, for the book's price. The titles of the subjects treated of are as follows: — 1. Observations on a mode practised in Italy of excluding the common house fly from apartments: by W. Spence, Esq. 2. Remarks on the passage in Herodotus referred to in Mr. Spence's paper: by W. B. Spence, Esq. [The drift of these two communications is stated in VII. 271.] 3. Descriptions of some hitherto uncharacterised exotic Coleoptera, chiefly from New Holland: by the Rev. F. W. Hope. 4. Explanation of the sudden appearance of the web-spinning blight [Yponomeùta padélla] of the apple, hawthorn, &c.: by R. H. Lewis, Esq. 5. Descriptions of the larva and pupa of Raphidia ophiopsis: by G. R. Waterhouse, Esq. 6. Descriptions of the larvæ and pupæ of various species of coleopterous insects: by G. R. Waterhouse, Esq. 7. De-

scription of a minute coleopterous insect, forming the type of a new subgenus allied to Tomicus; with some observations upon the affinities of the Xylophaga: by J. O. Westwood, Esq. [Numerous insects of the species described were found dead in the binding of a book, seemingly formed of pasteboard and paste, into which they had eaten burrows in every direction.] 8. Remarks on a species of Calandra occurring in the stones of tamarinds: by W. Christy, jun., Esq. 9. Description of the nest of a gregarious species of butterfly, from Mexico: by J. O. Westwood, Esq. 10. Description of several species of Australian Phasmata: by G. R. Gray, Esq. 11. Descriptions of some new genera of British Homoptera: by R. H. Lewis, Esq. 12. A few observations upon the habits of indigenous aculeate Hymenoptera, suggested by M. de St. Fargeau's paper upon the genus Gorytes, in No. 1. of the *Annales de la Société Entomologique de France:* by W. E. Shuckard, Esq. 13. On the habits of some Indian insects: by W. W. Saunders, Esq. 14. Journal of the proceedings of the Society. 15. Prospectus of essays on the subject of noxious insects, and remedies for their destruction, for which the Society will award prizes.

In the "Journal of Proceedings" are registered donations of books, and of specimens of numerous species of insects; and notices of memoirs on entomological subjects read at the meeting of the Society, and at those of the Linnæan Society. In these memoirs, some detailed descriptions of certain insects are given, and some particulars of interest relative to various insects. The figures in the plates seem to us admirably executed: Messrs. Westwood and Waterhouse have drawn them; Mr. Swainson has engraved them.

Bagster, Samuel, jun.: The Management of Bees; with a Description of the Ladies' Safety Hive. With 40 illustrative engravings on wood, and a frontispiece exhibiting the queen bee, worker bee, and drone bee, of the natural size and colour, and magnified. Small 8vo, 244 pages. London, 1834. *6s. 6d.*

A portion of the author's leisure through some scope of time has been applied to the happy occupation of keeping bees; in the progress of which he has endeavoured to descry, both by original observation and by reading what apiarians have written, all he can of the habits and instincts of these interesting creatures; and this to the end of gratifying his own curiosity as that of a naturalist, and to the end of discovering which of the artificial modes of managing them are most congenial to their habits and instincts. He has, ac-

cordingly, presented a synopsis of the natural history of the honey bee, and a review of various modes of managing bees. The principle of Mr. Nutt's mode is that which the author most approves; and this mode he has elucidated in most detail, and has applied some modified applications of it. Two of these are, "his attempt to apply the invaluable discoveries of Mr. Nutt to cottage practice," and his devising the "ladies' safety hive."

The author is right zealous to promote the extension of improved modes of managing of bees; and he has written his work so cordially, clearly, and agreeably, that it is not a little likely to conduce to this good end. He has endeavoured to exhibit reasons for the practices he recommends. He is not dogmatical; for these are his words: — "He hopes that those who enter perseveringly into the question will keep a diary of principal events, with results, and remit them to him; and proper use shall be made of them in a second edition, if one be called for.... Should he have erred, he will be thankful to have the error communicated to him; and he will take the earliest opportunity of acknowledging it."

ART. II. *Literary Notices.*

AUDUBON'S Biography of the Birds of America. — The Biography to the Second Volume of the Birds is announced (at Havell's, 77. Oxford Street) as "just published."

A Synopsis of the Phasmidæ, by George Robert Gray, M.E.S.L.; author of "A Monograph on the Phasmidæ of Australia."

Loudon's Arboretum Britannicum. — The first number appeared on the 1st of January; and we have here given a specimen of the plates, which are printed from zinc. The work will be completed in twenty-four numbers, in two years, and will form two volumes 8vo; one of letterpress, and the other of plates. We have circulated printed papers, to procure the dimensions of trees, especially of foreign trees, not only throughout Great Britain and Ireland, but all over Europe and North America. It will be the first work of the kind, that we are aware of, in which all the botanical specimens are drawn to one and the same scale. The plan of the work will be found in detail in the *Gardener's Magazine* for December; and we earnestly invite all our readers to send us the dimensions, and other particulars of any remarkably large indigenous trees, or any fine specimens of foreign ones, which may be in their neighbourhood.

THE MAGAZINE

OF

NATURAL HISTORY.

FEBRUARY, 1835.

ORIGINAL COMMUNICATIONS.

Art. I. *Notes of a Natural History Tour in Norway.* By Edward Forbes, Esq.

The tour which has occasioned the following notes was made in company with a friend, a fellow-student of nature, during the summer of 1833; and, as much of the ground passed over is new to the naturalist, I trust that these notices, however short, may not be without their value.

I was awakened, on the morning of June 6., with the pleasant news that we were nearing the shores of Norway. It was a beautiful summer morning; and we were only three or four miles from the islands which circle the coast as with a girdle: we were opposite the situation of Christiansand. Expecting to see a bold and precipitous coast, with distant mountains towering in the background, I saw a shore of low and shelving rocks, without a hill of any magnitude in sight. These rocks were bare and barren at first; but, as we proceeded eastward, the aspect of the country changed, the land became covered with mighty forests; and, on steering in among the islands, the novel sight delighted us of pine trees clothing the edge of the land, and mirrored in the clear deep blue water; often dipping their branches in the sea: while, now and then, we passed some little cove, the dwelling-place of pilots; whose bright red wooden cottages contrasted showily against the dark green background of the pine woods.

The billowy aspect of the little gneiss hills, and the innumerable islands, like the tops of hills whose bases were beneath the waters, presented a sight of a new and unaccustomed character. About two o'clock, we entered Arandal (whither we were bound), a small town built on several islands, in a most picturesque and exquisitely beautiful situation. After

partaking of some of the good things of the country, and settling ourselves for a week's stay, we strolled into the neighbourhood, with all the charms of novelty and a foreign land before us. The aspect of the scene of our Arandal rambles was that so beautifully expressed, in the fitting language for such scenery, by our poet laureate, the immortal Southey: —

——— " Pine-cover'd rocks
And mountain forests of eternal shade,
And glens, and vales, on whose green quietness
The lingering eye reposes, and fair lakes
That image the light foliage of the beech,
Or the grey glitter of the aspen leaves
On the still bough thin trembling."

The rocks about Arandal, at the season we arrived, were blushing with the showy *Lýchnis Viscària*; whose purple blossoms attracted the eye, to the disparagement of the no less beautiful, but more humble, Silène rupéstris; which flourished in great abundance, intermingled with *Sèdum ánnuum* and Scleránthus perénnis: which latter plant is very distinct from what I have been shown as British specimens of the species. The beautiful little Linnæ`*a*, of all plants the most loved of the botanist, trailed in profusion at the roots of the pine trees, among the polished leaves and waxen flowers of *Vaccínium Vitis idæ`a*; while, in the more shady places, Maiánthemum bifòlium and Trientàlis europæ`a displayed their chaste and maiden-like charms; mingled with the *Córnus suécica*, a plant which abounds everywhere in Norway. More rarely, a specimen of the lovely little Pýrola uniflòra rejoiced us; and, occasionally, the tall and stately *Hypochæ`ris maculàta*, so rare with us, lifted its golden head amidst thousands of *Hieràcia*.

Here and there, amidst the hills, there were small patches of grass, which bore some analogy to meadows. These furnished us with *Hieràcium dùbium*, A'juga pyramidàlis, *Polýgonum* vivíparum, *Sàlix fúsca*, and Convallària majàlis. In marshy places, *Lysimàchia* thyrsiflòra and the *Cálla* palústris abounded; while, on the margins of the woods, where *Vibúrnum Opulus* and *Rhámnus Frángula* were frequent, we found *Orobus* nìger and *Actæ`a* spicàta, growing with *Orobus vérnus*, *Vícia* sylvática, Aquilègia vulgàris, and Silène nùtans. We were too late for the blossoms of Hépatica tríloba, but found it in seed.

Buzzing round the fern plants were great numbers of Anómala hortícola; and the flowers of the apple trees in the gardens glowed with the brilliant Cetònia auràta, with an occasional specimen of *Rhàgium* inquísitor. Teléphori and

Geotrùpes swarmed; and under a stone occurred the *Buprés*tis quadrimaculàta.

Shells were scarce. On land, the Hèlix horténsis and híspida, with the Carocólla lapicìda. On one of the neighbouring islands I found several curious Clausíliæ. Sea shells, from the absence of tides, and the want of a dredge, were inaccessible; save the common periwinkle and the limpet, both of which were creeping on the rocks, at the water's edge.

The great attractions of Arandal are the iron mines, so well known for their fertility in mineralogical treasures: they are situated about a mile from the town, and present the appearance of large quarries. The ore (magnetic iron ore) is found in beds in the gneiss, and is easily worked. Many rare minerals occur, such as botryolite, datholite, wernerite, scapolite, and moroxite; besides abundance of epidote, actinolite, coccolite, and colophonite. The miners besieged us every evening with minerals for sale; and, as they often brought very fine specimens, at a trifling price, their visits were generally acceptable. One old man among them was well acquainted with the minerals, and knew the scientific names of each. He had been taught by a German collector; who had taken this method to further his views, the old miner acting as his agent. The miners, in general, appeared to be an intelligent race, but very lazy.

The country around Arandal is formed chiefly of gneiss, which abounds in veins of rose and milk quartz, and in iron ores. On the east, the rock termed zircon syenite by Von Buch occurs; and contains much Labrador felspar, but of bad quality. At its junction with the gneiss, plates of a black mica, often large, abound. In one of the islands, I found rocks of a beautiful primitive porphyry. The gneiss about Arandal abounds in garnets: sometimes the precious, but generally the common, garnet. In the Island of Illiseroe, those of the former kind are found of a large size and a fine colour.

We remained in Arandal and its neighbourhood ten days. Our original plan was to have directed our course up the country from Arandal; but the opportunity afforded us of visiting Bergen, by the Constitutione steam-packet, which goes there twice in the year, tempted us to desert our proposed route; since the visit to Bergen would enable us to reach the wildest and most mountainous portion of Norway.

Edinburgh, Dec. 5. 1834.

(To be continued.)

Art. II. *Records of the Results of Dredging.*

By Edward Forbes, Esq.

Having been of late in the habit of dredging on a part of the coast which has not been examined, it has occurred to me that the communication of some of the results of my labours would not be without its use, availing myself of the opportunity of making some remarks on the genera and species allied to the subjects of my notice.

The scene of my limited researches has hitherto chiefly lain in the Irish Sea, on the coasts of the Isle of Man; and, the ground being new, I have found my exertions amply rewarded by the addition of many of the scarcer British Testàcea to my collection. On the northern coast of that island, at the distance of from three to seven miles from land, there is a scallop bank many miles long, in twenty fathoms water, which is especially prolific in conchological treasures. Vènus cassìna and fasciàta, Cárdium lævigàtum and fasciàtum, *P*écten máximus, vàrius, and obsolètus, abound upon it. Its principal inhabitants are the *P*écten operculàris and the oyster; which, however, is large, coarse, and ill-flavoured. Adhering to oysters, there are Emargínula fissùra, Fissurélla græ'ca, Cápulus hungáricus, Chìton cinèreus, and more rarely Chìton læ'vis and fasciculàris. Velutìna lævigàta is also not uncommon. In the cavities of dead shells of Vènus virgínea, Kéll*ia* suborbiculàris occurs; and sometimes Tròchus striàtus. Tròchus tùmidus is very abundant. Pectúnculus pilòsus and Cytherè*a* exolèta are very frequent. Máctra ellíptica also occurs; but Máctra sólida and truncàta, which abound on most of the Scottish shell banks, have not been found as yet on the Manx coast. On the edge of the bank, where gravel predominates over mud, univalves are more frequent than bivalves; and *B*úccinum undàtum and striàtum, Fùsus antìquus and córneus, fill the dredge. The Fùsus antìquus attains a very large size on the southern coasts of the island, but on the north side it is generally dwarfish. The little Fùsus muricàtus is also frequent; and Tròchus zizýphinus and papillòsus are not rare. The white variety of T. zizýphinus occurs at times; the animal differs in no respect from that of the T. zizýphinus. Tròchus màgus is found, but always dead and worn; and the mouth is frequently filled up with a most beautiful and singular animal of the Actínia kind, to which I shall refer hereafter.

Starfish of the Ophiùra kind abound on the edge of the shell bank; they are often so plentiful as to fill the dredge. Two species occur, the O. rósula and O. lacertòsa. When

dredging in October, I took several specimens of a Comátula, apparently the rare Comátula rosàcea. Never having met with one of these curious animals before, I was deceived by their flexibility, and placed them without examination in a tin case along with some shells and Mollúsca, intending to examine them minutely when I had landed; but I was greatly disappointed to find that the creature had broken itself into pieces in the manner of the Ophiùræ. I have, however, preserved the central disc with its curious clawlike filaments (which, in my specimens, are arranged in five fasciculi, each of six or seven arms), and the severed pinnated arms.

Land and Freshwater Shells of the Isle of Man.—(*v. c.* mean very common; *c.*, common; *f.*, frequent; *r.*, rare.) Hèlix aspérsa, *c.*; nemoràlis, *c.*; Tróchilus, *r.*; ericetòrum, *f.*; ruféscens, *r.*; híspida, *c.*; serícea, *v. c.*; nìtens, *c.*; rupéstris, *r.*; radiàta, *c.*; pulchélla, *c.* Vitrìna pellùcida, *c.* Succínea amphíbia, *c.*; oblónga, *c.* Bùlimus acùtus, *c.*; lùbricus, *c.* Bàlea pervérsa, *c.* Clausília rugòsa, *f.* Pùpa umbilicàta, *c.*; pygmæ'a, *r.* Carýchium minimum, *f.* Lymnæ'a péregra (including ovàta and minùta), *c.*; palústris, *f.*; fossària, *r.* Phỳsa fontinàlis, *c.* Planórbis spirórbis, *r.*; contórtus, *f.*; álbus, *f.*; imbricàtus, *r.* A'ncylus fluviátilis, *c.* Valvàta piscinàlis var. depréssa, *c.*

Edinburgh, Oct. 30. 1834.

[We make use of Mr. Forbes's mention of the fact of the comatula's dismembering itself, to introduce here some remarks, by the late Rev. Lansdown Guilding, which we would persuade ourselves are connexible, without obvious violence, with Mr. Forbes's mention. Mr. Guilding's remarks had been penned in relation to the discussion, in I. 407., on "Too great Humanity to Animals."]

The lower orders of animals have their system gradually less perfect, and their sense of pain and mutilation is consequently weakened: hence, they suffer little from the loss of limbs and other injuries, which would be fatal to warm-blooded animals. The radiate and gemmiparous creatures, after violent mutilation, have their dissected parts converted into perfect individuals. Animals which lie concealed by day under stones have by nature the power of throwing off their limbs, which are soon restored after the fashion of buds: and it is wisely ordered; for the force of tides and accidents might crush or hold in captivity many creatures which would have now only to throw off an injured or crushed limb to

escape from the danger. Some night-feeding lizards in an instant jerk off their tails. [See, also, Mr. Guilding, in VII. 583., on the green species of lizard common in St. Vincent.] Crabs throw off their arms, while the Ophiùræ (*Astèrias L.*) cast off every portion of their body, except the small central abdomen. Without this incredible power, how often would these creatures perish! Instances have occurred of men groping in deep holes for lobsters and other crabs, who have been held firmly by the thumb till the tide rose and drowned them. Had these ill-fated fishermen possessed the power of the animals which kept them prisoners, they might have escaped with only temporary loss.

But, seriously, I would not be supposed an advocate for the infliction of the least unnecessary cruelty; these observations are only meant for those who rail at the sacrifices made for science. The learned and experienced naturalist is commonly remarkable for his general humanity. I have seen celebrated collectors, who have preserved thousands of animals for their collections, yet chide their children for killing, without necessity, the meanest reptile.

> "I would not enter on my list of friends
> (Though graced with polish'd manners and fine sense,
> Yet wanting sensibility,) the man
> Who needlessly sets foot upon a worm.
> . . . . . .
> They are all, — the meanest things that are, —
> As free to live and to enjoy that life,
> As God was free to form them at the first,
> Who in his sovereign wisdom made them all.
> Ye, therefore, who love mercy, teach your sons
> To love it too!"

[With Mr. Thompson's notice of the Pentacrìnus europæ`us, in II. 114., Mr. Guilding had connected the following remarks]: —

I am at present employed in dissecting and drawing up from living specimens the characters of all our starfishes, which are naturally divided into two great families.

STELLERI´DEA.

1. Rays somewhat solid: respiratory pores scattered, innumerable, and indistinct.
   Astèrias and some subgenera.
2. Rays long, slender, pliable: respiratory pores few, abdominal, and distinct.
   A. Arms simple, snake-shaped. Ophiùra and a few subgenera.
   B. Arms dichotomous and raptorious. Gorgonocéphalus *Leach*, and some subgenera.

In all the surface of articulation is simple.

The Crinöïdea, connected with the starfishes by the osculant forms of the Gorgonocéphali, must now receive the Comátulæ: one section containing the sublocomotive Comátulæ; the other, and greater, division embracing the various genera so well described and plainly figured by Mr. Miller, and the Pentacrìnus of Thompson [figured and remarked on in our II. 114, 115.], which have the base attached to various bodies, and their want of locomotion compensated by the unusual length of the vertebriform column. In all these the surface of articulation is carved, and beautifully radiate. It has been doubted whether the vertical spot in *Astèrias* affords any passage through the crust. In dried specimens it may appear not to be the case, as the spot becomes as much indurated as the general crust; but the zoologist, who contemplates the harder species alive, and observes the facility with which they, when overturned, contort and alter the shape of their rays, in order to recover their position, will easily believe that the disc is really perforated. I have never seen the fæces expelled through this rude contractile orifice; and it may, possibly, be only connected with the ovary. In a subgenus figured in the *Supplement to Parry's Voyage*, 1824, if one can depend upon the engraver, the aperture is terminated by a perforated bulb: the spot beneath it I do not profess to understand. —[*L. Guilding. St. Vincent, May* 1. 1830.]

ART. III. *An Introduction to the Natural History of Molluscous Animals.* In a Series of Letters. By G. J.

Letter 15. *On their Food and Digestive Organs: Herbivorous Mollúsca.*

THE herbivorous, or, as they are frequently named, the phytophagous, Mollúsca belong exclusively to the class of gasteropodes, and embrace, with few exceptions, the Pulmonífera, the Nudibránchia, the Inferobránchia, the Scutibránchia and Cyclobránchia, a great proportion of the Tectibránchia, and all the Pectinibránchia which have no slit or siphon in the collar of the mantle, or, which is the same thing, whose shell has an entire aperture.* What proportion these united may bear to the zoophagous, it is impossible to say; for we are not in possession of a complete catalogue of

* The families Trochöïdes and Capulöïdes of Cuvier. (*Règ. Anim.*, iii. 72. 86.) Adanson has given the distinguishing characters between the zoophagous and phytophagous pectinibranchial Mollúsca very correctly. (*Hist. Nat. du Sénégal*, p. 80, 81. 193.)

the species: but to make a conjectural approximation to the solution of this question, let us assume that the enumeration of the species given by Lamarck is equally defective in all the families (and I know of no fairer mode of coming at the truth), when we shall find that the phytophagous are less by a third than the zoöphagous; so that Meckel errs in asserting that the great bulk of the gasteropodes live on vegetable matters.

Zoophagous.		*Phytophagous.*	
Pteropodes	9	Tritoniens (Nudibranchia)	26
Bulléens	13	Laplysiens	5
Testacellus	1	Phyllidiens	56
Ianthina	2	Semi-phyllidiens	3
Canalifères	274	Calyptraciens	42
Ailées	42	Limaciens	8
Purpurifères	197	Colimacés	268
Columellaires	172	Lymnéens	28
Enroulées	328	Melaniens	22
Cephalopodes	17	Peristomiens	21
Heteropodes	8	Neritacés	92
	1063	Macrostomes	26
		Plicacés	11
		Scalariens	11
		Turbinacés	163
			782

The marine tribes live on sea weed, —

——— "part single, or with mate,
Graze the sea weed their pasture, and through groves
Of coral stray;"

and it is probable that the species in general are not limited to any particular weed, nor are even very nice in their selection. At the same time, it may be observed, that some are rarely found except on one and the same plant, as, for example, the pretty Patélla pellùcida, which pastures almost uniformly on the broad frond of Laminària digitàta, and has shown both sense and taste in choosing so wide and tender a field. The land tribes seem to refuse no tender herb: we know that they will eat with avidity the spring corn, clover, peas, and turnips; they are very fond of all kinds of fruit; and the mushrooms afford them a grateful delicacy, even the acrid and milky species being greedily devoured by them. To me, they seem to prefer all these in a fresh state: my personal observation leads certainly to this conclusion, though I am aware it has been said that they, like modern epicures, are fonder of their food when it has advanced some way to putrefaction. Dr. Fleming says: — "Those which are phytivorous appear to prefer living vegetables, and refuse to eat those which are dried. We are not aware that putrid vege-

table matter is consumed by them, although many of the snails and slugs are found under putrid leaves and decayed wood. In those places there is shelter from the sun, together with dampness; so that it is difficult to determine whether they sojourn in an agreeable dwelling or a well-stored larder." (*Edin. Encyc.*, xiv. 602.) On occasions they eat voraciously; but, when necessary, they can sustain a fast longer, perhaps, than any other animated beings; snails having been kept for upwards of a year, nay for years [VII. 114.], and the Lymnèi and Planórbes for many months, without any food except that small and tenuous portion which they might extract from the air or water. (*Müller, Verm.*, ii. xii.)

I am not aware that any carnivorous mollusc ever resorts, for variety's sake, to a vegetable diet; whereas many herbivorous ones seem to have a strange hankering after flesh, and become very cannibals in satisfying this propensity. Lister asserts that snails will eat not only bread and cheese, but flesh of all kinds, particularly fish and salted meat (*Exer. Anat. de Cochleis*, p. 90.); and, in another place, he tells us that, having once placed an individual of the Hèlix aspérsa with another of the *L*ìmax àter in a vessel together, he found, on the following day, that the former had slain the slug, and had miserably torn and eaten its skin, "tantus animus est etiam pigerrimis animalibus." (*Anim. Ang.*, p. 114.) I have repeatedly seen the black slug (*L*ìmax àter) feeding on individuals of its own species which had been accidentally crushed, and were yet scarcely dead; and the observations of Mr. Power, which have been since confirmed, show that they feed voluntarily on earthworms, dead or dying. Of the aquatic tribes, we are informed by Mr. Jeffreys, that "the food of the Limnèi is animal and vegetable matter in different states of putridity; which makes them deserve the perhaps not unapt epithet of 'scavengers of the waters.' In the absence of other nourishment, they will even devour each other, piercing the shell near its apex, and eating away the upper folds of its inhabitant. This accounts for the mutilated and often imperfectly repaired state of the upper volutions of some specimens." (*Lin. Trans.*, xvi. 371.)

The mouth in this tribe, as in other Mollúsca, is always anterior and terminal, with, often, an inferior aspect; in Dòris, and Cyclóstoma, and a few others, it is prolonged into a sort of snout, which can be shortened or elongated to a small extent; in Aplysia and Pleurobránchus [VII. 348.], there are labial tentacula at the sides; and it is overshadowed in the Tritònia by a deeply crenate veil, which receives a

very remarkable developement in the Tèthys, of which I have already given you a figure [V. 36.]. It is in no instance furnished with the complicated retractile proboscis of the pectinibranchial Zoóphaga; but, on the contrary, we very generally find, within the lips, jaws of a cartilaginous or horny texture *, fitted for dividing their food into appropriate portions. In the marine tribes there is a pair of these instruments acting horizontally; but they differ so much in size, form, and even consistence, in the different genera, that no general description could be made applicable. Usually they are merely oblong pieces of cartilage; sometimes thin reticulated plates: whereas, in Tritònia, they are composed of solid horn; and, in reference to their form, Cuvier compares them to the scissors with which sheep are shorn, the blades being large, oblong, curved, deeply emarginate behind, and partially serrulated on the upper edge. (*fig.* 6.) The slugs and snails (Pulmonífera), whether terrestrial or aquatic, have a single jaw † placed on the upper side of the oral aperture; and it acts in cutting the herbage by being brought to press against a mammillary eminence on the floor of the mouth; it is of a semilunar shape, hard and corneous, and either serrated on the cutting edge, or armed with a single obtuse knob in the centre. The tongue is a membrane roughened with minute prickles, set in the most regular array, either in close transverse lines, or on the angles of a network of the most minute delicacy. These prickles, by pointing backwards, prevent any regurgitation of the food; and, as they are capable of being raised and depressed at pleasure, they must tear and rasp the vegetable fibre into shreds, and prepare it for an easier digestion. The shape of the tongue, and the pattern in which the prickles are set, are very variable; and I know few objects which are more interesting to the microscopical observer. It is always, as Swammerdam remarked of that of Paludìna vivípara, "so elegantly formed, that it can scarce be exactly described, and as difficultly be represented in a figure;" ‡ for, indeed, the figures which have been

* Dòris, Pleurobránchus, and the pectinibranchial Phytóphaga (Littorìna, Tròchus, *Nerita*, &c.) in general are exceptions.

† Hook, in his *Micrographia*, has given a magnified view and description of the snail's tooth, p. 180. tab. 25. fig. 1. See also Swammerdam, *Book of Nature*, p. 49.; Lister, *Exer. Anat. de Cochleis*, tab. 2. fig. 2., and tab. 3. fig. 9.; List., *Conchy. Anat.*, tab. 1. fig. iv., and tab. 4. fig. ii.; Cuvier, *Mém.*, pl. 2. fig. 4.

‡ Book of Nature, p. 79. Cuvier asserts that the tongue of the slugs and snails is not spinous, and that the food is introduced into the gullet by a sort of peristaltic movement of the tongue and the buccal mass on which it lies. (*Mém.*, xi. 17.) Dr. Fleming repeats the assertion of the

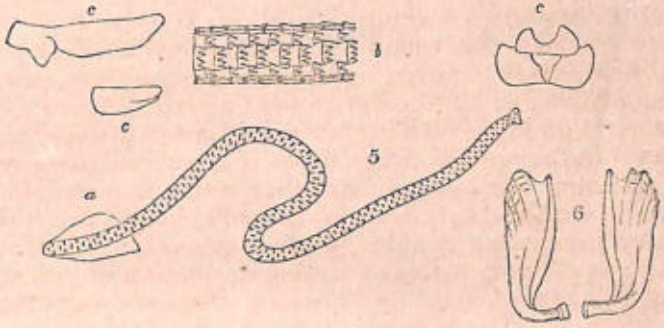


Fig. 5. : *a*, The tongue, natural size, of the common limpet (Patélla vulgàta) ; *b*, a portion magnified ; *c c c*, the cartilaginous jaws. — *Fig.* 6., Jaws of Tritònia.

given of it convey not the slightest idea of the extreme beauty and delicate organisation of this wonderful organ; nor am I able to supply this deficiency. It is sometimes broader than long, as in Tritònia and Dòris; at other times elliptical or spoon-shaped, as in the snails; and in others it is lengthened out in the most extraordinary manner, so as not merely to equal, but greatly to exceed, the length of the body! * In the latter cases it lies reversed along the gullet, and reaches the interior of the stomach, where it is convoluted or twisted into spiral bendings, like a serpent closely rolled together. The periwinkles (Littorìna) and limpets afford familiar examples of this remarkable modification; and I enclose a figure of it (*fig.* 5. *a*), from the common limpet: it is a narrow riband-like body, fully 3 in. long, of nearly equal breadth throughout, except at the apex, where it is soft and somewhat dilated, the surface roughened with three rows of teeth, the side rows alternating with the middle one, which is quadrifid, while the side teeth are divided only into two points. There is also placed along each side a double row of cylindrical tubes whose apertures look towards the base. This curious spinigerous tongue is never protruded beyond the margin of the lips. It seems to be used for rasping down the food; and, in proportion as the anterior prickles are worn away in this operation and absorbed, another portion of the tongue is

want of lingual spines. (*Phil. of Zoology*, ii. 451.) I will not contradict such an observer as Cuvier, although, from my own examination of the organ in question, I had come to a contrary conclusion.

* For a rude and unfinished figure of the tongue of Tritònia, see Cuvier's *Mém.*, tab. 2. fig. 8, 9.; of Aplysia, tab. 2. fig. 6. b; of Paludìna, tab. i. fig. 8, 9.; of Patélla, tab. 2. fig. 18, 19.

brought forward to supply its place; but, that there may be no deficiency in its length, we find the apex soft and vascular, where, in fact, a continual growth and addition are going on. (*Cuvier, Mém. sur la Patelle*, p. 18.)

The food taken hold of first by the lips, and then divided by the jaws, is immediately seized by the prickles of the tongue, which prevent its regurgitating, while the actions of the adjacent muscles force it into the gullet; on the sides of which there is a pair of lobulated salivary glands, or sometimes two pairs, which have each a single excretory duct to convey their peculiar secretion into its upper part, to lubricate and soften the mass. The gullet is a muscular canal, lined interiorly with a mucous coat, presenting, indeed, the same structure as the whole alimentary canal, and is generally plaited in a longitudinal direction. But the variety exhibited in the form, structure, and disposition of the stomach and intestines is too great to permit us to attempt a general view. The former is sometimes merely a membranous bag, or simple dilatation; sometimes there is a gizzard, analogous to the gizzard of birds *, to triturate the food previously to its transmission into this bag; sometimes there is a series of dilatations, or stomachs, three or four; and, again, in others we find the gizzard, or stomach, armed with horny teeth, or laminæ, of which the Scyllæ`a affords a remarkable instance. (*Cuv. Mém.*, p. 10. tab. 1. fig. 6.) "There is no division of the alimentary canal into small and large intestines, as in the higher classes; or rather, among the Mollúsca, the relative size of the different parts is reversed. Here the pyloric extremity is usually the largest, while the anal is more slender." (*Fleming, Phil. Zool.*, ii. 411.) The intestine is usually a simple canal, which, after making a volution or two among the lobes of the liver, returns upon itself, and opens outwardly on the side towards the anterior part of the body; but, in Dòris, the anus is pierced on the back towards the tail; and we find, in Chìton and Dentàlium, other exceptions to the usual course; for, in them, the intestine is straight, and has a posterior terminal aperture, like the annulose tribes. To show to what extent the alimentary canal is varied in this tribe, let me give you a representation of that of the Tèthys (*fig.* 7.), which you will compare with that of Pleurobrán-

* Of the stomach of Limnèus Swammerdam says, "it is of the same structure, in all respects, with that of the hen or cock kind; so that one would think the real stomach of a hen is here represented, without any difference, but that it is much smaller."

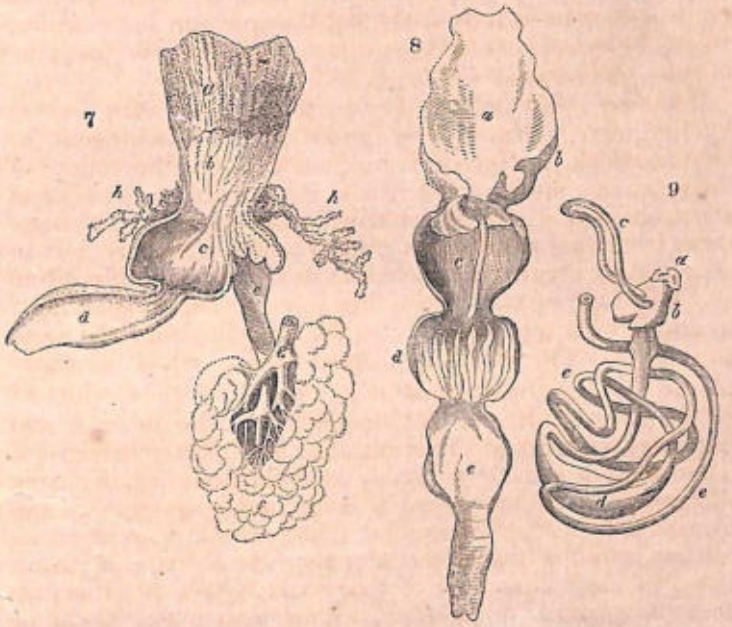


Fig. 7., Alimentary canal of the Tèthys: *a*, the proboscis; *b*, the œsophagus; *c*, the stomach; *d*, the intestine; *e*, hepatic duct; *f*, the liver; *g*, hepatic artery; *h h*, salivary glands, the parts are laid open. — *Fig.* 8., Alimentary canal of the Pleurobránchus: *a*, first stomach; *c*, second stomach; *d*, third stomach; *e*, fourth stomach. — *Fig.* 9, Alimentary canal of the Patélla: *a*, the mouth; *b*, the buccal mass; *c*, the tongue; *d*, the stomach; *e e*, the intestine.

chus (*fig.* 8. *); and, again, contrast these with the same parts in Patélla (*fig.* 9.). That these contrasts in structure are accompanied with decided peculiarities in the quality of food, can scarcely be doubted; but we know nothing of what these peculiarities are: their manner of feeding, and, we may even add, their kind of food, are almost conjectural. Blainville gives it as his opinion, that all the species destitute of jaws must swallow soft and decayed vegetable and animal matter: being, by their structure, incapacitated from chewing

* "In the Pleurobránchus the œsophagus dilates into a membranous crop (*fig.* 8. *a*), at the lower part of which (*b*) the bile is poured in. It communicates by a narrow cardia with the second stomach (*c*), which is a gizzard with thin but muscular parietes. The third stomach (*d*) is membranous, and precisely resembles the plicated stomach of ruminants, in being disposed in large but delicate folds, by means of which the alimentary matter contained in it is moulded into long whitish cords. The fourth stomach (*e*) is membranous, like the crop, but smaller. It is remarkable that the gizzard contains a narrow groove running through its whole length, leading from the first to the fourth stomach, and probably subservient to a species of rumination." (*Carus, Comp. Anat.*, trans., ii. 10.)

a fresh material (*Man. de Malacol.*, p. 177.): but the conclusion is a hasty one; for I, at least, am not inclined to attach that value to deductions of this kind which many seem to think they merit. The Aplysia has very small obtuse mandibles, of a soft cartilaginous substance; yet that mollusc eats its sea weed bit by bit, and nips away a portion from a large frond as easily as the Tritònia can be supposed to do. * It is not unlikely, however, that those jawless species which possess the spinous tongue may take their food by rasping it off the surface by aid of the prickles; for it may be remarked that the Patéllæ and the periwinkles, when active, are constantly protruding the anterior portion of the tongue between the lips, and withdrawing it in rapid succession.

The liver appears to be proportionally greater in these tribes, in relation to the other viscera, than in the zoophagous Mollúsca; and, unlike that of the acephalous Mollúsca, it rarely envelopes the stomach. It occupies, very generally, a backward position among the viscera, filling the upper convolutions of the shell; and it is composed of lobes and lobules †, of which the ultimate are in the form of hollow globules, in each of which a biliary vessel originates. These vessels, by successive reunions, contribute to form one, three, or four large canals, which open directly into the stomach, and pour in, we may presume, a large quantity of bile; essential, apparently, to the rapid digestion and assimilation of the food. Sometimes the biliary pores, as in Dòris, are so large, that Cuvier wonders by what means the food is prevented entering them (*Mém. sur le Doris*, p. 15.); but, according to Professor Grant, it actually does enter and fill them. "Upon opening the cavity of the stomach," says this distinguished naturalist, "we see, as in the tunicated animals, and in the inhabitants

10



11



fry of Astèrias pappòsa. *Fig.* 10. the upper, *fig.* 11. the under surface.

* Although no doubt can be entertained that Tritònia is really herbivorous, yet it seems sometimes to indulge in other food; for I took from the stomach of one some curious bodies, of which I annex magnified figures, and which appear to be the

† Swammerdam says it is divided into lobes, "according to the different course of the intestines, which make as many divisions in it as they have turnings and windings." Our description of the liver is derived from Blainville, *Man. de Malacologie*, p. 123.

of bivalve shells, the large perforations leading from the cavity into the substance of the liver. Here, again, we observe the short, wide hepatic ducts, bearing the same general character which they have from the lowest of the Mollúsca up to the class of fishes. Baron Cuvier remarks, that it is surprising the vegetable food does not gain admission from the stomach into the cavities and substance of the liver. I have collected many of those animals upon our coasts, and have opened them in all conditions as regards food taken into their stomach, and I have found the stomach often completely filled with minutely divided portions of coarse marine plants; but I never found them with their stomach thus filled, without finding that the hepatic ducts were also filled with the food. These hepatic ducts are obviously continuations developed from the stomach itself, and the obliquity of their entrance does not protect them from the ingress of the food. We observe opening, also, into the stomach of the Dòris, which is destitute of teeth, a glandular cœcum of a pyriform shape. That glandular cœcum differs obviously in its structure and form from the structure of the liver. It consists of a single wide cavity, studded internally with minute glandular orifices or follicles: it opens into the pyloric extremity of the stomach, and, consequently, pours its secretion into the alimentary canal at the same place with the liver. From this position of the organ, and this termination of its duct, we cannot consider it as analogous to the salivary glands. From its position in the vicinity of the hepatic organ, it is rather analogous to the *pancreas* in higher animals. This I was more anxious to examine, on account of its having been stated by Cuvier and by many other writers, that no invertebrated animals possess a pancreas. Tiedemann has adopted my view of this gland; Meckel, in his last work, was inclined to do the same; but Cuvier continued to regard it as a peculiar organ. This form of the pancreas exists also in the Aplýsia and some other gasteropods; and I have also shown that, under a more complicated form, that organ exists in the cephalopods." (*The Lancet*, No. 572. p. 708, 709.)

Relative to the times when molluscous animals feed, a very few facts only have been ascertained. Among the earlier naturalists it seems to have been a prevalent belief, that oysters and other bivalves were fat and in season at the full moon, and lean and out of season at the new moon *; and, even so

* "Ostreis et conchyliis omnibus contingit, ut cum luna pariter crescant, pariterque decrescant." (*Cicero, De Div.*, ii. 14.)

late as 1666, this belief had strengthened by its growth: for, in the *Philosophical Transactions* of that year, travellers to India are solicited to enquire, "whether those shell-fishes that are *in these parts* plump and in season at the full moon, and lean and out of season at the new, are found to have contrary constitutions in the East Indies:" a nice question, to which I do not find any answer was ever returned. To the marine Zoóphaga there are probably no set hours or seasons, and I do not see why it should be otherwise with the Phytóphaga, although the latter certainly inhabit a shallower water, and may consequently be somewhat influenced by the degree of light. The littoral species appear to feed during the night, as Mr. Guilding informs us the Chitónidæ do on the shores of the Caribbean Sea. (*Zool. Journ.*, v. 30.) Snails and slugs in general prefer to dine, like ourselves, late in the evening, when the sun's fervour has abated, and the dew has begun to fall; but, most unlike ourselves, they may be found at breakfast, their appetites not a whit blunted by their late prandial repast, in the very early mornings of summer, before the sun even has risen to drink up the evening's moisture. But, in moist weather, they may be found feeding at all hours; and after a sultry dry term, no sooner does the rain commence its fall, than they are astir, be the time when it may. Lister is indeed rather too nicely discriminative here: he tells us that the snails (*Cóchleæ*) feed at all times of the day, especially of a rainy one; the black field slugs almost only at sunset, but the cellar slugs not before midnight. (*Exer. Anat. de Cochleis, &c.*, p. 89.)

[*Li'max* variegàtus, Sowérby*i*, and other, probably all, slugs, have very certainly a strong liking of animal matter. *L.* variegàtus I have known plentiful in two houses in the London neighbourhood in which I have lived, about the kitchen sink: it is, one would hence think, usual in London houses. The places of its retreat are cavities between the sink and wall, or the sink and pump, or upon the under surface of the sink itself. At nightfall, the slugs sally forth to pasture on whatever may be found about the sink, or parts close by, suited to their taste: they will pick bones most perfectly, eat boiled potatoes, &c. One, which had been killed by accident, was filled with fragments of cooked potatoes and starch in a pulpy state: some of the latter had been left in a basin near the sink. The slugs have always all retreated by the morning. On going to the sink with candlelight at night, the slugs are pretty objects in their almost transparent

flesh, variegated with markings. The parasitic mite (IV. 538.) usually abounds upon them.

L. Sowérby*i* and other out-door slugs feed readily on any discarded bone they may meet with: fish bones are not disliked. On Sept. 18. 1834, I found a larger *L.* Sowérby*i* feeding on a living smaller one of its own species: it had eaten the head and a portion of the body of it; the remaining portion was still alive. This is the only instance of this habit which I have witnessed, since supposing the existence of it in V. 696.

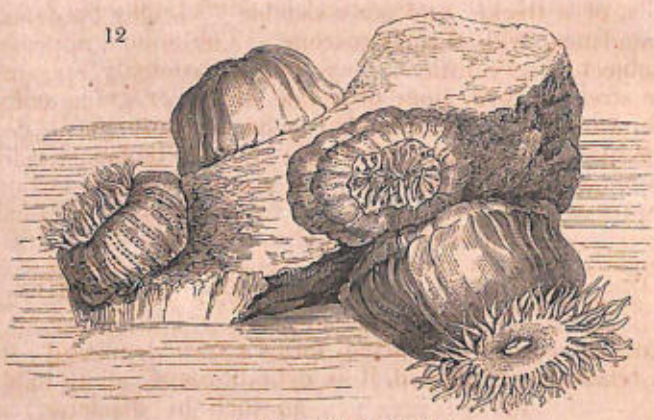
A gardener, Mr. Peter Martin, has, in the *Gard. Mag.* (viii. 149. 370.), described a means of decoying slugs and snails, which one who has tried it has found effectual. Warm cabbage leaves until they are quite soft; suffuse the hands slightly with unsalted greasy matter of any kind, melted; and then pass the leaves one by one between the hands, applying these with a little clap to both faces of the leaf, so that some taint of grease may be transferred from the hands to the leaf. Leaves thus prepared, laid in the haunts of the slugs and snails, are found to attract them to the leaves; so that the gardener can readily collect them for destruction.]

ART. IV. *Illustrations in British Zoology.* By GEORGE JOHNSTON, M.D., Fellow of the Royal College of Surgeons of Edinburgh.

29. ACTI'NIA MESEMBRYA'NTHEMUM. (*fig.* 12.)

Synonymes. — Prìapus equìnus *Lin.*, Syst. edit. 10. p. 656. *Hỳ*dra disciflòra, tentaculis retractilibus, extimo disci margine tuberculato, *Gærtner*, in Phil. Trans., lii. 83. t. 1. f. 5. Actínia equìna *Lin.*, Syst., p. 1088.; *Dicquemare*, in Phil. Trans., lxiii. 364. t. 16. f. 1—7.; *Mull.*, Zool. Dan. Pr. p. 231. no. 2793.; *Flem.*, Br. Anim., p. 497.; *Cuv.*, Règ. Anim., iii. 292. Ac. mesembryánthemum *Soland.*, Zooph., p. 4.; *Turt.*, Br. Faun., p. 131. Ac. hemisphæ'rica *Pen.*, Brit. Zool., iv. 104.; *Berk.*, Syn., i. 186. Ac. rùfa *Stew.*, Elem., i. 393.; *Lam.*, Anim. s. Vert., iii. 67. *Hỳ*dra mesembryánthemum *Stew.*, Elem. ii. 451.

THERE are few more common or more beautiful animals on our shores than Actínia mesembryánthemum. It lives between tide-marks, and is to be met with almost everywhere; but here it prefers the cavernous recesses, or *coves*, which the tide has hollowed out in our bold rocky coast. The floor and sides of these gloomy caves are studded with numerous specimens, hanging in a somewhat horizontal position, for they are rarely to be observed either quite erect or pendulous. Many are left long uncovered by the recess of every tide,



Actinia mesembryánthemum.

when they lie relaxed and in a state of partial expansion, very indicative of apathy and lazy repose: others, having chosen a little rocky basin, filled with the purest water, for their residence, are generally seen expanded; the tentacula all displayed, and held so still, that no ripple or current alarms the unsuspicious crab or snail as it creeps within the circle of these tubulous suckers, from whose embrace it will certainly not escape. Actínia mesembryánthemum never, so far as I have observed, emits from the mouth, like some other species, any thread-like tangled filaments; nor does it seem to have the power of protruding the membrane of the stomach in the form of vesicular lobes. Gærtner says that "the colour of its body is always red in the summer, but changes into a dusky green, or brown, towards the latter end of autumn," a remark which certainly does not hold good on the northern shores of England, where the red and dusky green varieties may be found at all seasons.

The body is an inch, or an inch and a half, in diameter, hemispherical when contracted, very smooth, and of a liver brown or olivaceous colour; the base is generally of a uniform greenish colour encircled with an azure blue line, but frequently it is streaked with red, and the blue marginal line is wanting; tentacula numerous, multiserial, of the colour of the body, entirely retractile; margin of the oral disk ornamented with a circle of azure blue tubercles, which are formed by papillary projections of the proper substance of the body, covered over on the top with a thick layer of dense blue matter; in which, as well as in the skin generally, minute fusiform calcareous

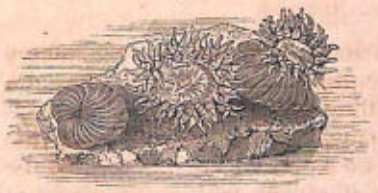
spicula, of a thicker and more slender sort, may be detected in abundance, with the microscope. The animal appears to be subject to very little variety, but occasionally specimens occur streaked with lines of a fine bluish or green colour, which are sometimes interrupted or broken into spots. Very young specimens have only a single circle of tentacula, which are proportionally longer than they are in the adult.

30. ACTI'NIA VIDUA'TA. (*fig.* 13.)

Synonymes. — Actínia viduàta *Mull.*, Zool. Dan. pr. p. 231. no. 2799.; Zool. Dan. t. 63. fig. 6, 7, 8., copied into the Encyclop. Méthod. tab. 72. fig. 4, 5.; *Turt.*, Lin., iv. 101.

THE body, when contracted, forms a very depressed cone: when relaxed or expanded, it is cylindraceous, about half an inch in diameter, and scarcely so much in height, smooth, olivaceous, striped longitudinally with white: the tentacula are shorter than the diameter of the disc, biserial or triserial, olivaceous, prettily annulated with white, with a darker ring at the base, and the oral disc is mottled or striated with pale lines.

13



Actínia viduàta.

This may be, as I long believed it was, an immature state or variety of the preceding; but I have lately discovered some peculiarity in its habits which induces me to consider it distinct. Actínia mesembryánthemum is always exposed, and very cleanly in its person, never allowing its glossy coat to be soiled by mud or other extraneous matter; but A. viduàta buries itself in the sand, and lies very snugly concealed. Attaching itself to shelving rocks which are covered with compact sand for about an inch in depth, it burrows in the same, leaving a small aperture opposite the mouth, through which the tentacula are displayed when the tide flows. At ebb nothing of the animal can be seen, and the holes in the sand scarcely betray it, for they are exactly similar to those of most arenicolous worms.

Berwick upon Tweed, Nov. 10. 1834.

ART. V. *Observations concerning the Indigenousness and Distinctness of certain Species of Plants included in the British Floras.* By the Rev. J. S. HENSLOW, M.A., Professor of Botany in the University of Cambridge.

THE present demands of the botanist are not to be satisfied by receiving a mere description or enumeration of the species to be found "wild" in any country, but he expects also that some account will be given of their mode of distribution, and of various other circumstances of interest in elucidating the general history of the vegetable kingdom. The earlier botanists were often too hasty in admitting certain species into local floras, upon very unsatisfactory grounds, and later writers have not always exercised sufficient discrimination in rejecting them, or, at least, in accurately distinguishing between such as have been introduced by the agency of man, though now strictly naturalised, and such as are unquestionably indigenous. Until of late years, many of the authors of our local floras seem to have been inspired with a desire of swelling their catalogues, rather than of examining attentively into the circumstances which may probably, or *possibly*, have brought certain species within the limits of their observation. We do, indeed, in many cases, find an (*) attached to some plants, which were considered as doubtful natives in the district under examination; but when some of these have been gathered in several distant parts of the country, the original suspicion of their exotic origin is likely to wear off; and if any collector, less cautious than others, should be decided in pronouncing any of them as "truly wild," the chances are that their claim to rank as "indigenous" species will be also admitted. Now, I beg leave to observe, that there is a wide difference between allowing a plant admission into our flora as a "wild" and as an "indigenous" species: and, we may ever hope to arrive at a knowledge of the laws which regulate the geographical distribution of species, it is of the highest importance, that all writers of local floras should be very particular in mentioning the exact circumstances under which every species in their lists may have been observed to grow. Provided this rule be attended to, there can be no objection to their admitting many more species as "wild flowers" than they do at present; and to these they might append an account of such trees and shrubs as thrive or fail in plantations, and of such herbaceous plants as succeed or not in agriculture. But what I am anxious to impress upon British botanists is, the propriety of our acting upon some common principle, in our endeavours to obtain a co

history of the indigenous vegetation of our country. We ought, at least, to be agreed about rejecting some species which have erroneously crept into our flora, and we ought to endeavour to agree about others which have certainly been introduced by the agency of man. But, besides these, I think we might notice a third class, concerning which I am more particularly desirous of obtaining the opinions of your correspondents and others; to be composed of species, of whose introduction we cannot feel positive that it should be attributed to the agency of man, but of which we have a "suspicion" that they were thus introduced, arising from the peculiar conditions under which they are found. We might indicate this suspicion by some mark, as (†), distinct from that (*) by which we characterise the *certainly* naturalised species. If these dubious marks were to accumulate against the same plant obtained from various stations, we might hunt it, as it were, back to the spot from which it had originally roamed in the society of man to other botanical regions, but in which it would not have been found, had it been left to the operation of natural means alone for its dispersion. The considerations upon which I conceive these marks of doubt may be made to depend, I shall presently revert to.

The idea of soliciting discussion on these points has principally originated in a wish to promote an enquiry which has been ably commenced by Mr. Watson, respecting the geographic distribution of the plants of Great Britain. [See VI. 265. and VII. 20.] This gentleman has rejected many species commonly admitted into our flora, and has increased the list of naturalised species, by including several of those which are usually considered to be strictly indigenous, and has also grouped together, as varieties, several plants which are generally accounted distinct species. These are all points in which our flora stands in need of a decided reformation; and, so far as my own observations have enabled me to judge, I generally agree with Mr. Watson's proposed emendations. We may, possibly, arrive at farther results by a more general discussion of these points, and I know of no place so well adapted to this purpose as the pages of your magazine. I have engaged several of my botanical friends in the University, who are in the habit of meeting once a week for conversing on subjects connected with natural history, to discuss the circumstances under which they may severally have noticed the species included in our flora, so that the communications which I may hereafter transmit to you must be considered as the joint-stock opinions of our resident botanists. There are hour[illegible]ds to which our enquiry will extend: —

1st, To such plants as ought to be entirely excluded from our flora (°).

2dly, To such as have *evidently* been introduced by the agency of man, but are now strictly naturalised (*).

3dly, To such as may be *suspected* of having been originally introduced by the same means (†).

4thly, To those plants usually considered as distinct species, but which there is reason for supposing may be merely varieties.

1. *Plants to be rejected from our Flora.* — It seems hardly correct to include in our lists, even as naturalised species, such as are only occasionally to be met with on heaps of manure, or among rubbish which has been the outcast of a garden. These plants, of acknowledged exotic origin, are for the most part annuals, and seldom occur above once or twice on the spots where they have been observed. The *Datùra* Stramònium and *Amarántus Blìtum* may be instanced as plants of this kind. If any one, however, thinks it desirable that these plants should be noticed in our British flora, they might be placed in an appendix, distinct from the species which are allowed to be indigenous or naturalised.

There are several species which, it is presumed, have been admitted into our flora in mistake for some peculiar varieties of other species, with which they have been confounded. The *Papàver* nudicaúle, and *Lèdum* palústre, still retain their places in our lists, though, I believe, they will be omitted in the next edition of the *British Flora*, as Dr. Hooker lately informed me that he was now satisfied that a stunted specimen of Meconópsis cámbrica had been mistaken for the former species, and that the evidence for the latter was equally questionable.

2. *The naturalised Species.* — As it would be certainly improper to exclude those plants from our flora which have become strictly naturalised in our own country, and now form part and parcel of the wild flowers of our fields and hedges, it is perhaps the most convenient mode to register them continuously with the indigenous species, and merely to denote them by the usual mark (*). When a species is considered to be indigenous in one district, but merely naturalised in some other part of the country, this mark may be appended to the names of the places where it has been thus introduced.

There are certain species which are only to be met with in one or two spots of some cultivated districts, and under circumstances where no reasonable doubt can be entertained of their having been originally introduced by agricultural pr duce. These plants, which are mostly annuals, are conti disappearing and reappearing, according to the natu

crops which may happen to be under culture at the time, and they are perpetually shifting their quarters from one field to another. Some of these succeed in establishing themselves to a greater or less extent in the hedges, and about the borders of cultivated fields, but are never to be met with in uncultivated districts. Many of these can scarcely be considered as even naturalised, certainly not as truly indigenous plants; but it must be left to the judgment of the observer to decide whether any species in particular is to be placed under this or the following head, until better information respecting its mode of growth in other places has been obtained.

3. *Species possibly not indigenous.* — It is this third enquiry which will afford most scope for discussion; and many persons will at first be disposed to consider the object as of very little importance. But it seems to afford the safest means, at this late period of the earth's history, of arriving at anything like certainty in our conclusions respecting our truly indigenous flora. What has been said under the last head is, perhaps, almost sufficient; but the enquirer may often assist his judgment by obtaining local information, whether any particular species was not formerly cultivated in the neighbourhood, or may not now be growing in a spot which was at one time used as a garden, &c. I once observed *Íris* fœtidíssima and *Polýgonum* Bistórta growing together, in a small patch, in a copse where *Helléborus* fœtidus abounded, and a few plants of *Rósa* rubiginósa were also scattered. As these plants were not to be met with elsewhere in the immediate neighbourhood, and as the spot itself was on the outskirts of a village, I was suspicious of their being strictly indigenous; and, upon farther search, detected some straggling shrubs of *Búxus* sempervírens, which perfectly satisfied me that my suspicions were well founded.

It may be safely asserted of several of our rank weeds, that, unless the ground were cultivated, and the crops regularly grown, they would soon cease to spring up. In fact, although they make their appearance as regularly as the crops themselves, they are seldom to be met with in uncultivated ground; and certainly are not more frequently to be found "truly wild" than individual specimens of the species which compose the crops themselves. When I mention our common field poppies as not exempted from all suspicion of an exotic origin, it will be supposed that I am stating an extreme case; and yet I question whether some if not all the species of the genus *Papáver* (of Decandolle) would not ultimately disappear from our native flora, if the whole kinghour, were abandoned to the uncultivated state from which it

has been reclaimed for so many generations. I scarcely remember to have seen a specimen of a true *P*apàver in an uncultivated district, unless *P.* Argemòne be not an exception. One good test of the indigenous character of an annual plant is when we see it vigorously disputing possession of the soil with perennials. Thus, the Rhinánthus *C*rísta-gálli, which comes up abundantly among the herbage of our pastures, must be considered as truly indigenous; whilst the *C*aúcalis latifòlia and *d*aucöides, which are only to be met with in cultivated fields (in this county, at least), ought not to be considered in any other light than as introduced plants. The *R*anúnculus arvénsis is seldom, if ever, to be met with, except in cultivated districts; but its greater abundance would incline me to place it at present with the poppies, as an indigenous species under "suspicion," rather than as a truly naturalised plant. Some of your correspondents may possibly be inclined to point out other reasons for accepting or rejecting certain species; and, at all events, they may furnish us with an exact account of the circumstances under which some of the "suspected" species may be found in their respective neighbourhoods. For my own part, I consider it a far more laudable result, to succeed in establishing the exotic origin of a common weed, than to add a new species to our flora, interesting as such an event must be considered by every British botanist.

4. *Plants which may possibly be Varieties, and not distinct Species.* — It is hopeless to expect that botanists will arrive at any safe conclusions on this subject, until they shall consent to adopt the only sure and legitimate mode of satisfying their doubts; I mean, by the test of direct experiment. I have, on former occasions, alluded, in this Magazine [III. 406. 537.; IV. 466.; V. 493.], to the necessity of our adopting this philosophical course, if ever we would hope to arrive at the laws upon which specific distinctions are founded; and a plan of cooperation was proposed in the botanical section of the British Association, when it met at Cambridge, by which botanists from different parts of the kingdom might be enabled to compare their observations, and obtain more satisfactory conclusions than those at which we have hitherto arrived. It is not too much to say, that there are some genera whose species have possibly been multiplied fourfold beyond the number which they really contain. In consequence of this, our flora appears to occupy a much higher rank among the floras of different countries than it ought to do; and this must lead to very erroneous conclusions respecting the laws which regulate the numerical distribution of species in different latitudes.

ART. VI. *Facts and Opinions in question of the Distinctness, as Species, of certain Plants reputed to be Species, which inhabit Britain.* By W. A. BROMFIELD, M.D.

SINCE the confirmation, by Professor Henslow, of the very startling discovery, that Prímula vulgàris, vèris, and elàtior are all varieties of one and the same plant (III. 406.), it may be allowed to cast a doubt on the specific differences of other vegetable forms in which these discrepancies assume still less the character of permanent distinctions. Such appears to be the case with Pulmonària officinàlis and angustifòlia; two species, if you will, much more obscurely impressed with the marks of separate independent existence than in the instance above alluded to.

I collected, last season, both in the Isle of Wight and the New Forest, about Lymington, many specimens of each of these presumed species; but, except the greater or less degree of narrowness in the leaves, embracing every gradation between the two extremes of sublinear-lanceolate, on the one hand, and of ovate-lanceolate to almost cordate, on the other, I could discover no one decisive character on which to found any good claim for their remaining disunited. It is, indeed, a matter of surprise, that botanists of the first rank should, in their respective descriptions, rest contented with characters so meagre and unsatisfactory as those assigned by them as distinctive of P. officinàlis and angustifòlia. The latter has hitherto been looked upon as a very rare plant; but, as far as my own experience goes, it is of nearly equally frequent occurrence in the districts above mentioned, where it grows promiscuously with P. officinàlis; and sometimes borrows so much of the broader features of the latter as to make it a task of some difficulty which title to affix, as my dried specimens can testify. The uncertainty that attaches to their discrimination is farther evinced by the opposite definitions of different authors. Sir J. E. Smith says, P. angustifòlia is twice as tall as P. officinàlis, and that the limb of the corolla is shorter in the former, with rounded segments; which I do not find to be the case; nor can I perceive any difference in the calyx when the seed is formed: but the remark that the narrow-leaved plant is seldom spotted appears to hold true, though only partially correct, as this character is otherwise common to both. Wahlenberg (*Flora Suecica*) affirms that the two pulmonarias are almost *equal* in height, and differ *only* in the *narrowness* of their leaves: he adds, "Flores tamoque simillimi." The root leaves of P. officinàlis are hour, ·e; but are not to be found on the plant at an advanced

stage of its growth: I cannot, therefore, say if any difference obtains between the two varieties in that respect. At all events, no good invariable specific character has yet been discovered for discriminating these supposed species; those pointed out by Smith, who has gone farther in this respect than most other botanists, being purely technical, and partaking too much of that analytical precision which we in England call splitting a hair. While on the subject of the undue multiplication of species from characters too hastily assumed as permanent, I cannot conclude without applying to some of our fellow-labourers, especially on the Continent, the lines of a great living bard on certain financiers then in office: —

> " Our *botanists*, skill'd in all the trick
> And legerdemain of arithmetic,
> Know how to place 1, 2, 3, 4,
> 5, 6, 7, 8, and 9, and 10
> Such various ways, behind, before,
> As make each *species seem* a score,
> And prove themselves most wealthy men."

Hastings, March 3. 1834.

Pulmona`ria officinàlis and P. angustifòlia, under culture in the botanic garden at Bury St. Edmunds, were obviously dissimilar plants. The plant of P. angustifòlia had, I believe, been derived, or was the offspring of a plant that had been derived, from the Isle of Wight; by, I also believe, the Rev. G. R. Leathes. It was the habit of P. officinàlis to increase by stolons, to have much of ovateness in its leaves, and to have a paniculate inflorescence: P. angustifòlia increased only by sprouts (turiones) produced at the top of the caudex, had much of lanceolateness in its leaves, and a capitate inflorescence, produced at the tip of a stem taller than the stem of P. officinàlis.

Chenopòdium álbum. — Of this species, as usually received, a variety with an inflorescence cymose in a good degree is not rarely to be met with. Is not this character hereditarily constant, and the variety a species?

Sónchus oleràceus. — The distinctly characterised forms included until lately under this specific name, are, I believe, hereditarily constant, and have, I have an impression, been somewhere described as distinct species.

For a few additional notices relative to Arts. V. and VI., see p. 117. — *J. D.*

ART. VII. *Some Particulars on the Fact of Two Horses dying shortly after eating of the living Leaves and Branches of the Yew Tree; and others on the Fact of Two young Guinea Fowls dying not long after feeding on withered Leaves of the Yew Tree.* By JAMES G. TATEM, Esq.

Two instances have recently occurred in this county, proving the fatal effects of the yew tree if taken into the stomach. The one to two horses belonging to a Mr. Ives, a respectable farmer at Prestwood Common, near Great Missenden, Buckinghamshire; and the other to some guinea chicks in my own garden.

From the report of the former case, by Mr. Beeson, a veterinary surgeon, it appears that, on the 5th of September, the trace horses of a team employed in carrying clover seed were, while the waggons were shifted, put under a very fine yew tree, which stood in the rick-yard; and were observed, by the carter, to crop it with great eagerness. No unfavourable symptoms appeared for the space of three hours; when, having staggered a few paces, they both dropped, and, before the harness could be taken off them, were dead.

On examining the stomach of each of the horses, after death, this organ was found to be contracted to one third of the natural size; and had forced on nearly the whole of its contents, a small branch of yew and a very little food being only left in the stomach. The bowels of both horses contained a considerable quantity of yew tree; and the inner cavities of the stomach and bowels were inflamed in that peculiar manner which is observed to arise from the presence of poison; neither in the brain nor other organs was a change from a state of perfect health observable. The other horses were not affected, from not having, it is imagined, eaten any of the yew tree. Mr. Beeson adds, in his letter to the editor of the *Bucks Gazette*, from which intelligent journal the foregoing account is extracted, that he has not a shade of doubt that both the horses were poisoned by the yew tree.

The second case, which occurred a few days subsequent to the one above stated, was nearly as follows: — Some young guinea fowl were placed in a coop, with their mother, a common hen, under the shade of a yew tree, the branches of which were beyond their reach; but having, it is supposed, picked from the ground some withered leaves (in which state, according to the Rev. W. T. Bree (VI. 48.), their injurious effects on cattle are well known), they proved equally fatal to takese birds. In less than half an hour from their being put hour, the garden, one of the birds was found dead: this was the

 and healthiest of the four. The remaining three were

removed in a state of languor and stupidity; from which state only two recovered, one having died in the course of the following night. They seemed to be chiefly affected by a nervous tremor, which gradually subsided. It is to be lamented that the birds which died were not opened; but of the cause of their death there can be no doubt.

We here see the deadly effects of the yew tree, both in a green and flourishing state, and when its leaves are fallen and withered; and that the animal and bird species fall equally victims to its poison. These instances may serve as a farther caution to persons as to the propriety of admitting the yew tree into their gardens or plantations; and an experience of its effects, by those who have preceded us, may be the cause of the yew tree being now so seldom seen.

Wycombe, Bucks, Dec. 11. 1834.

THE facts communicated show the poisonousness of the leaves of the yew, both living leaves and dead ones, to animals. Opinions, as to whether the fleshy portion of the fruit may be eaten safely or not, differ. Dr. Lindley has, in his *Introduction to the Natural System of Botany* (1830), p. 250., this remark: — "The succulent covering of the yew fruit [seed] is fetid, and said to be deleterious by Decandolle; we all know that its seeds, if eaten, are highly dangerous." Sir J. E. Smith has, in his *English Flora*, iv. (1828) 254., stated as follows: — "The leaves are fetid, and very poisonous; and prove speedily fatal to cattle accidentally tasting them when young and tender. The berries have a sweet mawkish taste, and may be eaten without danger." I remember having eaten of them in boyhood, without experiencing any ill effect. — *J. D.*

In the habits of animals there are facts in proof that what is one's meat is another's poison.

Ivy, its Leaves and Branches are, Mr. Bree has communicated in VI. 328., favourite objects of food with sheep. The leaves of Irish, or broad-leafed, ivy are, we learn from Mr. Coley (misprinted Coby), in VII. 631., "well known to be poisonous to poultry."]

ART. VIII. *Observations on Aurora Borealis, as affecting Atmospheric Phenomena.* By C. CONWAY, Esq.

IN the *Field Naturalist's Magazine*, i. 108., Captain Winn describes an aurora, and a gale that followed it; and desir farther investigation of the subject, as important to mar My attention has been recalled to the subject by

appearance of the aurora during the present autumn, and which I shall by and by describe. Let me, however, take a retrospective glance at my memorandum book.

On Dec. 11. 1830, I find recorded that the aurora was very distinct and brilliant; but I have no farther observation respecting it. I find added in a note: — "Falling stars, as they are commonly termed, frequently visible." The aurora is again noted as visible on Dec. 12. On Dec. 14., I find the following upon record: — "At eight o'clock in the evening, a beautiful meteor was visible; its course S.E. to N.W. After a short and rapid passage through the heavens, it burst; but, again re-collecting its scattered fragments, it made a second progress nearly as long as the first, and finally burst into numerous white particles." By reference to the register of my thermometer during this period, I find that, on Dec. 11., the wind was N.W.; on Dec. 12. and 13., E.; Dec. 14., E. and Dec. 15., W., with rain. Here we have a variable state of the atmosphere, certainly, as far as regards the wind; but, I think, nothing besides of any importance.

I find that the aurora again appeared on Dec. 25. This, I find, I have more particularly recorded. It formed an arch of pure white, extending from N.W. to N.E. It appeared as if cut into separate compartments, each radiating from a centre, exactly like the stones in the face of an arch of a bridge; and, after continuing visible for some time, disappeared in beautiful straw-coloured coruscations. An aurora, something of the same kind, is described and figured in *Mag. Nat. Hist.*, vii. 50—52., as having appeared at Hull on the evening of Oct. 12. 1833. In the present instance, however, the aurora presented much more the appearance of a regular arch. On Dec. 24., 25., and 26., I find recorded, "fair;" and, on Dec. 27., "snow."

The next notice which I have of the appearance of the aurora is dated Jan. 7. 1831. On that night it appeared, about nine o'clock, as a white cloud arching the heavens from E. to N.W. The colour afterwards changed to deep crimson. Soon afterwards it became agitated, and shot forth pillars across the heavens, nearly to the west. About ten o'clock, the whole collected into one bright focus near the zenith; and from this centre diverged beautiful rays, like an immense star. It afterwards dispersed; and remained during the greater part of the night stationary, like three or four bright clouds, in the north. It was nearly as light as if it had been full moon. I find that the first seventeen days of this month were "fair."

I have no farther memoranda of auroræ, until Capt. Winn's observations drew my attention to them afresh. My renewed attention was rewarded with the appearance of the aurora on hour, 1833. It began in the N.W., presenting very much

the appearance of a lunar rainbow. It afterwards became of a reddish tinge, and threw out columns nearly to the zenith. It did not last more than an hour. The following day we had a heavy shower of rain, resembling in intensity that of a thunder storm.

The aurora again appeared on Oct. 13., and was one of the most beautiful I have ever seen. It first appeared as a white cloud from N.W. to N.E., occasionally throwing up bright pillars to the zenith. The cloud finally disappeared; and was succeeded by waves of light rising from the northern horizon, and flowing after each other in rapid, uniform, and beautiful succession, and vanishing in the zenith. The effect was beautiful in the extreme; and appeared as if it were occasioned by a light reflected in the heavens from some flickering fire beneath. On Oct. 14. we had wind and rain.

I did not observe the aurora again until Nov. 3. 1834. It then showed itself in a most extraordinarily brilliant column, rising from a dark cloud near the horizon, at W.N.W. As it advanced in the heavens, the light became less intense, and took a little turn towards the north; and finally vanished at E.N.E. I hardly need say that it has been succeeded by very tempestuous weather.

Whether or not the aurora affects the atmosphere, so as to cause a change in the weather, is a matter, I think, not sufficiently proved: indeed, meteorological science is hitherto in its infancy. I am inclined to think that the changes I have above recorded, in connection with aurora, are too slight to allow us to trace them to that as a cause: indeed, I find that, in January, 1831, there was no change whatever in connection with it. The subject is certainly interesting, and deserving of farther observation. With this design, I have hastily thrown these few remarks together: they are of but very slight importance, certainly; but, if they shall serve to draw the attention of others to the subject, my object will be obtained, and the space they occupy will not be entirely wasted.

Pontnewydd Works, near Newport, Monmouthshire,
Nov. 12. 1834.

ART. IX. *A Notice of Instances of the Appearing of the Aurora Borealis, seen from Dundee, Perthshire, in* 1833 *and* 1834; *and of the State of the Weather subsequent to the several Instances.* By WILLIAM GARDINER, Jun., Esq.

THESE northern illuminations have been very frequent of late, as the subjoined list of dates of their occurrence in

and 1834 will show. From circumstances, I have been unable to make scientific observations on these interesting phenomena; but the statements I communicate are facts, and facts, however simple and apparently of little value in themselves, often come to be useful. The object I have in view, you will perceive, is to establish that the aurora may be relied upon as a sure prognostic of the weather. From the observations which I now bring forward, as well as a multitude of similar ones made prior to 1833, I have learned that an aurora is *always* succeeded by moisture, and frequently by storms, that are, in general, proportionate to the brightness, extent, and length of duration of the luminous manifestations. As scientific men have now set themselves seriously to investigate this subject, we may expect soon to know more about the nature of these midnight splendours; and, consequently, why they afford such true prognostications of the coming weather.

1833.

Mar. 21. Resembling the dawn. Snow and rain next day.
April 5. Luminous arch. Showers next day.
11. Faint. Soft shower followed that night.
May 16. Vivid. Violent thunder storm on the 17th.
17. Vivid. Showers on the 20th.
June 4. Faint. Soft shower in the evening of the 5th.
Aug. 6. Not vivid. Showers in the afternoon of the 7th.
20. Bright, with shooting stars. Heavy rain on the 21st.
Sept. 1. Vivid. Heavy rain in the evening of the 2d.
9. Vivid, beautifully coloured. Heavy rain the whole night of 10th.
12. Vivid. Heavy rain during the night of the 13th.
17. Magnificent display, reaching south of the zenith. Heavy rain and thunder on the 18th.
18. Faint. } Heavy rain during the night of the 20th.
19. Vivid. }
Oct. 6. Faint. Rain in the morning of the 8th.
8. Several coruscations. Shower on the 10th.
10. Bright. Showers and high wind on the 11th.
11. Vivid. Storm at midnight, which continued till next morning.
12. A very magnificent display, seen over nearly all Britain. Heavy rain on the 13th, lightning on the 14th, and very stormy at night.
15. Vivid. Much rain during the night and next morning.
Nov. 2. Faint. Showers on the 3d.
3. Faint, with fire-ball and shooting stars. Heavy shower the same night, and rain on the night of the 4th.
5. Faint. Rain, with high wind on the 6th.
6. A few coruscations, rather vivid. Rain during the night; 7th stormy.
7. Faint, without streamers. Shower of snow in the evening of the 8th.
8. Faint. Snow and sleet in the evening of the 9th.
15. Faint. Rain that night, and showers next day.
16. Faint, and shooting stars on the 17th. Dull on the 18th, took hour, drew to rain on the 20th, violent gale on the 21st.

Nov. 23. Very faint. Shower of snow on the 25th.
Dec. 4. Vivid. Stormy, with rain and hail that night and next day.
9. Not very vivid, with lightning and shooting stars. Heavy showers on the 10th.
29. Rather vivid. Rain during the night, and next day.

1834.

Jan. 3. Not vivid. Some rain on the 4th.
Feb. 9. Faint. Rain on the 10th.
Mar. 5. Luminous arch; aurora appeared like horizontal strata of light and shade, without coruscations. Rain during the night; and, on the 6th, violent gale, with rain, snow, and hail.
6. With a few coruscations, and much lightning. Rain that night and next day, with gale.
7. Similar to the last. Stormy, with rain and hail on the 8th.
9. } Very faint, no coruscations. Rain on the night of the 11th.
10. }
30. Faint. Shower on the 31st.
31. Faint. Rain on April 1.
April 4. Faint. Dense masses of threatening rain-clouds on the 5th shower on the morning of the 7th.
28. Faint. Rain on the 29th and 30th.
May 3. Faint. Rain on the evening of the 4th.
5. Faint. Showers next day.
7. Rather faint. Much rain on the 8th.
12. Faint. Rain on the evening of the 13th.
June 21. Luminous arch. Heavy showers with thunder next day.
July 18. Rather vivid. Stormy, with much rain on the 19th.
25. Concentric arches of light and shade. Stormy, with much rain next day.
Aug. 31. Vivid, with much lightning. Long and heavy showers next day.
Sept. 1. Faint. Rain during that night.
6. Faint. Shower on the evening of the 7th.
Oct. 1. Faint. Shower same night.
3. Faint. Slight showers next day.
4. Extensive, though not very brilliant, light, in broad waves reaching south of the zenith. Rain during the night.
5. Faint. Shower during the night.
6. With a few coruscations, and strata of light and shade. Rain during the night.
7. Faint. Stormy, with rain on the 8th and 9th.
23. Vivid, beautifully coloured. Stormy; many dense nimbose clouds passed over, but were not discharged here; frost strong.
26. Faint. Shower during the night.
29. Faint. Showers that night and next evening; wind high.
Nov. 2. Very vivid; at first of a green colour. } Very stormy, with much rain on the 3d, 4th, and 5th.
3. Faint. }
Dec. 4. Rather bright. Shower on the 5th.
5. Bright. Rain on the 6th.
6. Vivid. Very stormy, with much rain.

Dundee, Dec. 5. 1834.

[In a "Meteorological Report" for Nov. 1834, and for, we presume, Worcester, published in the *Analyst*, No. vi., Jan. 1835, p. 446., it stated that "a luminous arch, stretching across the heavens from east to west, was visible on the evening of the [Nov.] 3d." From the particulars on it given we quote the following: — "It was first observed at 8 P. M. . . . At the time of its appearance, the wind was light from the south, the temperature mild, and the sky generally overspread by a very thin stratum of cloud, more dense in the north than elsewhere. Stars of the first and second magnitude were very visible; the small ones mostly obscured. It will be seen, by the table [given], that the weather for the subsequent days was windy, with rain, accompanied with a considerable fall in the barometer."]

ART. X. *Remarks contributive to the Elucidation of Meteoric and Atmospheric Phenomena.* By W. H. WHITE, Esq.

IN compliance with the request of the Rev. W. B. Clarke, in his postscript (VII. 655.), I have extracted the following observations from my journal, relative to the meteoric appearances on the morning of Nov. 13. 1834, which, I regret, were both accidental and very limited, owing to the ill state of health I was in at that time. I have kept a journal of atmospheric and meteoric phenomena for some years, with the hope of deducing accurate conclusions on their origin, properties, and effects. Many of the results have been highly interesting; one or two of which, relative to aurora, I will take the liberty of noticing at the close of the following extract, as they are immediately connected with the subject in question.

Extract. — "Finding myself unable to sleep, from pain and restlessness, I arose at half past one o'clock this morning (Nov. 13. 1834). The moon was shining with such peculiar brilliancy, that I was induced to take a survey of that portion of the heavens which my windows commanded, the north and east. The wind was blowing fresh from the N.E. After looking in the direction of Leo and Ursa Major for a few minutes, I observed a few small meteors, perhaps five or six (as I did not note the number); but they presented nothing unusual in their appearance. I retired from the window for about a quarter of an hour; but my interest in a subject at all times so highly gratifying to my mind induced me to take another survey. I then saw, in the space of half an hour, ten meteors, all of them highly electrical, of a red

colour, and very brilliant: they were without trains or sparks; and most of them between Leo, Virgo, and Ursa Major. In a few minutes another meteor, of a paler colour than any I had observed before, glided almost perpendicularly towards the earth: this was succeeded by another of a more brilliant appearance, which took a westerly direction. This meteor cast a brilliant blue light, and had a short or truncated train, which was of a paler light than the meteor itself, and gradually shaded off into a yellowish red; it appeared, in fact, like a stream of light which the meteor, in its velocity, left behind. Another remarkable circumstance attended this meteor, which I have never observed before; and that was, the meteor separating itself from its train. The latter immediately vanished; while the former continued its downward course with amazing velocity, gradually losing its blue light, and increasing in redness as it approached the earth.* My health would not allow me to pursue these interesting phenomena longer, and I reluctantly retired to bed."

Had this beautiful meteor taken its course against the wind, which was blowing a strong breeze from the N.E., I should have concluded that the train was under atmospheric influence; but, as its direction was nearly with the wind, the train must either have been outstripped in velocity by the meteor, or it must have been the result of electricity or some other powerful agency.

A few evenings before the 13th, a gentleman has informed me that he saw a very brilliant meteor, about 7 P.M., which gave a very strong light, and had a train principally consisting of bright sparks. A similar meteor to the one above mentioned, I saw about eight o'clock P.M., on Dec. 17. 1830, just below Orion. It took an easterly direction. Its train consisted of sparks. The light produced by the bright blue blaze of the meteor was sufficient to have enabled me to see to read the smallest print. The wind was blowing a fresh breeze from the north. The weather, at this time, was very unsettled, and atmospheric phenomena abundant.

Auroræ were visible on Dec. 10. 1830, with many meteors: on Dec. 11. and 12., very brilliant, with many meteors in various directions; but not so electrical as those on Nov. 13. 1834: on Dec. 13. and 14. 1830, slightly visible, the

* As this meteor continued its course till surrounding objects hid it from my view, I inferred that it was the falling of a meteoric stone; but how far I am just in making such an inference, I have no proofs. I should, therefore, feel obliged by farther opinions of any gentleman on the falling of meteoric stones, and especially an eyewitness of so beautiful a phenomenon.

wind constantly shifting between the s.w. and N.W., with frost during the nights, and rain during the days. On Dec. 17., when the above meteor appeared, the wind veered completely round the compass in twenty hours, from s.w., by the N., to s.w. again. On the 18th, the wind was due N., with frost at night, and an aurora borealis. From this period the wind shifted to s.w., and the weather was mild, till Dec. 23., when a hard frost set in: wind N.W., till Dec. 29. The wind again veered to s.w., with rain, which continued on the 30th and 31st. The year closed with a very mild night.

I have been thus particular in a detailed account of the weather during the latter part of December, 1830, because I have generally found variable and stormy weather to succeed auroræ, particularly if they were accompanied with many meteoric appearances. During the period of my observations on atmospheric and meteoric phenomena, I have invariably found that a gale of wind, generally from the s. or s.w., has followed aurora within thirty hours, or, at most, thirty-six hours; but differing in degree according to the splendour and magnitude of the aurora and meteoric appearances; and therefore I think the following observations will hold good; viz., the more splendid and active an aurora is, the more violent, and, consequently, in the shorter period, is the gale that succeeds, and the shorter its duration; and, on the contrary, the more languid and dull the aurora appears, the longer the gale is in approaching, the less its violence, and also the longer its continuance. I should feel obliged by the observations of other gentlemen on this interesting subject; because, if the fact be universally true, particularly in higher latitudes, of what importance would it be to our navigators, especially in the Northern Ocean, to pay particular attention to these interesting phenomena, as they might be enabled to prepare against the storm which these appearances may be said to predict.

Old Kent Road, Dec. 10. 1834.

ART. XI. *On the Maidstone Fossil Skeleton, in the Museum of Gideon Mantell, LL.D. F.R.S., Brighton.* By R. B.

MANY of your readers may recollect seeing an account in the Kent and other newspapers, of a part of an immense skeleton having been found in a stone quarry near Maidstone, in the month of May last. This skeleton has, by the liberality of several scientific gentlemen in Brighton, been purchased, and placed in the museum of Dr. Mantell, now

removed from Lewes to Brighton. Dr. Mantell, to whom we are entirely indebted for a knowledge of the true character of the fossil bones of large animals found in the wealds of Kent and Sussex, has, with much labour and skill, cleared away part of the stone in which the remains of the Maidstone fossil are embedded; and has ascertained in a satisfactory manner, that it belonged to that enormous herbivorous reptile which he has called the Iguánodon, from its close resemblance in structure to the iguana of the West Indies. In III. 9—17. [VI. 75.], of this Magazine, there is a description of the Mantellian museum, then at Lewes, with cuts of the teeth of the iguanodon, and some account of the large bones which had then been discovered, and were placed in the museum. It is remarkable that all the bones of this animal which had been previously found in Tilgate Forest were detached and separate; but in the Maidstone fossil they are collected in one mass of stone, and evidently belonged to one individual reptile. Having recently visited Dr. Mantell's museum, I had intended giving a short account of this skeleton; but, as Dr. Mantell has since reprinted a catalogue (noticed in p. 125.) of his museum, which contains a brief and clear description of the Maidstone fossil, I shall extract it, as it will probably interest many of your readers, who have not an opportunity of visiting the museum:—

"The specimen consists of a considerable portion of the posterior part of the skeleton of an iguanodon, which, when living, must have been upwards of 60 ft. in length. The bones are embedded in the stone in a very confused manner; with but few exceptions, none of them are in the order of juxtaposition which they hold in the recent skeleton of the iguana, and all of them are more or less distorted by the compression they have undergone, since their first envelopement in the rock, which, we need scarcely observe, was originally sand.

"The following bones are well displayed; and there are fragments of many others which are too imperfect to admit of their characters being determined:— Two thigh-bones, each 2 ft. 9 in. long. One leg bone (tibia), 2 ft. 6 in. long. Bones of the hind feet, both metatarsal and phalangeal: these much resemble the corresponding bones in the hippopotamus. Two claw-bones (unguical phalanges), which were covered by the nail or claw: these correspond with the unguical bones of the land tortoise. Two finger, or metacarpal, bones of the fore feet, each 1 ft. 2 in. in length. A radius, or bone of the fore arm. Several dorsal and caudal vertebræ (bones of the spine and tail). Fragments of several ribs. Two clavicles, or collar bones, each 2 ft. 4 in. in length: these bones are of a very

singular form, and differ essentially from any known clavicle; yet it seems impossible to assign them to any other place in the skeleton. Two large hatchet-shaped bones, which appear to belong to the pelvis: they are probably the ossa ilia. A chevron bone, or one of the inferior spinous processes of the tail. A portion of a tooth, and the impression of another: the fortunate discovery of these leaves no doubt of the identity of the animal with the Iguánodon Mantélli of Tilgate Forest.

"This specimen from Maidstone is of great value to the comparative anatomist, because it affords decisive evidence that the separate bones found in the strata of Tilgate Forest, and assigned to the iguanodon by Dr. Mantell, solely from analogy, have been correctly appropriated, and belong to that animal; and we thus obtain a certain knowledge of many interesting facts relating to the structure and economy of the original. The recent iguana, as is well known, lives chiefly upon vegetables; and it is furnished with long and slender toes, by which it is enabled to climb trees with great facility in search of food: but no tree could have borne the weight of the colossal iguanodon. Its enormous bulk would require to be supported by feet of corresponding solidity; accordingly, we find that the hind feet, as in the hippopotamus and rhinoceros, were composed of strong, short, massy bones, and furnished with claws, not hooked, as in the iguana, but compressed, as in the land tortoises. The feet thus formed a massy base for the support of the enormous leg and thigh bones. But, in the fore feet or hands of the iguanodon, the bones are analogous to those of the fingers of the iguana; long, slender, flexible, and armed with curved claw-bones, the exact counterpart of the nail-bones of the recent animal; thus furnishing a prehensile instrument, to seize and tear to pieces the palms, arborescent ferns, and dragon-blood plants (Dracæ'na), which constituted the food of the iguanodon."

That the above families of plants supplied food for these enormous reptiles may be fairly inferred from the abundant fossil remains of their stems and leaves, which are found in the same strata with the bones and teeth of the iguanodon. These teeth, like those of the living iguana, are formed for cutting vegetable substances; and, from the manner in which they are worn down, Dr. Mantell infers that they also served to masticate their food. Indeed, from the size of the plants, their parts and fibres would require mastication to convert them into nourishing food. The geological position of the Maidstone fossil differs from that in which the other remains of the iguanodon have been found. It was not surrounded by freshwater strata, but embedded in the grey arenaceous

limestone, called Kentish rag, which is of marine formation, and abounds in marine shells, and forms a part of the green sand below the chalk strata. It must, however, be borne in mind, that the Kentish rag is in the vicinity of the Wealden strata; and we may imagine, without any violation of probability, that the body of the animal had been carried by a river or inundation into the sea, and embedded in the sand. Large as the animal must have been whose bones were discovered at Maidstone, much larger bones have been found in the west of Sussex. There are, in the museum, one very perfect thigh bone, 3 ft. 8 in. in length, and 2 ft. 11 in. in circumference at the largest extremity; and several caudal vertebræ which measure 2 ft. in circumference. By comparing these bones with analogous bones of a recent iguana, placed upon them, and taking the length of a skeleton of the latter (also in the museum), as a standard, which is $3\frac{1}{2}$ ft. long, we may infer that the length of the iguanodon to which some of the bones belonged must have exceeded 100 ft.

The museum contains a very instructive series of skeletons of recent fishes and reptiles, comprising the *Bòa* constrictor, the crocodile, various saurian animals, and several species of the tortoise, &c. By a careful comparison of these with the fossil bones and skeletons, we are enabled to obtain a correct knowledge of the osteology of extinct species, and to trace the difference between their structure, and that of analogous species at present inhabiting the earth. The collection in this museum is greatly increased (since the time when the description of it in III. 9—17. was written), both by the labours of Dr. Mantell, and the contributions of foreign geologists. Among the latter is a cast of the head of the Mososaúrus, a large fossil reptile of Maestricht, presented by Baron Cuvier. This is so correctly coloured, that we believe it would be scarcely possible to distinguish it from the original head in the Jardin des Plantes at Paris.

The removal of this museum from Lewes to Brighton may be regarded as a valuable acquisition to the latter place; as its liberal proprietor allows it to be visited by his friends and patients, every Tuesday, from two to four, on application for tickets of admission on the previous Saturday, which may be sent for on the Monday. In a notice at the end of the descriptive catalogue, Dr. Mantell states that, as the collection is strictly a private one, and being actively engaged in his profession as surgeon and medical practitioner, the above arrangement is absolutely necessary to avoid inconvenience and disappointment.

Hampstead, Dec. 9. 1834.

ART. XII. *Short Communications.*

MAMMIFEROUS ANIMALS. — *The Mole* (*Tálpa europæ`a*).—

" Descending now (but cautious, lest too fast,)
A sudden steep, upon a rustic bridge
We pass a gulf, in which the willows dip
Their pendent boughs, stooping as if to drink.
Hence, ankle deep in moss and flowery thyme,
We mount again, and feel at every step
Our foot half sunk in hillocks green and soft,
Raised by the mole, the miner of the soil.
He, not unlike the great ones of mankind,
Disfigures earth; and, plotting in the dark,
Toils much to earn a monumental pile,
That may record the mischiefs he has done."
COWPER's *Task*, book i.

The Mole (*Tálpa europæ`a*). — The life of the mole is passed in such a gloomy region, separated from the light of heaven, and the creature is regarded with such scorn by the illustrious bipeds of the earth, that we are tempted to regard its history as uninteresting: and yet, on examination, I find it the contrary. I procured a couple of lively moles, that had not been at all injured, and placed them in a birdcage with some straw, with the intention of minutely examining their actions. The snout, at this time, appeared moist, capable of great variety of action, and endued with fine sensibility; and the anterior parts of the body (head, chest, and arms) capable of quick motion, at short turns, under the skin, as if muscular motion were independent of the motion of the integuments. They, when placed in the cage, immediately buried themselves, heaving up the straw as they proceeded: the lifting was effected chiefly by the force of the hands and arms; a little by the back of the head, but not at all by the snout. The hinder legs have but little force, except for progression; but they are not unfrequently employed to scratch the body. In the forward half of the body it is probable that this animal exerts more force, in proportion to its size, than any other creature in existence. For several hours this pair were exceedingly active, but they were unable to climb; and, in passing each other beneath the straw, they seemed to be quarrelsome, the conquered sending forth a stridulous squeak. When, at last, one of this pair effected its escape, it was by turning the wire backward, not by thrusting [it] before it. It then passed through a hole in the floor, and finally through a crevice in the stone step leading to the street, thrusting much earth before it. From the orifice thus opened, it passed over 5 ft. or 6 ft. of the pavement, and then began to burrow; but as often as an attempt was made to

seize it, it returned to the hole by which it had emerged, as rapidly and directly as if in possession of perfect sight. When placed in rather hard ground in a garden, it began to burrow horizontally, by thrusting the earth above and at the sides: but the mouth of the adit [run or burrow] was not closed by a heap of earth for more than an hour; consequently, in finally filling the orifice, the earth must have been brought from within. In all these actions, the tail was carried erect. From my general observations, I am led to think that when moles change their quarters, the journey is made above ground, and by night; and, in this case, the mouth of the underground passage will be found open. With us, the nest of a mole is always in a hedge (which, in Cornwall, is a mound of earth 5 ft. or 6 ft. thick, and as many high), except the field be of unusual size; and the tracks proceed from the hedge across to the middle of the field, or to the opposite side. In severely cold weather, they confine themselves to these hedges, commonly near the centre, where a little fine earth, thrown out on the snow, marks the exact spot. The young do not quit their nests until about half grown. In six winter months, from harvest to the beginning of April, one man caught, in the parishes of Talland, Lansallus, part of Morval, and a small part of Pelynt, one hundred dozen of moles.

The following will form a proper supplement to my account: it is extracted from the *Youth's Instructor and Guardian*, for January, 1834, and is signed Samuel Jackson, of Winsford, in Cheshire: — "Within the last thirty years, I have read several articles professing to be descriptions of the mole, but each of them has been erroneous and defective; and, having been trained to the business of a mole-catcher from my youth, and having followed that occupation for about thirty-five years, in which time I have decoyed and taken away the lives of from 40,000 to 50,000 of these creatures, perhaps it will not be considered vanity in me, if I attempt to describe that little miner. It is, perhaps, the strongest animal of its size at present known. When at work, the tail stands upright, or inclining on the back. It is remarkable for quickness of hearing. Their smell is very acute; which is one reason why they are not very easily taken in some kinds of traps. It is often said that the mole will die should it lose one drop of blood. This is incorrect. In attempting to throw up a mole with my mole spade, I once cut off one of its hind feet, and yet it escaped. Some months after this, I caught the same mole in a trap, with its stump it will healed up and sound. In the course of thirty-five years the sur-

have caught four white moles, or rather cream-coloured ones. The mole dwells in burrows, excavated with wonderful skill, many rods in length, and some parts of them only a few inches below the surface of the earth; while others are some yards deep. It will make several yards of these runs in a day; and, in some land, will drive the soil before it by small portions, after it has worked it out of the solid, to a length of from three to six yards, before it reaches the place where it throws up its hillock. When this little animal thinks it too far to take the earth [soil] to the last hillock, it works another perpendicular opening to the surface of the earth, out of which it throws another heap. This is the case when the mole is making its deep runs. In these excavations it will travel at a wonderful speed. Even the weasel, which is a great enemy to the mole, cannot keep up with it; though, on the surface of the earth, it would perhaps travel four rods before the mole could travel one. I have frequently observed, in the bottom of these runs, a perpendicular hole or well, at which the animal probably drinks. Some of them are of a considerable depth, and apparently dry; but, not being able to see the bottom, I have dropped a little earth into the well, and by this means perceived that it contained water. Down these the mole can safely travel, and return at pleasure. In some kinds of land, and in wet weather, these wells are full to the brim. That moles have frequent recourse to water will be seen from the well-known fact that they are easily taken, and in great numbers, in a run which leads to a brook or pit, in dry weather. Its nest is generally made in some secure place, sometimes under the root of a tree or thorn bush; often in dry hedgerows; also in solid marl banks, several feet, or even yards, deep. I never knew more than six young ones to be found in one nest; generally there are four or five. The nest is composed of dry grass, but sometimes mixed with green grass; the inside is composed of old dry leaves, frequently oak leaves; its form resembles that of a wren's nest, being like an oven. The mole has many roads from the nest; as it is not only formed for the depositing of its young, but for a comfortable lodging through the year. In land where moles are not much destroyed, they will frequently make nests in the middle of fields, where they throw up a heap of earth six or seven times as large as the common hillocks. Moles are much infested with fleas, resembling those which trouble human wouls, but larger and lighter-coloured. Though I have I once great numbers of these creatures with me, I do not would nor ever to have seen one of these fleas on my clothes.

" In the month of June, the mole leaves its burrows, and runs on the surface of the earth in the night, in search of food. It is commonly said, that it thus runs for one month; but that depends much on the season, whether it be dry or wet.

" Few animals will bite more savagely than the mole, especially at a certain time of the year. When fighting with each other, they will hold like the bull-dog. When a boy, I was mischievous enough to save the moles alive, for the purpose of entertaining myself by seeing them fight. For this barbarous work my fingers suffered greatly. At one time I was obliged to use my teeth in order to loose the hold of one of them from my hand, the other not being sufficient for that purpose. I have frequently caught them with their flesh torn in various parts with fighting." So far Mr. Jackson. Oppian represents the mole as exceedingly voracious. — *J. Couch. Polperro, Cornwall, May* 29. 1834.

[Mr. Hawkins, a correspondent of the earlier volumes of this Magazine, has described, in the *Gardener's Magazine* (ix. 80.), a fall-trap for catching moles, which is in use near Monmouth; but he objects to the great cruelty induced by this trap, " as, when the traps remain for some length of time uninspected, the moles devour each other." For other notes on the mole, see II. 420.; V. 78. 298. 571. 765.; VII. 143.

A correspondent has somewhere remarked, that an old mole-catcher had observed to him that the flesh of the mole is good eating; that he was in the habit of eating moles, dressed; and that, if folks generally knew how good they are, many fewer would fall to his share. The skin of the mole is, it is known, manufactured into pouches, and other articles.]

Facts on the Mole (103.). — As some men were removing, on June 15. 1833, a " windrow," that is, a bank of earth by the sides of fields, which is afterwards carried on the land, they discovered a mole's nest. It was made of small roots, leaves, grass, &c., and contained seven young ones, most odd-looking little things, covered with a fine down, like young rats. It is a vulgar error that the mole has no eye [and an ancient one, " Aut oculis capti fodère cubilia talpæ "]. This organ, it is true, is very imperfectly developed; but it does exist. A slight depression serves as an orbit. There is no optic nerve; but its place is supplied by a branch from the superior maxillary nerve. It is very certain this animal possesses some of the senses acutely enough; for if a pig, or approaches one which happens to be out of the ground recapmake its escape, with astonishing rapidity, beneath dog had

face, either by burrowing a hole, or entering one already made. Where there is a colony of moles, there is generally a run leading to a ditch, by which they go to drink. They are seldom seen out of their holes, except when they go to drink, and sometimes in still evenings. — *J. C. Witham, Essex, March* 20. 1834.

[Some original information on the habits of the mole, as observed in a live one kept in a tub of earth for several days, is given in No. xvii. of the *Parent's Cabinet of Amusement and Instruction*. It never came to the top of the earth, but for food. It "fed on bread, little pieces of roast meat, pieces of fruit, and several other things. One day I gave him some dead minnows, and he licked them all over with his tongue, and then ate them. Mamma thought, by his licking the wet fish, that he might be thirsty, so I made a little hole in the earth in his tub, and sunk a cup of water in it, in such a way that the top of the cup was level with the earth. Mamma and I stepped back a little distance to watch him. He soon came up, looked all round timidly, and then, seeing no one, began to drink very eagerly. The moment he caught sight of me, he buried himself; but he quickly returned to the water. . . . I do not know whether a mole has ever been tamed, but mine was a fierce little fellow. If I touched him, he squeaked like a rat, and tried to bite me with his sharp teeth." (p. 220.)

Our correspondent Agronome has never seen a mole in Ireland. (V. 104.) A gentleman, familiar with the north of Ireland, informs me that he has never seen a mole there.

Instances of the mole in white fur are mentioned in V. 571., VII. 143.; in cream-coloured fur, in VIII. 105.; in fur of a silvery ash-grey colour, with an orange mark under the lower jaw, and a line of the same colour down the belly, in VII. 143.

For "Chrysocholìris capénsis," in VI. 512., read "Chrysochlòris capénsis." This animal, which inhabits the Cape of Good Hope, is allied to the mole. "Its fur is brown, but gives, in certain angles of light, a brilliant metallic green and copper colour," as implied in the term Chrysochlòris. (*Griffith's Animal Kingdom*, v.)]

The Hedgehog: Remarks in Obliteration of the Superstition which accuses it of sucking Milk from Cows (IV. 425. note *; VII. 559.; VIII. 32.); *and Facts on its Habits.*—It is incredible with what stupidity and obstinacy the more uneducated of the English farmers persecute animals which a little investigation (*Hystr*[illegible] convince them are really useful occupants of their fields. natives o[illegible]t tried to save a family of hedgehogs from a man who t be persuaded that they had not sucked his cows.

Although I hid them near a pond, he suspected my purpose, and sought them out, and killed them all. — *Lansdown Guilding. St. Vincent, May* 1. 1830.

It is not thirty-two years ago since our churchwardens gave 3*d.* for the body of every hedgehog brought to them that had been destroyed within the parish, because it was the general opinion that they sucked milk from cows. Some of my neighbours still contend that they do; and that they roll amongst crab apples, that the crabs stick to their prickles, and are thus carried into their holes. If you attempt to reason with these persons, they will tell you, rather than give up their point, that they have seen the hedgehog do these things. In November, 1831, I gave 2*d.* for a hedgehog to prevent its being killed. It is now with us, and although we supplied it with food, I am not certain that it ate any all winter; of apples (and among them the kind called the French crab), I am certain that it did not eat any. It now (April) lives principally upon bread soaked in water. It sleeps all day, and begins to bustle about at seven or eight o'clock in the evening. We provide it food against this time. Although it would not, at first, let us see it feed, and we only knew of its feeding by the absence of the prepared food in the morning, it has now become so far domesticated, as not only to eat its food in our presence, but as to feed, on the lap, on a piece of fresh meat. On one evening I had the following proof that its sense of hearing is acute: — My clock strikes with considerable intervals between the strokes. On one evening the clock commenced striking when the hedgehog was about the room. At the sounding of the stroke the hedgehog contracted itself, as if in fear; before the next stroke was sounded, the hedgehog had partly relaxed itself, but, at the sound of the stroke, again contracted itself; and so on of the successive strokes. The hour the clock was telling might be eight. — *J. D. sen. Waterbeach, near Cambridge.*

[I think I have been informed that this hedgehog effected its escape in the end; and this is no wonder, if the hedgehog is by night, or at any time when left totally alone and unobserved, one half so active as the allied animals, the armadilloes of South America, are, judging from the almost positively ceaseless running or action of one species in the Zoological Society's Gardens. No cranny or opening available to its escape could remain long undiscovered by it. — *J. D.* I have ascertained, since, as follows: —]

The hedgehog effected its escape in the end of May, or beginning of June, 1832. I have reason to believe I recaptured it in the beginning of November, 1834. A dog had

found a hedgehog about a furlong from the house, and had severely injured it. I took it, in a bleeding state, into the house. On my wife calling to it, it unfolded itself and made towards her; but it was too much injured to travel. We laid it in a basket with some clean straw. It is now (Nov. 22.) doing well. A few days ago, one of my neighbours brought me another hedgehog. I laid the two down together on a sack, when mine soon unfolded itself, and rubbed its prickles gently against the other; and afterwards put its nose under it, as if to apprise it that there was no danger. They are now on good terms, and have made their bed for the winter.

The stomach of a wild hedgehog, killed a good while ago, was examined: it was found to contain principally beetles, and a small portion of grass. — *J. D., sen.*

This testimony of the hedgehog's possessing the faculty of hearing in an acute degree, corresponds with the conclusions of C. S. E., in IV. 382., drawn from an examination of the structure of the ear of the hedgehog; and with those of J. J., in V. 297–8; but it disagrees with the conclusion to which Dr. Farrar's observations, in IV. 13., upon a living hedgehog kept by himself, and his examination of the structure of the ear in two dead ones, had led him. Dr. Farrar has, however, this remark: — "I have consulted many sportsmen and gamekeepers, who all assure me that the hedgehog's sense of hearing is very acute; but, when they have been closely pressed, whether or not its alarms are received through the organs of vision or hearing, they seem doubtful." (See IV. 13.)

On the Habits of the Hedgehog, besides the facts which may be gathered from the places indicated, these are stated of it, by Sir William Jardine, in one of his notes to his edition of White's *Natural History of Selborne*: — It "feeds indiscriminately on flesh and vegetables; and is very fond of eggs, doing considerable mischief by destroying game during the breeding season. It will even enter a hen-house, and, when within its reach, will turn off the hens, and devour the eggs. They are frequently caught in traps, baited with eggs, for the carrion crows. They are easily tamed, and become very familiar in a state of confinement, will eat bread, potatoes, fruit, flesh, raw or cooked, without any apparent choice."

The flesh of the hedgehog is occasionally eaten in England, by poorer persons; and, I have been told, by gipsies. It is reported to be agreeable meat; it looks very nice: the fat is of a yellow colour. Mr. Greenhow has informed us (VI. 511.) that the flesh of the allied animal, the Canadian porcupine (*Hýstrix dorsàta*), "is considered rather a delicacy by the natives of the countries it inhabits."

The hedgehog, I have heard it stated, whines by night, frequently, at short intervals, and this so audibly as to alarm the traveller unfamiliar with its sound, who may trip, lonely, in the still hour of night, the road skirted by the plantation or hedgerow in which hedgehogs may be: this animal, it may be assumed, forages for food by night. Shakspeare has attested that the hedgehog whines by night. In *Macbeth*, act iv., he has made his witches date the hour of night by these two natural signs,

> " Thrice the brindled cat hath mew'd;
> Twice, and once, the hedgepig whined."

Mr. Bree has supplied us, in VII. 545. note *, with ample gloss on the first of these lines, and our remarks may contribute to explain the second of them.

Dr. Buckland and Mr. Broderip have related, in *The Zoological Journal*, ii. 19., an account of a hedgehog's despatching a snake, by passing the snake's body through its jaws from head to tail, and regularly cranching each of its vertebræ in succession. Our correspondent, Mr. Murray, has, in VI. 457., these judicious remarks on this fact: — " To me, the experiment proves nothing. The circumstances under which they [the hedgehog and snake] were placed, were forced and unnatural; and, even by Dr. Buckland's account of the matter, the hedgehog had to be goaded to the deed. It seems to have destroyed the snake as an invader of its repose; and *hunger* impelled the hedgehog to make a sorry meal on the body of its enemy [inconveniencer]; for there was nothing else for it to eat."

Birds. — *Notices of Birds in Plumage of an unusual Colour.* — Since I sent my communication on birds with white plumage [VII. 593.] (suggested by the remarkable coalhood), a friend of mine has informed me that, while riding through a park, he saw a

Yellow Bunting (*Emberiza Citrinélla*) *with a White Head and Tail*, so as to have somewhat the appearance of the snowy longspur (Plectróphanes nivàlis). I was the more struck with this, as I had seen, not long before, an account of a similar case in Pennant's *British Zoology*: here are his words. "I received, in November, 1787, a bunting [which of the five kinds of bunting is not mentioned, I say *five*, because the ortolan bunting (E. hortulàna) is now considered a British bird] with a white head and tail, the head elegantly tinged with yellow, the back white and brown; the coverts of the wings the same, but on both the white predominated; the breast had all the usual marks of a bunting." In Dr. Shaw's *Zoology* is recorded an instance of

A White Régulus auricapillus. [Selby, to avoid calling this

bird by the erroneous name wren (Anorthùra), has denominated it "gold-crested regulus:" but why not translate the term into plain English, and call the bird golden-crested kinglet?—a name, by the by, which it has received in nine languages.]—Mr. Stephens says, in his continuation of Shaw's *Zoology*, x. 797., "There is a beautiful white variety of this species (the goldcrest) in the British Museum, which was captured in Devonshire."

[*Instances of the House Sparrow* (*Pásser domésticus*) *in Anomalous Plumage* are referred to in VII. 597; and] Willughby, in his *Ornithology* says, p. 249., "This kind of bird doth sometimes vary in colour, Aldrovandus setting forth a white and yellow sparrow." [See, in VIII. 43., a notice of another variation which has occurred in the sparrow.] In the museum of a specimen-collector near this is (among other rare birds)

A very light-coloured Tree Sparrow (*Pásser arbòreus* Blyth), which was shot in the neighbourhood: the black on the throat is as dark as usual. Mudie, in his *Feathered Tribes*, speaking of

The Window Swallow (*Hirúndo úrbica*), says, "Light-coloured ones, and even albinoes, occasionally occur, as in the preceding species" (*the Chimney Swallow* [VII. 597.]).

I am not aware whether it is a generally known circumstance, that

The Common Fowl (*Gállus commùnis*) *changes Colour from time to time.*—A male of this species, kept by a neighbouring farmer, which had the usual graceful feathers of burnished gold on the neck, wings, and rump, the tail and breast black, was observed by me to be entirely white after I had not seen him for some time; and on passing by the farm, not many months after, he had resumed his old golden livery! [In the known instances of female fowls attaining the plumage of male ones, the plumage must partly change in structure as well as in colour. See, for instances, VII. 103. 106.] Another curious circumstance fell under my observation not long ago: I had

A Pair of Pea Fowls or Pavos (*Pàvo cristàtus*), *the Female of which, having sat the usual time, hatched five young ones, two of which were White.*—Now, although it is very common to have broods of fowls (*Gállus*) and turkeys (*Melèagris*) with as many colours as individuals, yet I had always thought that pintados (*Nùmida*) and pavos (or peevos, as the common people call them) were uniformly of the same colour. In some books it is even doubted whether the white variety seen about gentlemen's houses be of the same stock as the common breed.

I have been thus particular in collecting instances, because I think that whatever is observed should be carefully noted

and faithfully recorded, thus putting in practice the maxim of that distinguished naturalist, Le Vaillant: — "The principal aim of a naturalist ought to be to multiply observations." I am persuaded that in this way we shall be in a more likely way for obtaining a clew, to enable us to understand and explain the apparent inconsistencies of nature, than by framing the most plausible ingenious theories. — *S. D. W. Near Derby, Oct.* 10. 1834.

Species of Larks in White Plumage: see VII. 597. and VIII. 43., and, in the present page, below.

The Robin in White Plumage: see VII. 598., VIII. 43.

The Blackbird in Anomalous Plumage: see VII. 596. and VIII. 43.

[*Notices, by J. D. Salmon, Esq. of additional Instances.*] — *The Common Pheasant* (VII. 595.), *female, in White Plumage*, is by no means uncommon: it appears that male pheasants are but rarely perfectly white, as those in which a tendency to whiteness is apparent have, in most instances, more of a pied character. Three pheasants, females, in white plumage, have been sent, within the last twelve months, to two young men, brothers, of the name of Reynolds, residing in this town [Thetford, Norfolk], for them to preserve: one of them was perfectly white, without a spot; the other two were nearly so, each having only here and there a single brown feather in the scapulars: the legs and bills in all three were quite white.

An Individual of the Green Grosbeak (*Coccothraústes Chlòris*), *in nestling Feathers of a very pale Yellow*, very similar to a canary finch, for which it had been mistaken by the person who had shot it, has also been sent to Messrs. Reynolds: the colour of the legs and bill was a delicate white. The person to whom it belonged informed them that there were three or four more of the same colour: the whole were, in all probability, of one brood.

[*The Nuthatch* (*Sítta europæ`a*) *in unusual Colours.*] — Messrs. Reynolds received, on Aug. 21., from Thomas Thornhill, Esq., Riddlesworth Park, Suffolk, an individual of the nuthatch which exhibited an unusual variation in the colours. It was almost white, having only a few light chocolate feathers at the vent, and here and there a dark feather intermixed with the rest of the plumage; the legs and bill were quite white.

Of the Skylark, I have had a specimen, *in Plumage of a dirty White or Stone Colour, with the usual Markings clearly depicted by Light and Dark Shades.*

Of the Blue Tit (*Pàrus cærùleus*), I have had a specimen *of a very light Yellow Colour, through which were clearly defined the dark markings of the head, throat, back, &c.*, these

appearing as if they were enveloped by a thin transparent covering.

[*The Skill of the Messrs. Reynolds, Thetford, Norfolk, in stuffing and setting Skins of Birds for Preservation.*] — The superior manner in which these young men have set up their specimens, their attention to every slight variation in the markings, &c., have obtained for their performances the approbation of all who have seen them. In giving to the specimens, too, the character of expression proper to the species, I have never seen them excelled, and but very rarely equalled. They are richly deserving the patronage of those who prefer to see animation maintained, as it were, in their specimens, to the formal, stiff, and unnatural postures which at present disfigure so many of the specimens in our public museums. — *J. D. Salmon. Thetford, Norfolk, Dec.* 8. 1834.

See, in p. 41—43., Mr. Blyth's generalisations on instances of the albino condition in animals.

The Rook is both Insectivorous and Granivorous (VII. 459.): *it is more Insectivorous than Granivorous.*—Mr. Bree has drawn, I think, a conclusion, in p. 461., from a passage in my *Gleanings in Natural History*, which the passage itself does not warrant. The passage is this: — "In order to be convinced that these birds (rooks) are beneficial to the farmer, let him observe the same field in which his ploughman and his sower are at work. He will see the former followed by a train of rooks, while the sower will be unattended, and his grain remain untouched." Mr. Bree concludes, from this statement, that I acquit rooks of the crime of eating grain. I am not only aware that they do eat grain, but had distinctly mentioned the fact in the first series of my *Gleanings*. My only object, in the passage referred to, was to show that rooks prefer grubs when they can get them, and this I am persuaded is the case. I also wished to show the incalculable benefit they are of to the farmer, greatly overbalancing any injury they may do to his corn. Indeed it is his own fault if they do any, as there are plenty of boys to be had for a trifle a week to drive them away.

During the late very dry spring and summer, rooks might find it very difficult to procure a sufficiency of grubs for themselves and their young, as I know from my own observation that

During the dry Weather Grubs penetrated much deeper into the Earth than usual, and the Common Earthworm rarely made its Appearance.—This may account for disgorged pellets of oat husks being found under a rookery [460., and note *]. I must, however, add, that perhaps one of the most extensive rookeries in England is that amongst the avenues of Hampton

Court Park. I am in the constant habit of walking and riding under it, and have never observed any pellets, which I should have done had there been any. The great extent of meadows along the banks of the Thames, where rooks can probably very readily procure food more congenial to their nature than oats, may account for this.

In Greenwich Park, either from the want of a rookery in the neighbourhood, or from the birds being driven away, owing to the park being so much frequented,

The Ravages of the Grub of the Long-legged Gnat [*Crane-fly*] (*Tipula oleracea*) *have been very great this Summer.*—Sixty grubs have been found there, under a square foot of turf, and about thirty acres have been much damaged. This probably would not have happened if rooks had had free access to the park; another proof of their great utility.

I beg, in conclusion, to thank Mr. Bree for his many agreeable observations in natural history which have from time to time appeared in this Magazine, and which I always look for with considerable eagerness.—*Edward Jesse. Hampton Court, Sept.* 9. 1834.

[Some number, not a very large one, of rooks and jackdaws build annually upon the trees in Kensington Gardens, the majority of them, perhaps, upon the trees which bound the garden on the south, opposite the south front of the palace. Between these trees and the palace are two nearly square areas of lawn, separated by an avenue of elms which stands between them, supplies a vista from the palace, and leads to the boundary trees first mentioned. In sunny afternoons in spring, it was a cheering sight to see these lawns, in the part most distant from the walk in front of the palace and frequented by persons passing through the garden, a scene of emulous activity with the rooks and jackdaws; they,

"Well clad in coats of glossy black,"

and there were starlings in a more variegated suit, were all, in point of unexceptionableness of exterior, quite on a par with any company in the garden, and, doubtless,

"Every day, for food or play,"

paraded these lawns, and other parts of the garden, which, it may not be amiss to tell folks in the country, though including forty-six acres, consists wholly of greensward, except great number of trees, some shrubs, the walks, and some water.

In about the end of July, the object and the effects of the researches of these birds into the turf of the lawns was not to be misunderstood: in places the green grass was quite

freckled with little tufts of dead plants of grass, of the colour of hay, lying on its surface. These tufts of dead plants of grass, myself, and a naturalist who was with me; for

"Birds of a feather will flock together,"

or join company; agreed to refer to the digging, stocking, or stubbing (the *science* of ornithology is well off for terms, but to express the *arts* of birds there are not too many of fit ones) of the rooks, jackdaws, and starlings, in early spring, in their search after the insects which had lain in the soil near the roots of these plants of grass now dead: and, doubtless, our reference was accurate enough. My companion, "by far whose junior" in experience as in age am I, even ascribed to these birds the possession of the faculty of knowing, by the aspect of plants, which those are at whose roots the grubs of insects lie.

A correspondent in the *Gardener's Magazine* has thus spoken (ix. 718.) on the rook: — "Hunger may compel the rook to feed on grain; but it is too well known for me to say any thing about it, that its favourite food is insects in the larva state. I have repeatedly examined the crops of rooks. In six young ones that had been shot, the crops were nearly filled with wireworms; in the crops of others I have found the larvæ of the cockchafer, and other grubs that I am not entomologist enough to know the names of. In one or two instances, in frosty weather, I have examined the crop of one or more rooks that had been shot; it contained dung, earth, and a small portion of grain. I will just notice, that the land adjoining Mr. Wiles's rookery is yearly sown with grain or pulse, and in no instance that I have known or heard of, has the crop failed in consequence of its nearness to the rookery; [while T. D——n, in his allotment in Midload, in which he shoots every rook he can meet with, has his crops annually ravaged by wireworm and ground-grubs to a vexatious extent.] — *J. D. sen. Waterbeach, near Cambridge, Oct.* 17. 1833."

The origin of the dung of other animals in the crop of the rook, during frosts of some continuance, in winter, and the corn found with it, may be referred to the pressing necessity to which the bird is at these times subject: their destitute condition, then, has been well described by Cowper: —

"The very rooks and daws forsake the fields,
Where neither grub, nor root, nor earth-nut, now
Repays their labour more; and, perch'd aloft
By the wayside, or stalking in the path,
Lean pensioners upon the traveller's track,
Pick up their nauseous dole, though sweet to them,
Of voided pulse or half-digested grain."

Sparrows, finches, buntings, and other small birds, alike under the pressure of the same necessity, do the same thing, and sometimes all in company, and sometimes all in the rook's company. It is this necessity which is made a means — man may interpret, and perhaps safely — of causing the appropriation, the fruition, the preservation from waste, of every atom of the liberal plenty provided in nature for all things formed.

CIRRI'PEDES. — *Lèpas anatífera* (55—59.). — The following remarks had been put in type, to be placed at the end of Mr. Clarke's communication on the subject of them, but want of space excluded them there: —

Touch is the fundamental and elementary sense, of which all the rest are mere modifications. It is, moreover, the sense most universally diffused among animals, from man to the polype, that feels even light. (*Walker*, in his treatise on the *Nervous System, Anatomical and Physiological*, p. 147.) The instance, noted by Mr. Clarke, of the lepas instantly perceiving the incidence of light, proves that, although the creature is destitute of the faculty of seeing, it is endowed with that of feeling in an eminent degree: its feet, in their structure (D), their joints, flexibility, contractility, extensibility, and the numerous filaments with which they are fringed, seem admirably adapted to the creature's exercising of this faculty. The protective covering of shells given to the more active part of the creature's person is consistent with this imputing of active sensitiveness to the creature itself. The peduncles of the lepases are flexible; and Dr. Weatherill has ascribed to the species which he has noticed in V. 339—342., the power of availing itself of this flexibility in "extending, shrinking, and writhing itself at pleasure." If one species possesses this power, it is probable that every species does, in some degree. The possession and the exercise of it provide an increased range of pasture; and this must conduce to the welfare of the animal.

Dr. Weatherill has well remarked the difference of the species he has noticed from *Lèpas anatífera*, in every individual of the former being attached to the nucleus common to the colony by its own distinct peduncle, and not clustered, that is, branched off one another, as in the *L. anatífera*. Compare fig. 76. in V. 340. with fig. 77. in V. 343. and fig. ?. in VIII. 56. We owe an apology to Dr. Weatherill for omitting, in V. 340., to explain that the words "*fig.* 76. *a* is about the ordinary length and size," have reference to Dr. Weatherill's drawing, and not to our engraving, which is not much more than half of the size, to the best of our recollection, of his drawing.

Pentalásmis striàta Leach, *with Peduncles more than 2 ft. long.* — At a meeting of the Zoological Society on Nov. 12. 1833, Captain Belcher laid on the table several specimens of a barnacle, the Pentalásmis striàta *Leach*, remarkable for the great length of their peduncles, which exceeded 2 ft. (*The London and Edinburgh Phil. Mag. New Series*, vol. iv. p. 299. April, 1834.)]

Plants. — [The following notices had been intended to follow those in the lower portion of p. 90., but the typographical arrangement beyond this point excluded them there.]

On the comparative Scarcity of certain Species of British Plants, Changes in their Habitats, and Introduction, by Man, of Species exotic to Britain, into British Localities, see Mr. Lees and others in IV. 437—442., and Mr. Bree in V. 197—200.]

Á juga Chamæ'pitys has disappeared, temporarily at least, from one of its Habitats. — In 1832, an old botanist, for many years resident in the neighbourhood, showed me this somewhat rare plant growing, in considerable abundance, in a gravelly field on the banks of the Severn, near Welch Pool. He had never seen it there previously, nor in any other part of the neighbourhood; nor could he discover any other trace of it, after ransacking the country for full ten miles round. Last year (1833) it was altogether lost: there was not a single specimen to be found; neither is there, at least as yet, any appearance of it this year, although the ground has not been ploughed, nor otherwise interfered with. — *J. Jones. Gelly, Llanfair, Montgomeryshire, March* 28. 1834.

Lýcium, not any Species of, is wild in Britain: so far as I know.—I have felt surprised at this. The plant of one species, at least, is often to be seen about cottages; and its roots sprout forth young plants so vivaciously, and it bears fruit, which is fleshy, so plentifully, and this includes, I presume, perfect seeds, that one might expect plants to be established wild, either from birds feeding on the fruit and thence disseminating the seeds, or from cottages being rased and the rootstock of the *Lýcium* being left, and liable to sprout at Nature's bidding. I have seen the blackcap feed heartily on the ripened berries of a garden honeysuckle. — *J. D.*

Lílium Mártagon *grows wild in Surrey.* (III. 153.) — Would Alpha [Mr. George Penny, A.L.S., nurseryman, Milford, near Godalming, Surrey] oblige me, and correspondents in general, by indicating, more precisely than he has done in III. 153., the exact locality, at Woodmanstone,

near Epsom, where *Lílium Mártagon* occurs? as well as the time of its flowering there? — *W. A. Bromfield, M.D. Hastings, March* 3. 1834.

Aspérula arvénsis L. *obsolete in the only British Habitat of it known.* — We have given, in VII. 272, 273., Dr. Bromfield's evidence on this point.

Narcissus (*Ajax Haworth*) *moschàtus has been found wild* in the adjoining parish of Meriden; and has been communicated to me by its discoverer, Miss Gresley, of that place. It is quite a new plant to the British flora, I believe; and you may announce it as such, if you like. Poor Haworth would have jumped for joy at the intelligence, had he still been among us. (*Extracted from a Letter from the Rev. W. T. Bree, Allesley Rectory, near Coventry, Warwickshire, dated May* 20. 1834.)

Geology. — *Inflammable Gas arising after boring for Salt.* — In Jameson's *Philosophical Journal*, iv. 40., reference is made to the *Transactions* of the Philosophical Society of New York for a fact of this kind. It appears, also, from the first work, that from a salt mine at Rheine, in Germany, a continued current of inflammable gas has issued for sixty years; which is used not only for light, but as fuel for cookery. Currents of inflammable gas, issuing from perforations in rocks which have been bored for salt water, often occur in the United States.

1. In the year 1824 a company were boring through a rock in Elk cr. [? creek], Ohio, and, at the depth of 24 ft., struck a large vein of very cold water, and a little brackish. At the distance of 116 ft. they passed through a rich vein of copper, about 4 ft. thick; and at 180 ft. they opened a strong vein of air, which instantly found vent at the top of the well, in a loud roaring and spouting of water, to the height of 30 ft. For some distance round the perpendicular sheet of water plays a gas, so inflammable as instantly to take fire whenever a torch is applied to it. The verge of the circumference of this gas is not perceptible; therefore, those who are not acquainted with its inflammable quality have found themselves enveloped in flame when attempting to set it on fire. The intervals between the spouting are uncertain.

2. In the year 1824, Mr. Denton, in boring for salt, about three miles from the village of Sparta, in Tennessee, struck upon a vein of gas, which, in ascending, found another vent than the tube, through a rock in the bed of the "Calf-Killer river," forcing a passage through the surrounding waters, which boiled with considerable violence round the place of escape. A torch being applied, a column of fire, nearly 40 ft.

high, ascended from near the middle of the river, which is here about 50 yards wide. The next year, a short distance below Mr. Denton's, a similar phenomenon took place. The well is on the margin of the river. A hole, 3 in. in diameter, is perforated in a limestone rock to the depth of 400 ft.; the salt water is forced by the gas through the hole in the rock, in which a tube, the upper end of which is copper, is placed, 50 ft. long, above the surface of the rock: at the distance of 45 ft. a copper faucet is inserted into the wooden tube, and into another of the same kind, standing 2 ft. from the first one. The salt water forced up is conducted by the copper faucet into the second tube, and then descends 25 ft. to a cistern holding 25,000 gallons. The water making its escape from the first to the second tube, the gas passes up to the top of the first tube, and, upon the application of a lighted candle, instantly flashes into flame, and ascends to the height of 20 ft. or 30 ft. At night the surrounding country, which is encircled by high mountains on nearly three sides, exhibits the most pleasing and sublime appearance. Other instances might be mentioned. — *J. M. Philadelphia, Oct.* 29. 1833.

Rise of Lake Erie. — For several years past the rise of the waters in the lake has made serious encroachments on its southern shore in many places. For a considerable distance above the mouth of Black River the bank of the lake is low and without rock. Twelve years ago the bank was generally sloping, with a wide beach; now the waves beat against a perpendicular bank, which, from continual abrasion, often falls off. From one to three rods in width are worn away annually. The cause remains unexplained. (*Ohio Atlas*, April, 1833.) — In 1815, a newspaper at Buffalo, state of New York, remarked, that "the water of Lake Erie had been rising for about three years, during which time it had risen nearly 3 ft." — *J. M. Philadelphia, Oct.* 29. 1833.

A Notice of the Result of a Visit to the Isle of Man in search of Fossils. — The total number [of species] collected from the mountain limestone (at Poolvash), during a two days' stay at Castleton, is fifty-three, of which only the fourteen following are named in Sowerby's *Mineral Conchology:* — Ampléxus corallöìdes, Ammonìtes sphæ'ricus, Orthócera undulàta, Búccinum acùtum, Pleurotomària striàta, Ampullària helicöìdes, Pileópsis tùbifer, Spírifer pínguis, Prodúctus depréssus and Martìni; Terebrátula hastàta, sácchulus, púgnus, and resupinàta. Thirty-one species of the others are identical with unpublished species found in the mountain limestone of Yorkshire and Lancashire, and the remaining eight species are entirely new to me.

A considerable number of duplicates of these, and of other mountain limestone fossils, including several species of crinoidal bodies [VI. 281. 560., VII. 179.], remain in my hands, after making a selection for my own cabinet, which I should be glad to exchange with any person who can offer me good specimens, either of fossils or of recent shells, in return. — *Wm. Gilbertson. Preston, Lancashire, Nov.* 28. 1834.

[*The Engravings in the Transactions of the Entomological Society were not executed by Mr. Swainson, but by Mr. Swaine.*] — Sir, I beg you will contradict a strange error in your last Number [p. 63.], where I am stated to be the engraver of the plates to the *Transactions of the Entomological Society*. So far from engraving other people's drawings, however accurate they may be, I would willingly get rid of the trouble of engraving my own, could I find a competent hand. — Yours, &c. *W. Swainson. Jan.* 3. 1835.

We beg to present our best apology for the misstatement, which arose from our mistaking the "J. Swaine sc." engraved on each of the plates, for "Swainson sc." We did not look at this matter so closely as we should have done; and, somehow, the notion became spontaneous to us, that Mr. Swainson had done the Entomological Society the benefit of the application of his talent. We hope to be more cautious in future. — *J. D.*

REVIEWS.

ART. I. *Titles of Works on Subjects of Natural History, published recently.*

Various Authors: Nouveaux Mémoires de la Société Impériale des Naturalistes de Moscou. Dédiés à S. M. l'Empereur Nicolas I. Tome III., avec 32 planches. 4to, 369 pages. Moscow, 1834.

THE titles of the treatises contained in the volume may prove useful clews to those pursuing kindred subjects. We give the titles of most of them: —

"Tentamen de Abrotanis, seu de sectione secunda Artemisiarum Linnæi, auctore W. G. Besser, M.D., &c." This is an elaborate synopsis of a monograph prepared by the author. The synopsis supplies distinctive and, in some cases, detailed descriptions of seventy-four species, and of many varieties; and figures of six species, and three varieties. The author views the genus *Artemisia* as composed of four sections. He is next engaged in investigating the species of the section *Absinthium*.

" Observationes in Plantas Rossicas, et descriptiones specierum novarum, auctore Ch. Steven." Eremùrus caucásicus, taúricus, and altäïcus are described and figured; *Asphódelus* inderiénsis is described; some species of *Tilia* are distinguished: and a disposition of the species of the genus *Astrágalus* into several groups, as so many genera, is proposed: the species are assorted into the proposed generic groups; and these are named, but not characterised.

" Anas cucullata, nova species camtschatica, descriptione et icone illustrata, auctore G. Fischer." The essential description is " corpore griseo fusco, cauda acuta, subtus albo-flavescente; fronte et vertice nigris albo-cinctis, maculaque cruciata cuculli ad instar viridi-ænea."

" Notice sur quelques Lépidoptères des Antilles, avec la description de plusieurs espèces nouvelles, par M. Ménétriés." There are descriptions of fifty species, and coloured figures of eight species.

" Descriptiones Plantarum minus cognitarum Sibiriæ, præsertim orientalis, quas in itinere anno 1805 et 1806, observavit M. F. Adams." Twenty species are described, and three of them figured.

" Diagnosis Piscium, ad genus Accipenserinum pertinentium, præprimis eorum qui habitant in aquis Imperii Rossici, a Profess. Lovetsky." This supplies distinctive descriptions of eleven species and varieties, and figures of ten of them.

" Ueber Fossile Knochen aus den Felsenhöhlen bei Schlangenberg (Smeinogorsk), vom Prof. H. Rathke."

" Recherches sur les Ossemens Fossiles de la Russie, par G. Fischer de Waldheim (No. 2.)." This treatise is illustrated by five plates of figures.

" Recherches microscopiques sur quelques Fossiles rares de Podolie et de Volhynie, par A. Zborzewski." The species described are also figured. They are placed under the heads Microphytozoa, Micracanthozoa, Micrepizoa, Micropolythalama.

" Mémoire sur les Puits Artésiens ou Forés, par E. Marin-Darbel." Our correspondent Mr. Clarke has, in p. 11., commended this memoir.

" Lacertæ Imperii Rossici variis in itineribus meis observatæ, auctore Dre. E. Eversmann." Fourteen species are described, and ten of them figured.

Jardine, Sir Wm., Bart., F.L.S.: The Natural History of Game Birds. Illustrated by 31 plates, coloured. With a Memoir and Portrait of Sir T. Stamford Raffles. Small 8vo, 172 pages. Edinburgh and London, 1834. 6*s*.

The partridges, francolins, quails, ortyxes, grouses, ptarmigans, sand-grouses, the crowned cryptonix, the white-spotted ortygis, the black-necked ortygis, the guazu, and the tataupa are the subjects described and illustrated.

The Memoir of Sir T. Stamford Raffles is of much interest, in respect both to biography and to natural history.

Purchas, Samuel, A.M., and *Bagster, Samuel*, jun.: Spiritual Honey from Natural Hives; or, Meditations and Observations on the Natural History and Habits of Bees. First introduced to public notice, in 1657, by Samuel Purchas, A.M.; now modified and republished by Samuel Bagster, junior. Small 8vo, 176 pages. London, 1834. 3*s*.

Mr. Bagster has thus spoken of this work: — "In the course of my researches, I bought a volume on bees, written by Mr. Samuel Purchas, in 1657, at the end of which he has annexed Meditations, drawn from similes of the bee, taken from a multitude of olden authors, and collected by him. They are so very excellent, that I have reprinted most of them, and headed each meditation with a text of Scripture. They are published in a separate volume, under the title of 'Spiritual Honey from Natural Hives.' As it corresponds in size [with Mr. Bagster's work on *The Management of Bees*], the reader may bind the two together; but, as it is exclusively devotional, my publishers sell them separately, unless specially ordered."

This second little volume, the *Spiritual Honey from Natural Hives*, cannot but be desirable to those who delight to associate sentiments of religion with natural objects.

We regret that want of space in our last Number (p. 64.) obliged us to separate our notices of works so closely allied.

Don, George, F.L.S.: A General System of Gardening and Botany, containing a complete Enumeration and Description of all Plants hitherto known; with their Generic and Specific Characters, Places of Growth, Time of Flowering, the Manner in which they are cultivated, and their Uses in Medicine and Domestic Economy; preceded by an Introduction to the Linnæan and Natural Systems, and a Glossary of the terms used. Founded upon Miller's Gardener's Dictionary, and arranged according to the Natural System. In 4 quarto volumes. Vol. III. 4to, 867 pages, with numerous woodcuts, 3*l*. 12*s*.; or in monthly parts, 6*s*. each. London, 1834.

For a notice of the first volume, see V. 74.; of the second, VI. 65. The third volume, recently published, includes de-

scriptions of as many species of plants, of the following orders, as the author's research in the amplest stores of the best means of information has led him to the knowledge of: — Cucurbitàceæ, *Papayàceæ*, Passiflòreæ, Malesherb*iàceæ*, *Loàseæ*, Turner*àceæ*, Fouquier*àceæ*, *P*ortulàceæ, *P*aronychièæ, Scleránthеæ, Crassulàceæ, *Fi*cöideæ, Nitrariàceæ, Reaumur*iàceæ*, *Cá*cteæ, Grossularièæ, Escallòn*eæ*, Cunon*iàceæ*, Galacíneæ, *S*axifragàceæ, Umbellíferæ, Araliàceæ, *H*amamélidæ, *C*órneæ, Loranthàceæ, *C*aprifoliàceæ, *R*ubiàceæ, *Valeriàneæ*, *D*ipsàceæ, Calycèreæ, Lobel*iàceæ*, Stylídeæ, Goodenòv*iæ*, Campanulàceæ, Epacrídeæ, *E*ricàceæ. In the orders Lobel*iàceæ*, *E*ricàceæ, and Loranthàceæ, much original matter has been introduced, and many new genera adopted. The genus *E*rìca, into which a store of incongruous species had been accumulated, has been divided into several genera.

Nees ab Esenbeck, T.F.L., M.D., &c.: Genera Plantarum Floræ Germanicæ, Iconibus et Descriptionibus Illustrata. Fasciculus III. 8vo. Bonn, Henry and Cohen.

This fasciculus is equal in excellence and interest to the two preceding ones, noticed in VI. 439., VII. 190. It includes illustrations of the genera *M*yrìca, *J*ùglans, *U*lmus, *C*éltis, *M*òrus, *F*ìcus, *U*rtìca, Parietària, *C*ánnabis, Hùmulus, *E*uphórb*ia*, Crozóphora *Neck.* (*C*ròton sp. *L.*), *R*ícinus, *An*dráchne, *M*ercuri*alis*, *B*úxus, *E*mpetrum, *E*læágnus, *H*ippóphae, and *O*sỳris. The analysis of the parts of fructification in each and all of these is so extended as to produce a rich supply of details of structure, which the botanist will appreciate and appropriate.

Professor Burnett's Outlines of Botany. A Complaint of the publishing it at a greater cost than was originally proposed. — An extract from J. Churchill's *Catalogue of important Medical Works*: — "*Outlines of Botany*; being a Practical Guide to the Study of Plants; by G. T. Burnett, F.L.S., Professor of Botany in King's College, London. To be completed in twenty numbers, illustrated by 200 engravings on wood, executed by Branston and Wright. Price 1*s.* each." I have already paid 30*s.* for twenty-nine numbers of Burnett's *Outlines of Botany* (No. 2. being charged 2*s.*), which is one third more than the stipulated price of the work, which is not yet completed. I am aware that in the publication of periodicals there is often some degree of uncertainty as to the limits of a proposed work; but nothing can justify the extension of a work so much beyond the originally stipulated limits and price, as in the instances adduced in this and my

last [in VII. 606., on Henderson's Translation of Cuvier's *Règne Animal*] communication. It is an imposition on the public, who are induced to purchase in the expectation of possessing a good work at a moderate price; but, however the former condition may be fulfilled, they find themselves much deceived respecting the sum to be paid for it. — *John Reynolds Rowe. Wimborne, Dorset, Nov.* 4. 1834.

Bertrand, Alexander, M.D. of the Faculty of Paris, and formerly Pupil of the Polytechnic School: The Revolutions of the Globe familiarly described. Translated from the Fifth French Edition, with Supplementary Notes and an Appendix, by *S. C. Horry*. Large 12mo, 413 pages, and two plates exhibiting the Palæotherium, the Small Palæotherium, the Common Anoplotherium, and the Slender Anoplotherium. 7*s*.

A very interesting work, both from the subject, and from the able and agreeable manner in which the subject is discussed.

The primary of the points treated of are the following: — the internal mass of the globe; earthquakes; volcanoes; the mineral crust of the globe; soil of transport and sediment; fossil animals in their various kinds, as elephants, mastodons, hippopotamus, rhinoceros, horse, Palæothèria, Anoplothèria, marine mammifers, reptiles (including the saurians), Crustàcea, and Mollúsca; osseous brecciæ and caverns; fossil vegetables; the mass of waters; the atmosphere.

These subjects, and subordinate ones, incident to them, are treated of in nineteen letters, addressed to a lady. The author has not pretended to exhibit in the letters only original views of his own, but rather to present a faithful, clear, and concise transcript of the more important of the discoveries and deductions of those who have most investigated the relative subjects. We think him a finished and philosophical compiler; and one who is

> " Correct with spirit, eloquent with ease,
> Intent to reason, and polite to please; "

and his intentness and capability to reason much avail him in the discussion of contested questions. For instance, in discussing the question of the condition of the internal mass of the globe, the author advocates the opinion that this internal mass is subjected to the action of a heat capable of retaining it in a constant state of fusion; and adduces an assortment of arguments in support of this opinion.

The translator has added notes here and there, which evince his ability to do justice to the author.

Fischer de Waldheim, Gotthelf: Bibliographia Palæonthologica Animalium Systematica. Editio altera, aucta, jussu Societatis Cæsareæ Naturæ Scrutatorum impressa. 8vo, 414 pages. Moscow, 1834 (July 25.).

The author has produced a surprisingly extensive catalogue of works; and has arranged them under the following heads: — Bibliographi, Diaria, Ortus petrefactorum, Prototypa petrefactorum, Examen eorum chemicum, Musea petrefactorum, Systemata petrefactorum, Descriptiones petrefactorum et Observationes miscellaneæ de petrificatis; Scriptores topographi, in genere; in specie: in the latter class are included those of the following countries of Europe, — Great Britain and Ireland, Portugal, Spain, France, Switzerland, Germany (in ten of the states), Belgium, Denmark, Norway and Sweden, Russia (including Poland), Greece; and then Asia, Africa, America, and Australia. Scriptores de cavernis ossiferis; Scriptores monographi ossium fossilium, in genere; and then, in specie. The enumeration of the works of the last class occupies the greater portion of the work: they are arranged in the order of a descending series of classes identical with the zoological classes to which the animals treated of have belonged; and the works are farther assorted into groups under each genus of animals of which fossil remains have been discovered. We are surprised at the extent to which geological zoology has been investigated by geologists, as shown by this work. Under the names of the genera of shells the author has stated the number of the species, both fossil and recent, known; and given the names of some of them, with references to figures of them; and has mostly mentioned the strata in which the fossil species have been found. He regrets that his arrangement of the topographical works has not been rather stratigraphical than geographical; but his materials have been insufficient to enable him to effect the preferable one. He commends, as works excellent in this kind, Brongniart's *Tables* and Dechen's (German) edition of De la Beche's *Manual*. The author has given three indexes to the work; one of authors, one of places, and one of objects. He has expressed his hope that readers, on perceiving the defects in it, will kindly impart to him the means to amend it.

Mantell, Gideon, LL.D. F.R.S.: A Descriptive Catalogue of the Collection, illustrative of Geology and Fossil Comparative Anatomy, in the Museum of. 8vo, 28 pages, 3d edit. London, Relfe and Fletcher, 17. Cornhill, 1834.

See VII. 49. Mr. (now Dr.) Mantell has at length located in "20. Steyne, Brighton;" has arranged his most emphati-

cally interesting collection; has opened it to the access of his patients and friends, from two o'clock to four, on Tuesdays; and has produced the present *Catalogue* as an interpreting guide to the objects contained in it. Some notice of the geological characters of the districts whence the author has collected them is given. The objects are classed, and the positions assigned to the classes are shown in an engraved plan of the latter, included in the pamphlet. See our p. 99.

Lea, Isaac, Member of the American Philosophical Society, &c.: Observations on the Genus Unio, together with Descriptions of New Genera and Species in the Families Naiades, Conchæ, Colimaceæ, Lymnæanæ, Melaniana, and Peristomiana; consisting of four Memoirs read before the American Philosophical Society, from 1827 to 1834, and originally published in their Transactions. 4to, 242 pages, with [numerous] coloured plates. Philadelphia, 1834.

The portion of these memoirs which has been sent to us is commenced at the 135th page, and includes two treatises entitled, "Observations on the Naiades, and Descriptions of new Species of that and other Families;" and "Observations on Lamarck's Naiades." This portion, it is clear, from the list of contents in the book, is meant to be added to a part or parts which have been previously distributed to scientific friends. The purchase of any, or of all, of the memoirs cannot be made, we presume, unless by the purchase of that volume, or those volumes, of the *Transactions* in which they are included.

The first of the two treatises named contains figures and descriptions of fifty-five species of bivalve, and of thirty-one species of univalve, shells; whose characters are expressed in the descriptions, and exhibited in the figures. Of almost every one of the bivalve species three views are given; one of the outer aspect of a valve, one of the inner, and a view of the hinder aspect of the shell, whose commissure, beaks, and contour are shown by this means. Most of the species are from American localities; but some have been derived from Europe, and a few from China.

The "Observations on Lamarck's Naiades" are mainly with a view to synonymy. The author has had an opportuity, in a tour in Europe, of inspecting the collection of shells that was Lamarck's.

Mr. Lea is distinguished for his attention to shells, both recent and fossil. See VII. 383.

Swainson, W., F.R.S., &c.: The Elements of Modern Conchology; with Definitions of all the Tribes, Families, and Genera, Recent and Fossil, briefly and plainly stated: for the Use of Students and Travellers. 12mo, 64 pages. London, 1835. *3s. 6d.*

"Conchology, as a Science, must be founded both upon the structure of the soft parts of the animal [that is, the structure of the animal itself], and upon the shell which covers it. ... As our present business, however, is with the shells, and not with the animals, we shall chiefly confine our remarks to the latter." The scope of Mr. Swainson's work is, accordingly, mainly on the shell part of conchology. We are glad to have the means of access to so much from him; and cannot doubt that the definitions of the genera, and notices of their ordinal relations, &c., are worthy the reputation of the author. We think that some of the introductory definitions are not free of vagueness; and we perceive that not a few typographic errors are apparent in the hard words of the book. The author, in producing an elementary work, ought to have imposed on himself the duty of seeing it expurgated of such errors. There is a possibility, at least, of their proving an inconvenience to those who have need of elementary works. The last chapter in the work is "on collecting, preserving, and arranging shells:" it includes, besides, "a plan of study."

ART. II. *Literary Notices.*

BECHSTEIN, J. M., M.D., &c.: Cage Birds: their Natural History, Management, Habits, Food, Diseases, Treatment, Breeding, and the Methods of catching them. With notes by the translator. Post 8vo, 434 pages. Orr and Smith. London, 1835. [This work is published.]

Of *Partington's British Cyclopædia of Natural History*, parts vii. and viii., which contain generalisations on the attributes of birds, on their structure, and the functions of their organs, are two parts replete with interesting matter, supplied by, it is understood, Mr. Mudie. They contain rather many woodcuts. The parts are 1*s.* each.

Of *The Naturalist's Library*, seven volumes, on the following subjects, additional to one on *The Dogs* and one on *The Deer and Antelopes*, notified in VII. 656., have been announced: —

The Natural History of Parrots.

The Natural History of Fishes.

The Natural History of British Butterflies.

The Natural History of the Columbidæ (*Pigeons*), by Mr. Selby, with illustrations from the Drawings of Mr. Lear: this "will very soon appear."

The Natural History of Coleopterous Insects (*Beetles*), by the Rev. James Duncan (author, in conjunction with James Wilson, F.R.S.E., of the *Entomologia Edinensis*, noticed in our VII. 188, 189.). This volume "is also nearly ready for publication;" and it will include figures of "upwards of 110 insects," and "be enriched by a memoir and portrait of John Ray, the father of zoological science in Britain."

Illustrations of British Birds, indigenous and visitant, by H. L. Meyer. — Proposals for publishing a work corresponding to this title have been distributed. The numbers are to be monthly, in imperial quarto, and to include five coloured plates, four of birds, one of eggs: price, to subscribers, 10*s.* 6*d.*; to non-subscribers, 12*s.* 6*d.* The illustrations of the birds are to include those of the animal, insect, plant, or tree, which either constitutes the food of the birds, or elucidates their history. The drawings to be made on stone. A list of subscribers lies at Messrs. Longman and Co.'s, Paternoster Row.

Yarrell's *History of British Fishes*, part i., on March 2.

A Monograph of the Echinodermata, by L. Agassiz, M.D., Professor of Natural History at Neufchâtel, accompanied with plates, is in prospect. (*The London and Edin. Phil. Mag.*, Nov. 1834.)

No. x. of *The Entomological Magazine*, published in January, completes the second volume, except "the title, introductory address, &c." These may be had shortly, on application, or with the number for April. The number for January is an interesting one; and its cover bears this notice: — "The third volume of *The Entomological Magazine* will be published in quarterly numbers, as heretofore; and will be conducted by Mr. Walker."

A Grammar of Entomology; being a compendious introduction to the history, physiology, classification, and preservation of insects; by Edward Newman, author of *Sphinx vespiformis*. This was announced, on Jan. 1., as published.

Of Professor *Phillips's Guide to Geology*, mentioned in VII. 656., a second edition is already in preparation.

THE MAGAZINE

OF

NATURAL HISTORY.

MARCH, 1835.

ORIGINAL COMMUNICATIONS.

ART. I. *On certain recent Meteoric Phenomena, Vicissitudes in the Seasons, prevalent Disorders, &c., contemporaneous, and in supposed connection, with Volcanic Emanations.* No. 6. By the Rev. W. B. CLARKE, A.M. F.G.S. &c. [Continued from p. 28.]

" Quid sit, unde sit, quare sit. . . . . quod ipsum explorare et eruere sine universitatis inquisitione non possumus, cum ita cohærentia, connexa, concatenata sint." — M. MINUTIUS FELIX, xvii.

THE concluding observations of the last paper [1—28.] had reference to some examples of the connection of the winds and terrestrial heat which occurred in September, 1834. I shall commence the present communication with observing, that an earthquake occurred at Comrie, in Perthshire, on August 25. 1834, concurrent with the gale of wind experienced by H.M.S. Thetis in the Irish Channel (VIII. 12.). The phenomena observed in Europe about August 27. (VIII. 12. and 13.) were also very peculiar. I have been favoured with the following additional particulars: — The weather at Rome and Naples, during the whole of the summer of 1834, was extremely hot. The thermometer at the former place was constantly (with the exception of a few rainy days) from 25° to 30° R. (89° to 100° F.); and at Naples from 25° to 28° R. (89° to 95° F.), up to August 25.; and, afterwards, at Naples, during the three following months, at 82°, 77°, 71° F. On August 27. the weather at Rome was so extraordinary, that no parallel to it was remembered: the air appeared filled with dust; the thermometer mounted up to 32° R. (104° F.), the wind blowing strong from the *south*. At the elevation of 100 ft. above the earth, the thermometer at the Observatory marked 29° R. (98° F.) *Several persons were taken ill, and several died suddenly.* This was, at the time, attributed to an eruption from Vesuvius (the distance is 154 miles), which,

indeed, was the fact; for the great eruption alluded to before (VIII. 13.) broke out on the 26th, and continued in the greatest fury during the 27th and 28th, abating on the 29th, and nearly ceasing on the 30th. About this time, also, it was observed that the waters of the Baltic were for several successive nights extremely phosphorescent (a circumstance unusual so far to the north, and seldom experienced in the Baltic); and it was observed that *this phosphorescence was most brilliant on August* 28.; the night being dark, the sky covered with clouds, and the sea perfectly calm. (See VIII. 15., note *.) This and the other occurrences of the time must be referred to the action of the volcano. The inundations in Switzerland were, as before stated (VIII. 12.), higher than before known. On August 27. the snow suddenly melted on the glaciers of the Grisons, carrying away whole villages, bridges, &c.; destroying the road over the Splugen; cutting off the communication between Italy and Switzerland, and converting the Upper Engeddin into a lake, the water of which was *four feet* higher than in the similar inundation of 1817, when the water attained its greatest elevation also on August 27. Continuing the record of events in September to the close of the year, as far as our present information goes: — The earthquake and tornado on September 4. 1834 have already been mentioned (VIII. 25.). On September 7., at 1 A.M. (preceded, on the 2d and 3d of that month, by torrents of rain, and for several days previous by tremendous thunder and lightning, the thermometer, in the shade, ranging from 96° to 98°), Jamaica was visited by three furious shocks of earthquake, from W. to E., of greater intensity than almost ever remembered in that island. There were eight or ten undulations, the last shock being extremely violent, and lasting thirty seconds. They were immediately preceded and succeeded by a sudden and most violent squall. I have private information, also, from a friend resident at Utica, in the state of New York, that, on Sept. 8., that place was visited by a most violent tornado, not more than two miles in breadth, attended by thunder, dreadful hail, and torrents of rain, which greatly injured the town. It was considered the effect of the extreme heat and intolerable drought that had been for some time felt there; and was succeeded by cooler and healthier weather. As Utica is only 1° 30′ E. of the meridian of Kingston in Jamaica, it is not improbable that the occurrence of this tornado may indicate an extensive draught of the air over the heated region of America to the south, a continuation of the derangements which took place in the atmosphere over Jamaica on the morning of the pre-

vious day. Kingston is in lat. 18° 5′ N., long. 76° 30′ W.; Utica in lat. 43° 40′ N., long. 75° W. The distance between them is, therefore, not above 1540 miles, which would give about forty-five miles per hour for the velocity of the aerial impulses, supposing that there was no more immediate cause. That there is sometimes a great interval between the localities of earthquakes and distant atmospherical phenomena is in some measure proved by this fact, that, during the whole of 1825 * and 1826, Brazil was affected (as in 1833) by a continued drought, which destroyed many head of cattle: even in the rainy season, the heat was excessive, and the showers scanty and partial, but accompanied by violent gusts of wind. It was observed, and remarked to me by a gentleman who resided at Bahia at the time, that at Tampico, during the same period, the greatest alarm prevailed, in consequence of almost incessant earthquakes, the daily repetition of which produced universal consternation: and these earthquakes were more violent at some times than at others; and these periods corresponded, with allowance for the distance, with the atmospherical convulsions in Brazil. From Bahia to Tampico it is more than double the distance from Utica to Jamaica.

On Sept. 11. occurred a violent earthquake at Hainau in Lower Silesia (VIII. 27.), Goldberg, Scheidwigsdorf, and Modelsdorf; preceded by thunder.

The passage relating to the earthquake at Chichester on Sept. 21. (VIII. 27.) was written a few days after that event. (Omit in that passage the words "But" and "do not.") But, although I suspected there was a connection with some distant commotion, I was not aware, till five weeks afterwards, that the shock happened during the hurricane that commenced, on Sept. 20., in Dominica. The following particulars have been derived from unquestionable authority, altogether private. Through the kindness of Capt. Polkinghorne, of H.M.S. Isis, I am enabled to show that the derangements of the atmosphere on Sept. 20. were more extensive than many persons are aware of. On the arrival of the Isis from Ascension, on Nov. 21., I wrote to her commander to request he would state whether anything remarkable was noticed in his log about the date of the 20th. This

* The year 1825 offered many peculiarities, in Europe, corresponding with those of 1833 and 1834. In Nov. 1826, after a long drought, many plants bore a second crop; the hazel and other trees were in bud, and the hawthorn in bloom, near Newmarket in Suffolk; green peas were gathered, that month, at Sudbury; and there were five rooks' nests built in Catherine Hall Grove, Cambridge, at the end of the month. (*Bury and Norwich Post.*)

I did, conjecturing, from similar cases, that so tremendous a hurricane was probably connected with other phenomena. Capt. Polkinghorne mentioned, in reply, that, on Sept. 20., the Isis was "visited by *the most violent tornado* he ever witnessed. The only sail he had set was blown to pieces. It was at the close of the rains on the coast of Africa, when squally unsettled weather is usual and expected. We entered the river Gambia on the 23d, and found the rains partially over, and generally followed by tornados and hot suffocating weather, the thermometer varying from 86° to 96°; the air damp and filled with malaria." On reference to the log, with a copy of which I have been also favoured, I find that the position of the Isis was 12° 54′ N., 18° 2′ W., Cape St. Mary bearing 66° E., eighty-seven miles. From one o'clock A.M. to 5 h. 50 m. A.M., the weather was moderate and fine, with light variable airs. At 6 h. 50 m., there was dark, heavy, squally-looking weather to E.S.E. and E. At 7 h. the ship was taken aback by heavy squalls with thunder, lightning, and rain in torrents; the fore-topmast stay-sail (the only one set) was split and carried away. At 8 there were light winds and rain, inclining to calm: at noon, light airs and fine weather. The winds were as follow: — At 1 o'clock A.M., N.N.E.; from 1 till 7, N. and N.W.; at 8, E.N.E.; from 9 to noon, N.W. to E.S.E., calm.

The hurricane at Dominica was preceded by unsettled weather for several days. The rain commenced at 6 P.M., Sept. 20., with gusts of wind, shifting from N. to S., till 11 P.M., when the rain ceased; the wind, however, increased till midnight, when it was a dead calm. A quarter of an hour after, the wind raged in all directions; and, before 1 A.M., Sept. 21., the island was desolated, and nearly all the buildings and crops destroyed. This hurricane was the most disastrous ever remembered; and its fury was felt for more than four hours. The swell attending it was tremendous: at Charlestown, in Nevis, the sea broke over the beach into the town for more than a quarter of a mile. At St. Kitt's many vessels were driven ashore, and literally knocked to pieces by the violence of the sea. At Porto Rico, the swell was also extremely frightful, and the hurricane was felt there slightly. The ship Lee, of Liverpool, which left Puerto Cavello, in Colombia, on the 18th, steering due north for the Mona passage, encountered the hurricane on the 22d; and her commander, Mr. Isaac Scott, gives me these particulars: — After leaving Puerto Cavello, the Lee had very fine weather, with light winds from E. and E.N.E., without any indication of the coming storm, till Sunday (the 21st), at

9 A.M., when it became calm, large black clouds beginning to gather, and the wind drawing to the north. At 10 P.M., it began to blow hard from the N.W., with heavy rain, and vivid flashes of lightning. At 2 A.M. (the 22d), it blew harder, drawing to W., with a tremendously heavy sea *rolling from all quarters.* "But from 5 A.M. till noon it was the worst; the rain falling in torrents, and blowing as if the heavens had burst open, and all nature seemed at an end. We were," says Mr. Scott, "in lat. 16° N., long. 67° 30′ W." The weather moderated a little after noon, and the atmosphere became clearer; the wind was then about S.W.; and, twenty-four hours after, it gradually drew to S., S.E., and E., moderating, and the clouds clearing away, "as if nothing had happened." Mr. Scott adds, that "had he not had one of the best of vessels, he would not have been left to tell this tale." He farther states, that, from August 30. to Sept. 17., the period of his stay at Puerto Cavello, there was no particular difference in the state of the weather there, "*except it was much warmer than usual.*" On Sept. 23., the hurricane reached St. Domingo, and raged there from 4 to 7 P.M. It was so violent, that nothing could stand against it: every ship in the harbour was thrown on shore; houses were blown down, trees torn up by the roots; torrents of rain fell unceasingly during the next twenty-four hours. The average progress of this hurricane has, therefore, been traced 555 miles in about sixty-three hours, from Roseau to St. Domingo. The positions of the three localities are, Roseau, 15° 10′ N., 61° 30′ W.; Lee, 16° N., 67° 30′ W.; St. Domingo, 18° 20′ N., 70° W.: the distance between the former two being 355 miles, and between the latter two, 200 miles. The progress between the first two was at the rate of twenty-seven miles per hour; between the latter two localities, it was not more than seven miles per hour; the storm continuing about twelve hours in Dominica, and about fourteen hours with the Lee. I should presume this hurricane had a diameter of about 120 miles. The occurrence of the tornado off the coast of Africa gives reason to surmise that the hurricane commenced long before it reached Dominica; and that the former was, perhaps, the first indication of it.* On this supposition the ensuing calculation is founded. The length of a degree of longitude between the parallels of 12° N. and 15° N. (the latitudes of

* The ship Wellington, on her way to Bombay (as I learn from a friend on board), had heavy swells and contrary winds from Sept. 7., when she left Falmouth, till 20., when she reached Madeira; especially on the 13th, when a tremendously heavy swell came rolling in from S.W., indicative of a gale in that direction.

the Isis and Dominica) is about fifty-eight geographical miles; consequently the distance between the Isis and Dominica was about 2520 miles; the difference in time being 2 h. 53 m. Reduced, therefore, to one meridian, it was about 4 h. 7 m. A.M., Dominica time, when the tornado fell on the Isis. Reckoning, then, from the height of the tornado to that of the hurricane, we have 20 h. 8 m., which gives about 126 miles per hour for the velocity of the atmospherical attraction. The direction of the winds during the tornado (to say nothing of the agreement of character in the storms), if resolved according to the laws of mechanics, will give, as the resulting direction of the wind, the very line which connects the two localities. We may certainly state, that the extremities of this line of more than 3000 miles, as well as the intermediate points, were consecutively affected between Sept. 20. and 23.: and, assuming that the shock of earthquake at Chichester indicates a severer shock elsewhere, it is not unreasonable to presume, after considering what has been observed before (VIII. 26.), that the hurricane was accompanied by earthquake. The shock at Chichester occurred at 11 h. 20 m. A.M., English time, or 7 h. 17 m. A.M., Dominica time, on Sept. 21.; the difference in longitude being 60° 42′. Consequently it took place about seven hours after the height of the hurricane in Dominica, while, indeed, it was in progress towards the spot where the Lee met it, and which seems to have been the place of its greatest intensity. If it was the result of a shock in Dominica at the time, the velocity of the earth's vibration would be seven miles per minute. But it was, probably, simultaneous with a shock in the hurricane's course; nor does the distance between Dominica and Chichester (about 2940 miles) preclude this supposition; for, as already stated by Mr. Bakewell (*Geology*, 3d edit. p. 336.), from documents in existence, the earthquake which destroyed Lisbon was felt the same day in Europe, Africa, the United States, and the West Indies. "Incredible as it may seem, one fourth of the northern hemisphere was agitated by the same earthquake;" which, by the way, I have always considered the most satisfactory example of the nature of an earthquake; Hecla at that time being in dreadful eruption; Etna and Vesuvius having erupted, the latter, in March, 1755; and the former, in Dec. 1754, within twelve months. Mr. Lyell calculates the rate of this earthquake at twenty miles per minute. (*Princip. Geol.*, i. 440.) It may be argued that the occurrence of the tornado and hurricane at the equinox proves their connection with the sun. It may be so; but the earthquake at Chichester was contemporaneous; and there are those

(see VI. 299. note) who consider the sun to be the cause of earthquakes. The position I defend suffers nothing, therefore, on that account. The convulsions of the air were very extensive at that time for several days. On Sept. 24., the town of Materna, and the environs of Basilicata (Naples), were visited by a tremendous hailstorm; the stones were as large as walnuts, and lay a palm ($10\frac{1}{3}$ in. deep); 14,000 panes of glass were broken. At Monte Video, and throughout the Rio de la Plata (34° 30′ s., 56° w.), there were destructive and tremendous gales on Sept. 25, 26, and 27. On Sept. 25., also, Smyrna was visited by a furious tornado, which travelled northwards to the Black Sea, where a hurricane blew from the south, contrary to the usual wind there, on Sept. 28. If these gales were actually connected with the convulsions of the air in the West Indies, as they probably were, the interval of time corresponds with the distance, at the rate of under thirty miles per hour for the aerial impulse. But whether this calculation be, or be not, preposterous, I see no reason to question a connection of all these phenomena with each other. The hurricane of August 12. 1830 had a progress, in an ascertained direction, of about twenty miles an hour; while that of Aug. 10. 1831 travelled at the rate of fifteen miles an hour: but, in the atmosphere itself, unimpeded by friction with the earth, and flowing along in a right line, not in a circular sweep like the hurricane, the air must rush in to supply the vacuum caused by even a distant hurricane, with a speed which baffles calculation. Nor is the rate of 126 miles per hour across the Atlantic, on Sept. 20., a rate at all exaggerated, if we consider the tornado and hurricane as *indices* of an aerial torrent. There is one anomaly in the hurricane of September, if what is said above (VIII. 22.) be of any value; it did *not* occur at a change of the moon. That luminary was full on Sept. 17., the first and last quarters occurring on the 10th and 26th.* May not this give strength to the notion that it

* It has occurred to me, in the course of my reading on this subject, that earthquakes, volcanic eruptions, hurricanes, &c., occur frequently either at the time of the lunar changes, or, at the most, three or four days afterwards. Such was the case here; in the inundation at Petersburg in 1777; in the eruption of Vesuvius on Aug. 27. 1834, the day of the *last quarter*, &c.; and, as I understand from my friend Mr. Lloyd, Dr. Foster has observed the same things, especially respecting the *new* or *full moon*, of all great eruptions of Vesuvius, Etna, &c. &c. Should this be the case, I shall gain thereby another link for my argument; nor do I see any material objection to the supposition; for, if the moon attracts the sea, why may it not also attract the earth, and the volcanic *fluid* thereof? Dr. Foster, in

was occasioned by a vacuum from *below*, and not above? It is to be remarked, that the heat, in all the West India islands and the adjoining continent, has been very much greater than ever remembered by the oldest inhabitant. I have had many opportunities of ascertaining this from the actual observations of personal acquaintances.

The meteors on Sept. 29., and the aurora on Sept. 30., are named above (VII. 615.); also the meteors of Oct. 1. and 3. (*Ibid.*), on which latter day the thermometer at Fareham, in the vicinity of Portsmouth and Chichester, recently so often shaken, stood at 123°, the highest degree in the scale of the instrument observed.

On Oct. 2., a very thick and extraordinary fog extended over many parts of England, especially the whole southern coast, London and Bristol being included in its range. On the same day a heavy sea fog, accompanied with destructive gales, occurred off St. Andrews, New Brunswick, and in much of the space intermediate between England and America. We have here the extremities of an arc of 2500 miles simultaneously and similarly affected. This fact shows, again, the great extent of atmospherical and terrestrial affections. The wind, in England, was N.E.; and the snow, on Oct. 1., with the thermometer below zero, lay deep on the ground at Riga. This snow was preceded by a heavy fall of *hail* on Sept. 30. which lay 2 in. deep. The fog was, therefore, probably caused by a passing chill from N.E. cooling the air down below the temperature of the sea.* This chill, like the snow and cold at Riga, was of short duration; for the symptoms of winter in the north have been brief; the ground being again free from snow and under cultivation at Riga in December. A similar cause, doubtless, produced the fog off St. Andrews, New Brunswick, a warm sea and a cold icy atmosphere. In addition to the earthquake at Bologna, on Oct. 4. (VII. 615.), the thermometer at Fareham again marked 123° on the 6th; while, on the same day, Carthagena, in Spain, was visited by severe shocks, at 3 and 7 A.M., accompanied by very striking phenomena. The sky was

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his work on Epidemic Disorders, has, I am told, established the actual connection of epidemics with volcanic eruptions at a distance. The information in the former part of this note was derived from an announcement at Naples, dated Oct. 10. 1834.

* In a very interesting essay on the Indian summer, read before the Baltimore Academy (Dec. 16. 1833), it is stated, from facts observed in America, that "hazy weather is the result of a southerly or easterly current supervening to a cold northerly one." The whole essay is worthy of a careful perusal. (*Amer. Journal*, xxvii. 145.)

clear till the last shock, 7 A.M., when it became overcast, and the mountains were covered to their bases with lurid clouds. At 10 A.M., there fell tremendous torrents of rain, with lightning and thunder all day. At 9 P.M., the thunder and lightning were redoubled; the streets were like rivers; and next day the country was under water for miles, boats floating over the fields. These effects accompany volcanic eruptions, and illustrate the connection of them with earthquakes. On the 10th, commenced a series of gales which traversed all Europe till the 31st, and raged with almost unexampled fury. From the 16th to the 18th *, no less than fifty-six vessels were wrecked in Holland and off the east coast of England; the decrease in temperature producing ice, on the 18th, near London. On the former day, Ostend was exposed to the fury of the wind; while at the same time occurred a tremendous gale in the Gulf of Mexico, the Swallow packet being dismasted six leagues north of Vera Cruz; and several other ships being capsized, and greatly injured. A similar gale occurred there on Oct. 20. 1833. On Oct. 14. occurred a terrible hurricane at Laguna, on the coast of Brazil (28° 30′ s. 49° 30′ w.). which affords a singular corroboration of what I have observed above (p. 135.) respecting the hurricanes of Sept. 20—25.; for as the Rio de la Plata was visited by the gale two days *after* the hurricane in the West Indies, so Laguna was visited two days *before* that of Vera Cruz. On Oct. 15. a shock of earthquake occurred at Cracow (7 h. 20 m. A. M.), and two severer shocks at Lemberg, in Gallicia, at 7 h. 30′ the same morning. Contemporaneously, therefore, with these gales the earth was agitated.

The derangements of the air at this time were extreme. Whether or not the gale in the Gulf of Mexico induced a current from Europe, it would seem that something of the kind occurred; for, from a communication received from Captain Sullivan, R.N., I find that H.M.S. Pluto was in lat. 35° 55′ N., long. 37° 16′ w., on Oct. 18.; that, from Oct. 1. to 18., she had steady breezes from N.E.; but, on the 18th, the wind suddenly shifted to the north, blowing violently, with a heavy sea, for three days, when it became calm for a few hours; after which the whole of it returned from s.w., blowing, on the 21st, a very heavy gale, with an extremely high cross sea, in lat. 35° 32′ N., long. 34° 49′ w. Leghorn and Lisbon had a tremendous gale on the 22d, which travelled

* On Oct. 17., Montreal was visited by unusual darkness, with heavy rain, which deposited a black dust; supposed, by *some*, to be the effects of fires in the woods, the smoke being beat down and carried onwards with the rain.

round from S.W. to N.W. and N.E., spending its fury, on the 23d, in France, England, Scotland, Holland, Germany, and Denmark; attended, in England, with lightning, thunder, hail, rain, snow, and extremely high tides. The consecutive occurrence of these gales looks like one continuous hurricane, the direction of the wind answering to N. On the 22d, lightning was seen in a clear sky to the east, near Winchelsea. The aurora was also seen that evening in Scotland, preceded by thunder and lightning, and followed by ice near London, and snow on the Welsh and Scottish hills. The hurricane of the 23d was most fearful in its violence and effects: the Superb steamer was lost, in the awful night that followed it, off Jutland. On the 24th there was a terrible tempest at Clay, in Norfolk: the lightning was blue, and extremely vivid, and the hail lay 6 in. deep. On the 26th, Jamaica was shaken by three shocks of earthquake, scarcely less severe than those of Sept. 6–7., followed by thunder; the weather previously being unusually hot and oppressive. On the 27th commenced another series of gales of very destructive character. They began on that day at Algiers and Gibraltar, from S.E., passing over Lisbon and France, and, on the 28th and 29th, England; reaching Elsinore, in Denmark, on the 31st, when the wind was N.W. On the 28th, I saw, between Shaftesbury and Poole [Dorsetshire], about 9—11 P.M., a luminous band, stretching across the sky from N. to S., bordering a dense mass of clouds, which next day covered the sky, the temperature rapidly decreasing, and the gale commencing. Liverpool was visited by severe gales, from the 26th to the 28th; and Great Yarmouth had snow, hail, and rain, with violent squalls from the 18th to the 27th. On the 29th, the wind got into the east, in lat. 36° 34′ N., long. 33° 12′ W. (*Log of H.M.S. Isis*); and, in a few days after, blew from that point in England.

October presents two instances of extensive derangements of the atmosphere in Europe; the one apparently connected with a hurricane in the Gulf of Mexico; the other immediately following an earthquake in Jamaica; similar connections with Brazil also occurring; the direction of the wind, obeying the laws of the hurricane, traversing in a circular sweep, and finally blowing steadily from a point farthest from the supposed heated focus of convergence; the electrical phenomena also corresponding in time. I have little doubt that, if intermediate points be taken, and information obtained from persons at sea, it will be found that the draught of air in each case was to the locality where heat was developed; and that the gales succeeded each other at hour, the

vals exactly proportional to the usual progress of the atmospherical convulsions in a true hurricane.

November was distinguished by some striking atmospherical phenomena. On the 2d, the northern sky, as seen from this place, was covered with luminous clouds *; on the 3d, occurred a very brilliant display of the aurora borealis, seen all over England; followed, on the 4th, by one of less brilliance, and a heavy gale, with rain, which blew all that night, and the next day, from s. and s.w.; the motion of the aurora being to the westward. (See *Mag. Nat. Hist.*, VIII. 97.) On the 4th, also, occurred, in Nevis, what is there provincially called a "season," namely, a tremendously heavy rain, with thunder and lightning, cooling down the previously unusually heated atmosphere. Gales followed these displays of the aurora, from the 6th to the 10th, ranging all round the compass, and doing great damage in England. On the 7th, they blew from E. to S.W.; and on the 10th, from N.E. to W. In many places, as in the Isle of Man, they assumed the character of the hurricane, alternating calms and furious squalls. On the 10th, the aurora was again visible, from N.W. to N.N.E., from 6 to 9 P.M. On the night of the 13th, the wind blowing steadily, with a clear sky, from E.N.E, there was a brilliant exhibition of meteors, from 11 P.M. of the 12th to near daylight of the 13th, corresponding with former occurrences of a similar kind on this day of the month; and seen the same night, as stated in the American journals, in the state of New York. The particulars are as follow: — "The meteors came according to the predictions of several scientific gentlemen; among them, Professor Olmsted of Yale College, and a correspondent of this paper. Professor Olmsted and a large number of the college faculty and students sat up during the night of the 13th, anxiously waiting to see whether the prophecy founded on the history of the meteors would be accomplished. At about 3 o'clock they were gratified with the beginning of the shower, and it continued for an hour. The meteors were not so numerous as

* The winds corresponded, in their changes, with these phenomena. On Nov. 2., the wind changed to the west in lat. 41° 15′ N., long. 33° 33′ W., and blew from that quarter till the 8th; when, in lat. 49° 28′ N., long. 10° 37′ W., it again became easterly, blowing, through that space, strong gales: so that Capt. Polkinghorne, who gives me this information, sailed under close-reefed topsails. Captain Sullivan had similar weather, from Oct. 24. (in lat. 37° 9′ N., long. 30° 59′ W., the wind heavy, with lulls from N. to S.; backing round to the eastward, with two days' intermission, when it was S.W.) till Nov. 28. On the 8th, the cold was great in Russia, the thermometer at St. Petersburg being 5° or 6° below freezing: correspondent with the change of wind on that day.

last year; but in all other respects the appearance was the same. We have the statement from a Newhaven gentleman, and have no doubt of its accuracy. We have not as yet heard of the meteors being seen in any other place. Professor Olmsted has made a brief communication on the subject to the *Newhaven Herald.* He states that the presence of the moon permitted only the larger and more splendid meteors to be seen. The number of them, though smaller than that of last year, was much above the common average. They began to be frequent as early as four minutes past one o'clock, when a fireball of unusual splendour blazed forth as a signal. From this period they continued to fall at a pretty uniform rate until daylight was far advanced. It was estimated that 1000 fell during the night. Their directions were more remarkable than their number, and afforded more unequivocal evidence of the identity of the phenomenon with that of last year. They appeared, as before, to radiate from a common centre, and that centre was again the constellation Leo." (*New York Journal of Commerce,* Nov. 19. 1834.) Now, in VII. 654., I have recorded my observation of the meteors on the same night at this place. As will be seen, on referring to that statement, the particulars agree with those given in the foregoing account. I have since received information that they were seen by other persons in this vicinity; and that, as early as eleven o'clock P.M. on Nov. 12., they were observed in great numbers; one, especially, having a very remarkable train. The information I have is too scanty to be of much scientific use; but the time mentioned serves as a guide. It will, I suppose, be allowed that the same display of meteors was seen in America and in Dorsetshire; and that either they were the continued effects of an electric action in the air over a wide extent, or that they were, as Professor Olmsted supposes, the evidence of the return of his new cometic body. As he states that the motion of that supposed body is from west to east (see VII. 386.), the exhibition of 1834, like that of 1832, puts that notion to the test, and refutes the fact.

They were first seen (according to the *New York Journal*) at 1 h. 4 m. A.M., Nov. 13. They were first seen in Dorsetshire at 11 P.M., on the 12th.

The longitude of Newhaven is -	- 72° 50′ w.
The longitude of Poole is - -	- 1 58 w.
Difference - -	- 70 52 = 4h. 43′ 28″

Therefore 1 h. 4 m. A. M., Newhaven time, is equivalent to 5 h. 47 m. 28 s., Poole time; which, added to one hour, the

difference of time between the hour of observation here and midnight, gives 6 h. 47 m. 28 s., the interval which elapsed between the first appearance of the meteors in England and America. If, then, these meteors betoken the presence of a cometic body, it moves *westwardly;* and the position of Professor Olmsted is untenable. This is a fatal argument for the hypothesis; and we are driven to conclude, that the idea of the meteors being altogether electrical, arising from a certain state of the atmosphere, in certain years, at a certain period of the year, is sufficient to explain their occurrence. The subsequent agitations of the atmosphere, in 1834, as well as in 1833, the gales that occurred, and the volcanic phenomena that preceded, all lead to the same conclusion. Till, therefore, these difficulties shall have been reconciled, I shall adhere to my own supposition.

How well my own observations respecting the effects of meteoric phenomena on the changes of the weather are borne out by other writers (Mr. Conway, Mr. Gardiner, and Mr. White), may be seen in the last Number of this Magazine. (VIII. 92—99.) The last gentleman's account of the meteors very curiously balances mine in all points; and his deductions are also similar. He corroborates the fact of the appearance of the meteors being *earlier* in England than in America, and that they were electrical. From all enquiries I have made on the subject of meteors and the aurora, those phenomena seem to occur, in general, *very near* the earth, comparatively speaking; and, for some examples perfectly illustrative of this fact, we may consult Sir John Franklin's *Second Voyage*. I see in this an additional argument for rejecting the notion of a foreign cause for either, and for indulging the belief that from the earth do all the electrical agents or effects originally proceed. The Society of Natural History of Frankfort on the Maine undertook to watch the sky between the 10th and 15th of November, 1834, for the purpose of ascertaining whether the meteors of November would return. Whether they were seen there I do not know, as the Frankfort papers contain no information as to the result of the Society's vigils; and I have not yet had an answer to my private enquiries.

These meteors were, I believe, seen at sea; for Capt. Sullivan saw a very brilliant meteor, about the same time, traversing an arc of 40° to 45°, when about 700 miles from Falmouth; the same, perhaps, observed by a gentleman in Purbeck, who described it as having a long train. On the 12th and 13th there were heavy gales in the St. Lawrence, with snow; though the channel to Quebec was unencumbered with ice.

On the 14th, also, occurred a very heavy gale in the Baltic, doing great damage to the shipping off the east coast of Sweden; and in the night of the 17th, after almost complete darkness from 2 P.M., there fell at Gibraltar, about 10 P.M., a tremendous waterspout, accompanied by thunder, lightning, hail, and a furious wind, doing incalculable damage to the town and garrison, and washing down immense masses of stone and earth from the rock, destroying property and lives. Cold also followed the meteors on the 18th and 19th. On the 20th, a heavy gale from E.N.E. cleared the Downs of the shipping, snow falling at 5 A.M. of the 21st, but melting as it fell; the wind at N.E. changing to S. with luminous clouds. The gale of the 20th broke up the ice in the Neva, which had accumulated in the channel of St. Petersburg. This second chill in England, like that of October, was doubtless the effect of the wind blowing from the N.E. over the snow and ice in Russia, which, as before observed, has been only temporary. These facts and inferences strengthen what had been mentioned before, respecting chilly weather brought by the wind blowing from the ice. (VII. 627.) On the 22d, the Vistula was frozen entirely over; but a thaw ensued, and milder weather; and eighteen days afterwards the ice had disappeared. Nor does it appear that in Canada, though snow lay on the ground on Nov. 12., that winter had set in there in earnest; for, on the 15th, the weather was fine and open at Quebec.

On the 28th, here, there was considerable lightning in the S.W. in a cloudless sky, followed, on the 29th, by rain and wind from the W. and S.W., with a rainbow (unusual at this season). The lightning in a clear sky, like the aurora, betokens a change of wind to the quarter where it appears, or contrary to it, as I have invariably noted.

During the time the wind was at N. and N.E. and E. I occasionally observed that there was a higher current from the S. and S.W.; and particularly on the 23d I noticed the apparent descent of this current, when, about 1 P.M., the wind suddenly shifted, and blew back the clouds previously scudding from the north.

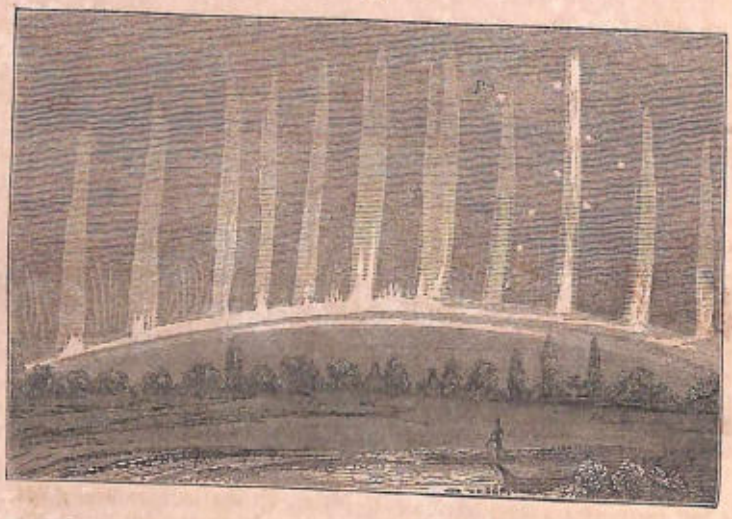
The direction of the winds is not sufficiently studied. Lieut. Burnes, in his *Travels to Bokhara* (the passages are before alluded to, VIII. 10. note *), distinctly states that the hot tornadoes he experienced at Moultan, in July, 1831, and in Bokhara, in July, 1832, came, after unusual heat, from the N.W., the attractive point of the earthquakes in those countries; and he says that these tornadoes were not produced by the desert, because, if so, all winds blowing would alike bring them, which is not the case. It is very certain, from

observations, that the s.w. and w. winds in the south of England have assumed the character of a *trade wind;* the trees, as I have shown in Loudon's *Gardener's Magazine* (ix. 548.), actually growing, throughout the south of England, from the s.w. so invariably as to become an unfailing guide. [The Rev. W. T. Bree has, in the same volume of the *Gard. Mag.* (ix. 714.), added his experience of the oak trees in the Isle of Wight being in this case; and has stated, farther, that, even in Warwickshire, in exposed situations, the oak trees show their aversion by turning their heads from that quarter.] The trees in the West Indies grow just in the same way from the east; and Lieut. Burnes says the trees in Bokhara grow from the north, owing to the prevalent winds there.

To continue our calendar of 1834. December set in mildly. On the 1st, a heavy thunderstorm, with torrents of rain, was experienced in Ribblesdale. On the 3d, at noon, a rainbow was seen by me, as brilliant as in summer time. On the 5th occurred a brilliant aurora, seen at Alost, near Brussels; and at Dundee (VIII. 96.) on the 4th, 5th, and 6th. On the 6th commenced a furious gale at N.W. at Liverpool, which did great damage, on the 7th, off the north coast of Scotland; blew till 2 P.M. of that day in the south of England; and on the 8th, at 1 A.M., came on again, in all its fury, off Aberdeen. On the 9th there was a tremendous thunderstorm at Manchester, some of the hailstones which fell measuring 2½ in. in circumference. On the 10th, the frost was very severe, both in the north and south of England; on the 12th, a thick fog occurred in the Thames and along the coasts; and on the 14th, the weather became warmer. The *Giornale del Due Sicilie* contains an account of a most extraordinary hurricane at Marsala and its environs, especially Palermo, on Dec. 16. During the 15th, the sky was serene, the sea calm, and the air perfectly tranquil, the night bright and cloudless. But on the 16th, at 4 A. M. *exactly at the time of full moon,* and *whilst that luminary was eclipsed,* a black spot was seen in the northern horizon, which rapidly enlarged, letting loose a most furious storm. The wind, rain, hail, lightning, and thunder were most terrific. The sea was in awful commotion; and for more than an hour there fell an immense shower, not of ordinary hailstones, but stones as large as a walnut, *of a yellow colour,* and extraordinary solidity, which did incalculable damage to the windows and houses; almost every pane of glass was broken to the *east* and the *north.* Trees were broken all over the country; great quantities of *birds were killed,* and cattle injured. The fall of projectiles lasted an hour; and the storm

itself ceased, and was renewed three times. It was a true hurricane. The air next day was affected by *excessive cold*, which caused the inhabitants to be on the alert, and to exhibit the greatest activity in repairing their dwellings. This hurricane must, I think, have been connected with some terrestrial convulsion; as, on the following day (17th), a shock of earthquake was felt at Coblentz. The shortest day was the brightest, warmest, and longest, ever remembered; followed, on the 22nd, by a most brilliant display of the aurora, from 5½ P.M. till 2 A.M. of the 23d. This beautiful phenomenon was visible throughout the south of England; the arch which was formed from the N.W. remained throughout the night, but it gradually disappeared, apparently from the effect of a gentle wind blowing to the north. Several meteors attended this display (*fig.* 14.). The frost that night was intense. There

14



was fog from evaporation, and hoar-frost, on the 23d; rain at 5 P.M. on the 24th (just forty-eight hours after the aurora); on the 25th, the wind was in the west, with fine summer-like weather; on the 26th, in the east; 27th, in the north; 28th, in the east, and variable, with a frost; and 29th, south, the thermometer at 53°, with heavy clouds, wind, and rain (the universal consequence of the aurora, sooner or later), which continued till the 31st, the year departing in a heavy gale from S.W. which commenced at sunset, after blowing hard all day; in this respect completing the parallel with 1833, which

closed its career with a similar storm *; the wind moderated after daybreak, backing round to the north; the new year commencing with fine skies, clear, and, for the season, warm weather, and a slight hoar-frost at night.

The close of 1834 has been marked by the same extraordinary characters which distinguished that of 1833.† In this county (Dorset) there are the same indications of precocious vegetation — blossoms, buds, and even fruit, a second and third crop, since the spring. The gnats have swarmed as in summer, in the lanes and enclosed places; the dust flew on Christmas-day; and the bees have been actively employed on the blossoms of the flowers; the anemone, heartsease, violet, honeysuckle, poppy, &c., yet expanding in my garden.‡ The temporary chills and occasional frosts have checked these things at times; but, on the whole, the weather has been delightfully pleasant, and a very early spring must follow, if

* This storm (Dec. 31. 1833) caused the tide to rise so high, that the river Lune overflowed its banks; and at Sunderland, seven miles from Lancaster, the effects of the inundation were seen in the abundance of dead earthworms, " with which," our informant [Mr. M. Saul] says, " the land was covered." It is supposed that the salt water stimulated them out of their holes and destroyed them: their remains were left, because the gale had blown away the seafowl.

† Mr. Cooper, of the New York Lyceum, states that there were many birds at New York in the winter of 1833 and 1834, not usually seen there during winter. (*Amer. Jour.*, xxvii. 149.)

‡ For many examples of the extraordinary nature of the year 1834 see Loudon's *Gardener's Magazine*, x. 573. et passim; and *Worcester, Herald*, Nov. 22., wherein mention is made of a *third crop* of pears at Pershore. A similar phenomenon is exhibited on an apple tree at Wimborne, Dorset, now (Dec. 23.) bearing apples as big as walnuts. Amongst the natural curiosities of the late season, the Berlin papers mention the fact of an apple tree near Cologne, on the Rhine, at least 65 years old, bearing a crop of ripe apples on the *south side*, whilst the *north side* was in full blossom; and this phenomenon had been observed in the same tree thrice during the last fifty years; viz. in 1779, 1787, and 1811.

In the *Annales de la Société d'Horticulture de Paris* (xiv. 240.), there is an interesting paper, by M. F. P. Mérat, on the extraordinarily hot temperature of the month of January, 1834. Amongst other things the writer mentions, that not only at Paris, but at Metz and along the Rhine, vegetation was at that time precocious. He says there was no snow in the winter, and that the thermometer in January descended but once to 1° or 2° below zero (29° and 27° Fahr.); that, on the contrary, it was frequently as high as 6°, 8°, and 10°, above it (46°, 50°, and 55°, Fahr.: the latter was the temperature of Dec. 31. 1834, in Dorsetshire); and that on one occasion the mercury rose to 16° (68° Fahr.); that almond trees blossomed at Paris on Jan. 15. and peach and apricot trees, also, exposed to the full wind; the Cobœ'a scándens *Cav.*, which usually dies in November, remained through the winter; and the Coronílla glaúca blossomed as in autumn. The violet also falsified the proverb *En Mars la violette*. The oldest inhabitants of France remember no such winter as that of 1833 and 1834; and the workmen were seen with naked arms, and open windows, without fires.

the wind remains in the south. The hazel, lilac, horsechestnut, and other trees and shrubs, are bursting into leaf. The thrush was singing loudly on December 7., the earliest date in Lord Suffield's table being Dec. 4. 1735 (II. 128.), the medium time being Jan. 14. 1747; lambs, *not* of the Dorset breed, were dropped in this parish (Longfleet), on Dec. 15.; and the moles commenced their operations in October, and continued them all through November and December. Frogs and toads croaked here, Jan. 27. 1835. (For the usual times of these occurrences, see Loudon's *Encyclopædia of Agriculture*, Kalendarial Index, p. 1189.)

Thus have we seen that the year 1834, as well as 1833, furnishes innumerable applications of the theory advanced. Certain it is, that, as far as the examples adduced conspire (and there are doubtless many others, of which, for the present, owing to distance and various other circumstances, we must remain in ignorance), a case has been made out, from the occurrences of the two last years alone, to warrant the indulgence of a belief, that the supposition of the connection in question is not altogether hypothetical. A recent statement confirms these conjectures, by adducing an argument which is conclusive as to a change in progress, in the vegetable kingdom, in Australia. The *Hobart Town Courier* (in a number recently received) relates that "a remarkable phenomenon has for some time been taking place in the interior of Van Diemen's Land, especially in the higher parts having an eastern exposure, in the death or decay of whole forests of that species of Eucalyptus commonly called the black gum. Some suppose that the seasons have recently undergone a change, and that the climate, generally, of the island, is becoming *colder* and less *genial* (a notion, this, *at variance* with the supposed effects of civilisation); and, consequently, that such plants and trees as had already reached the verge of their climate, are necessarily cut off to a certain extent, just in the same way as the she oak (Casuarina equisetifolia) and the cherry tree (Exocarpus cupressiformis) are not found beyond a certain height on the hills of the interior, or as the growth of gum trees may be seen from Hobart Town, on the side of Mount Wellington, to be limited to about the height of 3000 ft. from the level of the sea." Others suppose that these trees grow, and are principally found to die off, in plains and level places, surrounded by hills; they are destroyed by the morning vapours and fog, that kill so many crops of peas, potatoes, &c. In either case, this fact shows some great change in the southern hemisphere of late. But to resume the argument: we have instances on record of former periods, when

similar phenomena, tried by the same test, have produced similar results; and it is in full confidence that I leave the enquiry, commenced in these papers, to the investigation of future observers of the natural world, assured that these speculations will not be found worthless. The subject matter before me is not, however, exhausted; and in my future papers I shall endeavour to strengthen what has been already advanced by additional evidence; first introducing here a few facts illustrative of what has gone before, relating to 1834, which were accidentally omitted to be introduced in their proper places. As in 1833 (VIII. 10.), China was visited by inundations of a fearful character in 1834. On June 21st, 22d, and 23d, the water was 7 in. deeper than in the great flood of August, 1833, and higher than ever known by the oldest Chinese. Bengal, too, in August, and the country about Surat, were also inundated to a wide extent, great damage being in consequence produced. A tremendous gale occurred at Calcutta on August 3., preceded by a great fall of the barometer on the 2d. The wind blew first from N.W. in hard gusts, with heavy rain (7 in. in forty-eight hours), then suddenly changed to S. and S.E. Immense damage was done by it. It was remarked that the spring-tides were "most unusually high for the month of August:" the salt-water lake at Baloory was within an inch of the level it stood at during the hurricane of 1833. (*Cal. Cour.*) The accounts from all parts of India speak of awful inundations, especially in the west of Bengal, in Madras, and Bombay, on the 9th, 10th, and 11th of August. Villages and towns were carried away, bridges destroyed; the water stood in some places over the country, 40 ft. deep; in others the trees were under water. Such a flood had not been known "for twenty-five years;" "for forty years;" "for ages past." At Kumptee they had a flood on August 6.; the water falling in the Canar as rapidly as it rose. The mischief done to the crops, and the consequent famine, independent of the actual loss of life, were extreme. "The stench from the dead and putrid corpses is highly offensive," says one writer; "and will, it is feared, be the cause of more sickness." The details are given, as collected from various quarters, in the *Asiatic Journal*, No. 62. The *Meerut Observer* of May 1. states, moreover, that immense flights of locusts (as in China [VII. 308.] in 1832, 1833, and 1834) passed over Meerut, Saharanpore, and Muzuffurnuggur, doing incalculable mischief, leaving "a worse plague behind them, in the shape of myriads of young locusts, which covered the small trees and bushes;" and, when in motion, this mass made a

sound like the crackling of flames. (*A. J.* xxvii. 19.) In addition to what has been already adduced, I add here, that the Prussian papers state, that, at the end of July, 1834, the country about Marienwerder was visited by great swarms of locusts, and that extraordinary numbers of *wolves* have shown themselves there since 1833.

A hurricane, also, of a frightful character, visited Arracan on May 14th, just twelve months after that which desolated the vicinity of Calcutta in May, 1833.* Its principal seat of

* As illustrative of the subject, and to correct a former inaccuracy as to date, I append here the following list of earthquakes felt at Kathmandu (Katmandoo), in 1833 (see *M. N. H.*, vii. 302.), extracted from the Journal of the Asiatic Society of Bengal for Dec. 24. 1833 : —

Date.	Time.	Remarks.	No. of shocks.
Aug. 26.	One at 5 h. 55 m. P.M.; another at 10 h. 50 m. P.M.; a greater at 10 h. 58 m. P.M., which lasted three minutes : nine others the same night	All undulating	12
Aug. 27.	4 h. 53 m. A.M., 5 h. 20 m. A.M., 5 h. 26 m. A.M.	All undulating	3
Aug. 28.	7 h. 15 m. A.M., 4 h. 55 m. P.M.	All undulating	2
Aug. 30.	Four shocks : one at 9 P.M.	All undulating	4
Aug. 31.	Two during one night	Slight	2
Sept. 1. to 11.	Ten shocks	Slight	10
Oct. 4.	7 h. 30 m. A.M.: a smart shock, one minute	Vertical; felt at Gorakpoor and Allahabad	1
Oct. 18.	4 h. 55 m. P.M.: severe, with loud noise	Vertical; felt at Allahabad: one minute	1
Oct. 26.	10 h. 37 m. A.M.	Slight	1
Nov. 8.	3 h. 35 m. A.M.	Slight	1
Nov. 16.	Midnight	Slight	1
Nov. 26.	11 h. 45 m. P.M. (full moon)	Severe	1
	Many other slight shocks, not noticed.		39

The undulating shocks were destructive to property; but the vertical shocks were accompanied by a violent noise, and more rapid oscillations of the ground. The shocks of Oct. 4. and 18. were felt, nearly at the same moment, at Monghyr, Calcutta, Allahabad, Chittagong, and Jubalpoor. At Kat Sing Choke, north-east of Nepal, there were noises for five days previous, like the firing of cannon. It is said that, on the night of the shock there, and for several previous nights, a *large tiger* or *leopard* paraded one of the towns west of Katmandhu, *without molesting any of the inhabitants*. He was hailed as Ramjee, another incarnation of the great Preserver! How well this balances what Livy says of the *wolf at Rome!* (See VII.

violence was at Khyook Phoo, and Akyab. At the former place it left but one house standing, tore up tamarind trees by the roots, destroyed all the bridges, deluged the country with torrents of rain, and caused such a rapid rise of the sea, that the waves rushed over the land, washing away buildings, and wrecking all the vessels. The hurricane lasted there only two hours. At Akyab, it commenced at 4 A.M., blowing from the north till 11, when it shifted to the west, and blew most violently, carrying everything before it, till 5 P.M. when it ceased. Similar calamities occurred here as at Khyook Phoo. (*Asiatic Journ.*, xv. 198.) At this very period, famine, caused by long drought, was rife in Ajmere and other parts of India, and sickness of various kinds was depopulating the country of Arracan. (*Id.*) The cholera, also, was raging at Purneah and Calcutta most destructively. (*Id.* p. 195.) The upper part of the Bay of Bengal * is especially subject to hurricanes. The following particulars of the hurricane which occurred at Balasore on Oct. 31. 1831, are not without their interest, as exhibiting the awful effects of such a derangement of the elements. The passage is extracted from a private letter written about ten days after: —

"I can think of nothing but the hurricane which occurred here on the last day of October; such a calamity I never heard or read of: at least 10,000 persons in my jurisdiction were drowned, and I fear the accounts will show double that number, including children. The high road from Madras to Calcutta runs through Balasore, about six miles north of this; and where it is, in a direct line, *nine miles from the coast*, the sea crossed it, carrying with it every living thing in that space. At least 150 square miles were inundated from ten to fifteen feet deep. The deck and part of a vessel are on the road. Where the sea crossed it on the west side, and was checked by the road on the east side, are lying, all dead and heaped together, men, tigers, buffaloes, cows, &c. I have sent out hundreds to burn and bury, but if it does not breed a pestilence we shall be lucky: it is not easy to dispose of bodies covering miles. Persons whom I sent out report that for three miles inland, where my bungalow cottage was, all is silence and death; not a house or vestige of life remains; that

196.) The Brahmans say that, about 600 years ago, a far more frightful earthquake occurred, doing greater damage far and near.

The country shaken by these earthquakes was that comprised between Tingri (28° N.), Calcutta, and Rungpoor, and Delhi: a tract of 3000 square miles in and south of the Himalaya range.

* Calcutta is not more than 400 miles from the place of the hurricanes in Arracan, and only 141 miles from Balasore.

they found not a being to question — all was still. No one saw the invader: the sun had gone down before he left the bed to which hitherto he had always been confined: before dawn he had returned to it; but his visit, though unseen, will never be forgotten by the few who heard his approach and survived." (*Bury and Norwich Post.*)

The heat of the weather in 1834 has been universal and extreme *; but there have also been anomalies in its effects. Thus, while the vineyard countries have generally been unusually productive, Madeira has experienced a failure of nearly half its usual crop. It is mentioned in Silliman's *American Journal* (xxvii. 179.), that a log of hemlock wood [*Abies canadénsis*] caught fire from the sun, at Winchester, Connecticut, on August 5. 1834; indicating the presence of a heat in the air equivalent to that felt on the continent of Europe; and I am also informed, by a person entitled to credit, that a gust of hot wind, similar to that which was experienced on Sept. 16. (VIII. 28.), was felt by him, near Highgate, one evening in June last; and remembered as a puzzling occurrence at the time, though the date has escaped his memory.

The periods under consideration have also been remarkable for some *extraordinary variations in the tides.* This is, perhaps, a subject of doubtful character as respects our enquiry; but all the phenomena of the natural world give and receive a reciprocal light, and may be usefully canvassed.

The examples afforded during the storms of June and August, 1833, have been named in previous papers. On Nov. 2. and 3., also, during the hurricane of that date, the tides in the Thames and along the eastern coast were extraordinarily high, though not spring tides, the wind being at w.s.w. At Ipswich, the tide was 4 in. lower than in Feb. 1825: then 16 ft. above the level of the Orwell, and 4 ft. or 5 ft. higher than ordinary spring tides. The barometer stood, on Nov. 4., at 30 in., the thermometer being 48°. (*Mr. Bransby*, in *Ipswich Journal.*) On Nov. 2., a similar event occurred at Liverpool; and, again, on Dec. 31., when the hurricane raised the Mersey more than 6 ft. above its regular level. On Jan. 27. and 29. 1834, the highest tides known for years occurred at Dover and London: from Vauxhall to Deptford all was under water, occasioning great losses of property.

* As additional examples, it may be mentioned, that the Danube has been unusually low throughout its course; and that the Rhine above Cologne has been scarcely navigable by deep vessels, which have been obliged, so late as November, to discharge their cargoes to enable them to navigate.

The tide of the 29th was imputed to a sudden change of wind from S.W. to N.E., in addition to a hurricane and floods from the country. Major Rennel has observed (*Phil. Trans.*, 1809) that high winds from W. and S.W., blowing into the chops of the Channel, may force a greater body of water than usual through the Straits of Dover, and so cause extraordinary tides north of that place; and he says that, in storms at the entrance of the Channel, the surface of the water is often elevated to 30 ft., when, at common spring tides, it is only 20 ft. This, no doubt, will satisfactorily explain many of the great variations in the tides on our coasts; but I do not think that this can apply to what took place at Leith (where the wind was not high), or even at Poole, in Oct. 1833, notwithstanding the hurricane which blew off Scilly; for a high wind might elevate or retard a tide, but could scarcely produce an interchange of tides, or throw in a sudden supply of water into a particular spot, while the other harbours were not materially affected. I, therefore, venture to believe that there was some submarine convulsion causing a temporary alteration in the level of the sea, such as often takes place in earthquakes. As a striking confirmation of my conjecture, I find that Auvergne was at this very time shaken by a severe earthquake. (Vide *Mémoire de M. l'Abbé Croizet*, on the subject.) On March 7. 1833, while there was a perfect calm, and the sea quite smooth, the tide ebbed so greatly at La Hogue as to leave the roadstead dry; and several parts of the vessels destroyed there by Admiral Russel (on May 29. 1692) were exposed and taken up; together with six pieces of cannon and several cartloads of shot, which were found in good condition *: there being no record, since that action, of such a great recession of water there (*N. M. M.*, Dec. 1833.) On Oct. 3. 1764 (a year before introduced) occurred the lowest ebb in London, and the highest flood at Ostend, ever known: the latter town was under water. No cause, such as a westerly wind, was assigned; but, probably, that was the real cause: and this fact strengthens, on that supposition, what has been before said of the winds of that period. Sept. 28. 1764 produced the highest tide of the time at London. So, on Oct. 31.

* This is not the only instance of discoveries made recently by the effects of the elements. During the gales in Jan. 1834, by the action of the sea, part of the treasure of a Spanish galleon (wrecked shortly after the conquest of America by the Spaniards) was found on the Rhosily Sands, near Wormshead. About the same time, a gold ring and other things were thrown up near Lyme, which had been buried more than a thousand years. The Chesil Bank was so disturbed at that time, that great quantities of coins, wrecked there nearly two hundred years since, were picked up by the country people.

and Nov. 1. 1823, during a sudden hurricane off the east coast of England, the tide was an hour and a half before its time. Exactly similar to what took place on Aug. 31. 1833, were the great ebb and sudden return of the tide, in the Thames, as far as Gravesend, with the wind at s.w., on Feb. 6. 1822; and, again, on March 5. 1822, and Oct. 20. 1827, hurricanes extending from England to the West Indies. During the dreadful gales of Oct. 23. 1834, the tides of Heligoland were frightfully high, the effects of the wind from the N.W. It is an ascertained fact that the great inundations to which St. Petersburg is subject are occasioned by S.W. and W. winds, about the autumnal equinox, *near full moon*, blowing over the Baltic, after N.W. gales in the North Sea. On the other hand, during the prevalence of east winds, the water is so forced back that Cronstadt harbour is often left dry. In Tooke's *Russian Empire* (vol. i.), a list of these inundations is given. He mentions one particular instance, the inundation of Sept. 9–10. 1777 (*three days after full moon*), when the whole city was laid under water, and all the bridges were carried away, a violent storm from S.W. and W. raging all the while till 5 A.M. At 8 A.M. the wind chopped round to N.W., and drove all the water back again. This storm was supposed to have its origin from the North Sea. It was not my intention to include in this paper any notices of 1835; but, as an appropriate illustration, I cannot refrain from observing, that, on Jan. 16. 1835, we had here a violent gale from S.W. (from 11 P.M. on the 15th, to 3 P.M. on the 16th), attended by a higher tide, by several feet, than ever known since the famous storm of November 24. 1824. The harbours all along this part of the southern coast were filled with an enormous body of water, as at Weymouth, Poole, &c.; and, though the wind had certainly somewhat to do with it, I cannot help thinking that there was another cause acting from below, which threw into our harbours the amazing flood which accompanied the gale. On the 18th, the wind blew a hard gale from the *east*; and, on the 19th and 20th, occurred a sudden and furious gale from the north, sprinkling even our hills (a thing very unusual in this neighbourhood, even in winter time) with a slight covering, and blocking up the North of England, Scotland, and Ireland with a heavy accumulation of snow; on *the 19th occurring a shock of earthquake at Chichester*. During the hurricanes of October, 1834, the town of Embden suffered continual inundations from the forcing of the water of the Channel by the wind.

We have already seen what is related of the sea, during the hurricane at Balasore, in 1831, of the *swell* during the West

India hurricanes, and what has occurred during gales off our own shores: we may, therefore, generally expect extremely disorderly tides during the prevalence of high winds from particular points of the compass. It is a well-known fact, that, during a tremendous gale from N.E., in the Gulf of Mexico, in Sept. 1759, the Tortugas and other islands were completely buried under water, together with the highest trees in Larga; so that a vessel anchored over Elliot's Island, and, when the sea retired, the anchor was left, high and dry, on a tree (*Q. R.*, xiv. 374.): thus literally verifying what Horace has said respecting a flood in ancient times: —

> " Omne quum Proteus pecus egit altos
> Visere montes,
> Piscium et summa genus hæsit ulmo,
> Nota quæ sedes fuerat columbis,
> Et superjecto pavidæ natarunt
> Æquore damæ." *Od.* 1, 2, 7.

Nevertheless, inasmuch as the winds which occasion these high tides are themselves produced by heat, and that heat may sometimes be the consequence of volcanic action, the tides themselves enter properly into our calculations.

Occurrences of this kind are not, however, confined to the present, or any very recent, period. History, both ancient and modern, attests the exhibition of all the events we have treated of, at particular epochs; and " the earth has always presented phenomena," as Fuchsal justly has observed, " similar to those of the present day;" but our present object is to show the coincident concurrence of these phenomena in connection with derangements of the terrestrial organism. Thus Holingshead points out the year 1040 as a year when there were unusually large *tides*, as well as inundations, earthquakes, and a frost at midsummer. (*Hist. Scotland*, p. 238.) So, again, from Nov. 11. 1085 to April 1. 1086, the Rhine was passable on foot; and, in 1114 (14th of Henry I.), the Thames was so dried up between the Tower and London Bridge, and under the bridge, that horse and footmen, women, and children passed and repassed daily on foot. (*Stowe, &c.*)

The following cases are also in point, when compared with the seasons of 1833 and 1834: —

Crusius (*Chronicles of Suabia for* 1186) mentions that the winters of the years 1186 and 1187 were extraordinarily mild; that trees blossomed in January; apples, as big as nuts, occurred in February; corn was harvested in May, and the vintage was gathered in August: while 1188 was unusually severe on April 25.; and, in 1180, many towns in England

(*Baker's Chronicles*), and, in 1182, Jerusalem and almost all the towns in Syria were desolated by earthquakes; and Mrs. Somerville has stated that 1186 was an astronomical year, when, on Sept. 15., the five great planets were in conjunction: an occurrence which had not before happened for 3686 years! Without wishing to assign any of the earth's derangements to astrological causes, I may also add that the sweating-sickness happened at intervals of thirty-three years, during the conjunction of three of the great planets in the same signs. But I shall not *yet* allude more to the question of "*periodicity.*" (VII. 387.) In 1228, the harvest was gathered in before St. John's day; and, in 1230, the summer was so exceedingly hot, that "men roasted eggs in the sand." (*German Chronicles.*) The year 1289 was also, according to Steinhoffer (*Chronicles of Würtemburg*), so mild, that there was no snow in winter, birds paired at Christmas, and vines blossomed in April; *yet frost* occurred in *May*, retarding but not destroying the abundant vintage. In 1420, the winter was also mild; the harvest was gathered in at Whitsuntide, and the vintage by Aug. 24. The year 1671 (*Phil. Trans.*) also exhibited cherries, in Ireland, ripe in April; and it is stated that there had been no snow or frost for two or three previous years. These examples exactly parallel those of 1833 and 1834 in the mildness of the winters, the drought, and early harvests, and the sudden irruptions of unseasonable frosts in May. Of this latter phenomenon, the year 1063 affords a most striking instance: there was such dreadful destruction, for four days, in the spring of that year, by snow, *accompanied with raging winds*, that the trees, vines, men, and cattle were greatly injured. (*Hermannus Contractus.*)

As I have quoted a few instances, from the old chronicles, of seasons unusually hot, and as, before, we have traced some instances of unusual cold to volcanic action, we may add to the list the following examples of a contrary kind: — The year A. D. 1125 was so cold, that the eels left the water for the meadows; and there were no leaves till May. (*Her. Contr.*) Serres, in his life of Francis I., says that, at the siege of Luxembourg (1543), the wine froze; and was broken up by hatchets, and carried off by the soldiers. In A.D. 821, the Rhine, Elbe, Seine, Danube, &c., were frozen over for thirty days. Seneca, also, complains in his epistles (23. and 67.) of "*malignum ver*," "*præpostum frigus.*" We have, however, no means of ascertaining the connection of these inclement seasons with the other phenomena of the time. There are, also, several mentions of violent storms in the chronicles. In the year 1096 (in the reign of William Rufus), a hurri-

cane occurred which destroyed 600 houses in London, and Bow Church; driving beams, 27 ft. long, twenty-three feet into the ground: and Hakewell, in his *Apologie* (p. 131.), says that, in the fourth year of William Rufus, the lightning at Winscombe Abbey was so great, that "*neither incense, holy water, nor the singing of the monks could allay it!*"

Now, judging from analogy, the same cause which has produced similar results, at the present period, seems to have operated in the years just enumerated; and, if it cannot now be ascertained whether or not numerous earthquakes then occurred, it is at least certain that *drought* was present: and drought is sufficient to connect the phenomena and the periods in question, whether they be ancient or modern.

On reviewing what has been stated in the preceding observations, it will appear that evidence has been adduced to establish the positions which I have incidentally advanced in my former papers respecting the "line of *cold* between two lines of *warmth* during the late winter" (VII. 388.); and the belief that "the British Channel experienced some submarine convulsion in Aug. and Oct. 1833." (VII. 202.); as well as the cases of "unseasonable cold in certain years." (VII. 300.) The first and the last of these positions have their explanation in my statements respecting the ice in the Atlantic; and the second, in what has been stated respecting the odour from the sea * off Boulogne, and the sudden elevation of water in Poole harbour.

The general proposition may, I think, from the direct evidence alleged, be strenuously maintained; for it is impossible to consider the atmospherical phenomena of Aug. 1834, and not allow the tremendous convulsions of Vesuvius to be the true index of their cause: and the same may be said, without undue latitude, of the disturbances of 1833; nor can we refuse the evidence offered by the continuation of the gales of September and October, 1834. It may be, that I have adduced some examples which will not allow of more than an implied connection; and that I have too readily admitted statements which a severer criticism would have rejected: but I am persuaded that a careful inspection of the best established facts among those alleged will furnish full proof

* Unpleasant odours are among the most common precursors and attendants on earthquakes. Before the convulsions of 1760, the water turned foul, and smelt unpleasantly, in wells both in England and Italy. So, during the sweating-sickness in 1551, a stinking fog covered Europe. The same thing is related of the year 1348. The plague at Cyprus was preceded by a tremendous earthquake, with frightful hurricane; and, before the earthquake, a pestiferous wind, spreading a poisonous odour. (*Hecker*, p. 33.)

of the correctness of my argument. There are a multitude of others, not at all alluded to, which might have been fairly appended; and I shall introduce here one example, to show how accurately the connection between the whole of the phenomena in question is maintained on occasions of terrestrial convulsion. On Jan. 31. 1816, there was a dreadful storm, from the w. and s.w., off the coast of Ireland; during which many transports and other vessels were wrecked and lost. On the two succeeding days (Feb. 1. and 2.), the following observations were made at Lisbon: — A thick fog covered the country; in an instant, all became light, and a meteor approached the earth, and was dissipated. The thermometer was 60°—62°; the wind *north*. The weather, previously, cloudy, dull, and close, without sun or rain. The wind suddenly changed to the *south*, blowing a perfect hurricane, with tremendous rain. Then all became calm and clear and dry. After this, about 1 A.M. on the 2d, occurred two severe shocks of earthquake, lasting about three minutes. These were felt also at Madeira, about the same time; and by an American ship, 300 miles from the Azores, and about 700 miles from Madeira, which stood on, and appeared as if run ashore, though out of soundings.* At Lisbon, the rain after the second shock was incessant; and the air was filled with swarms of birds, uttering cries of alarm. It would be easy to multiply statements of this kind; but, as one general period is accessible, namely, that of the Black Death, during which every atmospherical and terrestrial phenomenon traced during the present, which I will call, for distinction's sake, the *Cholera, epoch*, [was paralleled,] it may be safe to leave all farther illustration to a brief analysis of Dr. Babington's clever translation of Dr. Hecker's celebrated work on that period.

For the present, I will merely allude to the stress laid, in the *American Journal of Science and Art*, upon the occurrence of the meteors of 1799, 1832, and 1833, about a particular day in November. This coincidence is again insisted on, in that work, by Mr. Twining, civil engineer and tutor in Yale College, in an "Investigation of the Meteors; and Remarks

* I take this opportunity of stating (for want of a better), that there is a shoal laid down in the charts, about 100 miles east of Descadu, a little to the north-east of Guadaloupe, and called Martin's Shoal, in lat. 17° N., and long. 60° 30′ w.; which probably owes its existence, as well as hundreds of reputed shoals in the ocean, to some such circumstance as that related in the text. The ship Kingston of Bristol, Capt. Emerson, sailed over it in November, 1826, and experienced *five* severe shocks of earthquake in the course of an hour: the night was calm, and no soundings on the spot with 80 fathoms. The ship Severn has since felt shocks in the same place. There is no doubt, I think, if a shoal really exists, of its volcanic character.

on Professor Olmsted's Theory." (*A. J.*, xxvi. 320.) In reference to this, I have before (VII. 387.) stated an opinion respecting a *periodical* derangement of the earth, as influenced by a general law, and producing corresponding atmospherical and meteoric phenomena. This may be a bold assertion; but there are coincidences of so strong a character to support it, that I have sent it out unqualified.

It is observable, though not often observed, that there are particular months and particular days of the month, on which certain meteoric phenomena have frequently occurred. A few examples shall suffice; and as the chief topic of the present paper is connected with the wind, I will choose the subject of hurricanes to illustrate the position.

August 31. 1833, and August 31. 1816 (at intervals of seventeen years), were the dates of extraordinary hurricanes in Europe. Now, within a day or two of this date, on Sept. 2. and 3. (the night before Cromwell died) in 1658, there was an awful hurricane all over France, Italy, the Mediterranean, Germany, and Great Britain. There are also many instances of hurricanes occurring about a particular day in May and September, as the hurricanes at Calcutta and New Orleans on May 21. 1833, and at Arracan, May 14. 1834; the hurricane at Dominica on Sept. 15. 1816, and Sept. 20. 1833.

A writer (*J. M.* [*Mr. Main*]) in this Magazine (I. 180.) has stated that the wind near London always blows from the eastward at the beginning of May, there being only two exceptions in the space of twenty-two years. His observations tend to strengthen my idea of the periodicity of atmospherical phenomena.

The last few days of October have also been often celebrated by the occurrence of remarkable hurricanes in different parts of the earth. The hurricane of Balasore, on Oct. 31. 1831, of which the particulars are given above (p. 149.), is, perhaps, as remarkable an instance, as any on record, of violence and devastation. On Oct. 31. 1753, occurred a hurricane at Wandiwah, about sixty miles from Madras; a distance which seems to have been the radius of the storm. (*Orme.*) On Oct. 29. 1768 occurred a destructive hurricane off the coast of Coromandel. On Oct. 30. 1731 happened a violent tornado in Dorsetshire (*P. T.*); and, on Oct. 30. 1669, a formidable hurricane in Northamptonshire.*

* October affords many other instances of violent hurricanes and whirlwinds: as, Oct. 13. 1670, at Braybrook, Northants; Oct. 6. 1756, at Wigton, Cumberland; Oct. 20. 1763, at Madras; Oct. 2. 1746, at Madras; all Oct. 1833, in Europe and America; Oct. 23. and 30. 1834, in Britain, Holland, Germany, France, and Mexico.

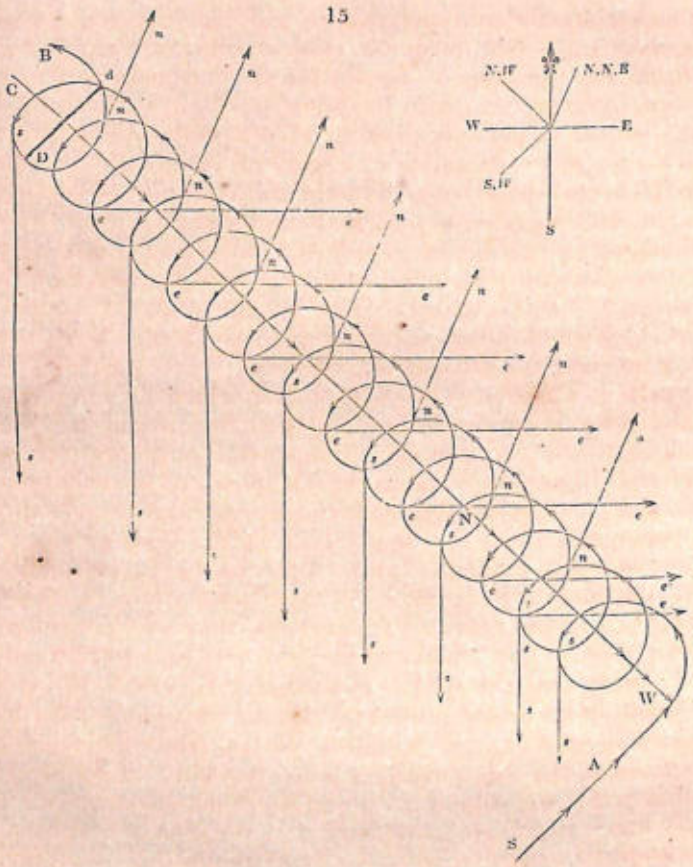
Now, if it be said that October, May, and September are hurricane months in the East and West Indies, this will not make against my argument; for though the causes of the meteors and of the hurricanes respectively produce their due effects, there is nothing more in the 12th or 13th day of November, than there is in the 31st of August, or 31st of October, to give weight to cometic influence. Those days of November are, as we have seen (VII. 385.), connected with other meteoric displays, which certainly have a volcanic connection: and there are other instances in which those days are rendered remarkable. But they seem more referable to terrestrial than celestial periodicity, when we consider that, nearly contemporaneous with these hurricanes, there were evidences of volcanic agency; when we take into the account, also, the occurrences of other particular days; and that locusts are conspicuous in America every *seventeen* years (VII. 610.); that the sweating-sickness * occurred thrice at intervals of thirty-three years; that the two great hurricanes of August had an interval of seventeen years, and that they corresponded in all other points, especially in the breaking up of the ice in Greenland; and that, as I could easily show, there is an extraordinary concurrence in all cases of *great* terrestrial and atmospherical derangement, with the multiples of a period of sixteen or seventeen years (the sum of whose digits is 33), and which periods, calculated backwards from the year 1833, will be found, with fixed allowance occasionally of from five to six years †, to comprehend almost every phenomenon of the kind on record, either in modern or ancient history. It is easy to play with numbers; but the results obtained by this calculation answer to periods of most marked and striking interest. There is an extraordinary agreement between the dates of recorded events, and the numbers obtainable by the process alluded to, if we assume 1833 as our base. We have, for instance, the years A. D. 62, a period of universal earthquakes; 79, famed by the ruin of Pompeii; 1750, 1755, 1794, of more recent celebrity; 711, mentioned by Morales; 431, the period named by St. Isidore; 519 to 563, the reign of Jus-

* I learn, with pleasure and satisfaction, that Dr. Babington, the translator of Hecker's work on the *Black Death*, is engaged in the publication of translations of two other works of that industrious writer; viz. the *Dancomania* and the *English Sweating-Sickness*. These three works form a series, on which Dr. Hecker is engaged, on the epidemics of the middle ages.

† Thus, $1833^{v}-17=1816^{v}$, $1816+6=1822^{v}$;
$1833-16=1817$, $1817+6=1823$; and
$1823+6=1829^{v}$.
Again, $1833-33=1800^{v}$, $1800-17=1783^{v}$; and
$1783-16=1767$; $1767-17=1750^{v}$; and so on.
The ^{v} implies a volcanic year.

tinian; 1800, 1817, and 1833, periods of pestilence; 1245, the astronomical year of Mrs. Somerville; 1333 and 1348, the limits of the Black Death epoch; with 1420, 1289, and 1189 (the latter within a year), periods named in the German Chronicles; 51, the prophetic year of famine in the days of Claudius; 365, the year of earthquakes all over the globe; and 18, the date assigned by Tacitus for the ruin of the cities of Asia. The calculation gives, also, the years B. C. 195, 202, 213, and 219, the identical years named by Livy and Tacitus, extracts from whom will follow in a future paper; and the year 103, in which year, Pliny (II. 57.) says, extraordinary lights were seen in the sky, during the third consulship of Marius.

It is, I think, impossible, that such a result should be obtainable, without there being a positive periodicity in the derangement of the earth and atmosphere; and such being the case, why should we refer the meteors of Nov. 12. 1799, 1832, 1833, and 1834, to a comet, when the earth can answer all demands upon it? I am not one of those who think that this earth, adapted as it is in all things for the purposes of its creation, is in any respect otherwise than under the guidance of those general laws by which its motion and phenomena are regulated; nor can I believe that earthquakes or volcanic eruptions occur by chance, which *they* suppose who deny a regulating law in these occurrences. Whatever be the laws which guide its internal economy, we have no revealed document to appeal to; it is by enquiry and patient observation alone that we can arrive at the truth, and the facts which occur are the alphabet from which the history of our knowledge is to be composed. There may be wise and merciful reasons in the Almighty Mind, why the seasons and the climates undergo certain changes, which we, for want of instruction, consider extraordinary; and thus, one period may be dry and another wet, one hot and another cold, to preserve that equilibrium which we cannot fail to perceive as the regulator of nature in all her departments; and the earth may be, and probably is, so constructed, that one phenomenon must, in excess, produce another; and thus the vicissitudes which form the subjects of our speculation are literally, perhaps, only the regular movements of the great machine, by which its course is preserved uninjured, and the promise of the Creator kept towards the productions of his infinite and foreknowing skill. ("While the earth remaineth, seedtime and harvest, and cold and heat, and summer and winter, and day and night, shall not cease." Gen. viii. 22.) He who ordained this, can surely produce it as he will; and it is certainly more rational to suppose the laws of which this promise is the proof are impressed upon the earth,



S W, Direction of south-west wind; and N W, Direction of north-west wind; which, meeting, produced the whirlwind. A B, A spiral curve, representing the circular motion of the hurricane, in the direction W N C, due north west. *s s*, *c c*, *n n*, Tangents to the spiral at the points *s c n*, representing the direction of the beams and trees, thrown by the centrifugal force to the south, the east, and the north-north-east. The arrow-heads show the direction of the wind. The progress of the hurricane is designated by the several stages in the line W N C. The breadth of the hurricane is indicated by the diameter of the curve, as at D *d*. It is evident that on the sea a swell must arise, upon the principle of a centrifugal action in the waters, also indicated by the tangents *s s*, *n n*, *c c*.

than to believe that so wonderful and so complicated a world should be dependent for the necessary *corrections* in its phenomena upon a foreign and independent body. The pages of sacred scripture teach us, that the extraordinary as well as ordinary phenomena of the earth, are under the control of its Maker; and it is not interfering with the distinctive elements of theology or geology, to quote but *two*, out of the numerous passages, in which the book of revelation shows the derangements of the earth to be under the immediate direction of God.

An *earthquake* delivers Paul from prison (Acts, xvi. 26.),

and an *earthquake* consumes Korah and his company. (Numbers, xvi. 32.) Nor need the most anxious or most jealous advocate for the respect due to the Bible fear for me, when I quote, in connection with the latter passage, as illustrations of the subject of my speculations, what is said in the 35th and 46th verses of the same 16th chapter of Numbers: for whether the occurrences were (like the rainbow after the deluge, Gen. ix. 13.) merely *foreseen*, and employed as ordinary phenomena, or extraordinary phenomena occasioned for the event, the statement of the historian can suffer no detriment from the observation I make, that the "fire" (v. 35.) and the "plague" (v. 46.), of which no mention is previously made, were connected in some untold manner with the "earthquake." But to return. There may be conditions in which it is necessary for the volcanic agency to be developed, as it were, in an unusual degree, in order to serve the general purposes of creation; and, therefore, without farther question, we may safely infer, that, if such be the case, it affords a sufficient explanation of phenomena which the simplicity of nature leads us to attribute to one predominant agency. Let it be always remembered that, after all, our knowledge of the earth is extremely limited; but that we know more of it, perhaps, than we know of any other planet. The radius of the earth is about 4000 miles (3962 true), and the height of its loftiest mountain added to the depth of its lowest mine may be about eight miles; our acquaintance, therefore, with the crust of the globe may be compared to the first page in a book of about 500 pages; yet of this page, we cannot read one *line*, one *word*, and all we really know is a *single letter* here and there in the scattered paragraphs composing only the first page in the sealed book of nature. This sentence is my defence, if geological or theological critics tax my conjectures with a charge of presumption. We run no more risk in walking over a volcanic soil, than the gentleman who encounters a comet at full speed, or prefers being shot at by an aerolitic popgun from the moon or the dogstar. If speculation in either case affect the strict province of reason, it is at least evident who stands the best chance of being deemed *lunatic*.

Stanley Green, near Poole, Dec. 31. 1834.

P.S. As explanatory of the principles relating to hurricanes in the foregoing and preceding papers (see VIII. 17.), I add a diagram (*fig.* 15.) illustrating the hurricane in New England, in July, 1761 (VIII. 26. note †), which, at the same time, explains all the phenomena involved, as far as regards the *motion* of the wind, and its effects on sea and land.

ART. II. *Notes of a Visit to the Haunts of the Guillemot, and Facts on its Habits.* By CHARLES WATERTON, Esq.

THE immense range of perpendicular rocks, lashed by old ocean's briny surge, offers a choice and favourable retreat to myriads of wildfowl, from far-famed Flamborough Head to Bempton, and thence to Buckton and Speaton, and onwards to the Bay of Filey.

He who wishes to examine the nidification of these birds ought to be at this part of the sea coast early in the month of May. About five miles from Bridlington Quay is the village of Flamborough, chiefly inhabited by fishermen; and a little farther on is a country inn, called the North Star, which has good accommodation for man and horse; but a lady would feel herself ill at ease in it, on account of the daily visits of the fishermen, those hardy sons of Neptune, who stop at it on their way to the ocean, and again on their return. Here they rendezvous, to fortify their interior with a pint or two of comfort, and to smoke a pipe, by way of compensation for the many buffets which they ever and anon receive in the exercise of their stormy and nocturnal calling.

On the bare ledges of these stupendous cliffs the guillemot lays its egg, which is exposed to the face of heaven, without any nest whatever; but the razorbills and puffins lay theirs in crannies, deep and difficult of access. Here, too, the peregrine falcon breeds, and here the raven rears its young; while the rock pigeon and the starling enter the fissures of the precipice, and proceed with their nidification, far removed from the prying eye of man. The kittiwake makes her nest of dried grass wherever she can find a lodgement, and lays two spotted eggs, very rarely three. The cormorant and shag inhabit that part of the rocks which is opposite to Buckton Hall. You are told that the cormorants had their nests, in former times, near to the Flamborough lighthouse; but now these birds totally abandon the place during the breeding season. The jackdaw is found throughout the whole of this bold and craggy shore; he associates with the seafowl, as though he were quite at home amongst his own inland congeners. Towards the top of the cliffs, both rabbits and foxes have descended from the table land above them, and managed to find a shelter among the crevices, in places where you would suppose that no four-footed animal would ever dare to venture. A low mound, half earth, half stone, thrown up by the farmers for the protection of their flocks, skirts the winding summit of the precipice. Cattle have been known to surmount this artificial boundary, and lose their lives in equate roaring surge below.

This extensive range of rocks, as far as appertains to birds, is not considered private property. Any person who can climb it may carry away what number of eggs he chooses. Still there is a kind of honourable understanding betwixt the different sets of climbers, that they will not trespass over the boundaries which have been marked by mutual consent.

The eggs of the guillemot and razorbills form a considerable article of traffic from old May-day till about the middle of June. Though the eggs of the kittiwake and puffin are of fully as good a flavour, still they are not in such request, on account of their tender shells, which are easily broken in packing, and in transporting from place to place.

The usual process of seeking for the eggs is generally carried on by three men, though two will suffice in case of necessity. Having provided themselves with two ropes of sufficient length and strength, they drive an iron bar into the ground, about 6 in. deep, on the table land at the top of the precipice. To this bar is fastened the thickest of the two ropes, and then it is thrown down the rocks. He who is to descend now puts his legs through a pair of hempen braces, which meet round his middle, and there form a waistband. At each end of this waistband is a loophole, through which they reeve the smaller rope. Sometimes an iron hook and eye are used in lieu of this loop. A man now holds the rope firmly in his hand, and gradually lowers his comrade down the precipice. While he is descending he has hold of the other rope, which was fastened to the iron bar; and, with this assistance, he passes from ledge to ledge, and from rock to rock, picking up the eggs of the guillemot, and putting them into two bags, which he had slung across his shoulder ere he commenced his arduous undertaking. When he has filled these bags with eggs, he jerks the rope, and the motion informs his friends at the top that it is now time to draw him up. On coming up again to the place from whence he first set out, all the eggs are taken from the bags, and put into a large basket, prior to their being packed in hampers and carried off in a cart by wholesale dealers, who purchase them from the climbers for sixpence the score. At Bridlington and the neighbouring places the eggs are retailed at a halfpenny a piece.

The rocks are searched for eggs every third day, provided the weather be fair. It requires considerable address on the part of the descending climber to save himself from being hit by fragments of the rock, which are broken off by the rope try ning in contact with them. He avoids the danger by *We*ng sidewise when the stone is falling, and by taking care, goes down, to clear away with his foot any portion of

the rock that seems ready to give way. One of the climbers, while he was imparting to me instructions how to act, grinned purposely, and showed his upper jaw. I learned by his story, that, last year, a falling stone had driven two of his front teeth down his throat; while the poor rascal, with all his dexterity, was unable to fend off the blow.

As I was lowered down, the grandeur and sublimity of the scene beggared all description, and amply repaid any little unpleasant sensations which arose on the score of danger. The sea was roaring at the base of this stupendous wall of rocks; thousands and tens of thousands of wildfowl were in an instant on the wing: the kittiwakes and jackdaws rose in circling flight; while most of the guillemots, razorbills, and puffins left the ledges of the rocks, in a straight and downward line, with a peculiarly quick motion of the pinions, till they plunged into the ocean. It was easy to distinguish the puffins from the razorbills in their descent: these presented a back of a uniformly dark colour; those had a faint white diagonal line running across the wings. The nests of the kittiwakes were close to each other, on every part of the rocks which was capable of holding them; and they were so numerous, as totally to defy any attempt to count them. On the bare and level ledge of the rocks, often not more than six inches wide, lay the eggs of the guillemots: some were placed parallel with the range of the shelf, others nearly so, and others with their blunt and sharp ends indiscriminately pointing to the sea. By no glutinous matter, nor any foreign body whatever, were they affixed to the rock: bare they lay, and unattached, as on the palm of your outstretched hand. You might see nine or ten, or sometimes twelve, old guillemots in a line, so near to each other that their wings seemed to touch those of their neighbours; and when they flew off at your approach, you would see as many eggs as you had counted birds sitting on the ledge.

The eggs vary in size and shape and colour beyond all belief. Some are large, others small; some exceedingly sharp at one end, and others nearly rotund. Where one is green, streaked and blotched with black, another has a milk-white ground, blotched and streaked with light brown. Others, again, present a very pale green colour, without any markings at all; while others are of a somewhat darker green, with streaks and blotches of a remarkably faded brown. In a word, nature seems to have introduced such an endless intermixture of white, brown, green, yellow, and black into the shells of the eggs of the guillemots, that it absolutely requires the aid of the well-set pallet of a painter to give an adequate

idea of their beautifully blended variety of colouring. The pen has no chance of success in attempting the description.

The rock-climbers assure you that the guillemot, when undisturbed, never lays more than one egg; but that, if it be taken away, she will lay another; and, if she be plundered of that, she will then produce a third; and so on. If you dissect a guillemot, you will find a knot of eggs within her. The rock-climbers affirm that the bird can retain these eggs, or produce them, according to circumstances. Thus, if she be allowed to hatch her first egg, she lays no more for the season; if that egg be lost or taken away, another is laid to supply its place.

The men also assure you that, when the young guillemot gets to a certain size, it manages to climb upon the back of the old bird, which conveys it down to the ocean. Having carried a good telescope with me, through it I saw numbers of young guillemots, diving and sporting on the sea, quite unable to fly; and I observed others on the ledges of the rocks, as I went down among them, in such situations that, had they attempted to fall into the waves beneath, they would have been killed by striking against the projecting points of the intervening sharp and rugged rocks: wherefore I concluded that the information of the rock-climbers was to be depended upon; and I more easily gave credit to it, because I myself have seen an old swan sailing on the water with her young ones upon her back, about a week after they were hatched.

He who rejoices when he sees all nature smiling around him, and who takes an interest in contemplating the birds of heaven as they wing their way before him, will feel sad at heart on learning the unmerited persecution to which these harmless seafowl are exposed. Parties of sportsmen, from all quarters of the kingdom, visit Flamborough and its vicinity during the summer months, and spread sad devastation all around them. No profit attends the carnage; the poor unfortunate birds serve merely as marks to aim at, and they are generally left where they fall. Did these heartless gunmen reflect, but for one moment, how many innocent birds their shot destroys; how many fall disabled on the wave, there to linger for hours, perhaps for days, in torture and in anguish; did they but consider how many helpless young ones will never see again their parents coming to the rock with food; they would, methinks, adopt some other plan to try their skill, or cheat the lingering hour.

Wealton Hall, Jan. 8. 1835.

ART. III. *Notes of a Visit to the Haunts of the Cormorant, and Facts on its Habits.* By CHARLES WATERTON, Esq.

THE fabulous story concerning the cormorant made a great impression upon me in early youth; and I well remember with what avidity I first read his true history in the pages of Buffon.

The old fable tells us that the cormorant was once a wool-merchant. He entered into partnership with the bramble and the bat, and they freighted a large vessel with wool. She struck on some rocks, and went to the bottom. This loss caused the firm to become bankrupt. Since that disaster the bat sculks in his hiding-hole until twilight, in order that he may avoid his creditors; the bramble seizes hold of every passing sheep, to make up his loss by retaining part of its wool; while the cormorant is for ever diving in the waters of the deep, in hopes of discovering whereabouts his foundered vessel lies. So far for the fable, which will always bring pleasing recollections into the minds of those who are fond of rural pursuits.

The cormorants often pay me a visit in the winter season; and, could they but perceive that there is safety for them here, and great danger elsewhere, they would remain with me while the water is unfrozen. But they wander, unfortunately, through parts where protection is not afforded them; and, being outlandish birds in the eyes of the neighbouring game-keepers, they are immediately shot at. Those which find their way here are so unconscious of danger, that, after they have spent a considerable portion of time in diving for fish, they will come and preen their feathers on the terrace which rises from the water, within ten yards of the drawingroom windows.

The cormorant may be justly styled the feathered terror of the finny tribe. His skill in diving is most admirable, and his success beyond belief. You may know him at a distance, among a thousand waterfowl, by his upright neck, by his body being apparently half immersed in the water, and by his being perpetually in motion when not on land. While the ducks and teal and wigeons are stationary on the pool, the cormorant is seen swimming to and fro, "as if in quest of something." First raising his body nearly perpendicular, down he plunges into the deep; and after staying there a considerable time, he is sure to bring up a fish, which he invariably swallows head foremost. Sometimes half an hour elapses before he can manage to accommodate a large eel quietly in his stomach. You see him straining violently, with

repeated efforts to gulp it; and when you fancy that the slippery mouthful is successfully disposed of, all on a sudden the eel retrogrades upwards from its dismal sepulchre, struggling violently to escape. The cormorant swallows it again; and up again it comes, and shows its tail a foot or more out of its destroyer's mouth. At length, worn out with ineffectual writhings and slidings, the eel is gulped down into the cormorant's stomach for the last time, there to meet its dreaded and inevitable fate. This gormandising exhibition was witnessed here by several individuals, both ladies and gentlemen, on Nov. 26. 1832, through an excellent eight and twenty guinea telescope; the cormorant being, at that time, not more than a hundred yards distant from the observers. I was of the party.

When I visited Flamborough Head in the first week in June, I was disappointed in not seeing the cormorant there; but I was informed in Bridlington Quay, that this bird was not to be found nearer than the rocks at Buckton; and that it had eggs very late in the season. In consequence of this information, I made a second expedition to the sea coast, and arrived at Bridlington Quay on July 14. 1834.

About three quarters of a mile from the sea, betwixt Flamborough Head and Filey Bay, stands the once hospitable mansion of Buckton Hall. I say hospitable; because its carved ornaments in stone, its stately appearance, and the excellent manner in which its out-buildings have been constructed, plainly indicate that mirth and revelry must once have cheered its walls. But the tide of prosperity has ceased to flow. Something or other seems to have intervened, and turned it down another channel: for now the once well-known Buckton Hall is a neglected mansion; and the stranger, as he passes near it, sees at one glance that it is no longer a place of rendezvous for the great. The present tenant kindly allowed the horse and gig, which I had hired in Bridlington Quay, to be put under cover till I returned from the cliff.

My guide, whose name was Mellor, and who possesses a very accurate knowledge of all the birds in this district, having mustered men and ropes in the village of Buckton, we proceeded across the table land to the Raincliff, which forms a perpendicular wall to the ocean, 140 yards high. Whilst I was descending this precipice, thousands of guillemots and razorbills enlivened the interesting scene. Some were going down to the water, others were ascending from it; while every ledge of the rock, as far as my eye could reach, was literally covered with birds of the same species.

The cormorants staid not to witness my unwelcome descent into their ancient and almost inaccessible settlement. They all took wing, as soon as we reached the edge of the cliff, and went far away to sea. It was a difficult matter to procure their eggs; for the nests were built in places where the rocks overhung them; and it was only by my giving the rope a swinging motion, and then taking advantage of it, as it brought me to the face of the cliff, that I was enabled to get a footing on the ledges which contained them. These nests were composed of thick sticks, plants from the rocks, grass, ketlocks which had gone to seed, and a little wool. There were four young birds in one, three eggs in another, two in a third, and one newly laid in a fourth. The shell of the cormorant's eggs is incrusted with a white chalky substance, which is easily scraped off with your penknife, and then you get at the true colour of the shell; the outside of which is of a whitish green, and the inside of a green extremely delicate and beautiful. The egg is oblong in shape, and you find it small for the size of the bird. The four young cormorants were unfledged, and covered with a black down. Their long necks, and long wing-bones, gave them a grotesque, and an almost hideous appearance. They would have been of service to the renowned Callot, when he was making his celebrated sketch of the Temptations of St. Anthony. There came from the nests a fetid smell, so intolerable, that you might have fancied you had got among Virgil's Harpies; or that you were inhaling exhalations from the den of Cacus. Nothing could have been more distressing to your nasal sensibilities.

It is remarkable that on the Raincliff not a kittiwake is seen to alight; and scarcely ever observed to fly close past it. I saw no signs that this bird had ever made its nest here. An attentive naturalist, who would take up his quarters in this neighbourhood, and visit the coast every day during the breeding season, might possibly be able to discover the cause why the kittiwake, which is seen in such countless thousands from Flamborough Head to Bempton, should shun the Raincliff, which, apparently, differs in nothing but height from the other parts of this bold and rocky shore.

I am positive that we have not two species of cormorant in Great Britain. The crested cormorant, with a white spot on each thigh, is merely the common cormorant in his nuptial dress. This is not the only bird which becomes highly ornamented during the breeding season. On some future day, when the storms of winter forbid all access to the fields, and condemn me to the dull monotony of life within doors,

I may possibly take up the pen, and write down a few remarks upon the change of plumage in birds.

The flesh of the cormorant possesses no flavour that would suit the palate of our modern epicures. Hence it is despised by aldermen, and, of course, is never served up at a Lord Mayor of London's feast. On the sea coast, this poor bird is shot at by marksmen through mere wanton pastime; and when he takes a flight inland, he runs great risk of never getting back again to sea; for nobody will befriend him, on account of his well-known inclination to make too free with the contents of well-stored fishponds. Still, for my own part, I love to see him come this way. Stay here, poor wandering mariner, as long as it pleases thee to do so. The sight of thee puts me in mind of the happy hours I spent in reading the *Metamorphoses* at the Jesuits' College. Well do I remember how beautifully the poet tells thy affecting story, before thou wert reduced to the necessity of diving for a livelihood. I do not care if thou takest all the eels in the lake. Thou art welcome to them. I am well aware that thy stomach requires a frequent and a large supply. So, pr'ythee, help thyself.

Walton Hall, Jan. 10. 1835.

"EVERY part of nature being peopled with inhabitants, we find that, as the bosom of the sea abounds in the finny tribes, its surface forms a resting-place for many families of the feathered creation. The numerous species of gulls, many of the duck tribe, the auks, the guillemots, the petrels, the divers, the cormorants, the goosanders, and various others, people the rocks and precipices, obtain their food in the ever-restless waves, and many may in truth be said to have their 'home upon the deep.'

"The foot of a bird is always adapted to its mode of life. If any of these sea-birds had a foot like that of the common fowl, the crow, the magpie, or the pigeon, it would not have served well for swimming; and hence we see that they are web-footed like the duck or goose. Their mode of living, however, is not in all the kinds the same; and, in order to meet the different circumstances in this respect, there are corresponding variations in the foot; relating to its form, the degree in which it is webbed, the comparative length of the leg, or some other particular: for example, the black-backed gull and the common cormorant. Both swim, and both have webbed feet, yet there are several points of difference between them. Why are the feet placed so much farther

back in the cormorant? They are so much so, that the bird stands nearly erect. The reason is this. The Deity has determined, in his wisdom, that the one bird should seek its food *on* the surface of the water, and the other *beneath* it; that one also should feed while on land as well as water, but the other in the water exclusively. Now, the gull cannot dive, however well it can swim; and, in consequence, it can only obtain such prey or edible substances as are to be found floating on or near the surface: but the cormorant subsists on fishes, which it pursues under water; and the backward position of the legs, it will be evident, must assist it most materially in diving after them. You will observe a difference, too, in the manner in which the foot is webbed in the two species: in the gull, the back toe is very small, and not connected with the others; while in the cormorant, it is not only of considerable length, but is united by a membrane to the other three, so that, in this bird, the whole four toes are webbed and connected together; a circumstance which tends to give great velocity to it when diving in pursuit of prey . . . If you examine the leg (tarsus) of a duck or goose, you will find that, though it is compressed laterally, still it has considerable thickness in front. These birds, however, do not require to swim with great velocity, and, in fact, a slow and deliberate examination and search with their bills is the most usual way of obtaining their subsistence. But we may readily conceive that in a bird, which, like the cormorant, depends chiefly for its success in capturing its prey on the rapidity with which the latter can be followed, such a leg would be less properly fitted, since it would offer considerable resistance and retard the velocity. Now, here, again, we have an example of that wisdom which pervades everything, whether the revolutions of worlds, the motions of a fly, or the structure of a bird. The cormorant's leg is so flattened on the sides, that the anterior edge which cuts the water is not thicker than the blade of a carving-knife. Then, again, observe how the bird is adapted in other respects to its mode of life. Its compressed legs, and the rapidity with which it can pursue fish, would still avail it little, were not its beak particularly formed for holding its slippery capture. This, instead of being spoon-shaped like a duck's, is long, and has at the end of the upper mandible a sharp hooked nail, which serves admirably for holding the fish: but still something more is wanting; for however well the position of the foot, the form of the leg, and that of the bill, may be up to the point of seizing the prey, how is the latter to be disposed of when it is captured, seeing that often it is very large, and

sometimes even consists of flat-fish? This is provided for by the vast extent of the œsophagus or gullet (the tube which conveys the food from the mouth to the stomach), which will admit a fish of incredible size, compared with the thickness of the neck." (From Dr. Drummond's delightful work entitled *Letters to a Young Naturalist on the Study of Nature and Natural Theology.*)

ART. IV. *Notice of the Ravages of Insects upon Barley and Turnips;* by J. C. FARMER, Esq.: *with Observations thereon, and Descriptions and Figures of the Insects,* by J. O. WESTWOOD, Esq. F.L.S. &c.

I SEND three winged individuals and two pupas of two species of insects (*figs.* 16. and 17.) which do much injury, in their larva state, to the interests of the farmer. Of these species, therefore, figures and full descriptions, and as detailed an account of their habits as the knowledge of naturalists can supply, should be given, as the most likely means of acquainting the agriculturist with his enemies, and of leading him to the devising of the most effectual method of preventing their ravages. What I know of them is this: — The largest, with long filiform antennæ, which appears to me to be an ichneumon, was obtained from a pupa which is to be found in the sheathing leaf of the flowering stalk of the common barley. My attention was first directed to this insect, in 1833, by a friend and brother farmer. The spring of this year was very wet, and much of the barley seed was not sown until the latter part of April or beginning of May. The latter month was remarkably warm. Subsequently, many of the plants were observed to be not healthy, putting on the appearance termed "grubbed," the heads [ears or spikes] either not appearing at all ("stuck in the hose"), or appearing so much later than those from the healthy plants as not to ripen at the same time: as the plants of both kinds are cut together, the grain of the later ones is little better than chaff. I examined the root, which the appearance of the plants suggested was the part injured; but I could not discover any cause until I examined the head, the stalk of which contained a furrow, and the head had, in many instances, been half eaten previously to its being protruded from the sheath. The season being advanced, the insect appeared mostly in the form of pupa, in a fold of the sheath; and, on its being placed under a glass, invariably produced the same insect, which cannot, therefore, be a parasite. This year [1834] I have found a few in some

late-sown plants of barley; but the injury from the species is trifling: in 1833, the corn destroyed by their devastations would amount to quarters [of barley] an acre.

The other species, which seems to be of a kindred genus, and of which I have sent more than one specimen, and a chrysalis, is the cause of the anbury, or fingers and toes, in the turnips. I procured a number from my turnips, August, 1833, in the condition of a small white grub with a black head: they came out into some sand placed for their reception, changed into the pupa state, and remained in it all the winter. Some of those hatched the earliest escaped me; those sent are some of the latest. I am not able to send a specimen of the larva, this year, from its being too late; but the larva is exactly like those in the knobs of cabbages, &c.

I have little access to the newer or expensive scientific works, and therefore I do not know whether this insect has hitherto been determined. It appears to me to be most assuredly the cause of the grubbed turnips, though not always to be found in the knobs. It would seem that in September it enters into the earth to undergo its changes; and to find it then is more difficult.

If my views are correct, the preventive must be some top-dressing, to prevent the insect striking the plant on the surface; or some acrid manure, to destroy the pupæ in the soil. As the places infected are usually so, the insect does not travel far; but it may be taken to another field if the turnips are stripped off early.

Northumberland, Sept. 23. 1834.

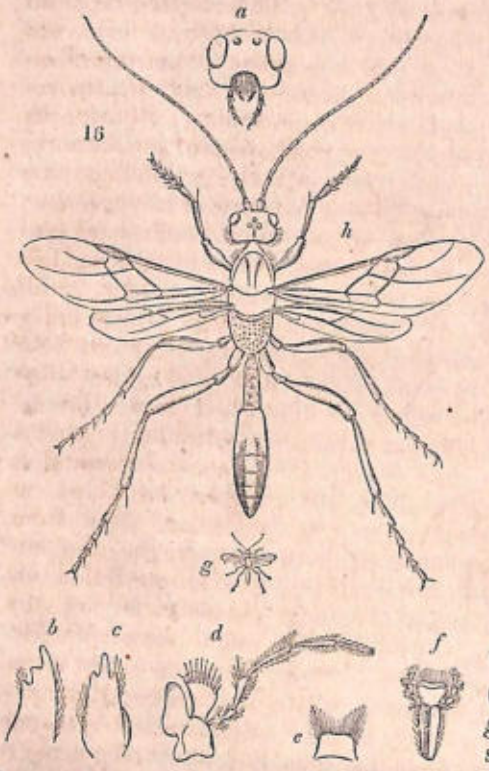
The preceding communication, and the insects accompanying it, having been submitted to me by the editor, I beg leave to offer the following observations thereupon, and descriptions and figures of the insects which are the causes of the injuries in question, to the readers of this Magazine.

But one opinion can be entertained of the necessity of a minute acquaintance with the habits and structures of those species of animals which, from their continual attacks upon our animal or vegetable productions, become, in very many instances, the sources of ruin to the agriculturist.

If, indeed, the investigation of these matters were unattended by any other gratification than that which the perusal of the works of nature, in that best of books opened by Nature herself, constantly confers upon those who patiently explore her almost, to the many, hidden treasures; the inducement to such exertions would, to the thoughtful mind, be sufficiently strong;

but when, in addition thereto, the student knows that his labours may possibly tend to the positive welfare of his fellows, his ardour is redoubled; and that which before was merely interesting to himself, acquires, not only in his own eyes, but in those of his readers, a real value. Hence arises that pure and unalloyed pleasure in the mind, which is one of the rewards — indeed, the greatest and most heartfelt — with which the observer of nature is repaid for his labours either of body or of mind. The outdoor naturalist forgets all the toils of a livelong day, in the discovery of some remarkable trait of economy in the objects of his study; or, if his attention be more especially directed to the acquisition of additions to his collections, by the capture of some rare insect, the discovery of some new plant, or the picking up of some unpossessed shell: while the indoor naturalist, after repeated and ofttimes microscopic and painful examinations, will, perhaps, discover some minute organ, or other peculiarity of structure, which will cause that eye, which midnight toil has dimmed, to shine again with more than wonted brightness. This, and the knowledge that his labours are duly appreciated by his brethren, a favour which it is the constant aim of his laudable ambition to obtain, are the returns which the naturalist hopes to receive in exchange for all his cares; and no one will deny that, to "the mind at rest," they are sufficient to give energy in research, and a sufficing consolation for every toil.

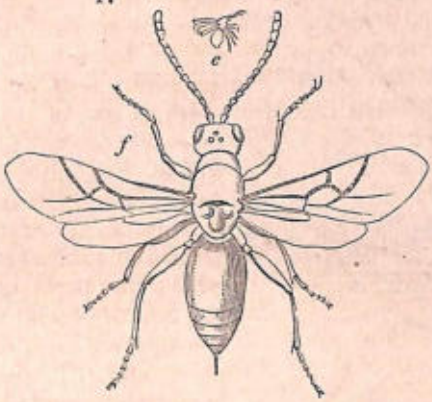
The insects accompanying Mr. Farmer's communication consist of one of the small *I*chneumónidæ, one of the Cynípidæ, and specimens of a chrysalis, which he has considered to be that of the latter insect. The first of these insects (*fig.* 16.; *g*, natural size; *h*, magnified) is a small and slender *I*chneùmon, belonging to the aberrant section Adsciti, and the subfamily Alysiides. It is of a black colour; the wings are stained dark brown; the tips of the basal joints of the antennæ, the thighs and shanks of the fore legs, and the knees of the four hind legs pitchy red; the hind part of the thorax, and the basal joint of the abdomen, are rugose; the antennæ are long and multiarticulate, and the abdomen is compressed at the extremity; the wings have one marginal and two submarginal cells, the first of which is the smallest, and separated from the discoidal cell by a nerve which runs to the extremity of the wing. In the form of the body, direction of the nerves of the wings, and the structure of the antennæ, this insect evidently belongs to the genus Chæ`non of Curtis; but in the only mutilated specimen sent by Mr. Farmer, the jaws did not seem to me to be extended laterally (*a* representing the head), as they are in that genus; perhaps, in-

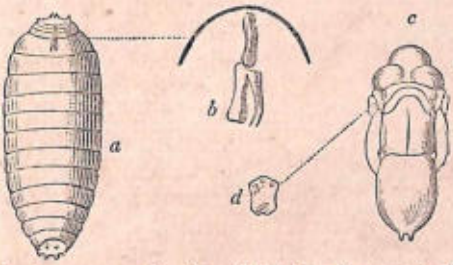


deed, they might have been broken off. In another specimen, as it appears to me, of the same species, of which I captured many individuals in a corn field near Cambridge and elsewhere (the parts of the mouth of which are figured in *b*, *c*, *d*, *e*, and *f*), the jaws were extended, the maxillary palpi 6-jointed, and the labial ones 4-jointed; thus establishing the identity of the genus, which has been considered by Mr. Haliday (*Entomological Magazine*, i. 264.) as synonymous with Cœlínius of Esenbeck; which latter, from having 5-jointed maxillary palpi, and 3-jointed labial ones (see Esenbeck's *Hymenopterorum Ichneumonibus Affinium Monographiæ*, 1834, p. 9.), belongs to a distinct subfamily, Bracónides.

Mr. Farmer has not given any account of the larva of this insect; indeed, he merely says, of its preparatory state, that it mostly appeared in the form of a pupa, which invariably produced the same ichneumon; whence it would seem that he supposes that this ichneumon, instead of being a parasite, is the real cause of the mischief which he describes, and was, consequently, in the larva state, a feeder on the vegetable. This circumstance would be so completely at variance with every recorded statement relative to the habits of these cuckoo flies, that analogy would most strongly induce us to reject it, if we could not find, what, I think, I shall be able to show, a more satisfactory mode of explanation. This, it appears to me, will be obtained from an examination of the "chrysalis" which Mr. Farmer has supplied, and had considered as that of the insect which commits the ravages upon the turnips

17





This chrysalis is of an oblong-oval form, not quite a quarter of an inch long, nearly resembling the smooth cocoon of a small moth, and exhibiting no traces of future limbs; but it is of a hard texture, of a dark reddish brown colour, with thirteen rather indistinct rings, and with the extremities furnished with several minute hard points. I have represented it highly magnified in *fig.* 17. *a*. Now, from analogy, we are enabled to state, that this chrysalis is not the pupa state of Mr. Farmer's turnip insect (*e*, nat. size; *f*, magnified), because the latter belongs to a family which, in that state, is destitute of any covering, lying in its cell or gall, with all its future limbs perfectly distinct. Until I had more minutely examined this chrysalis, I thought that it might be the cocoon of the ichneumon, as some of that family do spin silken cocoons, and that Mr. Farmer had confounded the two insects; but, on magnifying it, I found that it does not belong to either of them; that it was the immature state of a dipterous insect, being the covering of the real pupa, formed of the indurated skin of the larva, that the insect was consequently undergoing the coarctate kind of metamorphosis. Moreover, from its general structure, it appears to belong to one of the fly tribe, *Múscidæ*. *Fig.* 17. *b* represents a horny process inside the skin, which had formed the head of the larva, and which remained attached after the enclosed insect, figured in a highly magnified state at *c*, had become a pupa, and which is of a white colour, with large eyes, a rounded forehead, and two minute lateral rudimental antennæ. On each side behind the eyes, a dark-coloured spot is seen, figured at *d*, having several oval tubercles of a very minute size, and which seem to protect a pair of spira-

cles. This cannot, therefore, be the chrysalis of the turnip insect, neither can it be that of the ichneumon of the barley. Analogy teaches us that the gall-like protuberances upon the turnips are the results of the attacks of a cynipideous insect, and that the insect inhabiting this chrysalis cannot be the cause of it. What, then, is this dipterous insect? In the absence of direct information, I conceive that Mr. Farmer must have fallen into a mistake; that the chrysalis, instead of being that of the turnip insect, was found within the sheath of the barley; that the injury sustained by the latter plant was inflicted by the larva of this dipterous insect; and that the larva of the ichneumon, instead of being the "anguis in herba" [the snake in the grass], was parasitic upon the real enemy. We know, indeed, that some of the *Múscidæ* (Tephrìtis, &c.) form galls upon plants; but here we have a real gall fly caught in the act, while I am not aware that any of the gall flies (Cynípidæ) form cocoons; nor that any of the *Ich*neumónidæ are herbivorous. In fact, this is not the first mistake which has occurred of a similar nature, among those who have not paid much minute attention to the ways of nature. How often has the ladybird been regarded as the cause of mischief to plants, when it has only abounded in order to keep in check the myriads of plant lice (A´phides) upon which its larvæ feed! How often has the tomtit been charged with the ravages of our gardens, when it has been busied only in thinning the swarms of noxious caterpillars or other insects!

But there are other causes which induce me to fear that this chrysalis is the real cause of the injury to the barley, since two species of *Múscidæ* have been ascertained to attack it. *Músca* hórdei *Bierkander*, and *Músca* frít *Linnæus;* which latter insect, although stated, by Messrs. Kirby and Spence, not to be an inhabitant of Britain, is so similar, in its habits of getting into the ear, to Mr. Farmer's account of his insect, that I should conceive that the latter must be identical with it; and, according to Linnæus, the *Músca* frít annually destroys a tenth part of the produce of this grain in Sweden. The gelatinous larva of a *Tenthrèdo* (most probably a *Cèphus*) has, also, been ascertained to feed upon the upper surface of the leaves of barley, so as to occasion them to wither.

Mr. Farmer's turnip insect (*fig.* 17. *e*, *f*) is a species of my genus Eucoíla, described in VI. 494. note *, having thirteen joints in the antennæ of the female, which are thickened at the tips; a scutellum with three impressions, the basal joint of the abdomen short and woolly, and the wings destitute of a minute central submarginal cell. It is of a black

shining colour, with the wings slightly stained with brown; and with the base and tips of the thighs, the entire tibiæ, and the tarsi (except the tips) reddish brown; the basal segment of the abdomen is clothed with white hairs. It is about one eighth of an inch long.

According to Mr. Farmer's account, the diseases termed the anbury, and fingers and toes, appear to be synonymous; but, from the observations of Messrs. Kirby and Spence, such does not appear to be the case. These authors, after giving a formidable list of the insects which attack the leaves of the turnip, mention that the small knob or tubercle, often observable upon the roots, is inhabited by a grub, which they consider nearly allied to *Curculio contractus*. They state, however, that it is not known to them whether the disease to which turnips are subject, in some parts of the kingdom, called fingers and toes, be occasioned by insects or not; although, in a subsequent page, they state that they have reared the *Curculio pleurostigma* of Marsham from the knob-like grubs on turnips called, in some places, the anbury. On this subject, the editor, in a note to me, observes, that "fingers and toes, in turnips, are monstrous furcations of the base of the turnips into forms resembling fingers and toes. When the matter of the turnip has become applied to the formation of these, it does not form a tuber of any considerable dimension; usually, I believe, none at all."

From the observations of Mr. Farmer, it is evident that, at least, two very distinct species of insects are the cause of the gall-like excrescences on turnips; but, as yet, we are unacquainted with the details of their respective proceedings; which, from the totally distinct structure, must be very different. If, even among the obnoxious insects of our own country, so much remains unknown, how great must be our ignorance of those myriads of species which injure us not; what extensive and untrodden fields of pure delight remain, in which the observer of nature may wander from day to day!

Descriptions of the Insects above noticed.

CHÆ`NON (*Haliday, Curtis*) *nígricans Westw.* — Niger, nitidus; thorace postice rugoso; abdomine elongato gracili; segmento basali longitudinaliter striato; pedibus nigris, femoribus tibiisque pedum anticorum geniculisque posticis piceo-rufescentibus; antennarum articulorum basalium apice rufescenti; alis fusco-tinctis.

Longitudo corporis, lineæ 2. Expansio alarum, lin. $3\frac{3}{4}$

Habitat (parasiticè ?) in caule superiori *Hórdei* dístichi.

Eucoi'la ràpæ *Westw.* — Nigra, nitida; alis fusco vix tinctis; femorum basi et apice, tibiis, tarsisque nisi apice, rufescentibus; abdominis segmento basali pilis albis marginato.

Longitudo corporis, lin. 1½. Expansio alarum, lin. 3.

Habitat in tuberibus gallosis *Brássicæ Rà*pæ.

The Grove, Hammersmith, Nov. 30. 1834.

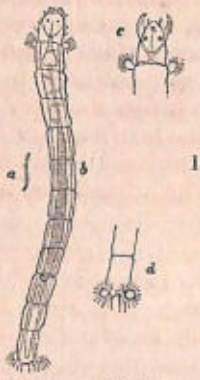
P.S. — The editor has called my attention to a series of communications contained in the fourth volume of the *Memoirs of the Caledonian Horticultural Society* (1829), upon the subject of the disease in turnips called anbury, or fingers and toes, forwarded to that Society in answer to a circular issued by the secretary, containing a variety of queries upon the nature and remedies of the disease in question. In one of these memoirs, by Mr. Geo. Sinclair, F.L.S. [now deceased], an account is given of the ravages of a larva found in each of the excrescences of the turnip, and which is stated to produce a species of Cỳnips. "As soon as the insect is prepared to leave its nidus, the root, or that portion of it formed into galls, begins to putrefy. Several insects are now attracted to the putrefying mass. *A species of Musca deposits its eggs on the surface.* The larvæ burrow in the mass." Whereupon the editor has suggested that it is much more likely that the pupa sent by Mr. Farmer, with his insect from the turnip, should be the pupa of the "species of Musca" mentioned above, than that Mr. Farmer should have mistaken the pupa from the barley for the pupa from the turnip. From what I have above stated, it will be perceived, 1st, That the information received from Mr. Farmer is not sufficiently precise, regard being had to the character of the insects forwarded; and, secondly, that, in the absence of direct information, I have been compelled to resort to analogy. Now, if we adopt Mr. Farmer's statement, we have the two following circumstances: — First, that one of the *I*chneumónidæ is herbivorous; and, secondly, that one of the Cynípidæ is parasitic in the cocoon of a dipterous insect. Hitherto no ichneumon has been noticed whose economy is not parasitic; and the Cynípidæ (with only two or three recorded exceptions) are herbivorous. But Mr. Sinclair enables us to get over the latter difficulty, by showing that the Cỳnips and the *Músca* have no connection with each other, but that both are confined to the turnip. Still, the former remains in all its force: and, knowing that two species of *Músca* attack the barley, I still feel inclined to retain the opinion I have ventured to give above, whereby the difficulty is got over in a more satisfactory manner. — *J. O. W. Jan.* 1. 1835.

[A writer in the *Gardener's Magazine*, viii. 498., who has referred the origin of "fingers and toes" to the attacks of Nédyus contráctus *Stephens*, remarked that "its attack can only be prevented by making the plant offensive to the parent fly [weevil]; and this, it has been lately discovered, can be done by incorporating with the soil soapboilers' waste, or any other substance of similar alkaline quality. Besides partridges preying on the larvæ, I have often seen magpies, crows, and, if I mistake not, even rooks, doing this useful service." Whatever may be the species of the insect which causes the "fingers and toes," the recipe cited may be found to have a preventive effect: therefore we have given it. In opposition to the preceding ascription of the origin of "fingers and toes" to the attacks of insects of the weevil tribe, we present, from the *Gardener's Magazine*, ix. 504., some observations by the late A. H. Haworth, Esq.: — "It is presumed that not any Curculiónidæ [weevil tribe], nor even any coleopterous insect, causes the vegetable disease called 'fingers and toes.' This is one of *contraction:* it is more probably the work of Tenthredínidæ [the sawfly tribe]. I have somewhere observed, in print, that lacerations on the green or growing parts of vegetables usually *enlarge* themselves, as is well observed on pin-scratched gourds, &c. The diseases of contraction, or those diverting the sap, &c., seem to be effected by haustellated insects. Marl is the great cure for 'fingers and toes:' and Norfolk marl is said to be the best."]

ART. V. *Illustrations in British Zoology.* By GEORGE JOHNSTON, M.D., Fellow of the Royal College of Surgeons of Edinburgh.

31. CAMPÓNTIA ERUCIFÓRMIS (*fig.* 18.) *Johnston*, in Zoological Journal, iii. 325.

DESCRIPTION. — Body 4 lines long, cylindrical, of twelve subequal segments (exclusive of the head), of a clear faint water green colour, smooth, and somewhat corneous. Head distinct, brown, subquadrate, sparingly ciliate on the margins. Eyes two, black, remote, not marginal, placed towards the front. Antennæ two, distant, very short, inarticulate, setaceous, originating in the front margin. Mouth with a pair of exsertile corneous brown hooked mandibles, which, when in motion, it is seen incessantly to protrude and retract; no proboscis. On the front and ventral margin of the first segment are two short unjointed legs, armed with a circle of retractile claws; and the last segment is furnished, near its



a, Campóntia erucifórmis, natural size; *b*, magnified; *c*, the head, slightly compressed between plates of glass; *d*, the under side of the anal segment.

termination, with two similar legs: the other segments are footless and naked; but a few hairs terminate the anal segment, which is very slightly lobate. Anus round, simple, small.

This animal lives among Confervæ, in pools left by the tide; and is very common in Berwick Bay. It moves with considerable quickness by means of its mandibles and legs; for the former seem to be as subservient to progressive motion as the latter; and, during its progress, the upper lip is considerably protruded, as shown in *fig.* 18. *c.* Within the first segment we observe a heart-shaped lobated organ, which, although colourless and almost transparent, is undoubtedly the stomach. The very short gullet enters it above; and from its inferior end a small intestine proceeds, which suddenly enlarges at the commencement of the fourth ring, and continues of the same calibre to its termination at the anus. This large intestine is always filled with earthy feculent matter, except that portion of it which traverses the three last segments, and which is usually empty. Two slender thread-like vessels are to be traced winding down the sides in the space between the skin and intestine; these occasionally anastomose by still slenderer transverse branches; but I could not discover any common centre of departure. At the end of the ninth ring there are four filiform dark-coloured tubular organs, which seem to originate in the sides of the intestine: they traverse the ninth and a part of the tenth segment, and end apparently with free extremities. These are probably hepatic vessels; and the deficiency of solid feculent matter in the intestine below their origin appears to prove their importance and necessariness to the proper assimilation of the food.

When I first described this animal, its close resemblance to some caterpillars was particularly mentioned; but the suspicion of its being actually a larva did not occur to me; for I believed it to be an established fact among entomologists that no insect passed its preparatory stages in sea water. I have been informed, however, that Mr. MacLeay, and no higher authority can be given, has proved that the worm in question is the larva, probably, of some dipterous fly; and if this opinion is correct (which its anatomy strongly confirms), then it will follow that at least one larva naturally lives and under-

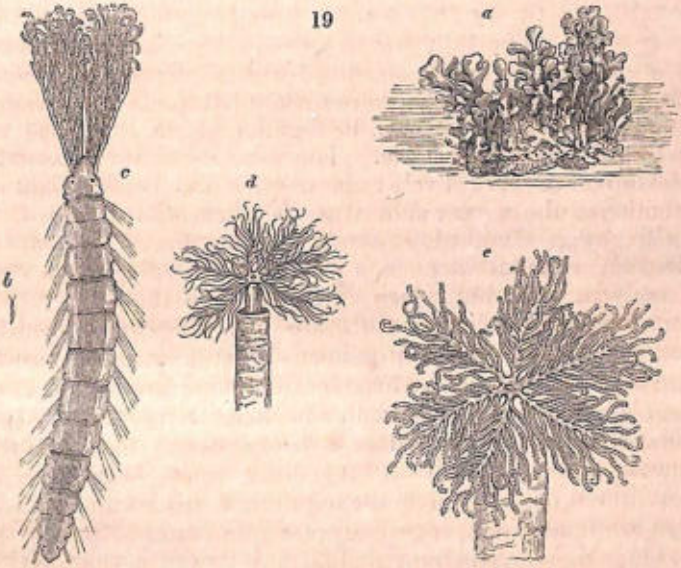
goes its changes in the sea; a conclusion which, I think, is one of some importance, and at variance with our present notions. Our Campóntia eruciformis may be found, at all seasons, at the roots of sea weed and corallines, in pools left by the recess of the tide. The very specimens before me were procured by myself, a few days ago, in pools to which no fresh water could have access, and which are covered to the depth of several feet by every tide; for they are near low-water mark.

Nov. 13. 1834.

32. Othònia Fabri'cii. (*fig.* 19.)

Synonymes. — Tubulària Fabrícia Mull., Zool. Dan. Prod. p. 254. no. 3066.; *Fabr.*, Faun. Grœnl., p. 440. no. 450. fig. 12.; *Turt.*, Gmel., iv. 668.

19



Othònia Fabricii: *a*, a tuft of Laurência pinnatifida, with Othònia Fabricii intermixed, natural size; *b*, the worm, removed from the tube, natural size; *c*, the same magnified; *d*, the head, protruded from the tube, with the tentacula displayed, as seen through the magnifier; *e*, the same, more highly magnified.

Description. — Body 3 or 4 lines in length, vermiform, cylindrical, narrowed posteriorly, of a reddish or yellowish brown colour, stained with the contents of the intestine, annulate, the rings thirteen in number, smooth, furnished on each side with a small fascicle of retractile bristles, which can be pointed either forwards or backwards; the terminal segment semioval, obtuse, marked on each side with a distinct black speck; bristles bent, and somewhat thickened about the middle, whence they taper to a very sharp point; two first segments

rather narrower than the following; the anterior with a projecting semioval process on the dorsal aspect, and marked with two round black eyes? placed towards the sides; branchial tentacula one third the length of the body, straw colour, unspotted, in two dense tufts originating in the sides of the head, each tuft consisting of three main stalks, which are ciliated with numerous filiform straight filaments, serrulate with very short processes on their inner aspects; mouth between the tufts; intestine straight, nearly equal throughout; the anus terminal; space between the intestine and sides mottled, transparent.

This, although not hitherto enumerated among our natives, is certainly the most common species of its family on our coast. It lives in a narrow cylindrical tube, about twice its own length, placed in an erect attitude at the roots of the lesser *Fùci*. The tube is constructed of fine mud cemented by a glutinous secretion, and lined within by a thin glutinous skin; and if the worm is removed, and left in clean sea water, it will, after a short interval, be found to have enveloped its body with a similar pellicle. The motions of the tenant in the tube are very lively: it withdraws on the slightest agitation of the water; and, after its terror has subsided, it again pushes the feathery tentacula from beyond the aperture, and expands them in a wide circle, keeping them very steadily at rest: but, when extracted from the tube, it lies very helpless. The tentacula are then stretched forwards, and generally held so approximated that they form a brush, like a hair pencil, on the head, having, however, the apices of the filaments always recurved or hooked. Sometimes the two tufts are a little separated even in this state; but, from the number and closeness of the filaments, the division of each tuft into three ciliated branches cannot be detected, unless they are lightly compressed between thin plates of glass.

There are several remarkable peculiarities in this species. The fewness of its segments, the same in number as in caterpillars, the presence of eyes, or at least eyelike specks, on the first segment, and on the caudal one (for this is not an accidental, but a constant, character), the form of the head, with the peculiar formation of the branchiæ, are all characters which separate it from Sabélla [VI. 405.], and mark it as the type of a distinct genus. This, accordingly, Blainville has established under the name of Fabrícia, which is, unfortunately, preoccupied in botany, and is commemorative of the celebrated entomologist. I have consequently thought myself justified in adopting another; and, in selecting the Christian name (Otho) of the natural historian of Greenland, I adopt

one euphonical enough, and, I hope, unobjectionable; for it has the same intention as Blainville's had, of honouring the memory of one of the best and most accurate of our faunists.

Berwick upon Tweed, Nov. 15. 1834.

ART. VI. *Short Communication.*

THE Mode in which Snakes take their Food having been the subject of controversy of late [VI. 466. 551., VII. 67. 165.], I send the following note on the subject: — During a visit to my friend Dr. G. Johnston, at Berwick upon Tweed, in Sept. 1834, I was much interested by observing a common snake (*Natrix torquàta Flem.*), which he had in a tame state, swallowing rather large frogs. It seized the frog by one of its *hind* legs, and gradually drew it into its mouth backwards; so that the head, or one of the fore legs, was the last part seen. But the most curious fact connected with this subject, and one which I do not remember to have seen noticed in any work on natural history, is, that

For full two or three minutes after the frog had passed into the stomach of the snake, it continued to have the power of croaking nearly as loudly as before it was swallowed. It would appear, therefore, that respiration is continued for a short time even in the snake's stomach; and it may be a question, whether the animal is killed by the pressure of the snake's muscles, or by suffocation, caused by the small quantity of air it can obtain in so confined a space, and the impossibility of its renewal when spoiled for the purposes of respiration. I may add, that the frog made no noise during the process of deglutition, but only when external pressure was made upon the part of the snake's body in which it was contained. — *C. C. Babington. St. John's Coll., Cambridge, Dec.* 17. 1834.

[Professor Henslow has communicated, in IV. 279., facts and remarks on the habits of the common snake, in relevance of a question distinct from that renewed by Mr. Babington, but to which some of the facts will also apply. " . . . . . I kept a couple of snakes for some time, which, after fasting for three months, at length began to take food. I have frequently seen them swallow the largest-sized frogs. When these were sometimes slowly receding, hind quarters foremost, into their enemy's stomach, the distended jaws of the snake were, in one period of the process, tightly contracted round the frog's head, producing the curious effect of an animal with one mouth (the frog's) and four eyes, two of which were winking continually, and the other two in a glazed stare."]

REVIEWS.

ART. I. *Titles of Works on Subjects of Natural History, published recently.*

AUDUBON, John James, F.R.S. L. and E., &c.: Ornithological Biography, or an Account of the Habits of the Birds of the United States of America; accompanied by Descriptions of the Objects represented in the Work entitled the "Birds of America," and interspersed with Delineations of American Scenery and Manners. 2 vols. royal 8vo. *25s.* each. Vol. II. published in the end of 1834.

The second volume of this valuable and original work has recently been published. Like the former one, it contains descriptions of more than one hundred species of birds; beside numerous animated notices of various quadrupeds and reptiles associated with them in the American wilderness; and interspersed with occasional narratives of the author's personal adventures, serving distinctly to present the character of the animals and scenery before the view of the reader.

No works on natural history are more instructive and delightful than those which describe the manners and habits of animals in their native solitudes; exulting in the pleasure of existence, and the free exercise of their powers and instincts; unrestrained by the intrusion of cultivation, or dread of the dominion of man. To execute a work of this kind well, requires years of patient investigation, amid dangers and difficulties which demand no small degree of patience and courage in the observer, and a constitution fitted to endure severe hardships and privations; but, above all, he should be inspired with an enthusiastic ardour in the pursuit of discoveries in nature, which finds a rich reward in extending the bounds of knowledge; and he should, besides, possess the power to describe clearly, and delineate accurately, the new objects that present themselves to his notice. That Mr. Audubon possesses, in an eminent degree, these qualifications, we think no impartial person will hesitate to admit who has read the two volumes of his *Ornithological Biography*, or seen his truly splendid and animated drawings of the *Birds of America*. A review of the first numbers of the engravings of his *Birds of America*, by W. Swainson, Esq. F.R.S., is given in the *Magazine of Natural History*, May, 1828 [I. 43—52.], to which we refer our readers. The numbers of this work which have been subsequently published fully sustain the high character assigned to the work by that distinguished naturalist. Baron Cuvier, in a report made to the Royal Academy

of Sciences, Paris, on the engravings of the *Birds of America*, says: — "On peut caractériser l'ouvrage de M. Audubon en peu de mots, en disant que c'est le monument le plus magnifique qui ait encore été élevé à l'ornithologie," &c. "We may characterise this work of M. Audubon's in a few words: it is the most magnificent monument that has yet been raised to ornithology. It is in the twofold quality of an artist and a naturalist that he has produced the work, which has been examined by the academy. You have been struck with the size of the engravings, which are equal, or superior, to any that have been published of this kind; and which have allowed him to represent large species of birds, like the eagle and the tetrao, of the natural size; and to depict the smaller species in a variety of attitudes. He has also been able to give, in the same plates, the branches of plants on which the birds commonly are perched, of their natural size, with the nests and eggs. The execution of these plates, so remarkable for their size, appears to us to be equally successful with respect to the design, the engraving, and the colouring."

The publication of a work so large and costly might well be regarded, at first, by Mr. Audubon, as a "hazardous and expensive undertaking;" but we are happy to find that it has received a liberal and extensive patronage in Great Britain and on the Continent of Europe*, as well as in the United States of America [VII. 173.]. It is, however, to the two volumes of *Ornithological Biography* that the present review refers; and, before we proceed, we think it right to correct a mistake which, we believe, has been common respecting this work: it has been regarded, by those who have not seen it, as merely containing illustrations of the splendid engravings of the birds of America. It is true, the descriptions are valuable accompaniments to the engravings, and are numbered the same as the plates; but, excepting this, the *Ornithological Biography* is entirely an independent work: as much so as White's *Natural History of Selborne*, and, like it, is replete with original observations of the habits and instincts of birds and other objects of natural history; but comprising a far more extended range of country, and a greater variety of animals, than could fall under the notice of Mr. White, in Woolmar Forest, or the vicinity of Selborne.

* As a proof of the encouragement given to natural history in France, it deserves to be stated that King Charles X., before his expulsion, had subscribed for ten copies of the engravings of the *Birds of America*: the present government of that country informed Mr. Audubon that the subscription would be regularly continued and paid until the work was completed.

Birds may be said to constitute the poetry of animated nature; and whether we regard the beauty of their forms and colours, the grace and rapidity of their motions when soaring in the sky, or swimming on the surface of the water, the extent of their vision, or their instinctive intelligence, they seem like creatures of a nature superior to those that are chained to the earth by the power of gravitation, and run or creep upon its surface. What can be really more marvellous than that the egg which we may take into our hand, and which seems as inert as the pebble at our feet, should, in a few weeks, be transformed into a majestic eagle; flying over the loftiest mountains, and into far distant countries, with the rapidity of an arrow! This transformation may be too common an occurrence to impress our imaginations, and we may deaden the feeling of admiration by the unmeaning words that "this is nothing more than the common course of nature," yet, common as it may be, when it is duly considered as an insulated fact, what miracle of creative energy can appear more astonishing? The power of rapid locomotion which birds possess, and their general dread or dislike of man, remove the larger species from populous countries, and make it difficult to obtain an intimate knowledge of their habits and instincts, though this constitutes the most delightful part of natural history. Within the last century, the eagle and the bustard have disappeared from South Britain; and even the raven is becoming a scarce bird in most parts of England, and the opportunities of observing its instinctive habits, in a state of nature, are seldom afforded to English naturalists. On this account, we shall extract part of Mr. Audubon's observations on the American raven, which, we believe, differs in no respect from the European species: —

"In the United States, the raven is, in some measure, a migratory bird; individuals retiring to the extreme south during severe winters, but returning towards the middle, western, and northern districts, at the first indications of milder weather. A few are known to breed in the mountainous portions of South Carolina; but instances of this kind are rare, and are occasioned merely by the security afforded by inaccessible precipices, in which they may rear their young. Their usual places of resort are the mountains, the abrupt banks of rivers, the rocky shores of lakes, and the cliffs of thinly peopled or deserted islands. It is in such places that these birds must be watched, before one can judge of their natural habits, as manifested amid their freedom from the dread of their most dangerous enemy, the lord of the creation.

"There, through the clear and rarefied atmosphere, the

raven spreads his glossy wings and tail, and, as he onward sails, rises higher and higher each bold sweep that he makes. Intent on convincing his mate of the fervour and constancy of his love, he now gently glides beneath her, floats in the buoyant air, or sails by her side. Would that I could describe to you, reader, the many musical inflections by means of which they hold converse together during their amatory excursions! These sounds, doubtless, express their pure conjugal feelings, confirmed and rendered more intense by long years of happiness in each other's society. Now, their matins over, the happy pair are seen to glide towards the earth in spiral lines. They alight on the boldest summit of a rock, so high that you can scarcely judge of their actual size. They approach each other; their bills meet, and caresses are exchanged as tender as those of the gentle turtle dove. Far beneath, wave after wave dashes in foam against the impregnable sides of the rocky tower, the very aspect of which would be terrific to almost any other creatures than the sable pair, which for years have resorted to it to rear the dearly cherished fruits of their connubial love. Midway between them and the boiling waters some shelving ledge conceals their eyry. To it they now betake themselves, to see what damage it has sustained from the peltings of the winter tempest. By degrees the nest is enlarged and trimmed; and, when every thing has been rendered clean and comfortable, the female deposits her eggs, and begins to sit upon them, while her brave and affectionate mate protects and feeds her, and at intervals takes her place. All around is now silent, save the hoarse murmur of the waters, or the whistling sound produced by the flight of the waterfowl travelling towards the northern regions. At length the young burst the shell, when the careful parents, after congratulating each other on the happy event, disgorge some half-macerated food, which they deposit in their tender mouths. Should the most daring adventurer of the air approach, he is attacked with fury and repelled. As the young grow up, they are urged to be careful and silent: a single false movement might precipitate them into the abyss below; a single cry, during the absence of the parents, might bring upon them the remorseless claws of the swift peregrine or jerfalcon. The old birds themselves seem to improve in care and diligence, varying their course in returning home, and often entering it when unexpected. The young are now seen to stand on the edge of the nest. They flap their wings, and at length take courage and fly to some commodious and not distant lodgement. Gradually they become able to follow their parents abroad, and at

length search for maintenance in their company, until the period of breeding arrives, when they separate in pairs and disperse. . . . The period of incubation extends to nineteen or twenty days. The young remain in the nest many weeks before they are able to fly. The old birds return to the same nest for years in succession; and should one of them be destroyed, the other will lead a new partner to the same abode. Even after the young have made their appearance, should one of the parents be killed, the survivor usually manages to find a mate, who undertakes the task of assisting in feeding them."

According to Mr. Audubon, the American raven never builds its nest in trees; and, though they are generally placed on lofty eminences, Mr. Audubon mentions an instance of one nest being placed in the deep fissure of a rock not more than twenty feet above the water, hanging over the stream, so that it was impossible to reach it either from above or below. Another instance is also given of a raven's nest being placed in the deep fissure of a rock in the immediate vicinity of a nest of the golden eagle: this was in the highlands in the state of New York. The disposition of birds, or what the French call *leur morale*, is generally given by naturalists on the principle of their supposed use or injury to man. Mr. Audubon is always disposed to judge favourably of the feathered race when he can. Speaking of the unrelenting enmity with which the ravens are assailed by man, he says, —"It is true that the raven may sometimes hasten the death of a half-starved sheep, or destroy a weakly lamb; he may eat the eggs of other birds, or occasionally steal from the farmer some of those which he calls his own. Young fowls, also, afford precious morsels for himself and his progeny; but how many sheep, lambs, and fowls are saved through his agency! The more intelligent of our farmers are well aware that the raven destroys numberless insects, grubs, and worms; that he kills mice, moles, and rats whenever he can find them; that he will seize the weasel, the young opossum, and the skunk; that, with the perseverance of a cat, he will watch the burrows of foxes, and pounce on the cubs. Our farmers, also, are fully aware that he apprises them of the wolf's prowlings around their yard, and that he never intrudes on their corn fields except to benefit them. . . . The flight of the raven is powerful, even, and, at certain seasons, greatly protracted. During calm and fair weather, it often ascends to an immense height; and, although it cannot be called swift, it propels itself with sufficient power to enable it to contend with different species of hawks, and even

with eagles, if attacked by them. It manages to guide its course through the thickest fogs of the countries of the north, and is able to travel over immense tracts of land or water without rest."

At the end of the descriptions, the scientific name of the species and its zoological specific characters are given.

The chapters that contain descriptions of American scenery and remarkable incidents are delightful little episodes, which increase the interest of the work without diverting the attention of the reader from its main object. The following brief account of an earthquake is extracted from the first volume (p. 239.): — "Travelling through the barrens of Kentucky (of which I shall give you a description elsewhere), in the month of November, I remarked a sudden and strange darkness rising from the western horizon. Accustomed to our heavy storms of thunder and rain, I took no more notice of it, as I thought the speed of my horse might enable me to get under shelter of the roof of an acquaintance, who lived not far distant, before it should come up. I had proceeded about a mile, when I heard what I imagined to be the distant rumbling of a violent tornado; on which I spurred my steed, with a wish to gallop as fast as possible to the place of shelter: but it would not do; the animal knew better than I what was forthcoming; and, instead of going faster, so nearly stopped, that I remarked he placed one foot after another on the ground with as much precaution as if walking on a smooth sheet of ice. I thought he had suddenly foundered; and, speaking to him, was on the point of dismounting and leading him, when he all of a sudden fell a groaning piteously, hung his head, spread out his four legs, as if to save himself from falling, and stood stock still. I thought my horse was about to die, and would have sprung from his back had a minute more elapsed; but at that instant all the shrubs and trees began to move from their very roots; the ground rose and fell in successive furrows, like the ruffled waters of a lake, and I became bewildered in my ideas, as I too plainly perceived that all this awful commotion was the result of an earthquake. . . . Who can tell of the sensations which I experienced when I found myself rocking as it were on my horse, and, with him, moved to and fro like a child in a cradle, and expecting the ground every moment to open and present to my eye such an abyss as might engulf myself and all around me? The fearful convulsion, however, lasted only a few minutes, and the heavens again brightened as quickly as they had become obscured; my horse brought his feet to the natural position, raised his head, and galloped off as if

loose and frolicking without a rider." It appears, from the farther account of Mr. Audubon, that a succession of shocks were daily felt for several weeks in Kentucky, and "near New Madrid, and for some distance on the Mississippi; the earth was rent asunder in several places, one or two islands sunk for ever, and the inhabitants fled in dismay towards the eastern shores."

But we forbear to make farther extracts, as we feel assured that the two volumes of *Ornithological Biography* will be perused with delight by every lover of natural history, and find a place in every public library, when the true character of the work is known. — *B.*

Waterton, Charles, author of "Wanderings in South America:" A Letter to James [it should have been Robert] Jameson, Esq., Regius Professor of Natural History in the University of Edinburgh. 8vo, 14 pages. Wakefield, Nichols. January, 1835.

In a review of the second volume of Audubon's *Biography of the Birds of America*, published in Jameson's *Journal*, January, 1835, want of candour is imputed to Mr. Waterton in the views he has promulgated on Mr. Audubon's contributions to the science of natural history. This imputation Mr. Waterton has met in the letter whose title we have placed above. He has met it, not by asserting the measure of the proportion of candour proper to himself, but by impugning the authority of the professor's opinion in matters of zoology. The subject which he has chosen is Mr. Audubon's notes on the rattlesnake, published in Jameson's *Journal*, for April and June, 1827, which Mr. Waterton says that the professor had "received and approved of;" Mr. Waterton inferring this, we suppose, from the fact of their being published in the journal. The point chosen will be apparent from our

Abstract of the Portion of Mr. Audubon's Account which Mr. Waterton has quoted. — "To give you an idea of the long time this poison [the poison of the rattlesnake] retains its property, I shall relate a curious but well-authenticated series of facts which took place in a central district of the state of Pennsylvania, some twelve or fifteen years ago. A farmer was so slightly bit through the boot by a rattlesnake . . . that the pain felt was thought by him to have been from the scratch of a thorn, not having seen or heard the reptile: . . . [he] died in a few hours. Twelve months after this, the eldest son, who had taken his father's boots, put them on, and went to church at some distance. On his going to bed

that night, while drawing off his boots, he felt slightly scratched on the leg: ... [he] expired before any succour could be applied with success; the cause of his illness, also, being quite a mystery.... His effects were sold, and a second brother ... purchased the boots, and, if I remember rightly, put them on about two years after. As he drew them off, he felt a scratch, and complained of it, when the widowed sister, being present, recollected that the same pain had been felt by her husband on the like occasion. The youth went to bed, suffered and died in the same way that his father and brother had before him. These repeated and singular deaths being rumoured in the country, a medical gentleman called upon the friends of the deceased to enquire into the particulars, and at once pronounced their deaths to have been occasioned by venom. The boots that had been the cause of complaint were brought to him, when he cut one of them open with care, and discovered the extreme point of the fang of a rattlesnake issuing from the leather, and assured the people that this had done all the mischief. To prove this satisfactorily, he scratched with it the nose of a dog; and the dog died in a few hours, from the poisonous effect it was still able to convey." We shall now give an

Abstract of Mr. Waterton's Animadversions. — "Here we have two men and a dog poisoned by scratches. I challenge the *whole world* to produce one solitary instance of any animal being poisoned by the scratch of a rattlesnake's fang, or any other poisonous snake's fang. The formation of the fang itself shows beyond all doubt whatever that this cannot possibly be the case. The wound is *always* a puncture, as though it had been done by the point of a pin.... Audubon expressly states that it was the *extreme* point of the fang which had done all the mischief.... The *extreme* point of *all* serpents' fangs is a solid bone, and ... the aperture through which the poison flows, when the snake is alive, is on the *convex* side of the curved fang, at a *distance* from the point. This being an absolute fact, it is utterly impossible that the dog should have been poisoned by a scratch. Suppose for an instant there was poison in the aperture, that poison was in a dried state; and, before it could have been moistened, the ... doctor would have had to thrust the broken fang into the nose till the orifice was covered; and there it must have remained for some time before its contents could be in a state to enter the circulation.... What I have said of the dog will equally apply to the two younger Doodles, who got their deaths by jumping into their father's boots.... Again, ... the wound which the farmer received, and which was so slight

'that the pain felt was thought by him to have been from the scratch of a thorn,' could not, by any chance, have been from the bite of a serpent; as... a sting from a snake's fang always causes instantaneous and most excruciating pain. So does the sting of our wasps and bees, which are mere pygmies to the smallest of the poisonous snakes. The *tooth* of a snake is fixed in the socket; the *fang* of a snake is movable, and invariably on the upper jaw. Now, I am decidedly of opinion that no rattlesnake could strike the point of his fang through an American farmer's boot. [Mr. Waterton has, in a note in a previous page, this remark: — "I know the thickness of an American farmer's boot; and I also know that the largest rattlesnake of America cannot strike his fang through it so that the aperture through which the poison issues can be seen inside the boot."] But granting that Audubon's snake did it [that is, did strike the point of the fang, not the aperture in it out of which the poison issues, through the boot] in this case, then the point of the fang must have been rankling in old Jonathan Clodpole's flesh all the time he was walking home; for the boot would fit just as closely to his leg *after* he had received his wound as it had done *before* he received it." Mr. Waterton, continuing, deems it matter of marvel that the eldest son could, twelve months after, "walk and sit in the same boots all day, and only just get a *slight scratch* on the leg when pulling them off at night to go to bed;" and asks, in reference to this case, and to that in which "the other brother put them on about two years after, and got his death also by *a scratch*, ... whence the poison came? ... The story of this depopulating ... boot ... was current when I was a boy. With the exception of a few interpolations by Audubon, this very same story ... was considered a good joke some fifty or sixty years back. The late Professor Barton, of the University of Pennsylvania, investigated it at the period of his publishing his pamphlets on the rattlesnake; and it turned out to be *an arrant yankee-doodle hoax*."

A Treatise on Structural Botany, by, it is understood, Dr. *Lindley*, is published in Nos. 179. and 181. of the *Library of Useful Knowledge*. The numbers are 6*d*. each, and the two include 64 pages and 80 woodcuts.

Anon.: Popular Botany, Physiological and Systematic, with numerous woodcuts. Smith and Orr.

A work whose nature is to correspond to this title is about to be published.

THE MAGAZINE

OF

NATURAL HISTORY.

APRIL, 1835.

ORIGINAL COMMUNICATIONS.

ART. I. *An Attempt to ascertain the Animals designated in the Scriptures by the Names Leviathan and Behemoth.* By THOMAS THOMPSON, Esq., one of the Vice-Presidents of the Hull Literary and Philosophical Society; being the Substance of a Paper read at a Meeting of that Society on Jan. 17. 1835.

WHEN, some years ago, I read a paper to this Society upon fabulous animals, it was intimated by a gentlemen present, that he was disappointed that I had not given my opinion on the leviathan and behemoth of the Scriptures. I presume that the gentleman had his own theory on the subject, but I could not at that time afford him an opportunity of broaching it, as I was obliged to reply, that, finding those animals, when named in the Bible, mentioned as actually *existing* animals, I could not consider them as fabulous ones. I had not then been able to satisfy myself as to what *particular* animals were intended to be designated by those names, but since that time I have satisfied my own mind upon the subject; and, although I may be, perhaps, more easily satisfied than some of those whom I address will be, yet, as the subject is one which has at different times engaged the attention of such learned men as Beza, Diodati, Bochart, Vansittart, &c., who, after all, have arrived at no satisfactory conclusion, and as my theory somewhat differs from all of theirs, I have thought that, if I should even fail to convince my audience of the truth of my own opinion, I shall have the satisfaction of failing in good company, whilst I may, at least, draw out some of their opinions on this subject.

Before, however, entering into this discussion, it may be as well briefly to review the opinions heretofore broached in relation to the subjects in question.

The leviathan, then, by the old commentators, was gene-

rally considered to be the *whale:* Beza, Diodati, Bochart, Vansittart, and most modern writers, however, conceive it to be the *crocodile.* As to the behemoth: by some it has been taken in the sense of *beasts in general;* but the description in Job, ch. xl. ver. 15—24., clearly applies to some particular animal. Bochart, Shaw, Calmet, and others, suppose it to be the *hippopotamus;* Schultens, Scott, Franzius, Bruce, Michaelis, and others, believe the *elephant* to be intended.

Besides the leviathan and behemoth, there is, however, another doubtful animal mentioned in the Scriptures, called in Hebrew "than," sometimes "thanin," or "thanim." What animal is meant by the "than," has puzzled the Seventy and all other translators of the Hebrew Bible; but they have not, in this instance, used the caution observed by them in the cases of the leviathan and behemoth, where, being ignorant what animals were really meant, they have retained the original Hebrew terms; but, in the case of the "than," they have ventured at a guess, and construed it mostly "dragon," sometimes "sirens," occasionally "sea monsters," &c. Now, the dragon and the siren are known to be purely *fabulous* animals; and, as the "than" is spoken of in the Scriptures of truth as an *existing* animal, it follows that neither dragon nor siren can be the true translation of "than."

On this subject I shall not enter very much at large, as the Rev. James Hurdis, in his work entitled *A Critical Dissertation upon the true Meaning of the word Than,* has most satisfactorily proved that it does most undoubtedly mean that species of the *crocodile* which still inhabits the Nile.

I believe that there is no animal mentioned in the Hebrew Scripture which the Seventy translators have ventured to translate by the name of "the crocodile;" though, undoubtedly, that animal, so numerous in the Nile, must have been known to the Hebrews, and most probably would be somewhere spoken of in their scriptures.

The crocodile was chiefly known to the ancients as an inhabitant of the Nile; hence it was anciently used as a symbol, signifying Egypt, or Egypt's king.

In order to give some slight idea of what animal was meant by the "than" in Scripture, we shall now introduce a few quotations wherein the word occurs, from which, I believe, it will appear evident that the crocodile was meant. In such quotations, I shall not use the translated terms, but the Hebrew name "than," in order not to perplex the subject. The word occurs in Ezekiel, ch. xxix. ver. 3., "Behold I am against thee, Pharaoh king of Egypt, the great *than* that lieth

in the midst of his rivers." That "than" here means the crocodile no one can doubt; the king of Egypt being likened, for his savage ferocity, to the crocodile in the midst of his rivers. Again, in Isaiah, ch. li. ver. 9., Egypt is thus spoken of under the Scripture name Rahab, "Art not thou he that hath cut Rahab (or Egypt), and wounded the *than?*" evidently meaning the crocodile, as symbolical of the ruler of Egypt.

Let us see if there be other points in which the crocodile answers to the account given of the "than" in the Scriptures. From the accounts of Adanson, Père Labat, M. Bosc, and others, it appears that the usual length of a full-grown crocodile is from 15 ft. to 25 ft. Griffith, in his translation of Cuvier's *Règne Animal*, says that their skin is covered with *small bucklers*, which are proof against the sword and musket ball; that, when in the coolest climates which they inhabit, they make *dens*, or deep burrows, in the marshes near the rivers and the edges of pools, where they pass the winter; he also notices that in summer they *utter loud bellowings;* and Jobson says they send forth *cries* which may be heard at a considerable distance, and which sound as if they came from the bottom of a well. Do we not hence perceive the force of that expression in Isaiah, ch. xiii. ver. 22., speaking of the desolation to fall on Babylon; "And the wild beasts of the islands shall *cry* in their desolate places, and the *than* in her pleasant palaces:" and again in Micah, ch. i. ver. 8.; "I will make a wailing like the *than*." The crocodiles, from the form of the mouth, are obliged to swallow their food entire; and this circumstance is noticed in Jeremiah, ch. li. ver. 34., concerning the "than;" "He hath swallowed me up like a *than*." And the den which they form is noticed in Jeremiah, ch. ix. ver. 11.; "And I will make Jerusalem a heap, a *den* of *thanim*." Again, the scales of the "than" are noticed in Ezek. ch. xxix. ver. 4., where, after having in the third verse, as already mentioned, denominated the king of Egypt "The great *than* in the midst of his waters," he says, "I will put *a hook* in thy jaws, and I will cause the fish of thy rivers to stick unto thy *scales;* and I will *bring thee up* out of the midst of thy rivers."

Here is a direct allusion to the ancient mode of catching the crocodile by a hook in the jaws, and dragging him forth from the river, as described by Herodotus in his *Euterpe*, ch. 70., "When they have fixed (says he) a piece of pork upon a hook, they throw it into the midst of the river, and on the banks have a living pig, which they beat. The crocodile, hearing him squeak, advances towards the noise, and, having seized the flesh, devours it: they then pull him; and,

having dragged him on shore, first of all fill his eyes with mud, and, having done this, he is easily despatched." The allusion, therefore, to the crocodile by Ezekiel, under the word "than," is completed by this reference to this practice of catching him by a hook in the jaws, and dragging him out of the river. Already enough has been shown, I think, to render it highly probable, if not certain, that the "than" of the Scriptures, usually translated "dragon," should have been translated "crocodile:" an animal which must have been known well to the Hebrews, but which, as before remarked, is nowhere mentioned in Scripture, except it be under this word "than," or under those of the "leviathan" or "behemoth," which have, each of them, been by some authors supposed to be the crocodile.

It is on these two latter animals that I have chiefly intended to address you in this paper, but I found it desirable first to offer a few words on the "than;" for, if the "than" be the crocodile, then neither "the behemoth" nor "the leviathan" can be that animal; and those who wish for further (and, I may say, the most ample) proof that the "than" is the same animal as the crocodile, I must refer to Mr. Hurdis's work, which is so full and satisfactory, that I have not thought it necessary to enter so deeply into this part of my subject as I otherwise should have done, having only so far illustrated it as may be necessary for rendering intelligible what I may have to say on the leviathan and behemoth, to which subjects I now hasten. I would, however, previously mention, as I may have occasion to refer to them hereafter, other ways used by the ancients for taking the crocodile. One is mentioned by Pliny, in his *Natural History*, lib. viii. cap. 25., which may be translated thus: — "There is a race of men hostile to the crocodile, called Tentyritæ, from an island on the Nile which they inhabit: their stature is small, but their courage in this practice is wonderful. The crocodile is terrible to them that *flee* from him, but runs away *from his pursuers;* and these men alone can attack him. They swim after him in the river, and, mounted on his back like horsemen, as he opens his mouth to bite with his head turned up, they thrust a club across his mouth, and, holding the ends of it, one in the right hand and the other in the left, they bring him to shore captive *as with bridles.*"

[Pliny's words, and also a translation of them, are given in our II. 13, 14.; where, and in p. 15., notices of modes of taking the crocodile are quoted from other classic authors, in illustration of Mr. Waterton's account of his riding on the back of a crocodile. That essay is illustrated by an en-



graving, which we shall take the liberty to introduce here also. (*fig.* 20.)]

M. Bosc mentions a third way of capturing him used in Egypt and Senegal. "As soon as the inhabitants perceive a crocodile out of the water, they go boldly up to him, and when he opens his mouth to bite, they boldly thrust in the arm with a piece of iron or strong wood *pointed at both ends*, in an upright position, which hinders him from shutting his mouth again, and then they despatch him with spears." Diodorus mentions that crocodiles were ensnared in iron nets by the ancients. But I hasten to my professed subject.

The Leviathan. — This animal is mentioned in Psalm lxxiv. ver. 14.; civ. ver. 26.; Isaiah, ch. xxvii. ver. 1., and the 41st chapter of Job. Here it may suffice for me to adduce the description from the latter place. [The 41st chapter of Job consists wholly of a description of the leviathan, and as this description can be referred to by any one, we omit to reprint it here.] The old commentators thought that the whale was the animal here intended, but, as the leviathan was evidently an amphibious creature, that idea has been long abandoned. Beza, Diodati, Bochart, Vansittart, and the modern commentators, pretty generally, agree in considering the crocodile to be the creature meant. To this identification I cannot assent.

[*Hull, January*, 1835.]

(*To be continued.*)

ART. II. *A few Remarks on Hybrids, in reference to Mr. Berry's Communication in* VII. 599. By Mr. EDWARD BLYTH.

Scit thalamo servare fidem, sanctasque veretur
Connubii leges: non illum in pectore candor
Sollicitat niveus; neque pravum accendit amorem
Splendida lanugo, vel honesta in vertice crista,
Purpureusve nitor pennarum; ast agmina late
Fœminea explorat cautus, maculasque requirit
Cognatas, paribusque interlita corpora guttis:
Ni faceret, pictis sylvam circum undique monstris
Confusam aspiceres vulgo, partusque biformes,
Et genus ambiguum, et Veneris monumenta nefandæ.
Hinc *merula* in nigro se oblectat nigra marito;
Hinc socium lasciva petit philomela canorum,
Agnoscitque pares sonitus; hinc noctua tetram
Canitiem alarum, et glaucos miratur ocellos.
Nempe sibi semper constat, crescitque quotannis
Lucida progenies, castos confessa parentes;
Dum virides inter saltus lucosque sonoros
Vere novo exultat, plumasque decora juventus
Explicat ad solem, patriisque coloribus ardet.

ADDISON, in the *Spectator*, No. 412.

Chaste are their instincts, faithful is their fire,
No foreign beauty tempts to false desire:
The snow-white vesture, and the glittering crown,
The simple plumage, or the glossy down,
Prompt not their love: the patriot bird pursues
His well-acquainted tints, and kindred hues;
Hence, through their tribes, no mix'd, polluted flame,
No monster-breed to mark the grove with shame:
But the chaste *blackbird*, to its partner true,
Thinks black alone is beauty's favourite hue;
The nightingale, with mutual passion blest,
Sings to its mate, and nightly charms the nest;
While the dark owl, to court his partner, flies,
And owns his offspring in their yellow eyes.

GOLDSMITH'*s Paraphrase.**

IN VII. 599., the very extraordinary circumstance is recorded, of a wild blackbird and a wild thrush pairing together, and rearing, two successive years, broods of hybrid progeny; "which were permitted to fly, and" which "evinced, in all respects, the features of strongly marked hybrids." With all respect, however, and deference for Mr. Berry's statement, I must beg leave to express a little scepticism on this subject; and I hope that that gentleman will not see any just cause to be offended at this free declaration of my opinions. The various phenomena of hybrids have long engaged my particular attention, and as this fact would, if thoroughly authenticated, upset one of my principal conclusions respect-

* *Animated Nature*, iii. 211. Yet this writer, after Buffon, advocates a contrary opinion. See the page above quoted.

ing them, I must be excused for endeavouring to sift it as closely as possible.

All the numerous instances of mule productions in the animal kingdom, which have come to my knowledge, have invariably been distinctly referable to the agency of man, either in a direct or in an indirect manner; and I am not aware that any of the numerous writers on the subject have mentioned a single satisfactory * instance similar to this of Mr. Berry, in which *both* parents were in a true state of nature; that is to say, each in their natural climate and locality, wild and free.

To descend to particulars. The domesticated horse breeds with the domesticated ass; the domestic sheep with the domestic goat; the wild wolf, jackal, or fox, under particular circumstances, with the domesticated dog; the wild pheasant with the domestic fowl; the stoat, and the pine marten, in confinement, have been known to breed with the ferret, or domesticated polecat; the lion, in a state of confinement, has bred with an imprisoned tigress; the zebra, in confinement, with a domestic ass; the linnet, siskin, goldfinch, chaffinch, and green grosbeak, in confinement, will mix with the domestic canary-bird; the British turtle-dove, in confinement, has been known to breed with the domesticated ring-necked turtle-dove of the West Indies: strange mixtures, in confinement, often take place among the *Anátidæ*, or duck family, but these mixtures have never been known in a wild state; the silver pheasant has, in confinement, hybridised with the common pheasant of this country; but we should, I presume, look in vain for such a union in the woods of China, where both of these, together with several other very congruous species, are said to exist in multitudes.

I have been accustomed, from these and various other facts, to deduce the following conclusions with regard to hybrids, which I still suspect will prove to be correct and sound: — 1st, that they are never produced by two wild animals; 2dly, that when a wild animal is concerned, it is invariably a male, with a domesticated female; and, 3dly, that all hybrid animals are, in consequence, distinctly referable to man's agency.

* The several reported cases of unions between the carrion and hooded crows, one of which (that mentioned in Nos. vi. and xi. of the *Field Naturalist's Magazine*) is given on most respectable authority, may seem, perhaps, to militate against the above; but it does not appear that any of these individuals were ever *examined;* and ornithologists are agreed on the fact, that black variations of the hooded crow sometimes occur. I have myself examined one, a female, in which several black feathers were intermixed with the ash colour on the back. [See in p. 228, in continuation.]

The second of these deductions is worthy of some attention, and it may be simply resolved into this, that no female wild animal will permit the approaches of a male of another species. Thus, it is only the female (domestic) dog which hybridises with the wild fox; and it is the wild male pheasant only which couples with the domestic poultry. Even the hybrid *Fringillidæ*, so common in the bird-shops, have, in almost every instance, for their female parent, the domesticated canary-bird: it being found by the breeders that a mixture will hardly ever take place in the opposite manner.

I have never yet heard of a hybrid animal being found wild, the origin of which might not, with more than probability, be traced to a domestic female, which perhaps had strayed and had acquired its liberty; and this particularly induces me to make farther and minute enquiry into the facts of the case stated by Mr. Berry.

I have been shown a caged bird, said to have been a mule production between the blackbird and thrush, but at once perceived it to be merely a hen blackbird, with a pale and very spotted breast; I have also seen another variation of the hen blackbird, so pale on the upper parts that, when flying, it might very easily be mistaken for a thrush; and, if I remember right, the skin of a similar individual may be seen among the specimens of British killed birds in the British Museum. Might not, therefore, in Mr. Berry's instance, another similar hen blackbird have been mistaken for a thrush.

Again, how is it that none of the progeny of two such remarkable unions have ever been examined? I say two unions, for it does not necessarily follow that the very same individuals paired together for two successive years; though I know that this is frequently the case with many insessorial birds, as I could easily prove. It is clear that no monogamous bird would ever hybridise but for want of a mate of its own species (a very unlikely case with either of the species in question), and if it even were to do so one season, is it at all likely that it should be obliged a second? Or even if one wild monogamous bird were to be inclined to hybridise, is it likely that it should ever be able to find a mate of another species also so inclined? If one of Mr. Berry's birds was a mere variety, there is nothing extraordinary in its being able to find a mate; but the probabilities are so decidedly opposed to this being a case of unnatural union, that a very rigorous examination is necessary, and it requires to be supported by the most satisfactory and conclusive evidence, before it can be admitted as a fact, that the blackbird and the thrush have bred together in a state of nature.

I have not the slightest shadow of a wish to call in ques-

tion the veracity of Mr. Berry: but, as all mankind are liable to be sometimes mistaken, I think it certainly no more than right to publish my doubts of an occurrence which I conceive to be wholly anomalous and unprecedented; and I much hope that Mr. Berry is prepared either to fortify his assertion, or to admit that some possibility existed of his being deceived by appearances.

The above remarks must be understood only to apply to the two classes of warm-blooded vertebrate animals; for out of these, I believe, no instance of a hybrid production in the animal kingdom has ever yet been recorded, nor am I aware that any experiments on the subject have ever been instituted, except in these two classes. Between most animal and the majority of vegetable unions there is the following highly important distinction, the bearings of which, in a state of nature, are worthy of close attention; that, in the former, the impregnation of one species by another can never be brought about by mere chance, whereas in the latter, such a commixture may be (and very often is) purely fortuitous. Consequently, it is necessary to be a little cautious how we attempt to draw analogies between the two great divisions of organic nature, at least in the matter of hybrids produced wild; for, with this grand distinction at the outset, it is very possible for a rule to hold general in the one kingdom, which may not always (as we are extremely apt to suppose *à priori*) be equally applicable throughout the other. How the fact may be with regard to those animals which (as fishes and batrachia) have no sexual union, we have at present no data on which to found an opinion; but it seems barely possible that, as in the vegetable kingdom, a mixed union may here in a state of nature take place fortuitously, especially among the latter, though it would require a certain concurrence of favourable circumstances, the exact coincidence of which is very far indeed from being ever probable. With the exceptions, however, of the golden carp, the silk-moth, and perhaps the cochineal insect, I believe there is no instance whatever of an animal which may be considered domesticated, which is not either a quadruped or a bird; and, therefore, as no mule animals have ever been known, except in the two latter classes, and as in these their existence (in every duly authenticated instance) can invariably be traced to the unnatural condition to which at least one of the parents had been reduced by man, we may pretty safely (as above) come to the general conclusion, that all animal hybrids whatever (though perhaps not all vegetable) are directly or indirectly referable to human agency.

Tooting, Dec. 17. 1834.

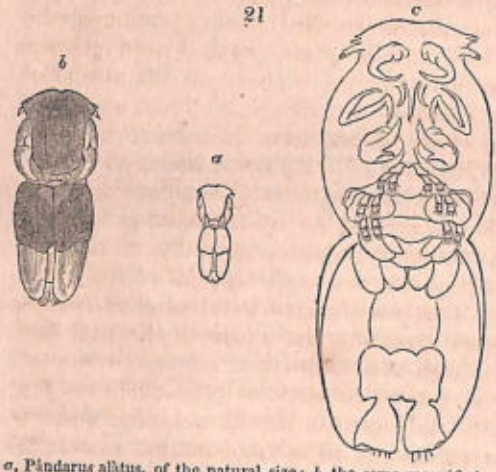
ART. III. *Illustrations in British Zoology.* By GEORGE JOHNSTON, M.D., Fellow of the Royal College of Surgeons of Edinburgh.

33. PA'NDARUS ALA'TUS (*fig.* 21.).

Pandarus ailé *Milne Edwards* in Dict. des Sc. Nat., xxviii. 80. tab. 8.

DESCRIPTION. — Body oblong, half an inch in length, two tenths of an inch in breadth; convex and smooth dorsally; the ventral surface flat, and of a dead white colour. Cephalothorax * roundish; with a very narrow membranous border, composed of a large middle; three small somewhat triangular pieces on each side, and a small square piece behind, sinuated on the lower edge; the middle piece chestnut brown, scored with irregular faint lines, minutely emarginate in front, with a small depression immediately behind this, and an impressed medial line on its hinder part; the front dilated and rounded, having the outer angles terminated by a small three-jointed antenna pointed backwards; the apical joint very minute. Inferior surface of the cephalothorax concave, with three pairs of jointed legs †: the first pair with a strongly curved and very sharp claw, placed anteriorly to the spiniform rostrum, at the sides of which is a pair of jointed small filiform palpi ‡; the second pair of legs, situated more towards the margins, longer, more slender, with a bifid obtuse claw, and, at their base, another pair of stouter acutely pointed palpi; the third pair swollen at the base, terminated with a single acute claw. Behind it there are three pairs of fins §, each

21



a, Pándarus alàtus, of the natural size; *b*, the same magnified; *c*, a view of the ventral surface, highly magnified.

* The *test* of Latreille, *shell* of Leach, *bouclier céphalique* of M. Edwards, *carapace* of Desmarest.

† *Pattes-machoires* of Edwards.

‡ What we have called palpi are the *machoires rudimentaires* of Edwards. The posterior palpi are *legs* in the nomenclature of Leach and others: and this seems correct.

§ *Pattes thoraciques* of Edwards, *legs* of Leach.

consisting of a stalk terminated with two small jointed processes sparingly ciliated at the apex; the stalks of the two posterior connected with a broad movable lamina. Abdomen * oval, longer and narrower than the cephalothorax; the upper half covered with two square movable elytra of a chestnut colour, very faintly scored and marked with pale scattered dots; the inner basal angles also pale, the posterior margin oblique; uncovered portion pale. Underneath, we find four foliaceous processes attached above; and near the anal extremity there is a small square organ †, to which are appended two foliaceous lamellæ, uneven on the posterior margin, and scarcely ciliated.

I took the specimen now figured from an individual of the Beaumaris shark of Pennant ‡; which was taken, in Sept. 1834, in Berwick Bay. It is a male; and the female, which I have not seen, differs from it in having two filiform styles or tubes, nearly twice as long as the body, appended to the tail. It appears to be parasitical on several species of fish; and generally attaches itself to the sides of the branchial covers, adhering tenaciously by thrusting the claws of the first and third pairs of feet through the skin.

The student who is anxious to see how ingeniously the few and simple organs of this creature can be analysed and resolved into parts corresponding with the complex organs of the crab and lobster, must consult the interesting memoir of Milne Edwards, above referred to; and who is the only naturalist who has noticed the species. I must acknowledge that the analogies seem not a little imaginary; and the nomenclature derived from them is at least faulty, in so far that it gives, or is apt to give, erroneous ideas relative to function. The *feet-jaws* are not subservient to manducation in any way. The animal is suctorial, and requires no jaws; and these organs are used solely to obtain fixedness of place: while the *thoracic feet*, again, are not organs to walk or creep on, but are only calculated for swimming; which, we can conceive, it may often have occasion to do.

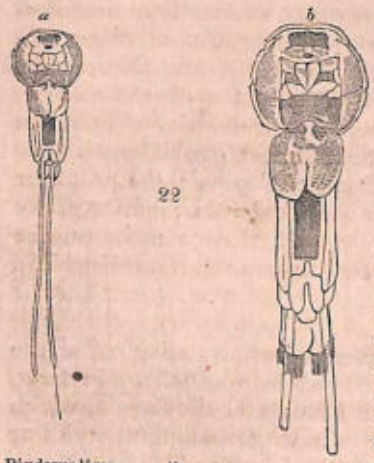
34. PA'NDARUS LA'MNÆ (*fig.* 22.).

Description. — Cephalothorax round, with a narrow membranous border, which, in drying, tears up like a fringe; convex dorsally; pale, with a brown blotch in front; com-

* The *thorax* of M. Edwards; of which the *carapace* is the first, the part covered by the scales or elytra the second, and the naked portion the third, segment or ring.

† The *abdomen* of M. Edwards, the *tail* of Leach.

‡ Lámna monénsis of Cuvier, according to Mr. Yarrell.



Pándarus lámnæ: *a*, the animal of the natural size; *b*, the same magnified.

posed of a large square central piece, faintly scored, and vaulted at each posterior angle, of three somewhat triangular pieces on each side, and a square piece behind, divided by some obscure transverse lines. Front slightly sinuated in the middle; the antennæ extremely minute. Underneath, the disposition of the mouth, legs, and fin processes seems to be exactly like that of the preceding; but, immediately under the antennæ, there are two small wart-like tubercles, which become pure white when dry. Abdomen shortly pedunculate, linear-oblong; the upper third covered with a pair of oval elytra of a uniform pale colour, smooth; the suture slightly waved. The central piece of the abdomen blackish, separated by a furrow from the lateral pale pieces, which run beyond it posteriorly and are rounded; the intermediate sinus occupied by three foliaceous processes, two above and one under them; and under this, again, the filiform tubes originate, which are nearly twice as long as the body. Underneath, we find, above, four small foliaceous processes arranged transversely; and, below them, two large ones, each of these consisting of two leaflets; and at each side of the filiform appendages there is a small leaflet, and two large oblong ones terminate the tail, each fringed with four ciliated spines.

I took three specimens of this Pándarus from a Beaumaris shark, captured, in Sept. 1834, in Berwick Bay, a few days subsequent to the capture of the individual from which P. alàtus was procured. It might have been conjectured to be the female of that species, had not the figure of Edwards been at hand to prevent the mistake; and, as it will not agree with the description of any species in Desmarest's work on the Crustàcea, I am led to consider it as a novel addition to the list of parasitical entomostracous insects.

Berwick upon Tweed, Dec. 12. 1834.

[*The Migration of Fishes.* — It is suggested, in I. 372., that the migration of fishes is, possibly, in some cases, induced by the annoyance they experience from parasitic animals. On the remarks offered in the place cited, the late Rev. L.

Guilding had thus noted: — Hostile parasites may doubtless take an active part in influencing the migration of fishes. In the West Indies, the parasitic Crustàcea are exceedingly numerous; and must form most distressing companions to the creatures which support them, on their bodies, without the power of removal. — While the *Echinèis* (itself a parasite) clings by its occipital apparatus to the roving shark, his own skin affords a resting-place for parasitic crabs; and many of our eatable species of fish are rarely taken without one or more of these troublesome attendants. — *L. Guilding. St. Vincent, May* 1. 1830.]

ART. IV. *A List of Species of Diurnal Lepidóptera known to occur in Switzerland, with Notices of the Localities in which they have been observed.* By P. J. BROWN, Esq.

I HAVE not been unmindful of the wish of your excellent correspondent, Mr. Bree, expressed to me when in England last spring [1834, and in VII. 524.], that I should furnish you with a list of the Swiss papilios; but unforeseen impediments have hitherto prevented my compliance with his desire. My return to this country was retarded until the busiest plant-drying, fly-catching period of the year. When the less inviting appearance of the fields sent me home to the brain-cudgeling occupation of extricating from their chaos the "rudis indigestaque moles" on one side, and the "confusa sine ordine moles*" on the other, which had been accumulating during brighter days, I endeavoured to acquit myself of the task to the best of my power; but was unwilling to forward the result of my enquiry without first submitting it to some one well qualified to detect its omissions: of the two most competent persons, one has, in the meantime, been removed by death; and the other, having been confined to his room by illness, was unable during a month to reply to my queries. It has appeared to me that the most satisfactory method would be to take as a guide the list published, in 1817 and 1818, by the late Professor Meisner, in his *Naturwissenschaftlicher Anzeiger;* inserting in their proper places such few additional species as I have been able to learn have been since discovered. I do not present this as an *exact translation* of the professor's list, but

* Having borrowed a few words from Ovid which are not in Johnson, I must comply with the orders on your wrappers, by explaining them: they mean two huge messes of hodge podge, and precious messes they are in general. The word mole *is* in Johnson, but his moles are quite different things from Ovid's.

as containing in a slightly condensed form those of his observations which appear to be interesting; and noticing all the varieties which are still occasionally met with, neglecting such only as may have presented themselves in a solitary individual. This list being essentially that of Meisner, the whole must be considered as his, except such species or notices as are included in parentheses.

The names are *invariably those of Ochsenheimer;* and as that author has made observations, in the same work, on a few of the species in this list, they are incorporated with the new matter, always with acknowledgment. I thought at first of rearranging the species, to adapt them to works better known in England; but, more especially as Ochsenheimer is *usually* cited by Mr. Stephens in his *Systematic Catalogue*, I have since determined to leave the list as I found it. Mr. Bree's term, "Swiss papilios," makes me presume that the list demanded was merely that of the "Diúrna," and to them I have accordingly confined myself; in fact, I scarcely know how I could have completed it satisfactorily for the Lepidóptera in general. Meisner's catalogue breaks off abruptly, with an unaccomplished "to be continued," at the genus Euprepìa; and I cannot learn that any other extensive list is extant. It is, however, to be hoped, that something of the kind will soon be given to the public, a circular having been addressed to the members of the Helvetic Society of Natural Sciences, requesting them to furnish the most ample zoological lists, with observations, for the purpose of preparing a Fauna Helvetica. The Alpine "Noctúrna" are, certainly, and will long remain, very imperfectly known; much, however, may be expected from the perseverance of the zealous and successful M. Anderegg of Gampsen, near Brieg, in the Valais (that El Dorado for a naturalist); but whether or not his two new species, *N*óctua helvetìna and *N.* cataleùca, published by Boisduval in the second volume of the *Annales* of the French Entomological Society, will stand their ground, is somewhat questionable.

SWISS DIU'RNA AT PRESENT KNOWN.

MELITÆ`A.

1. Cýnthi*a*. Grimsel, Gemmi, St. Bernard, &c.; August.
2. Mérop*e*. Similar places in the High Alps; August. Considered by many a variety of A'rtemis.
3. A'rtemis. Moist meadows; spring; common.
4. Cínxi*a*. Meadows and hills; spring; not rare.
5. Dídym*a*. Meadows and hills; June to Aug.; common.

(Trívi*a*. In the Valais in July; rare.)

6. Phœ'b*e*. Common in the Valais; July and August. Was once taken at Wohlen, two leagues from Berne.
7. Dictýnn*a*. Moist meadows; July and August. Very dark-coloured ones on the mountains.
8. Athàli*a*. Common in meadows; varies very much in colour and markings, as well as in becoming very dark on the mountains.
9. Parthèni*a*. With the last; very common in August and September.
10. Lucìn*a*. Meadows in spring; not rare.

ARGY'NNIS.

(Aphírap*e*. Valais in July; very rare.)

11. Selèn*e*. Not rare about Buren (a town five leagues from Berne) and Soleure; very common in many parts of Italian Switzerland.
12. Euphrósyn*e*. Frequent in spring in thinly wooded forests. In Alpine stations its flight commences in July and August.
13. Dì*a*. Common in May and August, in meadows, paths, &c.
14. Pàle*s*. Common on High Alps; Grimsel, Gemmi, &c.; with many variations, particularly on the under side. On the Cherbenon Alp in the Valais is a very dark variety, with a play of blue colour on the upper side. (The green variety, which is Hübner's I'sis, is found, but rarely, on the Grimsel in July.)
15. I'n*o*. In moist meadows in July. Not frequent.
16. Thòr*e*. This rare species I (i. e. Professor Meisner) found, for the first time, in June, 1804, in the Surenenthal, above Engelberg, at which time it was not anywhere described, and was considered as quite new. In 1809, I found females in the same locality, and am not aware of its having been since met with in Switzerland; it has been lately taken on the Alps of the Tyrol. (This was published in October, 1817; and Boisduval says it has since become more common in some spots of Switzerland.)
17. Dáphn*e*. In the Valais, about Saillon, Sierre, &c.; June and July; rather frequent.
18. Amathùsi*a*. On lower mountains and Alpine pastures, especially where shaded by shrubs or leafy woods. (In the original, "laubwaldungen," leaf woods or forests; that is, of beech, oak, &c., to distinguish them from the more common fir forests. Not only does the description of shade and general vegetation of the beech forest

differ from that of the fir one, but, although scattered beech trees occur at a considerable elevation, there are very few instances of their constituting a forest to the height of 4000 ft. above the sea; in the same districts the fir forests extend to nearly 6000 ft., which, however, is far above their usual limit.) In the valleys of Grindelwald, Lauterbrunnen, &c., a few individuals are not unfrequently found in July and August.

19. Lathònia. Very common on dry meadows, paths, and open woods; double-brooded.
20. Nìobe. Appears about Berne more rarely and always earlier than the following species. In the Alpine valleys, and on the Lower Alps, the female, especially, has its colour and markings very dark.
21. Adíppe. Common in July and August in meadows and Alpine valleys. On the north side of our Alpine chain I have never taken the variety without silvery spots, which I have often found in transalpine Switzerland; as between Lugano and Bellinzona, where, on the contrary, those with silvery spots are less frequently seen.
22. Aglàia. In July and August, common everywhere. In Alpine valleys, as Grindelwald, the female is often very large and dark-coloured, sometimes with a slight tint of violet.
23. Pàphia. In July and August, in the open glades of forests everywhere. Ochsenheimer's valesìna is a variety not rare about Brieg and the Viescherwald in the Upper Valais. (This variety is now decidedly rare.)
24. Pandòra. Near Martigny, Fouly, &c., in the Lower Valais, where I have found it in a glade (waldwiese). It flies in the middle of June.

VANE'SSA.

25. cárdui. Everywhere; some years few or none, others most abundant. I have even found it on the Seidelhorn (a mountain above the Grimsel, rising 9210 English feet above the sea).
26. Atalánta. Equally common, particularly in autumn.
27. Ìo. In spring and August; appears frequently to pass the winter in its perfect state.
28. Antìopa. Not rare in August; later ones survive the winter, and appear on warm winter days, or early in spring, with faded white margins, usually much tattered.
29. Polychlòros. Common. The rare variety described un-

der the name of *Testùdo*, was once taken on the common of Reutigen (near Thun).

30. urtìcæ. Common everywhere, even to the highest regions. A variety very analogous to the *Testùdo* has been found near Yverdon.
31. c. álbum. Gardens and hedges everywhere; double-brooded.
32. Prórs*a*. Not rarely here and there in the neighbourhood of Berne, in July.
33. Levàn*a*. Much rarer than the preceding (of which it is certainly a mere variety); in the spring: was once found in August.

LIMENI`TIS.

34. Lucíll*a*. Early in August, at Lugano; not known north of the Alps.
35. Sibýll*a* (Camíll*a* L. & Stephens). Common in woods in July.
36. Camíll*a* (Sibíll*a* L. & Stephens). Much rarer than the last; in June; about hedges and skirts of woods.
37. pópuli. From end of June to middle of July, about paths in woods where aspens abound: but nowhere common.

APATU`RA.

38. I`ris. In July and beginning of August, in and about woods, highways, &c.; in some years and places abundant. I have twice taken in the Grauholz, near Berne, the variety separated by many authors as a distinct species by the name of *Iole*; one had scarcely any trace of the white band on the hind wings, the other had it slightly marked.
39. I`li*a*, and its varieties, in similar places.

HIPPA`RCHIA.

40. Prosérpin*a*. On arid slopes near fir forests in July; very frequent in some places in the neighbourhood of Berne.
41. Brisèis. On arid heights in August and September; in many places very common. I have not met with Ochsenheimer's variety Piràta (which Boisduval marks as native of the South of France).
42. Hermìon*e*. Very common in the Upper Valais in July and August; also along the Jura, as above Bienne, &c., and in some places near Berne.
43. Alcyon*e*. Esper and Borkhausen consider this and the last as varieties of one species, in which I am not disposed to differ from them; as in the Valais, where

both are common in the same spots, individuals occur which are as referable to one species as the other.

44. Alliòni*a*, and

45. Statilìnus. I must confess I see no clear reason for separating these two. In the Lower Valais, from Martigny to Varogne, these flies are found in the spring, and in still greater numbers late in autumn; and with such slight shades of difference (es lassen sich da solche übergänge nachweisen) that we know not whether to consider them as Alliòni*a* or Statilìnus. It seems to me that the latter is merely a faded state of the former. (Boisduval has them both as synonymes of Faúna Fab.)

46. Phæ`dr*a*. Not rare in many places near Berne in Aug.; very common in all parts of the Valais; and the female often of an extraordinary size and beauty.

47. Córdul*a*. Valais, July and August; very common about Bex (Cant. de Vaud); it is also found on the Wengen Alp. The female varies much in the number of ocelli on the fore wings.

48. Sémel*e*. Not rare in August on stony arid spots.

49. Aéll*o*. June and July, on the Grimsel, Meyenwand, south side of the Gemmi; Surenenthal, behind Engelberg; and, lately, on the Wall Alp, at the foot of the Stockhorn. (I have also taken it on the Ralligfluh, above the Lake of Thun.)

50. Tithònous. Near Zurich, between Berne and Neufchâtel; Canton de Vaud, &c.; not rare.

51. Janìr*a*. July to Sept. very common in all meadows.

52. Eudòr*a*. Common in all parts of the Valais.

53. Hyperánthus. Common in all meadows. The variety *with white spots on the under side, Hubn.* f. 173., of which some make a species, Arèt*e*, is met with here and there. (Boisduval says variety Arèt*e absque oculis.*)

54. Dejanìr*a*. In Argovia near Zurich, Kaiserstuhl near Lungern, in June, in woods especially of alder; not rare.

55. Mæ`r*a*. In July and August common on roads and stony places; varies much in shade of colour and in size.

56. Megæ`r*a*. From May to autumn, on walls, roads, dry places, gravel-pits, &c., very common.

57. Egèri*a*. In woods; common.

58. Galathè*a*. From June to August, in all meadows. Near Louesch, in the Valais, is found a variety, in which the black is so much suffused, and, particularly on the hind wings, the white spots are so much narrower, as to produce in the male distinct ocelli. I have also a

variety from a hot locality, which, instead of black, is reddish yellow.

59. Phárte. Lower Alps, ex., at the foot of the Upper Gurnigel. I have not met with it above the limits of the woods.

60. Melámpus. Very common on all Alps; and usually the first of their true inhabitants which announces the Alpine districts: it is not, however, found on the Jura. The female has usually four spots on the fore wings, the male only two.

61. Cassìope. On the High Alps; very similar to the last in size and figure, but not so widely distributed on the Alps; the under side of the hind wings is always a uniform brown without spots.

62. Mnéstra. Near the glacier of the Aar on the Grimsel, on the Meyenwand, &c. (The Meyenwand is the south-eastern declivity of the Grimsel, leading from the heights above the Hospice towards the glacier of the Rhone.) It prefers, however, the Alps of the Chamouni. It has much resemblance to the foregoing, but is always larger: the ferruginous portion of the fore wings broader and more connected; the male usually without spots or ocelli.

63. Pýrrha. On Lower Alps, as the Gurnigel; and on higher ones, as the Wengen Alp; also at Kundersteg: common in July, and offering many varieties. The male has sometimes the upper side of the fore wings entirely black, without spots or ocelli (Cæcília Hübn.), or with two long orange-coloured spots, with black points; or with a band of spots on the fore and hind wings: the female is of a grayer colour, the upper side with very faint orange-coloured spots, or none; the under side with lemon yellow points, spots, or connected band, or entirely without any thing of the kind. In 1809, I found a singular variety on the Wengen Alp, the ground of the wings being almost Isabella yellow.

64. Bubástis Meis. (with a long description, &c., which Ochsenheimer cuts short in six words, by saying he knows nothing about it: "Bubastis kenne ich nicht in der Natur;" and we can scarcely, perhaps, do better than follow his example, the species not being mentioned by Gödart and Duponchel, in their *Hist. Nat. des Lépidoptères;* or by Boisduval, in either his *Index Methodicus* or his *Icones Historiques.*)

65. Œ̀me. Common here and there on the Low Alps; I have not found it above the limits of the woods.
66. Cèto. One of the rarer and most local species of this family; I have found it in a meadow between the Baths of Louesch and Inden, in June, in tolerable plenty; but nowhere beyond the limits of the meadow, except on one occasion, when I took it on the Simplon. (Gödart gives its locality, "the mountains of Dauphiné;" Boisduval, simply, "Helvetia.")
67. Medùsa. Not rare in June on the higher parts of the Jura, as the Weissenstein above Soleure. (A small variety is described, which Ochsenheimer says he had received from Steyermark, and that it is evidently a distinct species: he names it Hippomedùsa; but, as I do not find that name in either Gödart or Boisduval, I suppose it is dropped.)
68. Stýgne. On most Alps, Grimsel, Gemmi, Wengen Alp, Jura, &c.
69. Alécto. In very few parts of the Highest Alps above the Daube, on the Gemmi, one of the rarest of the family. (Meisner says the Swiss specimens never have ocelli; and he *supposes* Hübner's, t. 101. f. 515, 516., to be something else. Ochsenheimer says he has specimens with and without ocelli; and Boisduval says that on a great number, from different localities, he never saw a male with the least trace of them. I believe there is no question as to the female, although she has a band of ferruginous spots. Boisduval thinks that Gödart's figures, vol. ii. pl. 14. f. 5. & 6., which *have* ocelli, are probably his Lefebvri. *Icones*, vol. i. p. 161.)

(Nerìne Tr. On the Alps of the Grisons; very rare.)

70. Medèa. Very common in woods and meadows, on the plains, or in Alpine valleys; varies much in size and number of ocelli, as also in the band on the under side of the hind wings of the female, which is sometimes yellow, sometimes white.
71. Ligèa. In woods and their contiguous meadows; common everywhere; in subalpine woods, of superior size and beauty.
72. Eurỳale. Common as far as the limits of the deciduous woods on the Lower Alps; the ocelli have mostly white pupils, particularly in the females; the males have often black ocelli without white pupils; sometimes an individual is found, having part of them with pupils, and part without.

73. Prónoe. In subalpine spots, as Kandersteg, Oeschenenthal, south side of Gemmi above the Baths of Louesch; also on Wengen Alp, Scheideck, &c.; very common at Wimmis in the Simmenthal. The male flies in July; the female, which is far more rare, is first seen much later. (Meisner corrects not only Ochsenheimer's synonymes, but his description also. The latter says they were both correct, and that Meisner's fly was not the same, but Hübner's Pitho, which he admits to be a good species. Boisduval adjusts the point by making Prónoe a synonyme of Aráchne, and Pitho a variety: both are found in the same spots.)

(E'vias Gödart. In the Alps in July, but rarely.)

74. Goánte. In August, chiefly on the south side of the Alps, as Grimsel, Simplon, &c.; but sometimes to the North, as on the ascent to the Grimsel, between Gutlanen and the Handeck: and on the St. Gothard, from the Schöllenen as far as Wasen.

75. Górge. On the High Alps, chiefly in stony or schistose spots; ex., the Neuenen (on the chain of the Stockhorn), the Daube on the Gemmi, Cherbenen Alp. The ocelli and spots on the upper side are often wanting in the male.

76. Mánto. Common on the High Alps, up to the boundary of eternal snow. Of the whole of this family, it is the species found the farthest beyond the limits of vegetation.

77. Týndarus. Very common on the Alps; but always above the deciduous woods, and thence to the highest regions.

78. Dàvus. Very common on wet turfy meadows in June and July; varies much in the under side of the hind wings, as do also the following species: —

79. Pámphilus. Common in all meadows; spring to autumn.

80. I'phis. In June, on the Jura.

81. Arcàni*a*. In the warmer districts, as along the southern foot of the Jura, near Lausanne, Lugano, &c.; very abundant.

82. Satýrion. In subalpine meadows, and on the Lower Alps; rather common.

LYCÆ'NA.

83. Arion. Not rare in various districts in meadows, July and August. Of superior size and beauty, especially the females, at Irnisserstalden, above Giornico (Tessin).

On the Alps, on the contrary, is often found a much smaller variety, which, particularly in the females, has the upper side nearly black, and only slightly powdered with blue.

84. A'lcon. In July, near Berne; ex., the Engi, rarely.
85. Euphèmus. Moist forest glades, July and August; not common.
86. E'rebus. In July and Aug., near Berne, in turfy meadows.
87. Cýllarus. In May, on meadows and dry hills near Berne; rare.
88. A'cis, double-brooded. In May and August; rather common. A much smaller variety is found on the Alps.
89. Argìolus. About woods, in May and June.
90. Dàmon. In July and August; in the Valais, and by Bex, &c.; very common. On this side (i. e. the northern or Bernese) of the chain of Alps, it is found in but few places, as Grindelwald, Scheideck, Zubenstock, on way to the Grimsel.
91. A'lsus. Very common on the roads, in May and Aug.; also on the mountains, as the Jura, extremely small.
92. Pherètes. Here and there on the Alps; but always rare. I have found it on the Scheideck, in the Oeschenenthal, &c. It is more abundant on the Alps of Chamouni.
93. Dáphnis. One of the rarest; in the Valais between Sierre and Varogne; the female much more rare than the male.
94. Córydon. From July; common almost everywhere.
95. Dórylas. May and June; not rare in meadows.
96. Adònis. May and August; not rare in meadows near Berne.
97. Icàrius. In the Valais between Sion and Sierre; rather abundant. (Meisner, not being quite certain of his species, gives a long description, not necessary to repeat, as Ochsenheimer says it is the true Icàrius).
98. Alcæ'is. Common everywhere all the summer. (The variety mentioned by Ochsenheimer as nearly one half smaller, and with a line of black spots on the upper side of the hind wings, is found on the Alps.)
99. E'ros. Found by Professor Studer in the Lower Valais.
100. orbítulus. On High Alps, in July and August.
101. Agéstis. Upper side brown in both sexes; not rare in Alpine valleys of the Jura, Valais, &c.
102. Eumèdon. Also, upper side brown in both sexes; much larger than Agéstis, and particularly distin-

guished [there seems to be an omission here] which runs from the centre spot on the under side of the hind wings, towards the edge. In the vicinity of Meyringen, in Oberhasli; in August, but not often.

103. Eumèdes Meisn. A hitherto undescribed species; not rare about Berne in August; intermediate between the two last, which are not found near Berne; but distinguished by the darker blackish brown of the upper side, and the chequered margin; the under side comes nearer to Agéstis. (Ochsenheimer knows nothing about it, as he says in three words, "mir ganz unbekannt." Nor does Boisduval or Gödart take any notice of it).

104. Optilète. Higher Alps, as Grimsel, Scheideck, Wengen; rare.

105. A'rgus. Very common, especially about Sierre in the Valais; varies much, particularly the female, which is either with or without the blue tinge.

106. Æ`gon. Rather rare about Berne; but very abundant about Sierre in Valais, where the female varies much.

107. Ægídion Meisn. In the higher Alpine valleys, as the Ursernthal (St. Gothard); and also on the Higher Alps, as the south side of the Grimsel (very similar to Æ`gon; but Meisner thinks it distinct. Ochsenheimer says it is the Philónomus of Borkhausen; a species not mentioned by Gödart or Boisduval).

108. Amýntas. In August, about Berne; not common.

109. Polyspérchon. In spring; not common. (Boisduval makes it a variety of the last.)

110. Corètas Schiffermuller. Taken by Professor Studer in Lower Valais.

111. Hỳlas. Rare about Berne, in May. It seems to be double-brooded; at least in the Valais, where it is found in August.

112. Báttus. Irnisserstalden, above Giornico, and thence to Dazio (Tessin). Not rare in August.

113. Hélle. This species, which is found, in May and Aug., in the wet marshy meadows about Leipzig and other parts of Germany, is, with us, truly Alpine, and appears in June and July. I first found it, in 1808, on the Molesson (near Freiburg); and, since, on the Upper Gurnigel. It is, probably, on all the mountain chains.

114. Circe. Everywhere, in May, August, and September; the female varies much in size, as well as in the lighter or darker colour of the upper side.

115. Górdius. Upper Valais, particularly in the Vivschwalde; not rare in July and August. In the Lower Valais, a month earlier. In Italian Switzerland, still more abundant; and has been found, about Berne, in August. (I have taken it at Thun also.)

116. Chrysèis. In many parts near Berne, in June and July; also a variety particularly dark gold-coloured, and sometimes with a beautiful play of blue, in Alpine valleys; as in the ascent from Wyler to the Gentelboden, and near Engelberg, &c. (Is not this Ochsenheimer's Eurýbia? which, whether a good species, or a mere variety of Chrysèis, is found in the Valais; but is rare.)

117. Hippóthoe. Valteline, according to Füessly; probably in Valais also, and Italian Switzerland: but I have not met with it.

118. virgaúreæ. Rare about Berne; more abundant in Alpine valleys, where a female variety is found having a line of white spots near the outer edge of the hind wings; and the male has often a black spot on the upper side of the fore wings; when he much resembles the true Hippóthoe.

119. Phlæ'as. Everywhere in meadows, in spring and autumn. The spring brood seems always to afford larger individuals; the variety with the inner corner of the hind wing much lengthened into a tail. (Polyómmatus Elèus Fab. I have often found in Lower Valais.)

20. rùbi. Everywhere, in April and May.

21. quércus. In July and August, in places abounding in oaks, but nowhere abundant: as it usually flies about the upper branches, it is not easily taken.

122. bæ'ticus. Füessly has taken it in the Lower Valais, where Colùtea arboréscens, on which the caterpillar feeds, is common; but, notwithstanding all my attention in my frequent wanderings through this country, so rich in insects, I have never met with it.

123. spìni. Near Berne, and at entrance of the Simmenthal, in August. Seems to be everywhere rare.

124. ílicis. About Berne, in woods; very abundant in the Valais, in June and July.

125. w. álbum. In neighbourhood of Berne; but rather rare.

126. prùni. In neighbourhood of Berne, in June and July; rarely.

127. bétulæ. From the end of August till late in autumn, about thorn hedges and in gardens: common.

PAPI'LIO.

128. Machàon. Common everywhere on hills, in May and August.

129. Podalírius. More rare than the last. On this side of the Alps it appears but once, in spring. In the Valais it appears a second time, in August; and is there extremely common, particularly about Sion. (I have, however, taken it "on this side the Alps," near Thun, in July, August, and September.)

ZERY'NTHIA.

130. Polýxena. According to Füessly, this fine insect was once taken near Locarno.

DORI'TIS.

131. Apóllo. In sunny spots on mountains and in valleys, at a moderate elevation, particularly on stony slopes; abundant in the Jura, from July to autumn; never found above the limits of the deciduous woods. (Not usually, certainly; but I have occasionally met with it far beyond. Meisner describes a hermaphrodite, left side male, right side female, which he took on heights of Tourbillon, Sion, Oct. 10. 1816.)

132. Dèlius (Phœ'bus). Chiefly on the Col de Balme; also in the Valais and the Grisons, on the Gemmi, Hahnenmous between Lenk and Adelboden, &c. (Not rare on the Kiley, eight leagues from Thun. Meisner says he has a remarkable variety from Chamouni, in which the spots usually red are black, except those on the front edge of the fore wings: and Ochsenheimer observes that his specimens of the same kind are counterfeit, the red spots on the hind wings being covered with a sort of varnish; which was not removed by moisture, but could be detached with the point of a fine penknife.)

133. Mnemósyne. Grisons, in lower mountain pastures, and in the Valteline, on reclaimed Alps (zähmern Alpen). I first found it, in 1802, in the Surenenthal; and again, in 1809, in the Gentelboden, near the commencement of the Engstlen Alp, at a tolerably great elevation. (Abundant in May, at foot of the Kiley.)

PO'NTIA.

134. cratæ'gi.

135. brássicæ.

136. ràpæ. Very common everywhere.

137. nàpi. As the foregoing, common everywhere, in April and July. Hübner's dark-coloured fly (f. 407.) is certainly merely a variety of the female, which is not rare on the Alps. Wallner's observation, in Illiger's *Magazine*, that it is found in few Alpine spots, and not lower than 1100 toises, is unfounded; as I have taken it in much lower situations, and even on the Jura: in 1808, also, on the Molesson, *in coitu* with the common male. (The Molesson is only 5047 ft. above the sea. I have also frequently taken it below the elevation of 1100 toises. It is the variety separated by some under the name of bryòniæ. Meisner makes another observation, also, that Esper's and Hübner's napæ`æ is a mere variety of nàpi; in which most are willing to agree.)
138. Callídice. Highest Alps; ex., Oberaar, Gemmi, Cherbenon. I have, however, taken it in valleys; as at the southern foot of the Gemmi above the baths, and by the glacier of the Rhone: it flies very quickly, and is difficult to take.
139. Daplídice. Near Berne, in spring and August, rarely; very common in the Valais.
140. Bèlia. According to Jurine, on steep summits in the Allée Blanche and also on the Great St. Bernard.
141. Ausònia. Chamouni, and Great St. Bernard. (The variety simplònia, which many consider as a distinct species, is rare on the Simplon, &c., in June and July.)
142. cardámines. Spring and autumn; common.
143. sinàpis. Everywhere, in May and July.

Co`lias.

144. Edùsa. From August till late in autumn; common on both plains and mountains. The female variety Hélice is often found near Berne; and I took it, in 1810, on the Alps of the Valley of Tremola (southern descent of St. Gothard).
145. Phicómone. On Alps, near the lake in the Oeschenenthal, Gemmi, Scheideck, Grimsel, &c. It flies in the hottest part of the day with incredible swiftness, and always in a straight line, so as to be caught with difficulty; but in the afternoon it often reposes on flowers, as if fatigued, and is then easily taken.
146. Hyàle. Common in May, and from August till late in autumn, on meadows and sunny slopes.
147. Palæ`no. On the Higher Alps; ex., Grimsel, Meyenwand, highest part of Jura, at the Lake of Etalières,

&c. (I have taken it on the ascent of the Col de Balme, at no great elevation above Chamouni.)

148. rhámni. Common everywhere very early in spring, and a second time in July and August.

HECAE'RGE.

149. céltis. Found by M. Escher of Zurich, in 1811, on the road above Crevola, at the southern foot of the Simplon. No doubt everywhere in Italian Switzerland, where *C*éltis austràlis grows abundantly. (So says Meisner; but the plant is by no means common in Italian Switzerland.)

HESPE'RIA.

150. malvàrum. Common everywhere in May and June; particularly large in the Valais.

151. laváteræ. In the Valais, about Saillon, Lax, &c., rather abundant; also in the vicinity of Gampelen, on the Lake of Neufchâtel; and I have taken it at Berne.

152. álveus. In the Valais. (I have taken it in the Simmenthal.)

153. fritíllum. Common everywhere.

154. alvèolus. Common everywhere; varies very much.

155. Sertòrius. Rarer than the foregoing, which it much resembles: it is distinguished by a play of violet colour on the wings, and the distribution of the black bars on the chequered margin of the fore wings; two are placed near together near the front edge, then after a greater interval three in the middle, and then the last one near the inner corner.

156. Tàges. In April, July, and August, common everywhere.

(pumílio. Near Berne, in June; very rare.)

157. Stéropes. In Italian Switzerland. I found it in Aug. 1810, below Bironico, and on the south side of M. Cenere, on the road.

158. Paníscus. End of April, and in May, in and about woods; in many places near Berne: not rare.

159. cómma. Common everywhere in July and August.

160. Sylvànus. In May and June, in open woods; nowhere rare.

161. línea. Very common on roads in July and August.

162. linèola. Not rare near Berne.

It will be observed that the localities usually pointed out are, the neighbourhood of Berne, where Professor Meisner

resided; the Alps of the Bernese Oberland, which are those most visited by the inhabitants of the canton; and the Valais, as being abundantly rich in objects of natural history. The species found near Berne are probably met with in the greater part of Switzerland; those of the Oberland are most likely on other mountains, particularly those about the Lake of Lucerne, and in the cantons of Freiburg and Vaud; while the Valaisans, or, at least, many of them, may be sought for in the canton of Tessin, and in the southern parts of the Grisons. If I should hear of the capture of any additional species, they shall be communicated by way of supplement.

Thun, Canton of Berne, Switzerland, Jan. 2. 1835.

[This rich list of species, and of localities of them, obligingly supplied by Mr. Brown at Mr. Bree's kind request, may much avail those of our readers who contemplate collecting in Switzerland during the ensuing summer.

Mr. Brown has already communicated, in VII. 247—249., "some facts on the early appearance in Switzerland, during the cold weather of early springs, of Gonépteryx rhámni, Vanéssa urticæ and V. Io, and Amphídasis pilosària." Those facts may suggest some considerations applicable to the economy of some other species registered in the list above. With Mr. Brown's notice, in VII. 246, 247., of certain states of temperature observed relative to its influence on insects, should be coupled our correction, in VII. 522. note *, of an error we had made in giving that notice.]

P. S.—As Meisner's list goes as far as Euprepìa, the second division, or Crepusculària, is complete: if you wish to have it, and the fragment of the Noctúrna, please to say so. [We do wish to have them, and shall deem them valuable favours.]

Talking of insects, I found, on June 24. 1833, a Euprepìa matrónula *Ochsenheimer*, on which there is not the slightest vestige of fore wings.

Could you make known to English entomologists the wish of the representatives of the late Professor Studer of Berne, to sell his fine collection? The editor of the *Entomological Magazine* could, perhaps, also do the same. [This request has been submitted, and the answer is: — "The editor of the *Ent. Mag.* will do the same with pleasure."] The collection is extremely complete in Swiss specimens, and contains many unique ones, all in the highest state of perfection. I do not know the exact number at present, but have a memorandum taken some years since; and, although not greatly augmented, it has not been at a stand-still. There were then —

Lepidóptera	- 857 species	-	2680 individuals.
Coleóptera	- 1682 -	-	5023
Hemíptera	- 266 -	-	724
Neuróptera	- 59 -	-	137
Hymenóptera	- 443 -	-	902
Díptera	- - 260 -	-	573
A'ptera	- - 56 -	-	117
Exotic	- - 6 -	-	160
Total species,	- 3629		10,316

contained in well-made walnut-tree cabinets. The usual complement, when they could be obtained, was five specimens of each Lepidóptera, and three Coleóptera: the former are all fixed on English needles, the latter placed in their natural positions on pieces of card; and every part displayed with an unexampled perseverance and patience, which cost the late worthy possessor his eyesight. The collection is still at Berne, and may be seen by any one passing through that town, on application to either of the present Professors Studer. Any applications for farther information should be addressed to M. le Pasteur Studer, Erlenbach, canton of Berne. There is also the late professor's very valuable entomological library for sale; consisting, among others, of the works of Cramer, Olivier, De Geer, Reaumur, Schæffer, Jurine, Stoll, Herbst, Riessel, Esper, Lamarck, Huber, Meigen, Borkhausen, Ochsenheimer, Panzer, *Encyclopédie Méthodique*, &c.

ART. V. *Directions for producing Skeletons of the Leaves, Calyxes, and Seed-Vessels, or other Parts, of Plants.* By G. FRANCIS, Esq.

PROCURE an open-topped earthen pan, holding a gallon or more, and put into it a *quantity* of leaves, seed-vessels, &c., selected according to the subsequent directions; and pour upon them a sufficiency of *boiling* soft water to cover them. This done, place the pan upon the tiles of the roof of the house, or in any other place exposed to the warmth of a summer's sun and the vicissitudes of the weather. Stir the leaves occasionally (say, once or twice a week) and carefully, but never change the water. The putrefactive fermentation will now soon ensue; and, in about six weeks or two months, according to the nature of the subjects, many of the specimens will be completely macerated; and will require no other attention than holding them singly under the tap of the water-tub, or

some other small forcing stream of water, which will wash away all the other skin and green fleshy matter. If this matter does not come off readily when assisted a little with the thumb and finger, or a small knife, the leaves must be soaked for a longer time. Those of the leaves which seem liable to break during the washing of them may be preserved from breaking by placing them upon a little piece of board, and holding them by the thumb and finger; and, should a little of the green fleshy matter remain fixed between the interstices of the skeleton leaf, it may easily be removed by striking the leaf *perpendicularly* with a clothes brush.

They will now only require bleaching. This may be done, very effectually, by placing them in a bandbox, with a little sulphur burning in a small vessel beside or under them. The most sure way, however, of bleaching objects of this nature is, to immerse them, for a few minutes, in dilute chloride of lime, or chloride of soda.

The reason of the process of macerating directed will be readily understood by the chemist, who knows that the degree of success in the preparation of all anatomical subjects depends entirely upon the degree of putrefactive fermentation which takes place. Everything, then, which increases this fermentation hastens the object: it will instantly be seen, therefore, why the proper time is during the summer months; and this is, also, the only time when specimens can be procured. It will be evident, also, why the water must not be changed; and why a quantity must be done at once. The object in putting boiling water, in the first instance, is, to destroy vitality, and to soften, in some degree, the texture of the outer coating. Metallic vessels, especially iron ones, are very unfit to immerse any anatomical preparations in, as they communicate to the objects the dark brown stain of oxide of iron, which nothing afterwards will remove.

Choice of Subjects. — Such are to be chosen as are of a fibrous woody texture; and these are to be gathered at that time of the year when the internal woody fibre is sufficiently hard (as about June or July): though, in the case of leaves, those of ivy and of holly may be taken all the year; and seed-vessels may be taken a little before the seed is ripe. In making your selection, carefully avoid all which are of a resinous nature, as attention to these will be but thrown away: thus the leaves of the fir tribe, the camphor tree, the laurel, the bay, and of most of the evergreen shrubs and trees, are inapplicable. This advice will apply, with still stronger force, to the astringent kinds: it is in vain to try the leaves of the oak, chestnut, maple, elm, willow, horn-

beam, sycamore, tea, buckthorn, walnut, hazel, and many others; as the leaves of all these contain much tannin, which not only renders them imperishable, but, by contaminating the water, prevents the decomposition of the other leaves under maceration with them.

I have found the following proper and easy Subjects: — Leaves of the white poplar, black poplar, Lombardy poplar, apricot, apple, orange, lemon, box, ivy, holly, many of the exotic passion flowers; Magnòl*ia* glaúca, acuminàta, and others; lime tree, tulip tree. Calyxes of Moluccélla læ`vis, which are, when prepared, very beautiful; also the calyxes and seed-vessels of Nicándr*a* physalöides, of the winter cherry (Phýsalis *Alkekéngi*), of henbane (*H*yoscỳamus nìger); of all the campanulas, particularly Campánula Mèdium (Canterbury bell), C. rotundifòlia (the harebell), and C. Trachèlium; the larger mallows, the tree mallow (Lavátera arbòrea), horehound (*M*arrùbium álbum); *Er*ýngium Andersòn*i*, alpìnum, campéstre, and marítimum; Medicàgo falcàta and arbòrea; *S*tàchys sylvática, several of the nettles, *G*aleópsis *L*ádanum, *D*ictámnus álbus, *P*hlòmis fruticòsa, *Datùra* Stramònium, A'trop*a*, the scutellarias, and the capsules of all the species of poppy. To these may be added the stalks of cabbage, radish, flax, hemp, and stinging nettles; the tuber of the turnip; the involucres of Astrántia màjor and austrìaca, and of the Hydrángea Horténsi*a*.

Should not the above be sufficiently explicit, I shall be very happy to remove any difficulties, either publicly or privately; and be gratified to show to any correspondent or reader my collection of prepared specimens, which are numerous.

It is right to observe, that I have seen many other leaves, &c., of some of the thistles and of resinous plants, well dissected: but with these I have not succeeded; nor have I by the process of boiling them in dilute acid, though I have understood that, by this process, they may be done in a few minutes. The proper acid, the strength of it, and the manipulation required, I shall be glad to learn from any correspondent.

55. *Great Prescott Street, Feb.* 1835.

ART. VI. *A Notice of a Proposition that the Explosion of large Quantities of Gunpowder, in Battles, effects extensive Changes in the Condition of the Atmosphere.* By THOMAS LEE, Esq.

THE Rev. Mr. Clarke's communication, "On certain recent Meteoric Phenomena," &c., in VIII. 1—28., brought to my

recollection a train of observations which I had made during almost the whole of the late disastrous war; the effect of those observations having been such as fully to satisfy me that the atmosphere was very much influenced by the discharge of artillery, &c., in the numerous and mighty battles fought in that war. Indeed, I became so convinced of the certainty with which the atmospheric indications might be relied upon, that I felt quite enabled to say, some days before the news of a battle having taken place had arrived, that an extended battle had been very recently fought, and that the particulars would arrive shortly. I do not remember my conjecture to have been once baffled. I did make some notes upon the subject; and, particularly, put down my declared anticipations, made at the moment, with the results as to how far they had been realised: but I am sorry to say that I cannot at present find them.

When it is obvious that, on the firing of even one pound of gunpowder, a very large gaseous volume is evolved, tending to increase the common atmosphere then floating, as well as to agitate it to a considerable distance around or above the immediate site of the explosion, the conjecture to which I have adverted may not appear, even at first sight, a very idle one.

I do not at present pursue the subject; which really may well admit of very elaborate mathematical investigation, founded upon the tolerably well ascertained mass (if I may use the term) of atmosphere proper to the earth, and upon the more certainly known volume of gases disengaged by the explosion of a given quantity of gunpowder. To the effect to be produced by the mere disengagement of these gases must be added the concussion always resulting from the sudden explosion of gunpowder.

I think it right to add, that, about fifty-five years ago, I read in a book, at a stall, something to the effect I have mentioned; and quite enough to deprive me of the honour due to a first observer of important natural phenomena. The book was a small thin octavo; and, although I have been searching for it half a century, I have been unable to find it. I always thought it was written by Porny, and that its title was, *On the Atmosphere;* but not any bookseller, nor any catalogue, I have asked or consulted, has afforded me any information upon it. Perhaps some correspondent may be aware of the book; and will therein see that, if my notion be ill-founded, some one else, at least, had previously imbibed it.

9. *Inner Temple Lane, Feb.* 9. 1835.

ART. VII. *Remarks on the Deposition of Salt in the Mediterranean Sea.* By the Rev. W. B. CLARKE, A.M. F.G.S. &c.

THE question respecting the saltness of the Mediterranean has received an illustration from the introduction of steam-vessels into that sea. It is well known that a constant current sets eastward through the Straits of Gibraltar; and that a northerly current descends from the Black Sea; and that numerous rivers of great volume, as the Nile, Po, Rhine, &c., flow into the Mediterranean, bringing down various mineral products in a state of chemical solution. Of these, the calcareous and some other detritus are deposited at no great distance from the embouchures of the respective streams, forming banks of stone and sand. The particles of salt, however, cannot be disposed of, by deposition, in exactly the same manner; yet, inasmuch as evaporation on an immense scale goes on in the Mediterranean from the action of the hot and dry winds of Africa, Asia, &c., unless the current which sets in from the Atlantic be counterbalanced by currents in an opposite direction, large deposits of salt must necessarily take place in the deepest portions of the sea. Experiments have certainly led to the conclusion that there are under currents, as well as lateral currents, westward. But, as a bar stretches across the straits between Capes Trafalgar and Spartel, and the deepest part of the water over it is but 220 fathoms; while, between Gibraltar and Ceuta, the soundings are 950 fathoms, Mr. Lyell, in whose *Principles of Geology* (i. 298.) the reasonings on this subject may be seen, has concluded that there are, probably, basins at the bottom of the Mediterranean of incalculable depth; and that precipitations of salt take place "on the grandest scale, continuous masses of fine rock salt extending, perhaps, hundreds of miles," &c. Mr. De la Beche (*Geological Manual*, p. 98.) doubts this inference; and says that the theory, "though very ingenious, can scarcely be true," since the bottom of the sea, at the deepest places measured, is not salt, but mud, sand, and shells. Mr. Lyell has, however, mentioned the probability of central abysses *unfathomable;* and it is there he has placed the deposit he mentions. The objection, therefore, loses much of its force. Analysis proves that the water of the Mediterranean, at great depths, does contain more salt than at the surface, by the ratio of 4 to 1. The following table gives the examination of three bottles of water by Dr. Wollaston, as given in the *Philosophical Transactions*, 1829, part i. 29.: —

Bottle.	Latitude.	Longitude.	Depth in fathoms whence taken.	Density.	Salt per cent.
No. 1.	38° 30′ N.	4° 30′ E.	450	1·0294	4·05
2.	37 30	1	400	1·0295	3·99
3.	36	4 40	670	1·1288	17·3

The above statement contains nothing new; but it has been made, to receive the illustration alluded to.

The Carron steamer has returned to England, in consequence of the injury her boilers have received in the services she has rendered to the fleet cruising in the Mediterranean. The quantity of salt deposited in the boilers appears to have increased at the rate of one eighth of an inch in thickness *per diem*, extending as high up the sides of the boiler as the usual water-level. Between Malta and Vourla (a distance of 800 or 900 miles) such an accumulation takes place, that the boiler is obliged always to be cleaned out after every trip; lest the deposit, being so thick, should cause the action of the fire to destroy the iron. It has been calculated, by the parties employed in the steam navigation of the Mediterranean, that, in the passage from Malta to Vourla, as much incrustation occurs as during six months' regular work between Falmouth and Lisbon. This being the case, it is clear that even the surface waters of the Mediterranean contain vastly more salt in solution than the Atlantic; and it is, therefore, by no means improbable that the deposit at the bottom of the former sea equals Mr. Lyell's calculation: at the same time, it strengthens the notion of there being no very considerable return of the waters westward.

The navigation of the seas and rivers, by steam-vessels, might be rendered useful to purposes of chemico-geological research; since it would not be difficult to an ingenious person to fit up an apparatus, to be connected with the boilers of the steam-ships, by which the saline and other deposits might be measured according to a scale of evaporation: also, in experiments so tried, the water could be obtained at any given depth.

Stanley Green, near Poole, Dorsetshire, Dec. 15. 1834.

ART. VIII. *Short Communications.*

MAMMIFEROUS ANIMALS. — *The Fox, its Habits and Food.* (II. 457.; IV. 11. 24.; VI. 207.; VII. 134. 181. 240. 401.) — I have heard it asserted that the fox feeds upon the large black slug. That

The Mole feeds, during night, upon the common slug, I believe. It has been observed in Selkirkshire, that, where the moles have been nearly extirpated, upon the Duke of Buccleugh's pasture-farms, slugs have increased to such a degree as to render it probable that they really consume a great proportion of the herbage. On the pasture land of other proprietors, where the moles are not destroyed, the slugs are certainly not so numerous, not more so than usual. Now, it is well known, whatever may be the reason, and no other can be thought of, that the grounds upon which the moles are destroyed do not keep so many sheep as formerly when the moles were not destroyed.

Where rabbits are not found, the fox preys upon the mole. On some of the sea lochs on the west of Ross-shire it has been observed that both the fox and

The Polecat (*Mustèla Putòrius*), and likewise *the Marten* (M. *Foina*), descend to the shore during night, and feed upon the shellfish, particularly upon the large basket muscle (*Mýtilus modìolus*). I have, myself, seen these shells far up on the sides of the mountains, and in the birch copses, broken and empty. They must have been carried thither by some animal.

A curious circumstance occurred at Duart, on Loch Torridon, some years ago. The shores of this wild and sequestered inland bay abound in shellfish. There are large accumulations of the common muscle, useless as the rocks of hard sandstone, which would be a princely fortune near London, as the muscles would furnish bait for Eyemouth, Buckhaven, and Newhaven to boot. There are, also, very many of the large basket muscle, or yogg, as the Shetlanders call it (*Mýtilus modìolus*). Some of the largest size are found 7 in. long. These, for reasons which they best know, detach themselves from the groups of their species, and may be seen in a solitary state here and there along the shores, adhering to the crevices of rocks or larger stones below the sand, by their strong *beards* (byssus). These are more peculiarly relished by the foxes and martens. One morning, at daybreak, a man of the name of Murdoch Mackenzie observed a fox on the shore, by no means an unusual sight, for their habits in this respect are well known to the people; but the tide was coming in, yet the fox seemed heedless, and busily engaged with something. Murdoch, after observing him for a little time, went to his hut for his gun, and forthwith down to the shore; when, to his surprise, the fox was, to all appearance, as careless of his approach as of that of the coming tide. He shot him. On going to pick him up, Murdoch became

successive appearance and disappearance of coloured spots in the mantles of several of the cephalopode molluscâ.

[For lucid information on the structure and secretions which actuate the colours in Mollúsca, see G. J. in our V. 618—622.]

Fishes.—*Fishes and Reptiles have the Power to assimilate, in some degree, their Colour to that of the Objects about them, to the end of concealing themselves from their Enemies.* — I observe, in VII. 599., in some interesting remarks by O., on the habits of the stickleback, that he notices, with some surprise, the rapid change of colour which takes place in some individuals of this genus on being removed from one vessel to another. I beg leave to call his attention to the fact, that various fishes and reptiles possess the remarkable power of accommodating their colour to that of surrounding objects. Some interesting experiments on this subject were detailed a year or two since, in Jameson's *Journal*, by my friend Dr. James Stark of Edinburgh, who imagines, and, I think, with great plausibility, that this power is a provision of nature, whereby they are enabled, in a degree, to conceal themselves from their enemies by assimilating their colour to that of the bottom of the stream.

[*A Species of Stickleback which has Four Dorsal Spines* (*Gasterósteus tetracánthus* Cuvier) *has been captured in Scotland.*]— While on the subject of sticklebacks, allow me to add that another species has been added to our fauna by Mr. John Stark of Edinburgh, found in that neighbourhood with the commoner species. It appears to be identical with Cuvier's Gasterósteus tetracánthus, under which name it will probably appear in Mr. Yarrell's forthcoming work on British fishes. — *W. C. Clapham Road, Dec.* 15. 1834.

[A brief mention of this species is made in *Jameson's Journal*, No. 35., January, 1835. At a meeting of the Wernerian Society, on March 15. 1834, Professor Jameson described it, and exhibited drawings of it. It has four dorsal spines (implied in the term tetracánthus). Mr. Stark had detected it in the ditches of Hope Park.]

It may be that Six Species of Stickleback are known to occur in Britain. — Mr. Yarrell has made known, in III. 521—523., that three three-spined species, the Gasterósteus trachùrus, semiarmàtus, and leiùrus, of the *Histoire Naturelle des Poissons* of Messrs. Cuvier and Valenciennes, occur in Britain; and he has also made known, in III. 521—523., by descriptions and figures, the distinctive characteristics of these three species; and has remarked that the three had been constantly confounded under the name G. aculeàtus *Lin.*, and that, "as the old term aculeàtus applies equally to all of them, this ap-

pellation has been dropped." In the *Phil. Mag.*, new series, vol. v. p. 299., it is stated to the amount that W. Thompson, Esq., vice-president of the Belfast Natural History Society, made known, at a meeting of the Linnæan Society, on May 6. 1834, that he had discovered in the north of Ireland a three-spined species of stickleback, which he had deemed distinct from the three above named, and, he also deemed, probably identical with the G. brachycéntrus (short-spined) of the *Hist. Nat. des Poissons* of Cuvier and Valenciennes, a species which is published in that work as one newly discovered, and mentioned as having been obtained by M. Savigny from the brooks of Tuscany. Should Mr. Thompson's view be confirmed, four species of three-spined sticklebacks will be known to occur in Britain. One four-spined species, additional to these, is the G. tetracánthus noted above (p. 230.); and a ten-spined species (the G. pungítius *Lin.* and *Pennant*) is noted by Mr. J. D. C. Sowerby, in our III. 332. where there is a figure of it by him. The words "ten dorsal fins," in his notice, are a misprint for "ten dorsal spines." In the report of Mr. Thompson's communication above alluded to, it is stated that he had pointed out a discrepancy between Cuvier (*Règne Animal*, 2d edit.) and British authors relative to the G. pungítius.

Facts and Remarks on the Characteristics of the Species of Fish called Char, and a Suggestion respecting the Synonymy of it. — While I resided in the county of Cumberland, forty or more years ago, I learned that in that county was to be found a fish called char, which was to be met with in very few places elsewhere; I was, consequently, very desirous of meeting, and becoming acquainted, with it. My wishes were, at length, gratified. A gentleman, an expert angler, who frequently angled for char in its season of spawning (perhaps the only time when it is to be taken by a bait), apprised me of the time of his going for that purpose. Having arrived at Ennerdale Lake, he soon caught some in the river that runs into it. Upon seeing them, and observing that they were extremely different in point of colour, I immediately exclaimed that the fishes which he had produced were of two different kinds; upon which he replied, that the fishes which he had produced were what were called char. I proceeded to examine and describe them, committing my observations to writing. As, however, my manuscript has been mislaid, it must be observed that I now speak from recollection of what took place forty or more years ago, and from seeing my manuscript six or seven years ago. I was rather surprised to find the rays of the branchiostegous membrane on one side exceed by one their number on the other side

(Pennant), an anomaly that had not occurred in any one species of the fishes which I had previously examined. After having carefully noted down the number of rays in the pectoral, ventral, anal, caudal, and dorsal fins, and the sex, I then proceeded to examine another of the fishes, which was of very different colours from that which I had examined; and was very much astonished to find the same irregularity in the number of rays of the branchiostegous membrane, and in every instance the same number of rays in the respective fins, but the sex different. I at that time was, and ever since have been, decidedly of opinion, that one of those fishes, which undoubtedly was the *Sálmo Salvelìnus* of Bloch, is the male of the same species of which the *S. alpìnus*, the other of them, is the female. The only author whom I have seen, who seems to have the least suspicion that these fishes are of the same species, is Bloch; and he supposes the difference of colour to arise from the difference of the water, or from the greater or less degree in which the waters from which the two fishes respectively come are shaded by trees. I cannot, however, conclude otherwise, than that the difference of colour will be found to be a distinctive sexual mark. Both were caught in the same hour, and in the same stream; both spawners and milters seemed equally ready, the former to shed their roe, the latter their milt; both came out of the same lake, consequently must have had the same shade, or rather the same want of it; for, as well as I can now recollect, there were no trees near the lake. Some of the females had a very slight tinge of orange on a part of the belly, but many were quite free from the least of that colour. The bellies of the males were universally of a very deep orange. — *Francis Mascall.* [*Received, Oct.* 21. 1833.]

[Any remarks in relevance of Mr. Mascall's suggestion, from any reader versed in ichthyology, will be valued. A contribution towards the history of the habits of the char has been communicated by O., in V. 316, 317.]

The Salmónidæ of Scotland. — Sir Wm. Jardine, and some friends of his, made, in June, 1834, an excursion to the north-west of Sutherlandshire, mainly for the purpose of investigating the fishes inhabiting the lakes and rivers. He has communicated "Observations upon the Salmónidæ met with," to Jameson's *Philosophical Journal*, and these are published in the number for Jan. 1835. They are of much interest. It is proposed that there are four migratory species: the common salmon, the sea trout, the herling, and the grey; and of species not migratory, the common trout, with five principal varieties of it, some of which may, it is re-

marked, be species; the *S*álmo fèrox *Jardine and Selby;* the *S*álmo Sálmulus *Ray*, or par; and the char (*S.* alpinus). Facts on the habits and characteristics of all these are supplied. Sir W. Jardine has not any "hesitation in considering the parr not only distinct, but one of the best and most constantly marked species we have."

It delights us to have to place after this brief notice testimony to just the same amount, given incidentally in the following notice on the eel, by the practical naturalist, our valued correspondent, "W. L. of Selkirkshire." W. L.'s communication is without date; we received it on Feb. 11. 1835; and although the views of Sir W. Jardine had been published previously, we dare answer for W. L.'s not having seen them, as he makes no mention of them.

Observations on the Eel (*Anguílla Muræ`na*). (V. 313. 744.; VII. 283. 538. 601.) — The varieties, and more especially the young, of the salmon, namely, of *S*álmo *S*àlar, have been a subject of dispute for the last forty years at least; and this, not only among scientific naturalists, but among the anglers, those who delight in the voice of the living stream for its own sake, as well as on account of all that are therein; and even among those who make their "bread upon the waters." This controversy, from Sir Humphry Davy to the Ettrick Shepherd (both equally good anglers, and both almost equally ignorant of fish), has never failed to draw in, or end with, the par [VII. 204. 521.], *S*álmo maculàtus vel mínimus*; and sometimes the antagonists have transferred the contest to eels.

I have lived at different periods, and for many years, on the banks of the Tweed; and, since a bare-necked runagate at school, killing them in dozens with a table-fork purloined from the kitchen for a tiny spear, I have been convinced that they were the most numerous genus in the river, always excepting the minnows (*Cýprinus Phóxinus*); yet, for the greater part of these years, whence they came, or whither they went, was almost, if not altogether, a mystery, like the winter abode of the swallow before the time of Pennant and White. I had, indeed, heard stories of swarms of young eels having

* It is now nearly ascertained that this fish spawns in brackish water. I have taken a dozen, caught with the rod, and opened them, and found roes in about five out of the twelve. The *roe-bed* in the month of July is about 1¼ in. long, and nearly as thick as a crowquill. The roes are easily distinguished by young people without the aid of a glass. I have repeated this examination several times. Surely it is full time that this most interesting and beautiful [species] of the genus should have a *learned* name. Might it not be called *S.* mínimus? Maculàtus, although sufficiently descriptive, would not be quite pretty enough for such a pretty fish. — [*W. L.*]

been observed entering the Esk, at Musselburgh, but these we never saw in the Tweed. In this river, although it is probably better stocked with trouts than any other river in Scotland, yet, as I have already said, I am convinced the eels are still more numerous: but the latter are not good, having far more of the peculiar *fishy*, or, rather *eely* taste than those got at Linlithgow, or in the Leven, as they descend from the loch of that name, the only eel fisheries in Scotland.

I have now ascertained that swarms of young eels (that is, the fry of the eel) regularly enter the mouths of most of the rivers in the north: several fishers have informed me that they do so in the Ness, the Beauly, and the Conon. In the latter river, they begin to run up about the 20th of May; a few days sooner or later according to the season, or, mayhap, some other circumstances; and their appearance is always the forerunner of the ascent of the grilses. The time at which the eels descend the river in autumn (which, no doubt, they regularly do) does not seem to have been observed.*

When they enter the river, it is in a slender column of about 1½ ft. or 2 ft. wide, along the very edge of the stream; and so close together that a yard in length will contain many hundreds of them. After that they seem to separate, probably as they get stronger, or more accustomed to the fresh water. It is not a little curious that they do not appear to be preyed upon by the gulls, or any other piscivorous bird. The column has neither forerunners nor stragglers, and passes usually in the course of three days. The eels are of about the thickness of a crowquill, and the column of them has been traced unbroken, from the tideway, for about four miles up the river, to the junction of the Raasay, or Blackwater, which joins the Conon from the north-west.

A salmon-fisher, in whose veracity I have full confidence, has informed me that he was induced to try if they were easily stopped in their march. For this purpose he took a broad and thin stone, and set it on edge at right angles to their course, and for a short time they accumulated in myriads on the lee side of it. Their ascent up the Ness and the Beauly is equally well known; and another salmon-fisher, of much experience, and possessed of equal observation and

* I have, since a boy, known that the eels descend the river Yarrow in the end of September; and I concluded their destination was the sea. And in the first edition of the *Encyclopædia Britannica*, article "Yarrow," it is said that in the end of September, such numbers of eels descend the river from St. Mary's Loch, that people fording the river have been overturned by them. I know this to be a monstrous exaggeration; and the wonder is, how such an incredible story got there.

shrewdness, has told me that he has seen them *creeping* up the wet posts of the sluices of the saw mills, at the celebrated falls of Kilmorack, on the latter river, to the height of ten feet. I can corroborate this curious fact so far, as follows: — About the latter end of May, 1834, I had occasion to be on the river Ewe, which has been rendered celebrated by Sir Humphry Davy in his *Salmonia*. The river has only a run of about two miles from Loch Maree, is full of large stones, and very rapid, and the banks are bounded likewise by large stones, and rocks of small height jutting here and there into the stream; but there are no perpendicular falls, except one of a few feet, where the river plunges into a narrow pool at low tides like the lock of a canal. All along the margin of the river, among the crevices of the rocks and large stones, I was delighted to find (for it was the first time I had ever had ocular proof of the fact) myriads of young eels attempting to make their way upwards. These tiny *Muræ`næ* seemed to find this a journey of much difficulty: they were evidently quite incapable of facing the current*, and had taken shelter on the lee side of the rocks, and were often in conglomerated masses; and in several instances had wrought and twisted themselves into round balls of from 3 in. to 4 in. in diameter, with their heads outwards, forming a most curious but unsightly spectacle. These looked as if they had, in the meantime, given up as hopeless the prospect of all progress upwards; but I found a few actually crawling in a serpentlike manner up the wet perpendicular sides of the crevices, which showed that they possessed evidently the power of doing this. After this we may wonder the less that eels are found wherever there are streams, or pools of water and mud, or aquatic plants, to cover them. [VII. 601.] I have heard it averred that they have often been met with early in the summer mornings, many yards from water, *serpentising* amongst the wet grass in search of earthworms, &c. It is requested that correspondents will be so kind as to communicate whatever information they may have acquired on this curious and interesting subject.

[*Lampreys.*] — I have been informed by many old people that lampreys were formerly plentiful in their spawning season in the Tweed, and in its tributaries, the Teviot, Ettrick,

* A gentleman has informed me that he has repeatedly stopped the progress of the column of eels which annually ascends the Conon, and that they have immediately descended to the bottom, and taken shelter among the gravel and small stones; but that they, after lying in this way for about two minutes, have begun to ascend to the surface, and, when the obstruction has been removed, to proceed on their way.

and Yarrow, particularly in the two former. They formed deep holes in the gravel, always in the middle of the river, and in the currents between the pools, to which they conveyed stones of a large size in their mouths; but for what purpose I never could learn. They were hated, and somewhat dreaded, by the country people, who, like cats by the shrew (*Sorex aráneus*), killed, but never ate them. They were extremely irascible when their place of spawning was approached. The late well-known Tom Purdie, forester and gamekeeper at Abbotsford, told me that he had speared many of them in his younger days; and that he never killed one but that it brought out a stone in its mouth, sometimes of the size of 8 lb. or 10 lb. weight; and that they, immediately on feeling themselves wounded, seized on the largest stone within their reach. They are now rarely to be met with in the Tweed; but I understand that they are still plentiful in the Annan and the Nith, and their larger tributaries. — *W. L. Selkirkshire.*

[Valuable original information on the sexual condition, mode of spawning, &c., of the lamprey and lampern, are given in V. 679—681., by our correspondents T. G. of Clitheroe, and S. T. P. T. G. has noted, in V. 290., the aversion to eat of lampreys which is extant in Lancashire; and W. L. has noticed, above, the existence of the same feeling among those who reside contiguous to the Tweed. In the *Worcester Herald*, of Feb. 7. 1835, there is a singular proof that the same feeling is not universal, in the fact of an advertisement, part of which we quote: — "*Lampreys.* Maria Coates, successor to Mary Heath, whose receipts have been so universally approved of for potting and stewing lamperns and lampreys in their respective seasons, begs to return thanks to her friends for favours already bestowed, and to inform them that she has at this time an excellent supply of lampreys potted and stewed, for which she will be happy to receive their commands," &c.]

Art. IX. *Retrospective Criticism.*

Audubon's Plates of the Birds of America. [p. 184.]—Your correspondent, who signs himself B. [p. 190.], refers your readers to a review of *Audubon's Plates*, by W. Swainson, Esq., F.R.S., which appeared in the *Magazine of Natural History* for May, 1828. [I. 43—52.]

Mr. Swainson says in that review, "I have heard that Mr. Audubon resided twenty-five years in the woods of America, devoted to this one pursuit. Without any other testimony than the

plates before me, I can well believe the fact. He must have lived with a note-book in his pocket and a pencil in his hand. Nothing short of such a period, and of such enthusiasm, could have achieved what he has done." [I. 50.] Now hear Audubon himself, in the introductory address of his *Biography of Birds*, 1831:—"For a period of nearly twenty years, my life was a succession of vicissitudes. I tried various branches of commerce, but they all proved unprofitable, doubtless because my whole mind was ever filled with my passion for rambling and admiring those objects of nature, from which alone I received the purest gratification." So much for a residence of twenty-five years in the woods of America.

Now, let us see by Mr. Audubon's own avowal, how much time it required to complete the four hundred designs, containing nearly two thousand figures. See Cuvier's report to the Royal Academy of Sciences, Paris, to be found at the end of the *Biography of Birds*. "An accident," says Audubon in the Introductory Address, "happened to two hundred of my original drawings. A pair of Norway rats had taken possession of the whole, and had reared a young family amongst the gnawed bits of paper, which but a few months before represented nearly a thousand inhabitants of the air." Mr. Audubon, in the space of *three* years, replaced this loss with drawings better executed. "I felt pleased," he assures us, "that I might now make much better drawings than before, and ere a period not exceeding three years had elapsed, I had filled my portfolio again." Here then we have a distinct avowal that Mr. Audubon finished nearly one thousand of his birds in the space of three years.

His whole work is only to contain two thousand.

Swainson's review came out in the year 1828, and Audubon's *Biography of Birds* appeared in 1831. Surely, then, there was time enough in the interval for Audubon to have pointed out to Swainson how egregiously he had miscalculated the time necessary to complete the drawings. In lieu, however, of taking such a necessary step, we find Audubon, in his Introductory Address, referring his readers to Swainson's unfortunate review. He says, "as one of the first ornithologists of the age, who kindly reviewed a few numbers of the plates, has spoken upon this subject in a manner which I cannot here use, I refer you to his observations. The name of Swainson is doubtless known to you." But lest the reader should not have been sufficiently incited by Audubon to peruse this review [I. 43—52] by Swainson in 1828, your correspondent B., in 1835, refers [VIII. 184.] your readers to it. I, for one, have perused it, and I do not

hesitate to pronounce either Swainson's estimation of *twenty-five years*, or Audubon's statement of *three years*, totally unworthy of credence.—*Charles Waterton. Walton Hall, March 9. 1835.*

REVIEWS.

ART. I. *Titles of Works on Subjects of Natural History, published recently.*

SWAINSON, William, F.R.S., &c.: A Preliminary Discourse on the Study of Natural History; being No. 59. of Dr. Lardner's "Cabinet Cyclopædia." London, 1834. 6*s*.

Mr. Swainson's "Discourse" is the most lucid, complete, and masterly introduction to natural history that has hitherto been published in any language. The author was, before the appearance of this volume, deservedly regarded as the greatest zoologist Britain has produced; he may now fairly claim to be placed on an equality with the most esteemed of any age or any country. The plan of the work is simple, the arrangement of the subject excellent, and the phraseology vigorous and flowing. The volume before us is the first of a series from the perusal of which we anticipate much pleasure as well as instruction; and we most cordially recommend the series to such of our readers as desire to obtain a general knowledge of zoology. It is with great pleasure that we see the great masters in science thus devoting their talents to the task of instruction, instead of the more selfish occupation of hoarding up stores of knowledge available only to themselves. — *E.*

Mr. Swainson has presented, in the work commended by E., some notice of some of the institutions extant in Britain, whose office is the promotion of natural history. The British Museum, and the Ashmolean Museum at Oxford, are two of those which he has noticed. On these two we possess the following notices by the late Rev. Lansdown Guilding, our publication of which, in this place, may supply those who may peruse Mr. Swainson's work, at E.'s instance, with the views of two writers, at once, on the same subjects. Mr. Guilding's views mainly agree with Mr. Swainson's, and supply additional information.

The British Museum. [Mr. Guilding had made his remarks in relation to those offered in I. 181.] — However strong may be the correct and honourable feelings of Englishmen generally, as to the scientific institutions of their country, we never

can expect our national museum to equal, much less to excel, those of other nations, till a more liberal and rational policy is pursued by the trustees of the museum. Over every branch of natural history there should be some one placed, learned, zealous, and respected; not one who has to commence the rudiments of science (however respectable he may be in other respects), but a man already celebrated for his acquirements, and well able to make known to his countrymen the treasures placed under his care, as well as to arrange them for public instruction. It is a lamentable fact that, for many years, while large sums were expended on the national collection, the zoological part with little exception was all confusion. The labours of Dr. Leach, valuable and constant as they were, could not effect that which would require the undivided attention of many able men; and the museum was, in consequence, an object of just ridicule to every foreigner who visited the capital. Something has lately been done, by the very proper appointment of Mr. Gray and others, to remove the stigma, but there is even yet little prospect of our equalling our Parisian neighbours. Without calling in the aid of foreign naturalists, how many able men are there in England who would accept offices in the institution, did the trustees apply for proper funds for their support, and make the situations not matters of favour, but objects of contest among the learned!

There can be no doubt the time is near at hand when the present crowded building will be totally insufficient for the display of the treasures of the museum, if it be not so at the present moment. How desirable would it be to give up the whole of the present building for works of art, and to erect a museum more worthy of the nation, in the Regent's Park, which might be solely devoted to natural history, and the library of works directly illustrating the study of this branch of science. — *Lansdown Guilding. St. Vincent, May* 1. 1830.

The Ashmolean Museum, Oxford. (I. 16.) — I can speak from examination of the scandalous and defective state of the Ashmolean Museum in Oxford, so late as 1817. This collection, one of the first which had been formed in England, and which the university should have prized as one of its greatest ornaments and most valuable possessions, seems for many years to have been perfectly neglected; while admission fees were demanded by an illiterate keeper, for the purpose, one would suppose, of deterring the curious traveller and the scientific student from entering this Augean stable. The office of curator, too, at that period was conferred on persons totally ignorant of every branch of natural history; and while every thing was going to decay, the more valuable specimens

(once said to exist in the collection), with the exception of the dodo's head, had been stolen by those who knew their value, and seized some of the many opportunities allowed them of removing them from the trash with which they were surrounded.

Often in this distant land do I call to mind, with disgust, the deplorable state of an institution which the university was bound to support with the utmost liberality. Still do I fancy before me the zebra's skin stuffed by some blacksmith, and placed as an ornament to the entrance; the half a score of ludicrous paintings which defaced the staircase; the dresses of South Sea Islanders in English masks, and without a feather remaining; the pretended skull of Cromwell which had been oftentimes broken by the mischievous undergraduates, and as often replaced as genuine as ever; some paltry fragments of Roman pottery; the dust of a mummy totally decayed; a few skulls of Mammàlia, from which the teeth had been taken for the turning-lathe; fifty or sixty insects reduced to powder by the *Acari*, or without a limb on their bodies; and the room full of works and papers on astrology, worthy only of the flames! After the fate which had befallen the original museum of Ashmole, what man in his senses would have bequeathed his collections to such an institution, or even have presented his useless duplicates? During a residence of several years, the only addition I remember was that made by my friend Sir Christopher Pegge, who presented to the university a valuable series of minerals. With the exception of the mineralogical collections under the charge of the justly celebrated Professor of Geology, and which had been greatly augmented by his daily exertions, *all* was confusion, and dust, and filth.

It is some satisfaction to hear that the present active curator, Mr. Duncan, has undertaken the herculean task of cleansing this receptacle of remains, and is diligently employed in adding to the collections, and arranging the subjects so as to assist the researches of the student. If the university would make some amends for their long neglect of the institution, they would erect a larger and more commodious building, and appoint some learned zoologist to deliver lectures on a study daily becoming more delightful and interesting. In the Radcliffe Library the university already possesses one of the very finest libraries of natural history in Europe; which (as I am bound to testify) is thrown open at all times to the zealous student, by its amiable and excellent curator, the Regius Professor of Botany. — [*Lansdown Guilding. St. Vincent, May* 1. 1830.]

The Robin Redbreast.—Mr. Swainson has taught that this bird is eminently frugivorous. "Country gentlemen," Mr. Swainson says, "complain of their fruit being devoured by birds, and orders are given for an indiscriminate destruction of birds' nests. The sparrows, more especially, are persecuted without mercy, as being the chief aggressors; while the robin redbreast, conceived to be the most innocent inhabitant of the garden, is fostered and protected. Now, a little acquaintance with the natural history of these two birds would set their characters in opposite lights. The sparrows, more especially in country situations, very rarely frequent the garden: because, grain being their chief food, they search for it round the farmyard, the rick, and the stable; they resort to such situations accordingly. The robins, on the other hand, are the great devourers of all the small fruits; they come from the nest just before the currants and gooseberries are ripe, and they immediately spread themselves over the adjacent gardens, which they do not quit so long as there is anything to pillage. It may appear strange, as it certainly is, that no writer on our native birds should have been aware of these facts; but it is only a proof how little those persons — who are, nevertheless, interested in knowing such things — attend to the habits and economy of beings continually before their eyes. In like manner, we protect blackbirds for their song, that they may rob us of our wall and standard fruits with impunity." (*Mr. Swainson's Discourse*, p. 144, 145.)

Alas! poor Cock Robin! What shall I say in thy behalf, against an authority reputed so impressive? Yet injustice has surely been done thee, and thy case should be counter-pleaded. — In the Isle of Ely, and that part of Cambridgeshire which intervenes the town of Cambridge and the Isle of Ely, fruit-gardens are numerous; the acres that they in their aggregate occupy, and the fruit that is produced in them, are points well worth the attention of students of statistics and of commercial economy. In these gardens robins abound, and so well regarded are they by the proprietors of the gardens, and by the fruit gatherers, that the robins are, in some of the gardens at least, on the happiest terms of confidence and familiarity with the former parties, the young speckle-breasted robins especially. It is not a very rare sight, to see one of the latter sitting on the rim of the very basket which the currant gatherer is holding; and a frequent sight, to see one or more perched upon the edges of baskets which may be standing round about; not, reader, to partake of the ripe currants — no — but to dart down in an instant on the insects which the currant gatherer's disturbing of the branches and leaves of the

currant bush may dislodge. I had witnessed these things when a boy, and myself one of the currant gatherers; but now, however, fearing that I might have then observed imperfectly, I have asked of one still familiar with them. I append his reply.—*J. D.*

The robin and hedge-sparrow build their nests the earliest of any birds that I am acquainted with; they both live on insects. A pair of robins had built their nest, a week ago last Sunday, on John Oslar's premises; I have no doubt that the female has laid eggs, and now sits on them: if she is fortunate in hatching, her brood will be fledged rather too early for ripe fruit. It is true that I have seen a young robin pick a currant (perhaps when in a starving state, and deserted by its parent); but I have never yet seen an old one, or one with a red breast, eat fruit of any kind. When the ground is locked up by severe frost, he will boldly venture into the abode of man for food and protection, when hunger will induce him to make a meal of bread-crumbs. When in the garden stirring the ground, Robin is sure to be there [more especially in frosty weather]. If a load of dung is thrown down, you find Bob ready to examine it, to see if there is any thing that fits his appetite. Bob is a favourite of mine, and of all (I think I may say of all) working gardeners.—*J. D., sen. Waterbeach, near Cambridge, Feb. 25.* 1835.

The Robin (*Redbreast*) *and the Wren.*—"Were it not for these despised creatures [insects], the redbreast and the wren would desert us." (*Kirby and Spence, Introd. to Entomology*, 4th edition, i. 288.)

The Common Sparrow, though proscribed as a most mischievous bird, destroys a vast number of insects. Bradley has calculated that a single pair having young to maintain will destroy 3360 caterpillars in a week. They also prey upon butterflies and other winged insects. (*Ibid.*, 288.)

The Blackbird, though he will have his share of our gooseberries and currants, assists greatly in clearing our gardens of caterpillars. (*Ib.*, 287, 288.) See, in this Magazine, VII. 243., and note*, notices of the effective agency of the thrush family, which includes the blackbird, in destroying snails.

Houston, John, M.D. M.R.I.A. Curator of the Museum of the Royal College of Surgeons, &c.:—Descriptive Catalogue of the Preparations in the Museum of the Royal College of Surgeons in Ireland: Vol. I. Anatomy. 8vo, 250 pages. Hodges and Smith, Dublin, 1834.

We are glad to observe that the practice of printing catalogues describing the contents of museums is increasing, as

calculated to be of service to those who are situated beyond the reach of personal observation.

This volume contains a description of the preparations, illustrating the structure of animal bodies in their normal state: the second part of the catalogue, which is intended to follow, will refer to the same structures when altered by disease. The preparations are arranged in eight classes of organs of different functions; these again being divided into orders. A particular mode of notation being adopted both as to labels and catalogue, the student or visiter can with ease find and refer to both the preparations and their descriptions, in any class or order of subjects which he may desire to consult.

We remember to have seen a catalogue of the contents of the museum at Guy's Hospital, with many valuable physiological remarks by Dr. Hodgkin; and the College of Surgeons in London have lately published two parts of a descriptive and illustrated catalogue of the physiological series of comparative anatomy, by which justice will be done to the merits and memory of John Hunter, although in 1835. — *S.*

A Veterinary Surgeon: A Concise Account of Veterinary Surgery, its Schools and Practitioners; for the benefit of proprietors of domesticated animals. 8vo, 24 pages, small type. Glasgow, 1834. 1*s.*

We trust that the following paragraph (it is the last in the author's book) will bespeak more for the author than any assumed opinion of ours would: — "Those who tolerate the quack do not know him. Those who know him, but think him too low for exposure, are little aware of his influence; or they think too much of themselves, and too little of others. They surely cannot have beheld with indifference multitudes of sensitive beings silently, yet mournfully, writhing under his cold-blooded ferocity, and ultimately sacrificed to his ignorance. They have not seen the poor man and his family deprived of their little all, of their only means of subsistence, while, from the defective state of our laws, the shameless ruffian escapes with impunity." The notices on the scope of the English veterinary schools, their several advantages and defects, are written from a practical intimacy with them.

Beale, Thomas, Surgeon, Demonstrator of Anatomy to the Eclectic Society of London, Assistant Surgeon to St. John's British Hospital, and Medical Assistant to the

Royal Humane Society: A Few Observations on the Natural History of the Sperm Whale, with an Account of the Rise and Progress of the Fishery, and of the Modes of pursuing, killing, and "cutting in" that Animal, with a List of its favourite Places of Resort. 8vo, 58 pages, and 4 woodcuts. London, Effingham Wilson, 1835.

The author had been occupied, at a time shortly previous, "upwards of two years in the South Sea whale-fishery;" and, in the course of the voyage, amused himself by noting in a log book, "daily, the most interesting objects presented to" his "notice." He did this, not in the thought of publishing the result of his notes, but, "on returning to England," and finding that "little" was "generally known of the natural history of almost the largest inhabitant of our planet, the great sperm whale," he has acted on the advice of friends, in throwing together the whole of his observations on the natural history of it, with a view to publication. "In following this suggestion, I hold myself responsible for every fact stated, except where I give my authority; so that, though the quantity of information is much more limited than the importance of the subject demands, still, so far as it goes, it may be depended on. The style of the author's account participates the popular and the zoological. The cuts exhibit attitudes of the whale.

Waterton, Charles, author of "Wanderings in South America:" Second Letter to Robert Jameson Esq., Regius Professor of Natural History in the University of Edinburgh. 8vo, 15 pages. Wakefield, Nichols, March, 1835.

The passenger pigeon, the vulture's power of smelling, and a certain hurricane, are the chief of the subjects. The first has been treated of in VII. 281—283.; the second in V. 233—241.; VI. 83—88., 163—171.; VII. 165—169., 276—278.

Yarrell, William, F.L.S.: A History of British Fishes, illustrated by Woodcuts of all the Species and numerous Vignettes. Part I. London, John Van Voorst, 3. Paternoster Row, 1835. To be completed in 14 monthly Parts.

Some twenty or more years ago, as we recollect, there were frequent vague reports afloat, that the incomparable author of *A General History of Quadrupeds and of British Birds*, Thomas Bewick, had it in contemplation to give to the world also a history of fishes. These reports, it should now seem, were not wholly without foundation. But whether this great artist ever seriously entertained the idea of completing such a task,

we know not. Certain it is, the work on fishes has never appeared, and Bewick has now been dead between six and seven years. We rejoice to find, however, that his spirit (so to speak) has revived again in the person of Mr. Yarrell, who has commenced a history of British fishes in a style and mode of illustration in all points to correspond with those of the works of his great northern prototype. No man, we believe, is better qualified, by long experience, intimate knowledge of his subject, and deep and accurate research, for such an undertaking than Mr. Yarrell, aided, moreover, as he candidly acknowledges himself to have been, by valuable assistance from various other quarters. The first number only of the work is yet published. The woodcuts (the artist's name does not appear) are excellent, and the letterpress and natural history of the book far superior to the corresponding portions of the volumes of Bewick. We observe in the present part but one only of those purely fanciful vignettes, or tailpieces, which so charm us in turning over the pages of our old favourite; but that one is admirable — the juvenile anglers. It were to be wished that these little, piquant, *second-course* delicacies had been scattered with a rather more lavish hand. We hope also that, as the work proceeds, Mr. Yarrell will enter somewhat at large, as occasion offers, upon the *growth and management of freshwater fishes*, a subject which presents some curious facts not readily to be explained, and one which is sadly neglected by those who have the opportunity, and whose interest it is, to institute enquiries into it. It should seem almost that our knowledge on these points has rather retrograded than advanced in the present day. But we must forbear. When we say (as we can conscientiously) that the *History of British Fishes* is worthy to occupy a place on the same shelf and in juxtaposition with the *History of Quadrupeds and of British Birds*, we think we have assigned to it no ordinary share of praise, and said more than enough to recommend it to our readers. In a word, *Yarrell's Fishes* must be added to the library of every British naturalist. — *B. March* 7. 1835.

Children, J. G., Sec. R. S., &c.: An Address delivered at the Anniversary of the Entomological Society, January 26. 1835, by J. G. Children, President. Printed at the request of some of the Members. 8vo, 7 pages.

" . . . . . This society is too firmly rooted in public opinion, the earnest of the good which it has already given is too obvious," to leave to its supporters any ground of apprehension of its declining. The addresser expressed high gra-

tification in his "conviction that . . . . . this society will not only prove a centre round which the entomologists of this country will rally, but also be the means of facilitating a cordial intercourse with our brethren in every quarter of the world. The advantages to be expected from such an intercourse cannot but prove most important to the best interests of the science; the promotion of which, by every means in their power ought to be, and, I am confident, will be, the great object of the members of the . . . . society, especially of those who, in the full enjoyment of youth, health, and talent, are best qualified to effect it."

Newman, Edward, F.L.S.: The Grammar of Entomology. Foolscap 8vo, 304 pages, 4 plates, 2 of them coloured. London, 1835. 8*s.* 6*d.*

Extracts from the Preface. — "The want of an easy introductory work on insects has been obvious to many. For the last two years, during which time it has been generally known that he has contemplated the task, the author has received numerous and pressing solicitations to proceed with it. He has at last made the attempt: he has done his best. . . . . He supposes his reader utterly ignorant of entomology, and endeavours to show him that it is the History of Insects [book i.], and the Physiology of Insects [book ii.], and the Classification of Insects [book iii.], and the Art of preserving Insects [book iv.];" and to explain to his reader each of these. . . . . "The third book, entitled Classification of Insects, may be charged with being too original. It may be said that the author should have given the views and arrangements of others, in preference to his own. He would ask, whose system was he to select? That his own is the most simple, and the most readily understood, no one will deny: that it is more perfect, or more accurate, or more philosophical, than any other, he does not presume to contend."

The author is distinguished for the intimacy and extent of his knowledge of entomology. This is a ground for an assurance of the excellency of the matter contained in the present work; and this matter he has presented so agreeably, and so explicitly, that not any one who is anxious for a knowledge of the science can use this *Grammar* of it without finding it a powerful means of furthering the object in request. The work will, we feel impressed, very much promote the already increasing popularity of entomology. This result would be to the author, who is enthusiastic in diffusing and increasing the pleasures which a cultivation of the knowledge of entomology produces, his dearest meed.

Anon.: Botany, Parts I. and II., which include a Treatise on Structural Botany, by, it is understood, Dr. Lindley, Professor of Botany in the London University. Published by the Society for the Diffusion of Useful Knowledge, in the Numbers 179. and 181. of their Library of Useful Knowledge. 64 pages, 80 woodcuts.

Never previously has so much been done for the extension of botany to the enjoyment of the mass, as in the cheapness of the present treatise, and its excellence considered with its cheapness. Not any botanist should be without this treatise, and presents should be made of copies of it to those in whom it is desired to encourage the cultivation of botany. The author has purposed to treat of botany under the heads structural, physiological, descriptive, and systematic; the three last heads are to be the subjects of treatises yet to be published.

Partington's British Cyclopædia (noticed in VII. 382. 605.; VIII. 127.). — A few days ago my bookseller sent the February part of the *British Cyclopædia* (subscribed for by one of my children), and being unoccupied at the moment, I opened and read a few paragraphs. Judge of my astonishment, when I read on the 609th page (the first page of the part), that "fifty-three genera, and eight hundred and thirty-seven species" of ferns have been "already described." Sprengel, in his *Systema Vegetabilium*, describes 66 genera, and above 1400 species! The order *Equisetàceæ* is said to contain ten species of *Equisètum*. Sprengel describes 18! Of the Lycopodíneæ, it is asserted that there are "two genera and nineteen species." Sprengel describes 140 species of Lycopòdium; and Drs. Hooker and Greville 190 (in the *Botanical Miscellany*). Of each of the genera of Marsíleàceæ there are, we are told, a single species. Sprengel has eight Marsíleæ; and there are two others in the *Icones Filicum*, by Hooker and Greville; there are also five *Azóllæ:* &c. &c. I had never opened this *Cyclopædia* before, and cannot speak as to its merits or demerits in other departments. — *A Botanist. Feb.* 6. 1835.

[We remember observing, under the treatise on the order *Acanthàceæ*, that the writer had spoken of the contents of the order as they existed some, we think we may say many, years ago; and had not hinted a word on the fact that Professor Nees von Esenbeck has elaborated a valuable monograph on a rich store of Indian species, which is published in Wallich's *Plantæ Rariores Asiaticæ*, vol. iii. 1832. The monograph occupies 48 folio pages.]

Anon.: Arcana of Science and Art; or, an Annual Register of Useful Inventions and Improvements, Discoveries and new Facts in Mechanics, Chemistry, Natural History, and Social Economy; abridged from the Transactions of Public Societies, and from other Scientific Journals, British and Foreign, of the past Year; with several Engravings. Eighth Year. 12mo, 316 pages. 1835. 5*s.*

Of its 316 pages, 112 are accompanied with scraps on subjects of natural history. By our use of the word "scraps," in this case, we do not mean that there are not, among the matters selected, notices of some length and significance; but we mean that the individuals of the collection are given without a declared estimate of each, and without a notice of the measure of its relation to the interests of science. They are dislocated limbs, unanimated by a pervading spirit.

ART. II. *Literary Notices.*

A MANUAL on the Vertebrated Animals of Britain, by the Rev. L. Jenyns, M.A. F.L.S. — This work is announced in VI. 442. as in preparation for publication. The printing of it has been commenced. It is the author's intention to precede the publication of the *Manual* by a catalogue of the names only of the species to be afterwards described.

Illustrations of British Birds indigenous and visitant, by Mr. Fowler. — Coloured representations of British birds are about to be produced in parts, each intended to include a family. The first part will be devoted to the Sylviadæ (warblers).

Illustrations of British Birds frequenting Worcestershire and the adjacent counties, engraved from the original drawings by R. Havell; with observations on the habits of the birds by C. L. E. Perrott. To be published in two-monthly parts, size elephant folio, and completed in two volumes. Each part to contain five plates and five pages of letterpress: price 14*s.* plain, 21*s.* coloured.

Illustrations of the Geology of Yorkshire, by Professor Phillips.—The professor is preparing for publication a new edition of the first volume; and also the first edition of the second volume, which is to contain numerous maps, sections, and plates of organic remains. (*Phil. Mag.*, March.) Among the figures of organic remains, will doubtless be included those of the crinoideal animals discovered by Mr. Gilbertson, adverted to by him in our VII. 181.

THE MAGAZINE

OF

NATURAL HISTORY.

MAY, 1835.

ORIGINAL COMMUNICATIONS.

ART. I. *Notes of a Natural History Tour in Norway.* By EDWARD FORBES, Esq. [Continued from p. 67.]

IT was with regret we sailed away from Arandal, and left its sunny isles and shady forests; but our sorrow soon vanished in the delights of the picturesque though short voyage to Christiansand, where we landed to spend the night and next day on shore in the town, which, being built on a level sandy plain, is very regular, more so than any town in Norway. The following day was spent in the neighbourhood, naturalising, in company with M. Blytt, botanical lecturer to the University of Christiania; who, to our great joy, was a fellow-passenger, and bound to Stavanger on a botanical excursion. We found *Sèdum ánglicum* in abundance, also Teesdàl*ia* nudicaúlis, and the violet termed by some Continental botanists *V*iola lancifòlia, approaching in its characters our *V.* láctea. In a wood we obtained an A'juga, perhaps alpìna, Convallària verticillàta, Digitàlis purpùrea, and Pýrola mèdia, the last an addition to the flora of Christianstoft. The golden blossoms of the A'rnica montàna rejoiced us for the first time; and Lobèl*ia* Dortmánn*a* grew with Lycopòdium inundàtum on the margin of a lake; whilst, on the sea shore, occurred *Scírpus* marítimus, *Júncus* bóttnicus, and *Glaúx* marítima. Great numbers of Póntia cratæ`gi were flying about, and coleopterous insects were very abundant.

The structure of the country is various. Christiansand is built, as its name implies, on a bed of sand; the rocks around are gneiss and syenite. In one place we came to a limekiln, where they were burning a white granular limestone: it may be the same with the transition bed at Christiania, though I have never heard of such a formation occurring in this neigh-

bourhood. The men of the kiln told us it was found about two miles (fourteen English) from Christiansand.

We left Christiansand early in the morning of June 21st. Our course lay, as before, amongst the islands, and the passage was exceedingly narrow in many places, often with a street of houses on each side of us. Mandal was the first town we stopped at, but we did not land. A discussion of a rather amusing nature took place here amongst several of the passengers, two of whom, besides ourselves, were English, as to the merits of Derwent Conway's (Mr. Inglis's) book, which, by the by, is every where abused in Norway as incorrect, and nowise to be relied upon. He says (if I remember rightly) that he landed at Mandal at low water, and was carried on shore over a sandy beach. Now, there is little or no tide on the south coast of Norway; and many Norwegians on board maintained there was no such thing as a sandy beach at Mandal, where they had often been. On turning round a small promontory the enigma was explained: there was a beach, which, though not at Mandal, was very near it, but had escaped the observation of our Norwegian friends.

We soon made the Naze; but I was greatly disappointed with the appearance of this famous headland. Instead of a high and precipitous cliff (as I had been led to expect from Mr. Inglis's description), frowning proudly over the waves of the Atlantic, the coast was lower than usual, and the rocks shelved towards the sea. In the mean time we busied ourselves arranging the treasures of the preceding day's excursion, occasionally banishing the melancholy thoughts which might distract us at the sight of so many fair flowers cut off in their bloom of beauty, by a glance at the still fairer living flowers, who peered curiously, with an arch smile and a questioning eye, into our plant-pressing occupation. Without joking, the ladies of Norway are exceeding pretty, and well worthy the attention of the naturalist.

We were now sailing northwards along the western coast of Norway; and the more they receded from the south, the higher and grander became the precipices. At Zisterland, however, a flat tract of sandy ground occurs, where M. Blytt informed me he had found *Eryngium maritimum*, *Viola lactea*, *Anagallis arvensis*, and other sand-inhabiting plants. On the rocks he pointed out *Euphorbia palustris* (a plant not found in Britain), and kept a keen look out for ivy, which, in the north, is esteemed as a precious desideratum. About five o'clock in the evening we arrived at Egersund, a small town situated at the end of a long fiord; and, as it is light enough there at that season to botanise all night if one chose, we

immediately set out on an excursion. We first ascended a hill, about 800 feet in height; but were disappointed in not finding so alpine a vegetation as might be expected. The more remarkable plants were *O*'robus sylváticus, A'rnica montàna, *H*ieràcium boreàle and maculàtum, Habenària álbida, and Pàris quadrifòlia. The general vegetation resembled that of Britain much more than at Christiansand and Arandal. From the summit of this elevation an extended prospect lay before us of barren and bare hills, like volcanic billows; on some of which lay snow even at this season, though they did not appear to be of any remarkable elevation.

We left Egersund early the next morning, and arrived at Stavanger at one: the country and botany were of a similar character, but rather more fertile. Stavanger is situated on a fiord studded with islands, and, with its old cathedral, presents a very picturesque aspect. The rocks around were chiefly gneiss; but on the north there appeared mica slate. On the summit of a small hill of the latter rock we found a great boulder of gneiss: unfortunately we had no rule or string to measure its exact dimensions; but, calculating by the height of a gentleman who stood by it, it must have exceeded 18 ft. in height, and was rather broader than high, though resting on a base of not more than 5 ft. or 6 ft. We left Stavanger the next morning: the hills became higher and higher as we proceeded northward, and the country was very bare. When about half way, we saw the great glaciers of Folgefurd at a distance of fifty miles, like an immense sheet of ice hanging in the air. About seven o'clock in the evening we beheld Bergen, enthroned amidst high and bare mountains, and gladly, amidst assembled crowds, with all the honours, landed in the largest city in Norway.

(*To be continued.*)

ART. II. *Notes on the Habits of the Kingfisher.* By CHARLES WATERTON, Esq.

> "Perque dies placidos hiberno tempore septem
> Incubat Halcyone pendentibus æquore nidis."
> OVID. *Met.* lib. xi.

WHEN the delicious season of spring sets in, I often get up into the topmost branches of a wide-spreading oak; and there, taking the *Metamorphoses* out of my pocket, I read the sorrows of poor Halcyone. A brook runs close by the tree, and on its bank I have fixed a stump for a resting-place to the

kingfisher. On it, this pretty bird will tarry for a while in passing up and down, and then plunge into the stream, and bring out a fish. My elevated station on the oak gives me a fine opportunity of admiring its back, as it darts along beneath me. When the sunbeam is upon it, no words can do justice to the beauty of the glowing azure which attracts the eye.

Modern ornithologists have thought fit to remove the kingfisher from the land birds, and assign it a place amongst the water fowl. To me the change appears a bad one; and I could wish to see it brought back again to the original situation in which our ancestors had placed it; for there seems to be nothing in its external formation which can warrant this arbitrary transposition. The plumage of the kingfisher is precisely that of the land bird, and, of course, some parts of the skin are bare of feathers; while the whole body is deprived of that thick coat of down so remarkable in those birds which are classed under the denomination of water-fowl. Its feet are not webbed; its breast-bone is formed like that of land birds; and its legs are ill calculated to enable it to walk into the water. Thus we see that it can neither swim with the duck, nor dive with the merganser, nor wade with the heron. Its act of immersion in the water is quite momentary, and bears no similarity to the immersion of those water fowl which can pursue their prey under the surface, and persevere for a certain length of time, till they lay hold of it. Still the mode of taking its food is similar to that of the gulls, which first see the fish, and then plunge into the deep to obtain it: but this bird differs from the gull in every other habit.

You observe the kingfisher sitting on a rock, or upon the branch of a tree, or hovering over the water; and the moment a fish is seen in the stream below, it drops down upon it like a falling stone. If it miss the mark, which is rarely the case, it comes up again immediately, without further exertion in the water, and then flies off, or occasionally regains its former station in order to make another plunge. As this process of immersion is of very short duration, the bird is enabled to escape with impunity from the deep, in which, or on which, were it to remain for a very little time, death would inevitably be its fate.

These undeniable circumstances have induced me to wish for the restoration of the kingfisher to its former situation amongst the land birds; for I feel reluctant to admit that the single act of procuring its food from the water should be thought a sufficient reason for removing it from its old associates, and placing it amongst strangers, with whom it can

neither dive nor swim, nor even float with any chance of safety. If the kingfisher is to be considered a water bird merely because it draws its sustenance from the water, then our modern innovators ought to consider the osprey in the same light: and even the barn owl might give them a hint that she feels inclined to seek a new acquaintance; for I myself have seen her plunge into the water, bring out a fish, and convey it to her nest. [V. 13.] Indeed, the swallow, with a still better grace, might ask permission to form a new division, distant both from land and water birds, and call it ethereal; because it procures the whole of its sustenance from insects in the circumambient air.

When I remarked above, that the feet of the kingfisher are not webbed, I did not wish it to be understood, that I consider the webbed foot essentially necessary to the act of swimming. The water-hen is an expert swimmer, without having the feet webbed: but then, its form and plumage, so different from the form and plumage of land birds, enable it to move with swiftness and with safety, either on the water, or under its surface. [Further remarks by Mr. Waterton, on the fitness of the structure of the water-hen for its action in the water, are given in VII. 73.]

There is not much difference in appearance betwixt the adult male and female kingfisher; and their young have the fine azure feathers on the back before they leave the nest. This early metallic brilliancy of plumage seems only to be found in birds of the pie tribe. It obtains in the magpie, the jay, and, most probably, in all the rollers. Wherever it is observed in the young birds, we may be certain that the adult male and female will be nearly alike in colour. We are in great ignorance, and I fear we shall long remain so, concerning colour in the plumage of birds. The adult male and female kingfisher have a very splendid display of fine tints: so have the adult male and female starling; but, though the young of the kingfisher have their bright colours in the first plumage, we find the first plumage of the young starlings pale and dull. I have had an eye to this circumstance for above thirty years, and still I am sorely in want of the schoolmaster.

The old story, that the kingfisher hovers over the water, in order to attract the fish by the brightness of its plumage, is an idle surmise. In the first place, fishes cannot see an object directly above them; and, secondly, if they could see it, there would be nothing brilliant for them to look at in the kingfisher, as all the splendid feathers are upon its upper parts.

A brook runs through this park, and along side of it grows

a small oak, part of the roots of which are bare; the earth and gravel having gradually left them, and fallen into the stream below. In the bank where these roots are seen, about six feet from the surface of the water, is a hole in which a pair of kingfishers have had their nest time out of mind. They have afforded me the best possible opportunities of examining their economy; and, from what I have seen, I am perfectly satisfied that this pair of birds, at least, live entirely upon fish: I have never been able to detect them feeding either upon snails, or worms, or insects. They bring up a fish from the water, crosswise in their bills, and then chuck it down their throats head foremost. I do not think that they ever eat a fish piecemeal: and these birds, with me, never utter their ordinary shrill piping succession of notes, except when they are on the wing.

I love to take my stand behind a large tree, and watch the kingfisher as he hovers over the water, and at last plunges into it, with a velocity like that of an arrow from a bow. How we are lost in astonishment when we reflect that instinct forces this little bird to seek its sustenance underneath the water; and that it can emerge from it in perfect safety; though it posseses none of the faculties (save that of plunging) which have been so liberally granted to most other birds which frequent the deep! I sometimes fancy that it is all over with it, when I see it plunge into a pond, which I know to be well stocked with ravenous pike: still it invariably returns uninjured, and prepares to take another dip.

There are people who imagine that the brilliancy of the plumage of birds has some connection with a tropical sun. Here, however, in our own native bird, we have an instance that the glowing sun of the tropics is not required to produce a splendid plumage. The hottest parts of Asia and of Africa do not present us with an azure more rich and lovely than that which adorns the back of this charming little bird; while throughout the whole of America, from Hudson's Bay to Tierra del Fuego, there has not been discovered a kingfisher with colours half so rich or beautiful. Asia, Africa, and America offer to the naturalist a vast abundance of different species of the kingfisher. Europe presents only one; but that one is like a gem of the finest lustre.

I feel sorry to add that our kingfisher is becoming scarcer every year in this part of Yorkshire. The proprietors of museums are always anxious to add it to their collections, and offer a tempting price for it. On the canals, too, it undergoes a continual persecution: not a waterman steers his boat along them, but who has his gun ready to procure the

kingfisher. If I may judge by the disappearance of the kite, the raven, and the buzzard from this part of the country, I should say that the day is at no great distance when the kingfisher will be seen no more in this neighbourhood, where once it was so plentiful and its appearance so grateful to every lover of animated nature. Where, in fine, its singular mode of procuring food, contrasted with its anatomy, causes astonishment in the beholder, and cannot fail to convince him that modern ornithologists were ignorant of the true nature of the kingfisher when they rashly removed it from its old associates, and assigned it a place amongst strangers, whose formation differs so widely from its own.

Walton Hall, Yorkshire, March 21. 1835.

ART. III. *Remarks on the Habits of the Canada Goose* (A*nser canadénsis* Willughby). By S. D. W.

IN this neighbourhood [near Derby] we are frequently visited by small flocks of the Canada goose (*Anser* canadénsis *Willughby*), which is a bird, I believe, of very local distribution. They always announce their approach by a loud noise (on the same principle, I suppose, as the guard of a coach sounds his horn on approaching a village), which is far from disagreeable when heard of a still evening, when nought save the cry of the meadow crake (*Créx* praténsis *Bechstein*) and the chatter of the sedge brakehopper (Salicària phragmìtis *Selby*) disturb the silence which reigns beneath the diamond-studded azure vault extended over this "terrestrial ball." This sound of the Canada geese is entirely free from the vulgar twang of the domesticated grey-leg goose (*Anser* palústris *Fleming*), and is always uttered loudest when they are on the wing, their long black necks being extended to their utmost length, horizontal with their bodies. After wheeling two or three times round the piece of water near the house, they alight and commence grazing. They are very ornamental objects stalking about the lawn, tossing their heads and making curious contortions with their long necks. It frequently happens that two remain when all the rest are flown. After reconnoitring the place for a few days, they usually fix on the corner of an island as their nesting-place. This favourite nook of theirs is not far from where a pair of gallinules (Gallínula chlóropus *Latham*) year after year rear their young; yet neither goose nor gallinule ever interfere with each other, but keep on very good terms; nevertheless the former does

not permit her sooty companion to make too close an approach. Well, after the female goose has fully made up her mind as to the locality of her nursery, she begins plucking feathers, straws, and other soft materials, until she has at last constructed a perfect *feather-bed.* Having laid her eggs, generally six, which is one less than the number which usually falls to the share of her neighbour the gallinule, she sits with most exemplary patience, and, notwithstanding the proximity of the water, which offers a great temptation, it is rare to find her off her nest. During the period of incubation the male is, through the greater part of the day, sailing "in measured time and slow" over the water, never approaching his mate very near, nor straying very far. On the approach of any intruder he displays great uneasiness, and his tranquillity does not return till the danger is over. Shortly after the goslings have extricated themselves from their brittle covering, they are conducted to the water by the female goose, when they are joined by the male, who brings up the rear. The little family remain together till the return of the flock, when all mix promiscuously, recruit themselves for a few days, and then depart.

In 1831, wishing to rear a pair of Canada geese, I crossed over to the island on May 11, and procured two of the five eggs on which the female had been sitting some weeks, and put them under a duck which had also been sitting some time. After two days they were hatched, and the duck was as completely deceived as ever pipit (*Anthus Bechstein*) or dunnoc (Accéntor *Cuvier*) were by the designing cucoo* (*Cùculus Willughby*). They were, as might be expected, much larger than ducklings, and their eyes were remarkably full. They throve wonderfully under the protection of their foster-mother, whom they were bidding fair soon to outstrip in size, when unluckily one of them was accidentally trod on. The surviving bird (which turned out to be a female) displayed great affection towards her tiny parent, following her about wherever

* I have omitted the k, in order that the written symbols may the more faithfully represent the sound made by the bird, who does not say cuc-koo, but cu-coo. Formerly this name was always, and sometimes is now, written cuckow. Neither the French, German, nor Latin names have the superfluous letter in the middle. Several other names of animals have become corrupted in like manner; such as redpole for redpoll, feldefare for fieldfare, cole tit for coal tit [VII. 148. note *], bul-finch for bullfinch (this name is altogether erroneous, and ought to be discarded by the ornithologist; together with goatsucker (nightjar), water ouzel (dipper), and several others); grossbeak for grosbeak; greyhound for graihound (see VII. 323.); hoopoe for hoopoo; osifrage for ossifrage (*Ossífraga albicílla W.*), &c.

she went; and seeming very uneasy when she was handled. On these occasions she would run up to the person who detained her guardian, and make a sort of cackling noise, and would never appear easy till she had been restored to liberty. When she had completed her second month, to prevent all possibility of escape, we deprived one of her wings of its volar powers, and ordered the gamekeeper to wing a male, that she might not be alone. The keeper having executed his commission, the two birds were introduced to each other; but the male, being very shy, skulked in corners, and did not at all seem to relish either his new situation, or his new mate: in about a month he escaped, and we never saw him after. We now allowed the female larger range than she had hitherto enjoyed, so that she could now resort to the neighbouring ponds. She was soon joined by a sweetheart, and the loving couple rambled about at pleasure; now sailing with stately mien over the pellucid lake, now grazing in the meadow, and anon reposing on the verdant bank. When they were approached, the male did not fly away until he was pursued so closely as to be in danger of being caught: he remained with his mate as long as was consistent with his liberty; when that was in danger, and not till then, he deserted the female.

In 1832 I possessed myself of several of the wild goslings; two of them passed into the hands of a neighbouring farmer, in whose possession they have remained ever since. They associate with his domesticated grey-leg geese, and are very peaceable.

I do not find this bird included in any work on British birds, except in the *History of British Birds* by Bewick. That celebrated artist, however, included several birds in his work which are not British, such as the Canary finch, the pintado, the turkey, the fowl, the pavo, the pheasant, and others. In Pennant's *British Zoology* there is no mention of it; but this work, although very excellent for the time when it was first published (1776), is now, in the present comparatively advanced state of zoology, felt to be very defective. Nor is it in Lewin's *Birds of Britain with their Eggs*, published in 1800. In the second edition of Montagu's *Ornithological Dictionary*, edited by Rennie, all that is given under the head Canada goose, is "an erroneous name for the bernacle goose." Temminck makes no mention of it in his *Manuel d'Ornithologie*; nor does Stewart in his *Elements of the Natural History of the Animal Kingdom*. Willughby, the illustrious author of the folio on *Ornithology* published in 1678, gives a short description and two figures. After noting the plumage, all he says is, "The title shows whence it comes: we saw and de-

scribed both this and the precident (the spur-winged goose, or gambo) among the king's wild-fowl in St. James's Park." Edwards (whose figures are often far more characteristic than many of the highly finished ones of the present day) has given a more particular account, and also a plate, in his *Natural History of Rare Birds*, iii. plate 151. Albin has misnamed his figure of the bernacle goose "Canada goose." Bewick's figure his rather too thick and heavy. In the annexed likeness [not engraved] I have endeavoured to give more of the character of the bird.

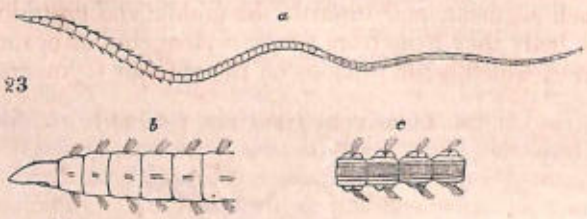
The Canada goose makes a plump appearance when brought up to table. The flesh is brown and savoury; and no doubt it might be improved by domesticating the bird, just as the flesh of the tame duck has acquired a superior flavour to that of the wild.

Near Derby, December 22. 1834.

ART. IV. *Illustrations in British Zoology.* By GEORGE JOHNSTON, M.D., Fellow of the Royal College of Surgeons of Edinburgh.

35. LUMBRI'CUS CAPITA'TUS. (*fig.* 23.)

23



Lumbrìcus capitàtus: *a*, worm of the natural size; *b*, the anterior portion, magnified; *c*, a portion from about the middle, magnified.

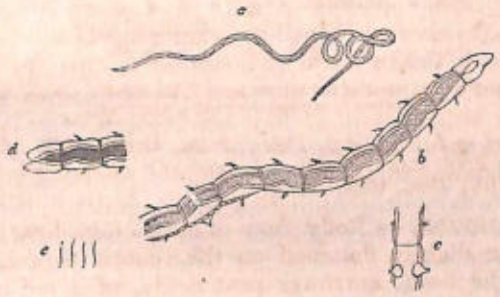
Synonymes. — *L.* capitàtus *Fabr.*, Faun. Grœnl. 279. *L.* littoràlis *Johnston*, in Zool. Journ. iii. 328. *L.* ármiger? *Mull.*, Zool. Dan. Prod. 215. no. 2610.; *Turt.*, Gmel. iv. 60.

DESCRIPTION. — Body from 3 in. to 6 in. long; slender, round, or slightly flattened on the ventral aspect, pointed towards the head, narrower posteriorly, of a red or scarlet colour, rendered dusky in many places by the contents of the intestine; and, in a state of extension, the posterior half is frequently pale or spotted, annulose to the naked eye, the segments not longer than their diameter, finely crenulate on the margin, and each of them armed with four little fascicles of bristles issuing from a small rounded papilla; the bristles reverted, short, slightly curved, arranged transversely; head

small, forming a sort of snout, beneath which is the mouth, furnished with a very short wide edentulous proboscis; anal segment small, emarginate; the anus opening in the sinus.

This species burrows in mud, under stones, and at the roots of *Fùci*, between tide marks, and is not uncommon. It is very contractile, and frequently collects a portion of the body into partial knots or swellings, and will again extend itself to a great length, until it becomes as slender as a sewing thread. Its red colour is very generally diffused, and to the naked eye no vessels are visible; but when placed under the magnifier and carefully observed, the blood may be seen propelled to and fro through vessels, one of which runs along each side of the intestine. The blood is grumous, and nothing can be more irregular than its course, now driven in one direction, then in the opposite, and then again settling at rest; for its motion seems to be dependent on the motions of the body and the extension of the rings. The intestine is, as usual, large, and deeply constricted at every joint; it is usually filled with earthy matter, and, when this is pressed out, it still appears dusky and somewhat reticulated in a very minute manner. I have never seen any specimens with a belt, such as we see in the common earthworm. The number of tufts of bristles is hard to be correctly ascertained; but there appear to be four on each segment, and towards the middle and posterior part of the body they issue from a very evident cordate or roundish tubercle, which is not obvious on the anterior segments.

36. LUMBRI'CUS LINEA'TUS. (*fig.* 24.)



Lumbrìcus lineàtus: *a*, worm of the natural size; *b*, the anterior portion, magnified; *c*, a view of the ventral surface of the 9th ring, to show the mammiform processes; *d*, the anal segments; *e*, the bristles, magnified.

Synonymes. — *L.* lineàtus *Muller*, Verm. i. part ii. p. 29.; *Fabr.*, Faun. Grœnl. 278.; *Turt.*, Gmel. iv. 59.; *Johnston*, in Zool. Journ. iii. 329.; *Mull.*, Prod. Zool. Dan. 215. no. 2606.

Description. — Body 1½ in. long, or, when extended, nearly 3 in.; slender, smooth, slightly attenuated towards each ex-

tremity, of a fine pellucid red colour, or clear white, marked longitudinally with a red zigzag line, often blotched with white and dusky spots, marking the position and contents of the internal viscera, distinctly annular; head pointed, the mouth placed in a sinus beneath, edentulous; rings longer than their diameter, cylindrical, bulged a little at the middle, whence the fascicles of retractile bristles issue; bristles in four series, few in number, five or seven in the superior and three or four in the inferior tufts, short, pellucid, somewhat curved like an Italic *f*, and not very acutely pointed; on the ventral surface of the eighth or ninth ring there is a pair of remarkable mammiform processes, terminated with a minute tubular pap: this and the two or three adjoining rings are thicker than the others, and white; anal segment emarginate; the anus terminal.

The skin of this worm is a clear very faint yellow, so that the red colour of the body depends on its blood-vessels, which run from one extremity to the other; one large vessel on each side of the intestine, uniting in the anterior segment, and being much slenderer there than they are lower down. The vessels and intestine are straight or tortuous, according to the state of the worm as to its contraction or expansion: the latter is usually filled with earthy matter, but is pale or empty at the divisions between the rings. When contracted, the sides are minutely crenulate. The mammiform papillæ are obviously connected with the generative function, and are not always present. I have seen them, in a great number of individuals, fully developed in January; and the ring to which they belong, as well as the one above and below it, are filled with a milk-white matter, over which some fine branchlets of the blood-vessels ramify, and the skin is thickened at the part.

Lumbrìcus lineàtus resides in places similar to the preceding, and is equally common. When thrown into fresh water it is evidently pained and soon dies. Cuvier has placed it in a section of his genus Nàis (*Règ. Anim.*, iii. 212.); but the propriety of this collocation may be doubted, and it will be better to retain the Mullerian name until the allied species, several of which have not yet been described by any one, are better known.

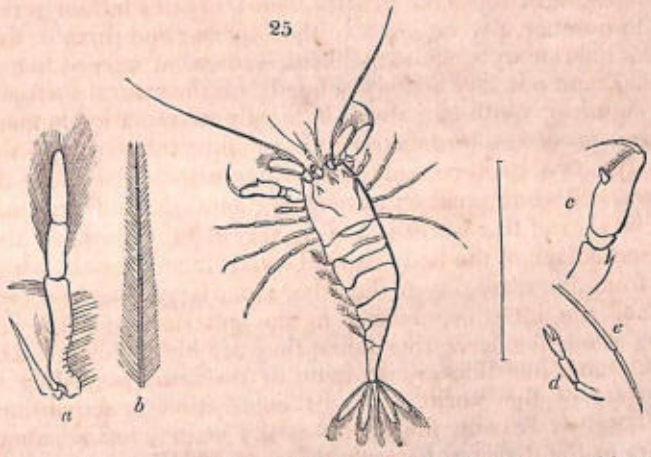
Berwick-upon-Tweed.

[In VII. 130. 131., two minute vermiform animals are figured from our valued correspondent C. M., which he has there denominated "Nàis Lin. serpentìna *Gmel.*" and "*Lumbrìcus*? Clitéllio *Savigny?* pellùcida." It has been suggested to us that at least one of the animals figured may be a larva. Our publishing this suggestion may lead to the testing of it.]

ART. V. *Descriptions of some Species of Crustaceous Animals;* by S. HAILSTONE, Jun. Esq.: *with Illustrations and Remarks,* by J. O. WESTWOOD, Esq. F.L.S. &c.

Ord. Macroúra, Fam. Palæmón*idæ*, Gen. Pontóphilus, Sp. trispinòsus *Hailstone.* (*fig.* 25.)

25



A female: *a*, The external foot-jaws; *b*, one of the fringed hairs at the extremity of the penultimate joint, highly magnified; *c*, extremity of the first pair of legs; *d*, extremity of the second pair; *e*, extremity of the third pair. All the figures magnified.

ON March 1. 1834, several individuals of a species of Pontóphilus (*fig.* 25.) were brought to me, which had been caught in a shrimping net upon this coast. They had only three spines upon the thorax; one in the middle, and one on each side of it. Their colour was much like a shrimp's, but paler, less clouded, and with a sprinkling of golden blots. Their length, about an inch. They were called by the man who had caught them "pug-shrimps:" he said that he had never observed them before this last winter. I shall be glad to learn whether this species has been described, and, if it has, in what book. Leach (*Malacostraca Podophthalma Britanniæ*, t. 37. A.) has figured only one species (the P. spinòsus *Leach*, the Egèon loricàtus *Risso*), but not the one in question. The females were with spawn. — *June* 3. 1834.

[*July*, 1834.] I send a description of two crabs, which I have found upon this coast; and, if you can inform me whether they are undescribed, I shall be obliged. They are not in Leach's *Malacostraca*. To this paper may be appended with propriety the communication I made to you of the new Pontóphilus, which must, of course, be denominated trispinòsus. — 16. *Undercliffe, St. Leonard's, Hastings, July*, 1834.

[We have prefixed, rather than appended, the communication on the Pontóphilus trispinòsus *Hailstone*, to preserve the order of time. We place next in order Mr. Hailstone's descriptions of the two crabs.]

Ord. Brachyùra, Fam. *Maïadæ*, Gen. Hỳas, Sp. [? coarctàta, in a young state] serràtus *Hailstone*. (*fig.* 26.)

26



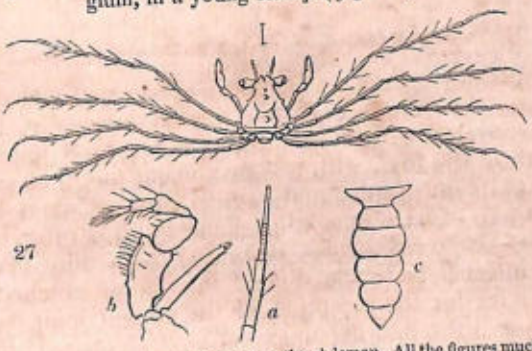
a, The external foot-jaw, magnified; *b*, the abdomen, magnified.

Description. — A male. *External antennæ* distant; the first joint larger than the second, and dilated externally, its outer margin serrrated with 5 or 6 teeth; the second joint nearly the length of the first, with one prominent tooth, or spine, on its apex at its outer side, and several obsolete ones behind; apices (tips) of the remaining joints with strong hairs or bristles. — *External double palpi* (*a*) with the first joint of their internal peduncle dilated internally, notched at its external apex for the reception of the second joint, which is emarginate at the internal apex. — *Shell* elongated, tuberculated, rounded at the posterior extremity, slightly convex, rostrated in front; the rostrum fissured, its segments divaricating, but approximating at their termination, their outer margins serrated, their inner ones obsoletely so. The sides behind the eyes, with a spear-shaped process, its margin serrated; the orbits of the eyes obsoletely serrated above and beneath, where the surrounding part of the shell is rough with short spines. Bristly. — *Eyes* not thicker than their peduncles. Each peduncle is furnished with three spines; one irregularly cloven, placed at its termination, immediately upon the eye; one at the anterior side of the peduncle, midway; and another a little below, nearer the orbit of the eye. — *Abdomen* (*b*) 7-jointed, carinate and emarginate; the first six joints of about equal length; the first joint broad, the second narrower, the third and fourth somewhat broader, the fifth narrowest, the sixth rather broader, the seventh subtriangular; the apex rounded; the first six joints somewhat arcuate at their posterior margins; the posterior corners produced, in the sixth

joint the most strongly so. — *Feet*. First pair of legs shorter and scarcely thicker than the others, didactyle (two-fingered), and equal; the internal margins of the fingers toothed; the second pair longest; the third, fourth, and fifth pairs shorter and nearly equal in length; claws somewhat arcuate, the most so in the fifth pair. All of the legs covered with strong hairs or bristles.

Of this crab I have found three specimens, all males, among some sertularias brought to shore by the trawl net. The shell of the largest of them measures about $\frac{1}{4}$ in. in length. If this species of Hŷas, as I take it to be, be undescribed and unnamed, the epithet serràtus may with propriety be appropriated to it.

Ord. Brachyùra, Fam. Macropodìadæ [Gen. Macropòdia, Sp. ? *Phalángium*, in a young state]. (*fig.* 27.)



a, The outer antenna; *b*, the external foot-jaw; *c*, the abdomen. All the figures much magnified.

Description. — A male. *External antennæ* (*a*) half the length of the body, distant, setaceous, inserted at the sides of the rostrum, before the eyes; first joint very short, and thicker than the second, which is about twice its length; third joint narrower than the second, of the same length as the first; the remaining joints elongate, the last subulate. — *External double palpi* (*b*) with the first joint of their internal peduncle notched at its external apex for the reception of the second joint, which is rather shorter and suboval, its inner margin fringed with hairs; palpi 3-jointed, hairy. — *Shell* subtriangular, tuberculated, rostrated in front with a very short rostrum, which is bifid, its segments sloping. Anterior part of the shell with two spines, the one behind the other, the anterior one very small; the posterior part of the shell with one prominent spine in the same line. — *Eyes* not thicker than their peduncles, which are very long, thick, and swollen; not retractile within their orbits. — *Abdomen*

(*c*) 6-jointed, carinated; first joint broad and longest; second, narrower and shorter; third, as broad as the first, and shorter; fourth, fifth, and sixth of the same breadth, the fourth being as long as the second; the fifth shorter, and the sixth abruptly narrow and arcuate. — *Legs.* Anterior pair shortest and thickest, equal, didactyle, as long as the body; hands slightly compressed. Four hinder pairs very long and slender. The claws of the two anterior of the four hinder pairs slightly hooked at their extremity; those of the two posterior pairs arcuate.

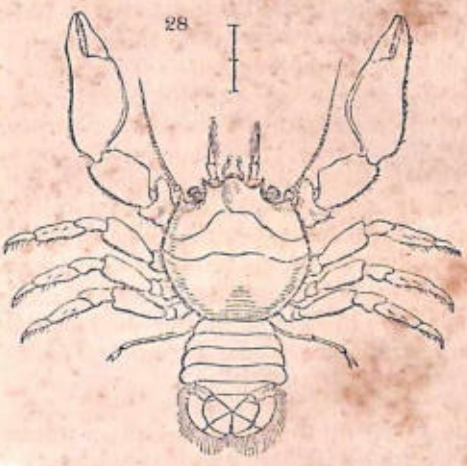
This crab I have found very abundantly along with the preceding one. (*fig.* 26.) I am at a loss to what genus to refer it. The shortness of the rostrum will preclude its being placed among the Macropòdiæ, to which genus its characters in other respects are most nearly assimilated. All the individuals I possess are males. The length of the shell of the largest is about one tenth of an inch. — *St. Leonard's, Hastings, July* 11. 1834.

[We, subsequently to receiving the preceding descriptions from Mr. Hailstone, asked him to favour us with sketches, or a sight of specimens, of the animals. He sent us on Nov. 7, 1834, specimens of the Pontóphilus, Hỳas, and Macropòdia, already described; and specimens of a form of Porcellàna, accompanied by the following descriptions of two forms referable to this genus:—]

Along with these specimens, of which you have descriptions of mine, i. e. a species of Pontóphilus, another of Hỳas, and a species allied to the Macropodiadæ, I send you two distinct, as they appear to me, species of Porcellàna, both of them differing from the P. platychèles. I should be obliged to you to submit them to the judgment of your adviser in Crustàcea. I send you descriptions of them, in case they should prove to be undescribed species; but, as I can hardly suppose this to be the case, I shall be obliged for their specific names when you return me the specimens. Of the smaller species there are four specimens, but, I am sorry to say, very imperfect ones.

Should any of the species represented in the specimens sent prove to be known ones, I shall be glad to receive their names, and a reference to the book in which they are described. Probably you could inform me whether there is any manual describing *all* the species of Crustàcea known. I possess Leach's *Malacostraca Podophthalma Britanniæ*, and Samouelle's *Entomologist's Compendium*, containing an abstract of Dr. Leach's arrangement, and a description of each genus, and of *one* species of it. I have, also, the *Règne Animal*, with Latreille's arrangement; but this does not describe more than the genus.

Ord. Macroúra, Fam. Galatèad*æ*, Gen. Porcellàna, Sp. minùta *Westwood.* (*fig.* 28., magnified.)



Description. — A female. *Anterior margin of the shell* with three lanceolate projections; the middle one the most prominent, depressed at its point; all denticulated as well as the upper margin of the orbits of the eyes, which are obsoletely so. On the margin of the shell, behind each eye, are three spines; and two thirds of the remaining margin is serrated. — *Thigh* of the first pair of legs much dilated at its internal apex; which dilatation is denticulated, and the rest of the apex of the thigh the same. — *The wrist* with its internal margin wavy, and almost imperceptibly denticulated as well as its apex. — *Hands* compressed, inner margin slightly denticulated, external deeply serrated and ciliated, one third broader than the wrists. Claws depressed. — *Shell* one eighth of an inch long; squamose, scales mostly ciliated and mottled with red and yellow when dead. — The individual here described is a female, and was taken with spawn last June [1834] out of the chambers of a mass of E'schara retifórmis which had been dredged up off Hastings.

Porcellàna, second species. [The card which had borne, by the mark, the specimen of this species, was found, on opening the box, to have slid from its place, and to be nearly denuded of objects.]

Description. — *Anterior margin of the shell* with a blunt projection, deeply channeled down its middle and depressed, denticulated. Before each eye is a sharp spine; and two thirds of the margin of the shell behind each eye is serrated. — *Thigh* of the first pair of legs produced at its internal apex with a spine. — *Wrists* spinulose, with two prominent spines on their inner margins. — *Hands* compressed, about the breadth of the wrists; their external margin serrated. Claws depressed. — *Shell* one tenth of an inch long, scaly, pellucid. — Found among sertularias in June, 1834. — 2. *Denmark Place, Hastings, Nov.* 7. 1834.

Observations upon Mr. Hailstone's Crustàcea. By J. O. Westwood, Esq. F.L.S. &c.

I have examined, with considerable interest, the Crustàcea forwarded by Mr. Hailstone, captured at Hastings, and beg leave to offer the following observations upon them; premising, in the first place, in answer to one of his enquiries, that there is no manual containing descriptions of the British Crustàcea, *A*ráchnida, *A*cari, &c., notwithstanding the evident utility of such a work.

Of Mr. Hailstone's Crustàcea, probably the new Pontóphilus (*fig.* 25.) will be regarded as possessing the highest interest, inasmuch as the propriety of the establishment of the group, which was at first confined to a single species, is thereby proved. The character of this genus, as defined by Dr. Leach, separating it from that of *C*rángon (of which the common edible shrimp [*C*rángon vulgàris] is the type) consisted in the very small size of the second pair of legs, and the length and acuteness of the terminal joint of the external foot-jaws, or pedipalpi. These characters, however, to which that of the spinose shell may be added, have been deemed, by the French crustaceologists, insufficient to warrant the *generic* separation of the two groups; and, on considering the characters of the new species from Hastings, the correctness of their opinion must, I think, be admitted; since it will be seen that, in several respects, its characters are quite intermediate between those of the types of *C*rángon and Pontóphilus. Thus the shell, instead of being armed with a double series of lateral and three rows of dorsal spines, as in the latter, is 3-spinose only, just as in the common shrimp; while the terminal joint of the foot-jaws is scarcely longer than the penultimate joint, and is broad, flat, and obtuse. The central piece of the tail is also much longer than in Pontóphilus spinòsus. Still the minute size of the second pair of legs corresponds with Pontóphilus; whence it will, perhaps, be more advisable to divide the genus *C*rángon into two sections: first, those with the second and third legs of equal length, the common shrimp; and, secondly, those with the second legs much shorter than the third, the Pontóphili of Dr. Leach: and, even in the former group, the comparatively delicate and imperfect structure of the second pair is very evident; thus proving, in a *natural* point of view, the generic identity of the two groups.

Of the two Porcellànæ described by Mr. Hailstone, the larger only remained upon the card. It was quite evident that some *D*erméstes had found its way into the box, and devoured not only the specimens of the other species, but

also several of those of the long-legged crab described by him [*fig.* 27.]. The small size of both species of Porcellàna might induce the belief that they were in a young and immature state; but the fact recorded by Mr. Hailstone, that the preserved specimen was found with spawn, disproves the presumption. But, is Mr. Hailstone quite sure that this was the case? as the preserved specimen itself, upon examination, exhibited no appearance of eggs. If so, the small size of the animal thus shown to be adult is far below that of any of the other species. It comes nearest to the Porcellàna Leách*ii* of Mr. J. E. Gray's monograph upon this genus, published in his *Zoological Miscellany*, p. 15.; but its colours, size, &c., are different, whence the name of P. minùta may be applied to it.

The two other species of Crustàcea (*figs.* 26. and 27.) appear to me to be animals in a very young state, both from their minute size, and comparatively imperfect appearance and organisation. They are certainly very distinct from the full-grown animals of the genera Hỳas and Macropòdia; but I feel little hesitation in referring the former to Hỳas coarctàta, and the latter to Macropòdia *P*halángium of Pennant (longiróstris *Leach*). At a period when the developement and supposed transformations of the decapod Crustàcea are matters of dispute among the first crustaceologists, it is especially interesting to exhibit the distinctions of form in which these animals appear in a very young state of their existence: in this point of view, I regard the animals sent by Mr. Hailstone as extremely valuable.

M. Milne Edwards, in an elaborate memoir upon this subject, has laid down the following theory; namely, that, in this group of animals, there is a constant tendency, during growth, to remove (éloigner) the form of the animal from a common type: in short, to individualise it. Now, the common type of form of the crabs is square, transverse, or more or less rounded; and both the animals now described fully support this doctrine. Hỳas, in its adult state, is triangular; the animal which I have supposed to be the young of Hỳas coarctàta is almost square: but, by the application of this theory, the ordinary square form of the Brachyùra will be lost by the greater swelling out of the hinder part of the body, until the triangular form of the adult Hỳas is obtained. In like manner, the adult Macropòdiæ are distinguished by their rostrated front; a character certainly not typical among the crabs, although it is among the Macrùra, or shrimps, &c. We may, therefore, expect, if M. Edwards be correct, that the young of Macropòdia will have the head not ros-

trated: and this is so precisely the case with the specimens of the animals described by Mr. Hailstone, that this gentleman mentions (p. 264.) the shortness of the rostrum as the character which excluded it from the genus Macropòdia.

Under such circumstances, I am sure Mr. Hailstone will pardon me for expressing a wish that he, or any other naturalist living upon the coast, will strive to throw farther light upon this interesting subject, by endeavouring to ascertain, by the examination of specimens captured at different periods of the year, whether intermediate individuals may not be found between that now figured and the adult rostrated Macropòdiæ. It would be likewise highly desirable to ascertain the still earlier stages both of the Macropòdia and Hỳas. This might easily be accomplished by catching the females with spawn, and confining them until the eggs should be hatched; whereby we should obtain a complete proof or refutation of the singular statements of Mr. J. V. Thompson. —*The Grove, Hammersmith, Jan.* 28. 1835.

[When we were (Feb. 21.) on the point of taking all the preceding notices on Crustàcea to press we found that Mr. Hailstone had sent us another set of specimens of the Porcellàna described in p. 265, and the following notice on them. This he had done without our having made the least intimation to him of Mr. Westwood's views on the case, and the coincidence of views thus proved we think interesting.]

In my last communication I sent you descriptions of two species of Porcellàna which I am now convinced are but one in different stages of growth, as will appear from the specimens which I forward you, and, accordingly, I beg you will substitute the accompanying description, made from the largest specimen I have seen, for the other two.

[We have not done this, because our engraving (*fig.* 28.) had been prepared, and because Mr. Westwood's remark above teaches us that information on the stages of growth in Crustàcea, which the giving of all Mr. Hailstone's descriptions supplies, is very interesting. Mr. Westwood has drawn a figure (*fig.* 29.) of one of the suite of specimens now received from Mr. Hailstone. The largest sent had become loose in the box, and very much broken.]

Genus Porcellàna, sp. (*fig.* 29. *c*, very young.)

Front of the shell with three denticulated teeth, the middle one depressed at its point, and channeled down the middle; behind each eye two lobes; behind that the shell is faintly

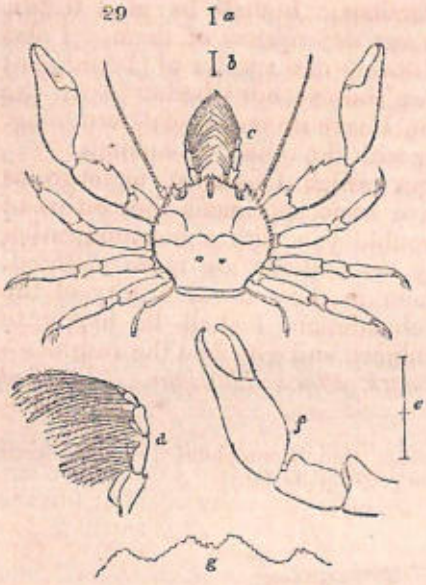
jagged.—First pair of legs unequal; the right, and sometimes the left, being the larger. — Thigh dilated at its internal apex into a blunt lobe.—Wrist with its internal margin, wavy. —Hands compressed, somewhat angular. Claws depressed and twisted, with a few blunt teeth internally.—Shell ¼ in. long.

This description is made from a full-grown individual. In what I take to be the young of this species, the lateral margins of the shell are toothed, the internal apex of the thigh of the first pair of legs is produced into a spine; the wrists are spinulose with two prominent spines on their inner margin; these last-mentioned spines gradually become lobes, and, at last, a mere wavy outline. In the middle-sized specimens, the hands are very rough with scales, giving the margin, especially the outer one, a denticulated appearance. In the full-grown ones they are quite smooth.

Very common in corallines brought up from deep water. In July last I found a female with spawn. During the last few weeks I have examined several dozens without finding any with spawn.—*S. Hailstone. Hastings, Feb.* 18. 1835.

[*Observations, by Mr. Westwood, on the Specimens of, and Remarks on, a Species of Porcellàna sent by Mr. Hailstone.*]—With respect to the gradual series of specimens of Porcellàna recently sent you by Mr. Hailstone, and exhibiting the changes undergone by this species in its progress to maturity, I beg to notice that they offer another instance of the necessity of more extended observation, before we can feel ourselves in a situation to place implicit confidence in the researches of Mr. Thompson, as at present developed.

In a list of memoirs proposed to be published by this gentleman, we find No. 13. to be upon "The Structure and Metamorphoses of the Genus Porcellana of the Crustacea with its new and singular Larva." Now, the smallest specimen sent by Mr. Hailstone is scarcely larger than a large pin's head, its length being represented *fig.* 29. *a*; so that, taken in conjunction with its comparatively perfect organisation, and the continued, although slight, changes which the species subsequently undergoes, it seems impossible to conceive that its form can have materially altered since it left the egg. *b* shows the length of the next-sized specimen, which at *c* is represented in a magnified state. Here the large size of the external foot-jaws, the teeth on the wrists, and the small spinose internal production of the anterior thighs, are noticeable. The shell is also somewhat longer, in proportion to its width, than at a more mature period. This and the preceding state differ only in the smaller individual being still rather more oblong. *Fig.* 29. *d* represents one of the external foot-jaws,



highly magnified, taken from *c*, and this organ presents no difference in the young and adult states, except in being of a comparatively larger size. It is impossible to give an adequate idea, upon so small a scale, of the beautiful appearance which it exhibits under a high-powered lens, arising from the exceeding delicacy of the ciliated hairs. *e* shows the natural length of Mr. Hailstone's largest specimen *, with the tail extended; *f*, the larger of the claws of this specimen, considerably magnified. The smaller one, whether on the right or left side, differs from the other in form, being more slender, and broadest at the place of insertion of the thumb. In the large specimens the centre of the anterior margin of the shell is so much depressed, that its extremity only can be seen as represented in *g*: this is magnified about four times the natural width. In all the specimens, two impressions exist behind the middle of the shell, which are often differently coloured from the remainder.

No more acceptable service could be rendered to crustaceology than by showing, as Mr. Hailstone has done, the gradual changes which take place in the different species of crabs, the subject being quite uninvestigated. — *J. O. Westwood. The Grove, Hammersmith, March* 12. 1835.

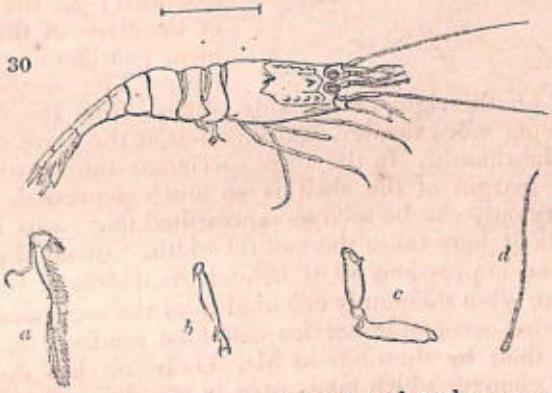
[*Notices of another Species of Pontóphilus, and of a Crustacean allied to the Genus Hippólyte; by S. Hailstone, jun., Esq.*] — I send descriptions and drawings of two species of Crustàcea which I cannot find mentioned in any book I have access to. I have made drawings of them, from finding the communication of the specimens to be so hazardous. I have used every care in their delineation, and nothing has been done at random: the drawings exactly represent the specimens in my

* The specimen previously figured (*fig.* 28.) is about half way between the large and small specimens; and yet Mr. Hailstone states it was found with spawn. This is a curious circumstance.

cabinet, with all their defections. I shall be glad if Mr. Westwood can refer me to any description of them. I also send, for his inspection, a drawing of a species of (I conceive) Ancèus, a genus new to our shores; but whether it be the forficulàrius of Risso, or not, I have no means of determining. Four of them I found along with the other two animals.

You mention the changes which Crustàcea undergo as they advance in age. I have some specimens illustrative of this, and may probably trouble you with a communication upon the subject, when my observations are more matured. If you can suggest any point in the natural history of the Crustàcea which requires elucidation, I shall be happy to direct my attention to the subject, and give you the results. — *S. Hailstone, jun.* 2. *Denmark Place, Hastings.* [*Received March* 11. 1835.]

Ord. Macroúra, Fam. Palæmónidæ, Gen. Pontóphilus [Sp. bispinòsus *Westwood*, in p. 273. (*fig.* 30.)]



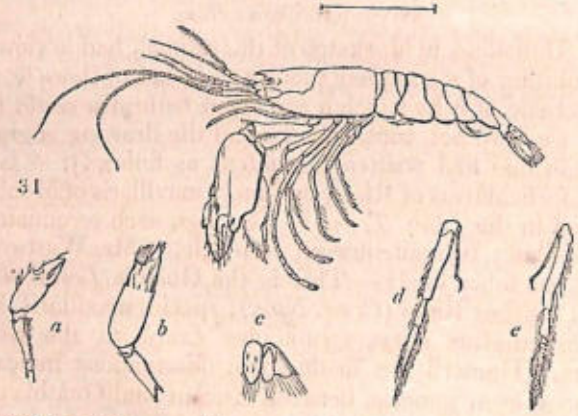
Pedipalpes (*a*) with the last joint rather longer than the preceding one, and bluntish at its termination. — First pair of legs (*c*) compressed, didactyle, with the thumb very short; second pair (*b*) rather shorter than the first, didactyle, the last joint half the length of the preceding one, which is compressed; third pair very slender, as long as the first pair, with a simple claw; fourth pair (*d*) and fifth pair of equal length, rather longer than the third, and somewhat thicker, but slender: claws simple. — Thorax with two prominent dorsal spines, one considerably behind the other, and on each side a row of blunt notches. A spine at the outer edge of the external plates of the tail. — Colour yellowish mottled with brown.

If this be a species of Pontóphilus (with Leach's description of which genus it tallies in all respects except the com-

pressed claws of the fourth and fifth pairs of legs), it differs from the species I am acquainted with in the length of the joints of the second pair of legs, in the claws of the legs above mentioned not being compressed, and in the length of their joints, and especially in the number and disposition of the dorsal spines.

[For a statement of the habitat, see at the close of the notice of Hippólyte rùbra.]

Ord. Macroúra, Fam. Palæmónidæ, Gen. ?Hippólyte, Sp. ?rùbra *Westwood.* (*fig.* 31.)



Superior antennæ with two setæ, the upper ones fringed with hairs and excavated below; inferior antennæ nearly the length of the body. — Pedipalpes (*d*, under side; *e*, upper side) with three exserted joints, the last bluntly pointed, and twice the length of the preceding one, with two rows of fasciculi of hairs. — First pair of legs didactyle, very large, with the hands (*a b*) very much compressed, unequal, the right (*a*, outward aspect,) being the larger, bristly; *b* represents the left hand, inward aspect: the thigh excavated beneath, and its inner margin spinulose: second pair didactyle, very long, slender; wrists many-jointed: other legs terminated by a simple claw, and spinulose within; the last pair the most slender. — Thorax with three short spines anteriorly. — Tail with five plates, the middle one blunt at its apex, with four spines arranged in two lines: *c* represents the middle and two side lamellæ of the tail. Colour deep scarlet, except above the eyes, which are concealed under the shell, and above them it is transparent and colourless: the tail is fringed with white hairs, and the legs are mottled with yellow.

This approaches nearer the genus Hippólyte than any other, but differs very much from all the species figured in

Dr. Leach's *Pod. Mal. Brit.* in the size of its first pair of legs, the formation of the finger and thumb, and in having its eyes concealed (though on peduncles) under the shell, and in the shape of the anterior part of its shell. I have found three individuals.

The line denoting the natural size represents the length from the end of the tail to the front margin of the thorax.

Both these Palæmón*idæ* were found in a mass of Filípora filogranà, which was brought up by the trawl net off Hastings, in February, 1835.

Ancèus forficulàrius *Risso.*

[Mr. Hailstone, in his sketch of this animal, had in view, not the exhibiting of a complete picture of it, but of those features characteristic of it by which a proficient naturalist could identify it: we have not, consequently, had the drawing engraved. Mr. Hailstone had written beneath it as follows]: — Is this Ancèus forficulàrius of Risso, or Cáncer maxillàris of Montagu, described in the *Linn. Trans.*? Ten legs, each terminated in a simple claw; two antennæ on each side. [Mr. Westwood's reply is the following]: — This is the Gnàthia *Leach* (*Edin. Encyc.*), Ancèus Risso (*Crust. Nice.*); species maxillàris *Montagu*, forficulàrius *Risso*, termitòìdes *Leach*, in the British Museum. Dumeril has made some observations indicating differences, even generic, between Ancèus and Gnàthia; but Mr. Hailstone's drawing, with one which I have made from Leach's specimens, clearly shows that the two groups are identical, the eyes being lateral, as in Montagu's figure, and the tail lamellose, as in Risso's. It has been said that this is the male of the genus Pranìza, of which I have published an account in the *Annales des Sciences Naturelles.* Is this so? — *J. O. Westwood.*

[Of the genus Pranìza, Dr. Johnston has communicated, in V. 520—522., a description of a species which he has named fuscàta, not previously published, as a native of Britain; and has made collateral notice of the P. cæruleàta, previously known to inhabit Britain.]

[*Notes on Pontóphilus, species bispinòsus* Westwood, *by Mr. Westwood.*] — I can find no description of any species either of Crángon or Pontóphilus * (for the size of the terminal joint of the external foot-jaws and of the second pair of legs seems, in this animal, to be quite intermediate between the

* The Crángon 7-carinàtus of Sabine (*Voyage to the North Pole*, pl. 2. f. 11.) belongs to the subgenus or section Pontóphilus, thus making a fourth species referable thereto, namely, spinòsus *Leach*, trispinòsus *Hailstone*, bispinòsus *Westwood*, 7-carinatus *Sabine*.

two), agreeing with Mr. Hailstone's description above (p. 271.). Is it in an adult state? the length being very short for one of the Palæmón*idæ*. It is to be borne in mind that the above figure is taken from a mutilated individual, in which the two anterior pairs of legs are broken off: these are represented as detached. Mr. Hailstone having omitted to complete his account by prefixing a name to the description, I have supplied the want by employing that given above, suggested by the two spines on the shell.

[*Notes upon Hippólyte ? rùbra, by Mr. Westwood.*] — This animal differs so completely from Hippólyte, not only in the characters mentioned by Mr. Hailstone, but also in the general slender form of the body, the abdomen not being gibbose in the middle, and in the length of the superior antennæ, that I should not hesitate to form it into a separate genus; that is, on the supposition that the latter organs are correctly described as only furnished with two filaments. This is, indeed, an important character; as the distribution of the genera of this family adopted by the best crustaceologists depends on the presence of two or three filaments. If the description be correct, this new genus must be arranged in a small group of genera consisting of Pèlias, Pontònia, Hippólyte, Alphèus, and Gnathophýllum, all of which have the two anterior pairs of legs didactyle. In Pèlias, however, these legs are nearly of equal size; the second pair being the thickest, with the wrists not annulose. In Pontònia, also, the wrists are similarly formed; but the second pair of legs is excessively large. Alphèus * comes nearest to this new genus; but its types are large Indian species having the first pair of legs large, but very unequal in size, and much longer than the second pair. In Gnathophýllum the wrists are not annulose, and the external foot-jaws are dilated.

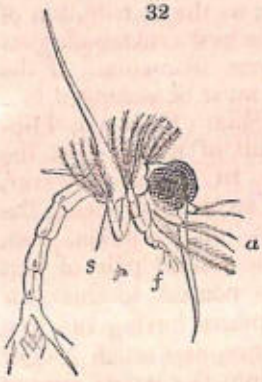
If, on the other hand, the superior antennæ have three filaments, the genus comes very close to A'thanas, in which, however, the eyes are exposed, the fore legs not so large, and the rostrum long; but there is a genus, omitted by Latreille, which appears to agree in every respect with that under consideration: it is the Cryptopthálmus of Rafinesque (*Précis de Découvertes*, 1814), which has, as the name implies, the eyes concealed by the fore part of the shell. The specific name, C. rùber, also points out the apparent identity; but the upper antennæ are stated to have three filaments. Conceiving it not improbable that these descriptions may relate to the same animal, I have employed the same specific name for the

* The Alphèus aculeàtus *O. Fabr.*, and A. polàris, both figured by Sabine in the *Voyage to the North Pole*, belong to the genus Hippólyte.

above, which will neither be inappropriate, nor lead to confusion, even if the animals should be distinct.

With reference to Mr. Hailstone's enquiry for suggestions as to those points in the natural history of the Crustàcea which require elucidation, it will, perhaps, be more serviceable to mention, in as few words as possible, the state of the question, as it stands at present, relative to the transformations of these animals. Dr. Rathke, in a most elaborate treatise, has traced the gradual developement of the eggs of the crayfish, and has clearly proved that this animal, at its birth, possesses the general form of its adult state. Mr. J. V. Thompson, on the contrary, and without a knowledge of the researches of the former author, has, in various memoirs, insisted upon the existence of transformations of the most extraordinary kind *throughout* the Crustàcea, and has stated that he has succeeded in hatching the eggs of the large common edible crab; and that the young, which he has figured [(*fig.* 32.: *a*, antennæ; *f*, feet; *s*, one of the lateral spines. This figure, and all its parts, are magnified from the size of the figure placed between *s* and *f*, which represents the natural size of the creature], are of a form totally unlike that of the adult state, being, in fact, referable to the genus Zoèa of Bosc, which is, according to Mr. Thompson, consequently composed only of the larvæ of crabs. The statements of Mr. Thompson are highly valuable, *if correct*, and sufficient, as Mr. Swainson has well remarked, in his *Preliminary Discourse*, to place Mr. Thompson in the foremost ranks of science. As, however, the crayfish and the crab are so closely allied, it would certainly be desirable to ascertain whether either or both of these opinions be correct; and, to persons residing upon the coast, it would be easy to examine the females of various kinds of crabs, as well as of the lobster, spiny lobster, and crayfish, at the period when they are with spawn; and also from time to time until the eggs are hatched. By this means, I apprehend, the point at issue may be satisfactorily cleared up. It would also be serviceable to place in spirits some of the spawn, taken at different periods, so that it might be microscopically examined and dissected. It is also a point of some interest as to the manner in which the shells of crabs and lobsters are periodically cast, *if, indeed, such be the case*, as well as to ascertain

32



what becomes of the exuviæ if, and when, cast.* — *J. O. W. March* 23. 1835.

[*Desultory Remarks relative to Points in the Economy of various Crustàcea, by the late Rev. L. Guilding.* — This naturalist sent, in 1831, 123 pages of notes, in manuscript, on subjects which occur in I. II. of this Magazine. We give here most of those that he had made relative to Crustàcea. The number of the volume and that of the page, prefixed to each remark, indicate the place of the notice which had excited the remark. The 123 pages of remarks have but one date, given on the last page: it is, St. Vincent, May 1. 1830.]

(II. 51.) *The Metamorphosis of the Crustàcea* was observed so early as 1789. Dr. Shaw, in the *Linnæan Transactions*, i. 103. tab. 9., has given an interesting account of Cáncer stagnàlis, accompanied by rude figures.

(II. 244.) *Mr. Thompson's Discovery is full of Interest.* — It is probable that all the species confined to the sea, or which seek it at spawning time, may go through some metamorphosis. I have seen a bay a mile in length covered with myriads of little dead crabs bearing formidable spears, such as Mr. Thompson has figured, which had been washed on shore before their metamorphosis. From their incredible numbers they were probably immature *Pagùri*.

I do not think any change will be found to take place in the terrestrial genera. While in some marine species the eggs are attached by threads in groups of thousands, our mountain crab (which lives in holes about rivulets, occasionally entering the water) seems to exclude but few eggs at a time, free and detached, though the operation may be soon repeated. These are retained under the broad tail of the female, and seem to increase in size and obtain nourishment from a milky secretion. In this case, the decapodous young certainly leave the egg *perfect*, though they remain growing in the same retreat for some time, till their crust is indurated; existing, it would appear, on this milky secretion, or some food supplied by the parent crab.

(I. 490.) *The Circulation in the Pagùri* has been but imperfectly studied. Some species of crabs must be pulmonobranchiate, [from their] residing for months even on elevated dry lands [see V. 477.]; while hundreds of species inhabit always the deeper waters of the ocean. Most crabs, on being captured, emit frothy bubbles, and sometimes with a crackling noise.

* Mr. Thompson (*Ent. Mag.*, April number) has published a memoir upon the pea crab (Pinnotheres), figuring another Zoèa as the young; and stating that he *saw* the ova of the crabs hatch under this form.

(I. 373.) The long eyes of most of the Podophthálma, when at rest, are laid in a cavity adapted to their shape: in many genera the fossula is excavated with extraordinary skill and care. In others, where the eyes are seated in a circular excavation the peduncles are short and thick, and are merely drawn down a little as a protective from danger.

(II. 206.) In my extensive and interesting collection of West Indian Crustàcea, there is a beautiful Portúmnus, on the arms of which are bright, square, pearly specula of great beauty. Now, though this genus does not cover its body with extraneous matter, and wait in ambush for its prey, I have no doubt that these splendid ornaments contribute to attract their prey.

(II. 24.) In this island [St. Vincent], the timbers of wharfs, &c., immersed in the sea, are sometimes coated with ship's copper: the plan of the rusty nails seems very ingenious, Some of our minute Crustàcea, from their countless numbers and boring habits, are not less injurious than the Terèdo.]

[*Variableness in the Characteristics of Crustaceans of the same Species, according to Age, Sex, &c.*—Dr. Johnston has expressed, in VII. 235., his opinion that, in certain forms of the genus Æ`ga, the greater or less dilatation of the basilar joints of the antennæ "is a sexual character, or one dependent on age, and of insufficient value, therefore, to be ranked among characters which are seized upon to divide tribes or families from each other; and that the conformation of the extreme caudal segment is not sufficient to discriminate species, as Dr. Leach seems to have believed, for his specific characters embrace no other part." We understand these remarks as intended to be applied, not to species of Æ`ga alone, but to species of Crustàcea somewhat generally; and we have, in this view of them, deemed them too useful to the student of the Crustàcea to incur us censure for reprinting them.]

A Mode of preserving Specimens of Crustàcea, practised by Mr. Yarrell, has been described by him in the *Entomological Magazine*, i. 421, 422.

ART. VI. *On Viola imbérbis* [Leighton], *a ? Species of Violet supposed to be new to the British Flora; with brief Observations on some Peculiarities of Viola láctea, Viola canìna, Ranúnculus Ficària, and Gàlium cruciàtum.* By W. A. LEIGHTON, Esq. B.A.

IN a botanical ramble in the immediate neighbourhood of Shrewsbury, in spring, 1833, I gathered on the south-western

slope of the Sharpstones Hill *, distant about two miles and a half south from Shrewsbury, a white sweet-scented violet, which I then concluded was only a white variety of *V*iola odoràta. Comparing it, however, on my return home, with the descriptions of *V.* odoràta and *V.* hírta in Smith's *English Flora*, i. 302., I speedily discovered that my violet did not entirely correspond with either of those species, but differed very materially in its characters from both, being apparently an intermediate species. Want of leisure prevented the continuance of my investigations at that time, but in the spring of 1834, I renewed my researches, the result of which tends greatly to strengthen my former opinion of this violet being intermediate between *V.* odoràta and *V.* hírta; but whether it may aspire to the rank of a species must be decided by more experienced and scientific botanists than myself; to facilitate whose determination, I enclose a few dried specimens, which you will probably take the trouble of distributing among such of our eminent botanists as you may judge advisable [we will, when this account has been published], who will doubtless favour you with their opinions.

The chief points in which *V.* imbérbis differs from *V.* odoràta and hírta are the following:—The whole plant [even both surfaces of the leaf, it is stated in a detailed description which we have omitted] is copiously covered with short pubescence, especially visible in the young unfolded leaves, of which Smith states *V.* odoràta to be destitute. [See the last paragraph but one.] This pubescence, though not so decidedly of the rigid hairy nature peculiar to *V.* hírta, approaches in quantity to the hairiness of that species, but differs in being shorter; and in that covering the petioles being deflexed [see the last paragraph but one], whilst in *V.* hírta it is horizontal.

* This eminence forms a portion of a low range of hills of greywacke mixed with mica, and in some places covered with an indurated stratum of rounded semitransparent quartz pebbles, cemented with clay. This delightful spot commands a highly interesting and beautiful panoramic view of the town of Shrewsbury and the plain of Shropshire, bounded by the long ridge of Haughmon, the Wrekin, Stretton Hills, Long Mountain, Breidden, and Welsh Hills. On its slopes grow the following plants:—Teesdàlia nudicaúlis, Diánthus deltöides, *Bérberis* vulgàris, *U*lex nàna, *C*àrex muricàta var. *β Sm.*, *S*enècio viscòsus, Scleránthus ánnuus, *O*robánche màjor, *O*robus tuberòsus, *P*olýgala vulgàris, Arenària rùbra, *H*ypéricum púlchrum, *O*rníthopus perpusíllus, and *R*anúnculus parviflòrus. At the distance of a few fields is Bomere Pool, where the botanist will find *R*anúnculus língua, *V*iola palústris, *E*látine tripétala, *C*ómarum palústre, *P*èplis Pórtula, *M*óntia fontàna, *Fedia* dentàta, Lobèlia Dortmánna, *Verónica* scutellàta, Scheuchzèria palústris, Habenària víridis and bifòlia, Epipáctis latifòlia, Erióphorum vaginàtum; *C*àrex cúrta, ovàlis, stellulàta, teretiúscula, limòsa, *P*seùdo-*C*yperus, vesicària, ampullàcea, and filifórmis; and Brachypòdium sylváticum [*F*estùca sylvática *Hudson*].

The peduncles are also clothed, though less copiously, with similar deflexed pubescence; and the bracteas are glandularly ciliated near the summits, and slightly hairy at their keels: facts not noticed in either *V.* odoràta or *V.* hírta. *The lateral petals are totally divested of the slightest trace of the hairy line, which is constantly present in all the other British species of* Vìola. The sepals have a few hairs on their membranous edges and spurs. The seeds approach more to an oblong form than those of *V.* hírta. The scions are creeping, as in *V.* odoràta; and not procumbent, as in *V.* hírta.

A plant corresponding in all respects with the violet at the Sharpstones Hill, I subsequently found on an open slope of Sutton Wood, about two miles from the former station. [The kind was plentiful in both the stations, it is stated in the detailed description.]

*V*ìola hírta, so far as my researches extend, does not occur in this neighbourhood; nor have I ever met with the blue variety of *V.* odoràta, although I this spring gathered more than a hundred specimens of the white variety of *V.* odoràta at Pulley, near this town; all of which I carefully examined, and found each to possess the hairy central line most distinctly on the lateral petals. It must, however, be candidly confessed, that the pubescence of this variety agreed generally with that of *V.* imbérbis. [The vernating leaf of cultivated plants of *V.* odoràta has its petiole and subface (under surface) abundantly pubescent, and the hairs upon the petiole are very obviously deflexed.]

I have transplanted into my garden roots of *V.* imbérbis, both from the Sharpstones Hill and Sutton Wood, and also of the white variety of *V.* odoràta from Pulley, for the purpose of watching any changes which may possibly take place, and for the convenience of making experiments in raising plants from the seeds of each.

Vìola *láctea.* — In May, 1832, in company with Professor Henslow and other friends, I collected in the fens [? Bottisham ten, for one] near Clayhithe, Cambridgeshire, many specimens of *V*ìola láctea, some of which I dried for my herbarium, and others I carried with me to Shrewsbury, and planted in my garden, where they have since remained. Judge, however, of my surprise, when from year to year I have perceived the leaves of this plant gradually changing from the ovate-lanceolate character of *V.* láctea, to the cordate-acute form of *V.* canìna; and its blossoms, from the cream-coloured state in which I gathered it, assuming the decided blue colour of *V.* canìna. Numerous seedlings have this year sprung up around

the parent plant, all of which have the cordate-acute form of the leaves of *V.* canina. Sir J. E. Smith (*Eng. Flora*, i. 305.), notwithstanding the statement that *V.* láctea is so little changed by culture, except in size, appears to have entertained considerable scruples in retaining it as a species; in which doubts he is followed by Dr. Hooker in his *British Flora*, i. 107. *V.* láctea does not grow with us, and it would be highly desirable if botanists in whose neighbourhoods it occurs would institute a course of experiments to ascertain the question of its being a distinct species, or merely a variety of *V.* canina. I send specimens of the plants of the *V.* láctea in both its states. [The leaves of the two compared are, in figure, most notably dissimilar, and as described. Amongst the forms of *V*iola allied to *V.* canina, there are more than one exotic one cultivated in some of the botanic gardens of Britain, under specific names, which are scarcely species; *V.* lancifòlia *Thore* is, if we have remembered rightly, one of these. See in p. 249.]

Viola canina. — I this year met with two or three specimens of *V.* canina, which had the *four* upper petals marked with a hairy central line.

Ranunculus Ficaria. — In addition to my friend C. C. Babington's tables of the varieties of this plant, in VII. 377., I send the following list of varieties noticed in an examination of 1203 specimens at Shrewsbury, in March and April, 1833, which was inadvertently omitted to be sent to him previously to the publication of his paper. The first column indicates the number of the variety in VII. 377., the fourth the number of specimens observed in each variety. Two new subvarieties occur in Nos. 10. and 11.

Number of the variety.	Sepals.	Petals.	Number of specimens.	Number of the variety.	Sepals.	Petals.	Number of specimens.
5	3	6	1	12	4	9	10
6	3	7	15		*4	9	1
7	3	8	802		4	10	3
8	3	9	209		4	11	2
	3	10	64	15	5	7	3
	3	11	13	16	5	8	1
10	4	7	22				
	*4	7	3				1203
11	4	8	37				
	*4	8	17				

Galium cruciatum. — On the back of the leaves of Gàlium cruciàtum, immediately below the apex, I have observed two small irregular oblong pellucid tubercles, one on each side of the midrib. These, I was at first induced to consider as the eggs of some insect, but a more extended examination has shown me that they are invariably present, and has convinced

me that they are appendages to the plant. So far as my observation extends, these tubercles do not occur in any of the other species of Gàlium. Perhaps some correspondent can communicate whether they are peculiar to this species, and can explain their probable use in the economy of the plant.

Shrewsbury, Dec. 1. 1834.

[In the genus *L*ìnum, not a few, perhaps all of the species have very minute more or less yellow glands at the juncture of the leaf with the stem: there is, if I have remembered rightly, one gland on each side of the leaf of *L.* perénne; while about the base of the leaf of *L.* flàvum, an exotic species not extremely rare in the gardens of cultivators, there are, I think, several. The only mention of the fact that glands occur about the base of the leaf of, at least, certain linums, that I have been able to find, is a mention of it, in relation to *L.* glandulòsum *Mœnch*, in De Candolle's *Prodromus*, 1. 425., in the words "foliis basi biglandulosis;" of this *L.* glandulòsum *Mœnch*, the *L.* flàvum, in which I have observed the glands to be several, is there made a variety. Another fact relative to certain linums in the mode of *L.* perénne is, that, in all the flowers of one plant of a species, all the stamens will be notably less tall than the styles; and in all the flowers of another plant the styles will be notably less tall than the stamens; and this when no such fact as a removal, &c., of either of the plants, to enfeeble it, is present to contribute to explain the difference. — *J. D.*]

[V*ì*OLA *odoràta: Images of endeared Scenes are connected with it, and with other Plants, in one Mind at least.*] — In my rural walks [the communication is dated Dundee, Dec. 5. 1834] I frequently meet with fine banks of that minute and highly curious moss Dícranum *b*ryöìdes, which is more abundant in our vicinity than its allies D. *a*diantöìdes and D. *t*axifòlium. The anomalous structure of the leaves of this group of mosses (a fact mentioned by Dr. Hooker) is certainly very remarkable, and deserving of investigation from those who are qualified for the task; the more especially, as we do not yet know for what purpose Nature has bestowed upon these species such a singular structure. Notwithstanding our ignorance on this point, the Dícranum *b*ryöìdes must be a favourite; for one cannot look upon this exquisitely beautiful little plant without thinking of Mungo Park and the deserts of Africa, and feeling a genial ray of that holy con-

fidence in the Universal Parent with which its contemplation inspired the breast of the weary traveller: and this, again, brings to our remembrance that delightful saying of the meek and lowly Jesus of Nazareth about the lilies of the field. Indeed, such an associating of plants with feelings, places, and circumstances, is one of the most important pleasures experienced by the botanical student. I never breathe the delicious incense of the *V*iola odoràta, nor meet, with my corporeal or mental eye, its deep rich purple blossoms nestling among green leaves, without an accompanying landscape of romantic beauty; where I have spent many a happy hour in the company of friends I love, and in the contemplation of objects I admire. A time-worn castle among trees, an ancient churchyard, a clear stream, a sparkling cascade, a one-arched bridge, and a rugged dell, bright with verdure and flowers, are the principal features of that landscape; and these seem to me imprinted on the sweet purple violets, for there I first gazed with rapture on their humble charms. When I see the Drósera rotundifòlia, there is also present a fac-simile of the beautiful Lake of Forfar in a calm summer evening, with a boatful of pike-fishers floating gently on its smooth waters, from whose jolly faces are reflected the rosy tints of the setting sun. A plant of Jungermánn*ia* epiphýlla always suggests a little mossy-margined spring, offering freely to every one that thirsteth its pure crystal treasures; and a cowslip, though seen in a herbarium at mid-winter, breathes of the fragrant woods, with their glorious luxuriance of foliage, their fresh airs, and their soul-thrilling bursts of vernal melody. Unaffected purity is linked with the snowdrop and lily of the valley; graceful modesty with the daisy; cheerful humility with the violet; disinterested benevolence with the rose; lasting constancy with the hyacinth; unfading friendship and warm affection with the little blue forget-me-not; and, in the Scottish bosom, love of home and of country, with the purple heather.

> "Flower of the wild! whose purple glow
> Adorns the dusky mountain's side:
> Not the gay hues of Iris' bow,
> Nor garden's artful varied pride,
> With all its wealth of sweets could cheer,
> Like thee, the hardy mountaineer."

In short, plants being thus associated with our best feelings and purest pleasures, and the loveliest scenes of our country, are, independently of their own attractive graces, talismans that conjure up within the bosom multitudes of delightful thoughts and recollections, whose cheering influence fadeth not with the lapse of years. — *Wm. Gardiner, jun.*

ART. VII. *Short Communications.*

A SHORT Account of two Cuckoos caged by me, in 1834. The first I bought of a boy for 6*d*., on June 14., almost full-fledged. This bird would never take its meat without cramming, which I attribute to its being too old a bird when first caged. It died suddenly, at about eleven o'clock at night, on July 22., in the hand of the servant; who, hearing it cry out, had taken it in her hand to see what was the matter with it. It was very fat when dead. The second was brought to me on July 12.; a much younger bird, not having lost its nestling feathers. I allowed it to have its liberty in my kitchen for about a month. I afterwards put it in a cage. This bird always took its meat freely, when offered it from the hand; was very fond of the servant who attended it; and especially of myself, the very person who had deprived it of its liberty. But if any other part of the family, or strangers, approached its cage, it always seemed uneasy. I placed this and the one previously spoken of in the same cage; but they did not agree.

In November, 1834, the inside of its [the second's] mouth became almost white. [Naturally it is, while the bird is in the nestling state, of a blood-red colour.] The bird lost, by some accident, the nail of the large toe on each foot. It frequently drank, which it did by sudden jerks. Its bill, in the beginning of 1835, began to change; the old one began to peel or shell off.

I was very careful in my management of it during the cold weather, placing its cage on a stool by the side of the fire, wrapping its cage over with a blanket, keeping a good fire all night, and feeding it with raw beef. By this management, I kept it alive until Feb. 4.; on which day it seemed very poorly, and refused its meat all the morning. I then killed it; but, before I had done so, my servants assured me that it had cried cuckoo very distinctly. It knew my footsteps and voice in a moment. — *B. T. G. Gloucester.* [*Received, Feb.* 14. 1835.]

The Cuckoo hatched and nurtured by the Pied Wagtail. — The following interesting fact has been just related to me by a friend residing at Cheshunt, who witnessed it last spring: — A cuckoo had been hatched by a water wagtail in the neighbourhood; and, as soon as the former was fledged, the two birds appeared together every morning, about nine o'clock, for nearly a fortnight, on the lawn in front of his house; which, though in an exposed situation, having merely a low hedge to divide it from the public road, is a famous resort of birds, no doubt from the facility afforded by the close-mowed

condition of the grass of the lawn for the detection and capture of the various insects on which they feed. The cuckoo, although strong enough to fly without difficulty, would not assist itself by picking in the slightest degree; but would wait, with open mouth, till the wagtail flew with the eagerly expected morsel, which it greedily devoured. The avidity shown by this little animal in attending to the wants of this usurper of its nest was truly astonishing, and delighted all who observed it from the windows. It ran about rapidly in quest of food, searched zealously and successfully; for it was seldom long before it returned with something for its companion, with the feeding of which it seemed never weary. The disparity in the size of these two birds rendered this display of maternal affection rather ludicrous; but I think that it will be agreed that it was a beautiful and interesting sight; and perhaps more curious from its having taken place so close to a dwelling. — *William Fowler.* 49. *Poland Street, March* 25. 1834.

The Cuckoo hatched and nurtured by the Robin. — In the summer of 1829, I was sent for by Mr. Fisher, proprietor of an extensive orchard at Cloudsburn, near Hamilton, Lanarkshire, to see what he conceived to be a young cuckoo in a redbreast's nest. The nest was in an old wall, or sunk fence, by a little rivulet, not more than fifty yards from Mr. Fisher's dwelling-house; and was secured and concealed, in the usual sly way practised by redbreasts, with leaves and dry grass, very much resembling in colour the brown wall in which it was built. It contained only one bird; which, from its large dimensions in proportion to the nest, and other characteristic features, I at once concluded to be a young cuckoo. Mr. Fisher assured me that he had observed the nest from its commencement, but that he had never seen the old cuckoo about it; nor could he understand how a bird so large contrived to get its egg deposited, the crevice of the wall in which the redbreast had built being barely sufficient to *admit the redbreast itself.* The observation of Mr. Fisher struck me forcibly on observing the nest; nor have I yet been able to unravel the mystery. Another circumstance, evident from inspection, was, that the young intruder had contrived to get the whole nest to itself; and this object it was observed to effect by the dexterous application of its wings and rump, by which it *elbowed* the young redbreasts out of their paternal abode, and became itself the pet. But the most curious circumstance in the history of this little community is, the solicitude which the female redbreast displayed for her foster-bird after it had quitted the nest, and was able to fly about the orchard. For many weeks did this kind-hearted but deluded bird follow

her gigantic supposed offspring from tree to tree, and feed it with her favourite food. This striking and affecting phenomenon I myself observed, and hundreds besides; and so anxious was the poor redbreast to satisfy the cravings of her monstrous charge, that she became at length so tame, that she would peck crumbs of bread out of the hand, and, after occasionally appropriating a morsel to herself, carry the rest to the cuckoo, who seemed to devour it with great relish. From the mutual attachment exhibited between these two birds, I am perfectly certain that *this cuckoo* exhibited no inclination to devour its foster-parent. Many naturalists, I am aware, in addition to taxing the cuckoo with cunning, have charged against it this monstrous cruelty; but it does not appear that it has been ever caught *in the act*. In the present instance, the parent bird was spared; for, when the season was far advanced, the cuckoo had disappeared, but the robin continued to frequent her ancient haunts. The male redbreast was not so assiduous in his attentions to the suspicious-looking stranger as the female; not (as Mr. Fisher supposed) because he doubted the constancy of his partner, but he seemed wilder, and to possess less of that instinctive love of progeny which is thought to be commonly most intense in the female sex. — *William Patrick. Hamilton, Lanarkshire, Jan.* 20. 1834.

The Cuckoo hatched and nurtured by the Pied Wagtail. — In V. 675., I have stated that I had known of the occurrence of three instances of this in the botanic garden at Bury St. Edmunds; and have promised, in the page cited, to detail, some day, some facts respecting them. I would now state them. First, as this garden, it will be shown, has been often the place of a cuckoo's nativity, it may be well to remark that it is situated in a valley, partially wooded, through which two watercourses pass, and which skirts the town on the east. Now for the instances: — there was one in 1823; in 1824 there was another; and, respecting this one, I shall quote the amount of some remarks which I communicated to the *Bury Post* newspaper respecting it, in which they were published on June 23. 1824. In a plant of ivy which was growing on the western side of an old wall, a wagtail's nest was discovered on May 21.: it contained five young birds, apparently recently hatched, and a rotten egg. In the next morning, four of the young birds were found lying dead on the rim of the nest: the night had been frosty: one was alive in the nest, and with it the rotten egg. The surviver proved to be, on examination, a cuckoo, being larger, and having longer legs. After some thinking and asking as

to the cause of the death of the four young wagtails, it was agreed that the young cuckoo's greater bulk and strength, and its using this faculty in promotion of its own ease and convenience, had hoisted the young wagtails out of the nest, and that the wagtails had died from the cold. The parent wagtails now showed the greatest care and tenderness towards the young cuckoo, and fed it with insects (and, perhaps, with small worms), which they collected with pleasing diligence and dexterity. Lawns kept shortly mown, and a sluggish narrow watercourse were adjacent. An almost incessant watch was kept over the nest by one or other of the pair; and, when a person approached the place where it was, they evinced their parental solicitude by calling with great eagerness, and flying about in an excited manner. They succeeded in rearing it, and it flew from the nest on June 9. It was seen again on June 12. on the top of a wall near to the place of the nest, and while it was sitting here an amusing and instructive sight presented itself; a thrush, which, probably, had a nest close by, in an adjoining garden, evinced the most passionate and marked antipathy towards the young cuckoo, by approaching it with feathers ruffled, beak open, and uttering an earnest cry: some small birds, too, drew near, as if to exhibit their dislike, and abet the thrush. A cuckoo sang in the neighbourhood of the garden at the time the young one was growing strong enough to fly ably; but one might have sung there had no young one been near.

From 1824 to 1828 one or more cuckoos were hatched in this garden; but I do not find that I have any notes on them. I remember that one young one had one wing so deformed that it could never have flown. This deformity seemed to have been induced by the condition of the nest, which was so placed against an old wall, that the corner of a brick or stone projected, in some degree, into it, and lessened the space of the interior, or made, at least, its figure unusual: I suppose that the wing of the cuckoo, while the bird was yet too tender and powerless to shift itself, had lain against this projecting body, and thus become deformed. This individual was taken, caged, and fed experimentally, &c., for for some rather short time, when it died. Young cuckoos, from the time they have become fledged to that at which they quit the nest, are in the habit, during the day, as they sit in the nest, of uttering a harsh, one-syllabled chirp of some length, and of a plaintive tone, indicative of, and induced by hunger, I presume, and repeated every few minutes: any one familiar with this chirp would, I think, be able to trace a young cuckoo by it anywhere.

Of the cuckoos hatched in this garden since 1828, Mr. Turner, the curator, has supplied the following account:—

In 1829, three cuckoos were hatched in this garden, two of them in ivy that clothes an old wall, and in two nests of as many pairs of wagtails; and the other in an alder tree, about 9 ft. from the ground, in a greenfinch's nest.

In 1830, there were two cuckoos hatched in this garden, near the places in which the young ones had been hatched in the preceding year: both of these had wagtails for their foster-parents.

In 1831, there was but one cuckoo hatched, to my knowledge; which was hatched and reared in a yellowhammer's nest: this nest was built near the ground, in the centre of a large clump of the plant *Lysimàchia verticillàta*.

On July 17. 1832, a friend informed me that he believed that a cuckoo had laid eggs in two nests of wagtails in his garden, as he had seen, early one June morning, a cuckoo leave the ivy in which a wagtail had just built; and that on the following morning he had observed it to fly from a large crevice in a wall where he had lately found the second nest. He did not, however, take any notice of this at the time; but, having that morning accidentally discovered one of them to contain a large young bird and five small eggs, he was induced to take a peep at the other, where he found two larger eggs, with three eggs of the wagtails.

On July 20. I saw the nests: the one in the ivy contained a fine young cuckoo, and four young miserable-looking wagtails, and a rotten egg; the cuckoo occupied the centre of the nest, which was somewhat flatter (less cupped) than usual. The nest in the wall contained three healthy young wagtails and two cuckoos, which appeared as if very recently hatched.

On July 24. I visited them again, and in the first I found the cuckoo all alone; but, on my looking about, I found one of the young wagtails by the side of the nest, and three upon the ground beneath, quite dead. I replaced the living one in the nest; but I found, next day, that dead upon the ground also; and, a few days after, the cuckoo had been stolen. In the other nest, although there were two cuckoos, the young wagtails were longer-lived. On July 24. they were all apparently well and growing apace; but the nest was much flattened and extended, and here the two interlopers were in the centre, with the rightful owners ranged around them. It appeared to be very fatiguing to the parent wagtails to supply the youthful party with food, for which their calls were loud and incessant.

On July 26. all the young wagtails were sitting upon the

stones by the side of the nest: I replaced them upon the nest; and, as the young cuckoos appeared very hungry, I spread a quantity of small worms, ants' pupas, and bread, upon a board close at hand, with which the old birds stopped their cries.

On July 29., one of the young wagtails was dead upon the nest, and the others sat shivering upon the ground beneath. I again replaced them; but, on August 2. they were not in the nest, nor could I ever see them afterwards, though I made a diligent search. The young cuckoos continued to thrive for some days, and then they fell a prey to a cat, which thus put an end to my observations. — *Henry Turner. Botanic Garden, Bury St. Edmund's, Oct.* 15. 1832.

The Cuckoo hatched and nurtured by the Linnet (*which Species of?*). — "In the nursery grounds of Mr. Burge, gardener and seedsman, of this town [?], a linnet, in the spring of the year, built her nest, in which a cuckoo deposited an egg, which, after incubation, produced a young bird. As soon as it was fledged, it was placed in a wicker cage by the proprietor of the grounds, and suspended to a tree near the spot, where it was carefully attended by its foster-parents, and is now grown a fine bird, about the size of a thrush [not having, we may suppose, attained a greater size at the time the report was prepared for publication]. It was at first very shy, but has subsequently become more familiar, and freely receives the food which is given it, consisting of worms, &c. The little birds, its generous patrons, constantly attend it, and administer to its support." (*North Devon Journal.* Date not preserved.)

The Species of Birds in whose Nests the Cuckoo has been known to deposit its Egg or Eggs, seem to be these. The pied wagtail more frequently (V. 277. 278. 675.; VI. 83.; VIII. 283—287.); the titlark (I. 374.; IV. 270. 302. 415.; V. 675.; VI. 83.); the redstart (V. 278.); the robin (VIII. 284.); the hedge-chanter (II. 242.; III. 192. 397.; V. 278. 675.; VI. 83.); the greenfinch (VIII. 287.); the linnet, of some species (VIII. 288.); the yellowhammer (VIII. 287.); and, according to Rennie's *Mont. Orn. Dict.*, 120., the larks, the whitethroat; and the wren, with a doubt. In VI. 83. is a notice of two wrens adopting a captured young cuckoo. For a notice of the species of birds in whose nests Mr. Hewitson has known the egg of the cuckoo to be found, see in p. 292. Should not the reed-sparrow be added to this list? Montagu has stated (*Orn. Dict.*, Rennie's edit., p. 117.) the fact of the cuckoo's egg being taken out of a reed-sparrow's (reed-bunting's) nest. What other species of birds?

The natural history of the cuckoo is so very interesting, that it cannot be too much elucidated; and in the hope of

inducing correspondents to contribute to the further elucidation, we would here exhibit a recapitulation of certain points, which, though they have received the casual attention of naturalists, seem never to have been thoroughly investigated and explained.

"The cuckoo, which bears a strong resemblance to the hawk when on the wing, is certain of a similar retinue wherever it flies." (*Professor Rennie*, in I. 374.) These, it may be assumed, are usually composed of one or more of the very species which are made the agents to hatch and rear the cuckoo; and, as it is admitted on all hands (I. 374.; IV. 415.; VII. 348.), that the bearing of those small birds which pursue adult cuckoos is, towards them, of the offensive kind, one cannot but be led into instructive considerations on the degree of intellectual capability in birds, on contrasting their manners, while engaged in this pursuit, with those which they manifest towards the infant cuckoos which they rear. The late Rev. L. Guilding had made this note in relation to the mention in I. 374. of the cuckoo's being pursued by small birds:—"It may not be unlikely that the cuckoo is sometimes mistaken, by flocks of birds, for a hawk, to which it bears, at a distance, no trifling resemblance. In the counties of Worcester and Gloucester, I have seen it punctually attended by small birds; but these were its foster-parents, the hedge-sparrow or the wagtail, which always fed it till capable of migration. —*L. Guilding. St. Vincent, May* 1. 1830."

What is the Number of Eggs laid by the Cuckoo at one Course of laying? Does it ever lay more than one Egg in any one Nest? Does it lay more than one Course of Eggs during its Stay in Britain?—Montagu believed that the number of eggs layed by the cuckoo, at one course of laying, is five or six (Rennie's *Mont. Orn. Dict.*, p. 119.): Professor Rennie has stated it (III. 399.) to be six. These it may be obliged to lay in as many nests of as many species of birds; for, from the aversion which, as we have seen above, small birds manifest towards the adult cuckoo, its deposition of its eggs in the nest of any one of them must be done by stealth, and the favouring opportunity of the absence of the parent birds is less likely to occur twice than once. It is stated in Rennie's *Mont. Orn. Dict.*, p. 119., apparently by Montagu, that the cuckoo never lays more than one egg in any one nest, and that "where two have been found in one nest, they certainly were layed by different birds." The grounds of this position are not given: we beg to leave it for proof or disproof to our correspondents. An instance of finding two cuckoo's eggs in one nest is noticed in V. 278.; and two instances of

finding two young cuckoos in one nest, in V. 62., VIII. 287. For an explanation of the grounds of our third question we refer to Rennie's *Mont. Orn. Dict.*, p. 118—120.

Has any Correspondent ever found the Egg or Young of the Cuckoo in a Nest so situated that the Parent Cuckoo could not possibly sit upon that Nest to deposit its Egg?—In consequence of some instances of the egg or young of the cuckoo being found in nests seemingly thus situated, conjectures and speculations on the mode in which the egg had been introduced have been offered: see Professor Rennie in his *Mont. Orn. Dict.*, 120, 121; whence we learn that Temminck has stated that "the female of the cuckoos, by some means not positively ascertained, carries the eggs which she has layed into the nests of different species of small birds;" and that M. Vaillant had obtained pretty satisfactory evidence that one at least of the African cuckoos carries the egg in her bill, in order to lay it in nests having a narrow side entrance." The nests which we have known adopted by the common cuckoo were so situated that the cuckoo could have sat upon them.

Mr. Patrick has communicated, in p. 284. of our present Number, a notice of an instance of a young cuckoo's occupying a robin's nest, so conditioned that the parent cuckoo could scarcely possibly have *layed* its egg in the nest. Mr. Hewitson, in his *British Oology, or Illustrations of the Eggs of British Birds*, in treating of the egg of the cuckoo (t. 55.), makes the following remark, applicable to the point under consideration here: — "I should have been exceedingly gratified could I have settled two very interesting points which yet remain undetermined; viz. what number of eggs the cuckoo lays in one season, and whether or not it ever carries its egg (after having laid it) to the nest of another bird. Mr. Williamson of Scarborough informs me that he has found its egg in the nest of a rock lark [rock pipit], close under the projecting shelf of a rock, and in a situation where he considers it impossible for the cuckoo to have deposited it in any other way. Though not myself inclined in favour of this supposition, yet there is something that renders it highly probable. Unless the cuckoo is thus able to transport its eggs after having laid them, numbers must be dropped to no purpose, when, at the point of laying them, it is unable to find the nest of another bird in which to leave them."

If the following supposition of Montagu's be the fact, a means of preventing this consequence is otherwise provided.

Montagu has supposed that "the cuckoo is actually endowed with the property of retaining its egg in the uterus,

after it is matured, till it has discovered a nest in a fit state to deposit it in." (Rennie's *Mont. Orn. Dict.*, art. Eggs of Birds, p. 163.) Our correspondent, Mr. Hoy, seems (V. 278.) favourable to this opinion, and has mentioned a fact in support of it. Montagu has adduced the following inference in connection with his opinion quoted above. "The consequence of this retention would be a dilatation of the embryo, by the internal heat of the body (the viper is oviparous, or, rather, ovo-viviparous, hatching its young by the internal heat of its body), and the fœtus advanced towards perfection in proportion to the time the egg remained in that state. Of course, after such a previous enlargement of the fœtus, were the egg dropped into the nest of a bird on the point of sitting, it would most certainly be hatched as long before the eggs of the bird whose nest it was deposited in as it had been forwarded in the uterus. It has frequently been observed, that, where the egg of a cuckoo has been found in the nest of a bird together with some of its own, that the cuckoo's egg is hatched first. (Jenner, *Nat. Hist. of the Cuckoo*, p. 3.) [See VIII. 287.] This seems difficult to account for, unless upon the principle we have suggested, as the egg of that bird is rather superior in size to that of any bird whose nest it makes choice of to deposit it in; amongst which the yellow hammer's is the largest, weighing, in general, from 36 grs. to 46 grs.; whereas that of the cuckoo weighs from 44 grs. to 54 grs. The other birds which the cuckoo more generally chooses to incubate its eggs, seldom produce eggs above 40 grs. in weight, and mostly from 30 grs. to 36 grs.; if, therefore, the embryo of the cuckoo were not sometimes enlarged before the egg was laid, is it reasonable to suppose it would be first hatched?" We hope that our presentment of these views will induce correspondents to communicate a statement of any facts which may tend to test the truth of them.

Montagu has stated, in the same article on the Eggs of Birds, that, "By experiment, it appears, that birds do not instinctively know the necessary time of incubation; for we have repeatedly taken the eggs of a bird unincubated, and placed them under another of the same species, who was on the point of hatching, and, *vice versâ*, those on the point of hatching into the nest of such as had only begun to sit; and in both cases the young were brought to maturity." The import of this statement does not oppose Montagu's conjecture, that the cuckoo's egg may be partly hatched before it is layed, for he has not stated that the young which had been "brought to maturity," that is, hatched and reared, from the

differently conditioned eggs, were hatched at the same time. In this statement we learn, too, that the interchanged eggs were identical in kind, and that this kind was that proper to the species of bird to which they were introduced: the eggs differed only in their condition. Montagu has remarked, in continuation, that "Birds will sometimes discriminate the egg of another species, and will turn it out." It is clear that all those pairs of birds which have been known to have hatched the cuckoo's egg have either not discriminated it, or have not turned it out. The egg of the cuckoo is, too, more or less dissimilar to that of the eggs among which it is introduced. A comparison of its weight and size with those of the eggs of certain other birds is already quoted above. Montagu has stated that the egg of the pied wagtail "exactly resembles that of the cuckoo." (Rennie's *Mont. Orn. Dict.*, p. 378.) Mr. Salmon has thus noted, in V. 675., on the egg of the cuckoo, as compared with that of the pied wagtail. It is "much superior in size, considerably darker, about the size of that of the skylark, but more of an oval shape. The difference is so great between the eggs of the cuckoo and those of the pied wagtail, that I am quite certain that any person with common observation would instantly detect it." Mr. Turner's friend noticed that the cuckoo-eggs, as they proved, were larger than the wagtail's. (p. 287.) Professor Rennie has described, in his *Mont. Orn. Dict.*, p. 193., the egg of the cuckoo as "small, rounded, and greenish, yellowish, bluish, or greyish white, and always blotched, not marbled, with olive or ash colour, being about the size of a house-sparrow's, and very like it in colour." Professor Brande has remarked, that "the cuckoo very commonly selects the nest of the hedge-sparrow, a spotted brown egg among bright blue."

Mr. Hewitson, in his *British Oology*, t. lv., has figured the eggs of the cuckoo, and, in a description appended, has this remark among others:—"The eggs of the cuckoo are found in the nests of several species of small birds. It, however, seems instinctively to prefer those, the eggs of which most nearly resemble its own. [The remarks adduced above will serve to test the accuracy of this view.] Among these are the several species of lark [Mr. Hewitson includes the rock pipits, and, perhaps, all the pipits, among these], the pied wagtail, and the grasshopper warbler: it most frequently, however, makes choice of that of the titlark, which is common on those open heaths, its favourite resort. [In certain neighbourhoods, not heathy, it may be that it oftener chooses the pied wagtail's nest: see p. 300.] The egg, which is remarkable for its small size, is thus, together with its colour, admirably fitted for the decep-

tion it is intended to practise. Though very similar in some instances to those of the skylark, there is a character about it peculiar to itself, by which it may be readily known: its shape is more oval; it is also, in most instances, marked with minute black dots."

In some of the instances in which man or the cuckoo has added to the eggs of certain birds an egg or eggs of another kind, these birds have been known to reduce the total number, and, in the reduction, to retain the alien eggs and discard their own. In V. 728. an instance of the buzzard's discarding its own egg from among the eggs of poultry, which it was incubating, is stated. Another is described by Professor Rennie in his *Habits of Birds*, p. 145.; it is this:—A few days ago we had brought to us three eggs of the wood wren (Sylvia sibilatrix *Bechstein*); and, being anxious to have them hatched, we introduced them, after warming them slightly, into the nest of a canary, then sitting upon four eggs of her own. In the course of the day, two of her own eggs had disappeared, having, we inferred, been destroyed by her, because she could not cover the seven so as to keep them at a uniform temperature, the three small eggs being nearly equal in size to the two which were gone." Professor Rennie has added: — "It is, no doubt, for the same reason, that the birds in whose nests the cuckoo parasitically deposits her egg, often, if not always, turn out or destroy their own to make room for hers."

The fact and suggestion cited from Professor Rennie are sufficient, probably, to account for birds reducing the number of eggs in their nests, when this has been rendered supernumerary; but it does not account for their retaining the alien eggs and discarding their own. The wood wren's eggs were individually smaller than the canary's, and might be disposable more compactly; the cuckoo's egg is, it is shown above, slightly larger than the egg of any species of bird into whose nest it is known to deposit it. Upon what principle, then, are the alien eggs retained, and the proper ones ejected? Probably upon that of accident only. Professor Rennie, in his idea, that "the birds in whose nests the cuckoo parasitically deposits her eggs, often, if not always, turn out or destroy their own to make room for hers," can only refer to instances in which the egg or young of the cuckoo has been found in nests. It may be that the instances, never known of by man, of the cuckoo's depositing it eggs in nests from which the owners of that nest discard it, may be more numerous than those instances, known of by man, in which the owners of the nest retain it. If we take the natural number of the pied wagtail's eggs at five, an instance is noted in V. 675.,

and others in VIII. 285. 287., in which the wagtail had not discarded one of its own eggs to make room for that of the cuckoo. From a remark by our ornithological correspondent, Mr. Hoy, in V. 278., it appears to be usual for the birds in whose nests the cuckoo may have deposited an egg, before they themselves have begun to lay, to cast out the cuckoo's egg.

Another view remains open: the parent cuckoo may itself sometimes reduce the number of the eggs of the bird to whose eggs it deposits its own. This suggestion seems to be but reviving a notion which is, it appears, deemed not true. In Rennie's *Mont. Orn. Dict.*, p. 117., will he found the reasons which had convinced Montagu "that the eggs of the foster-parent could not be destroyed by the old cuckoo." The following fact, communicated by Mr. Hoy, in V. 278., tends to an opposite conclusion: — "I once observed a cuckoo enter a wagtail's nest, which I had noticed a short time before to contain one egg: in a few minutes the cuckoo crept from the hole, and was flying away with something in its beak, which proved to be the egg of the wagtail, which it dropped on my firing a gun at it. On examining the nest, the cuckoo had only made an exchange, leaving its own for the one taken." Mr. Hoy's known skill in ornithology makes this fact one of real value. Mr. J. D. Salmon, another correspondent skilled in ornithology, has alluded, in V. 675., to the cuckoo's destroying the eggs of the pied wagtail as a matter known to him. If it destroy those of the pied wagtail, it will, doubtless, destroy those of any species of bird in whose nest it may lay its own eggs. Mr. Mudie, in his *British Naturalist*, has, as appears by an extract in our V. 63., spoken of the cuckoo's making "a meal of the eggs" of the bird whose nest it may appropriate. The context shows, however, that he has not any practical ground for this notion: but still it shows that the notion has been extant; and we remember a couplet, which was in use with our schoolfellows, which expresses a similar idea. The evidence of schoolboys on the distinctions of the species of eggs of birds might be admitted; but, on a disputed point in economy, like the present, is not of avail, farther than to show that such an imputation on the cuckoo has prevailed.

We may next consider the hatched young cuckoo in the course of being sustained by the foster-parent of it.

Birds will frequently breed up the young of another species exchanged for its own, provided they are of the same age, and not very large, when the experiment is made. (*Montagu*, in Rennie's *Mont. Orn. Dict.*, 161.) The conditions stipulated show that the substituted young are not committed to the elective affection of the foster-parent, but imposed upon

its inability to distinguish it or them. The parent cuckoo acts far within the line of these conditions, by introducing her eggs before they are hatched: even if Montagu's suggestion, that they are partially hatched before she lays them, be the fact. Neither are these conditions opposed by the hatched young cuckoo's speedy attainment of a size much greater than that of its foster-parents' own young hatched with it. "The extraordinary growth of the young cuckoo is no more than what happens with others from eggs of a disproportionate size: for instance, the egg of the raven is not half the size of that of the kite; and yet the young of the former are not longer in arriving at maturity than the latter." (*Montagu*, in Rennie's *Mont. Orn. Dict.*, 164.) Consistently with this view, the young proper to the young cuckoo's foster-parents should attain maturity in equal progress with the young cuckoo itself. That they would do so, did their parents secure to them their proper proportion of food, lodging-room, and brooding and attention, is not to be doubted.

This the parent birds cannot secure to their young. In building their nest they built it to their own proportions, and of dimensions adequate to the commodious lodgment of their young; but a giant has been stealthily introduced into it, and has appropriated much of the space that their own young need. The weaker must submit; the giant must be allowed to remain, and the parent birds' proper offspring must shift as best they can, subject to the inconvenience of want of room for ease and comfort, and liable, from the inability of the parent bird to brood over each one of its charge equally, to a greater or less degree of detrimental exposure to the cold. An instance of this last effect, occasioned to the foster-parents' young, is related in p. 287. Not only are they thus inconvenienced by the cuckoo's greater bulk, but are liable to total ejection from their parental cradle, and to death in consequence, from the young cuckoo's instinctive efforts to secure its ease (we shall scarcely err in referring them to this cause); and the facts related by Mr. Patrick, in p. 284. of the present Number, and by Montagu, in the following quotation from him, will show the manner, perseverance, and success of its exercising them. Montagu had once "ocular proof of the fact related by Dr. Jenner, of a young cuckoo turning out of a hedge-sparrow's nest a young swallow [he] had put in for the purpose of experiment." "I [Montagu] first saw it [the young cuckoo], when a few days old, in the hedge-sparrow's nest, in a garden close to a cottage, the owner of which assured me the hedge-sparrow had four eggs when the cuckoo dropped in a fifth. That on the morning the young

cuckoo was hatched, two young hedge-sparrows were also excluded; and that, on his return from work in the evening, nothing was left in the nest but the cuckoo. At five or six days old I took it to my house, where I frequently saw it throw out the young swallow for four or five days after. This singular action was performed by insinuating itself under the swallow, and, with its rump, forcing it out of the nest with a sort of jerk. Sometimes, indeed, it failed, after much struggling, by reason of the strength of the swallow, which was nearly full-feathered; but, after a small respite from the seeming fatigue, it renewed its efforts, and seemed continually restless till it succeeded. At the end of the fifth day this disposition ceased, and it suffered the swallow to remain in the nest unmolested." The instance related in p. 285. of the present Number, of all the young wagtails being found dead out of and near the nest, which they had shortly previous occupied alive, and which a young cuckoo was then occupying alive, and alone, with the exception of an abortive egg, is one adducible, without violence, in proof of the fatal effects on the progeny of its foster-parents of its own efforts to attain ease. That the parent wagtails did not discard from their nest their own young, from finding that all the inmates of the nest could not be accommodated, is assumptively proved by the cases detailed by Mr. Turner, in p. 287. and 288., in which two pair of wagtails had had the happiness to sustain their young for a longer time, collaterally with young cuckoos, under their care in the same nests.

As to food, those pairs of parent birds who have a young cuckoo and a brood of their own young to sustain cannot, we have said, supply to each individual of their charge the proportion proper to it. We said not this under the impression that they would not be able to collect a quantity sufficient (though of this we have now serious doubt; and Mr. Turner's facts, in p. 287., favour that doubt), but in the belief that parent birds, in feeding their charge, observe no such rule as dealing a share to each in succession; but that they collect the food with wonderful diligence, and bestow it with great assiduity, but without selecting the individuals to which they shall impart it. Those, we think, receive most of it who press forwardest, gape widest, or clamour loudest. If this view be admitted, it will also be admitted that the size and strength of the young cuckoo give it great advantage over its smaller companions: and we believe that we dare answer for the voracity of its appetite prompting it to make every effort in its power to attain satiety.

Instinct may be defined as, perhaps, passive agency. In

the preceding notices of certain of the details of the phenomena of the cuckoo's being hatched and reared by foster-parents, we have allowed the opinion to appear that the foster-parents are not capable to distinguish the egg of a cuckoo from an egg of their own, nor the young of the cuckoo from the young of themselves; and that their incubating the egg of the cuckoo, and their rearing the young cuckoo which they had hatched from that egg, are deeds performed in undistinguished and unqualified obedience to that impulsive instinct which, founded within them, and within every species of being, impels in every species a love of its own kind, and the exercise of the means of reproducing and nurturing it. However, in VI. 83., a fact has been communicated, by the distinguished by Mr. Ensor, which disagrees with this view, and should be coupled with it: — "In my neighbourhood [Ardress], a tenant's son found a cuckoo in a [titlark's] nest. He brought it home, and fed it on potatoes and oatmeal dough. In a few days, two wrens, who had a nest with eight eggs in the eaves, and just above the window fronting the cage in which the cuckoo was placed, made their way through a broken pane, and continued to feed it for some time. The cage was small; and the boy, preferring a thrush to the cuckoo, took it away, to give greater room to the thrush. On this, the wrens repaired to their own nest, and brought out the eggs that had been laid. This is very curious, and seems like fascination: to leave their own nest, and abandon their progeny in their incipient state, to feed a stranger, and, to them, a monster." In IV. 270., and VIII. 283. and 284., are related instances of foster-parents of young cuckoos catering for them, and feeding them, after they had left the nest, and could fly; and we believe that they do this in well nigh every instance; but, then, they, when unencumbered with the charge of maintaining a young cuckoo, do the same thing to their own young: and, hence, this may be set down as but the exercise of an instinctive habit.

Upon what Materials of Food is the young Cuckoo fed, from the Time it is hatched, until the Time at which it obtains its own Living? — The answer to this question may be best deduced from considering the following facts: — Of the species of birds which are noted in p. 288. and p. 292. as known to have reared the cuckoo, the following are termed by naturalists insectivorous birds; the pied wagtail, the titlark, the rocklark, the hedge-chanter, the redstart, the robin, the wren, and the whitethroat: and these granivorous; the skylark, the yellowhammer, the greenfinch, the linnet, and the reed bunting. Naturalists admit that some of the above-named

insectivorous birds take as food, occasionally, the seeds of plants; and that the deemed granivorous birds take insects for food occasionally. I remember seeing bread-crumb in the mouth of a dead wagtail: an individual, one of a pair, as I believed, engaged in rearing a cuckoo. Mr. Patrick has noted (p. 285.) that, when bread was given to the foster-parent robin, it carried part of it to the cuckoo. Mr. Turner has stated (p. 288.) that the wagtails applied the proportion of bread which he had supplied to them, along with small worms and ants' pupas, to the feeding of the two young cuckoos, in common, it seems, with their own young. Professor Rennie has noted, in his *Mont. Orn. Dict.*, that Vaillant has stated, of the species of cuckoo in Southern Africa, that they uniformly select, as receptacles for their eggs, the nests of birds which feed on insects; and never those of the birds which feed on grain, although these are the more numerous, and their nests more easily found. Professor Rennie has added that "Colonel Montagu makes a remark nearly similar, with respect to our common cuckoo; for, among a number which he examined, he found only one with any vegetable materials in its stomach."

The following facts are quoted from an account introduced by Professor Rennie into his edition of the *Mont. Orn. Dict.*: — "A young cuckoo, brought to Colonel Montagu, in July, just as it could fly, was, by great care, kept alive till Dec. 14. . . . . Nothing appeared to be acceptable as a substitute for insects except raw beef. Flies it would eagerly devour; but its most delicious morsel was any species of hairy caterpillar: these it seized with avidity, shook them to death, and softened, by passing several times through the bill, till they were perfectly pliant; when it would swallow whole the largest of the caterpillars of the egger or drinker moths." In II. 111, 112. note *, 243., VI. 83., VIII. 283., are accounts of caged young cuckoos, and of the kinds of food upon which they were fed: these were chiefly raw flesh, raw beef, and earth-worms. A pair of wrens had helped to feed that noted in VI. 83., which a boy fed awhile upon potatoes and oatmeal dough: he subsequently discarded it. The artificial food of caged young cuckoos can but obliquely answer the question, What is their natural food? Still the facts tend to answer it, especially those from Montagu.

Materials of the Food of the Adult Cuckoo.—Its "food is chiefly insects, particularly caterpillars, or the larvæ of all kinds of lepidopterous insects, and not the smooth sorts only, as some have imagined; for we have found the stomach of this bird lined with the hairs of the rough ones more than once." (*Montagu*, in Rennie's *Mont. Orn. Dict.*) Mr. Yarrell, as quoted

by Mr. Jennings in our II. 111., "has dissected many cuckoos; and he says that the stomach is similar in structure to the woodpecker's, and, therefore, fitted for the digestion of animal food only; that the contents of the stomach invariably indicate the presence of such food, namely, the larvæ of some insects." Mr. Jennings has thought that the cuckoo climbs about the trees which it frequents, and obtains its food from them. The late Rev. L. Guilding had written the following remark in relation to Mr. Jennings's opinion: — "The [adult] cuckoo doubtless obtains its food on trees. As far as I can recollect, caterpillars are always found in its stomach on dissection. I have frequently shot the old birds about Oxford, and opened them. Preparations of the stomach in spirit, made by me, were given, for the Theatre of Anatomy at Christ Church, to my early friend and preceptor, Dr. Kidd. The internal coat is lined with a velvet down, a peculiarity not observable in other birds I have dissected." — *Lansdown-Guilding. St. Vincent, May* 1. 1830.

H. N. has stated, in IV. 270., that the cuckoo "feeds upon the ground at times;" but he has not stated upon what objects.

The Age of the Cuckoo on its first uttering perfectly the Note proper to the Species. — Two facts, not wholly useless in relation to this point, are given in II. 243., and VIII. 283.

The Cuckoo uses two very distinct Notes; 1st, that which resembles its name: this it varies by "sometimes repeating the first syllable two or three times." (*H. N.* in IV. 270.) In note * in p. 256. of the present Number, it is contended that spelling this bird's name cu-coo, instead of cuckoo, would be more consonant with the note uttered by the bird. 2dly, A kind of chatter, like that of the blackbird, but much louder and stronger. (*H. N.* in IV. 270.) This second note has been noticed in greater detail by Mr. Main in IV. 415. note *; whose description we shall here reprint for the sake of unity, and of placing it more pointedly under attention. ". . . . The cuckoo, male or female, I know not which, has another note, as distinct from the common one as two sounds can well be, and which I never remember to have seen noticed by any writer. [It had been by H. N. in the words quoted above.] This other note is chiefly given when the bird is seated on the top of a tree. It is a loud, liquid, guttural, quickly shaken note, somewhere about A in alt. It is but seldom heard, and does not appear to be a response to the common call." We have heard this note, and think it a not uncheering one. If we recollect rightly, we have witnessed it to be uttered just before the cuckoo takes flight off a tree, or even

while passing from one tree to another. We suspect Mr. Blyth's words in VII. 348., "the full, melodious, note, which the cuckoo often utters on the wing," to be intended to signify this sound.

The usual, and the less usual, Note of the Cuckoo. Which of the Sexes utters each of these? Do both of the Sexes utter each of them?—It is as good as suggested, in IV. 415. note *, and VII. 348., that it may be the female, because the titlark has been observed to attack the cuckoo on the wing and singing: the object of its attack would, it has been supposed, rather be the female. The remarks in p. 289. present another view.

The Cuckoo sings sometimes on the Wing.—IV. 270. 415. note *; VII. 348.

The Cuckoo sings, in warm Weather, through the Evening, and through nearly all the Night.—IV. 147. 270. 466.; VI. 199. and note *, 291. note *, 374.

When does the Cuckoo become silent in Britain?—Contributions towards an answer are in III. 450.; IV. 184. 275. 466.

Dates of the Cuckoo's arriving every Spring in Britain.—The nearest approximation to these will be the dates of first hearing its call. Facts relative to these objects are given in III. 154.; IV. 270.; VII. 342., and note *. In a list of birds met with in the neighbourhood of the river Conwy, in Caernarvonshire, with notes upon some of them, lying by us, it is stated that the cuckoo had been first heard, in 1824, on April 21.; in 1825, on April 22.; in 1826, on April 21.; in 1827, on April 26.; in 1828, on April 29.; in 1830, on April 27.; in 1831, on April 21. At Bury St. Edmund's, a friend of ours first heard the cuckoo, in 1829, on April 21.; and another, or the same, friend, in 1831, on April 15.

Localities in Britain visited by the Cuckoo, and the Conditions of these Localities.—The localities in Britain are probably so nearly every where, that the point of interest, under this head, would rather be the localities in which the cuckoo is annually neither heard nor seen: there may be such. As to the condition of the localities in which the cuckoo has been known to annually occur, a collecting of notices of these would be not uninstructive. Two districts in which we had known it to occur—the neighbourhood of Bury St. Edmund's, Suffolk, and Waterbeach, Cambridgeshire—are conditioned with trees, water, and meadow land: but Mr. Hewitson, in his *British Oology*, t. lv., has noted "open heaths" as its favourite places of resort; Mr. Hewitson, speaking of, it is most probable, the county of Northumberland. Cuckoos have been noted to be numerous in the following localities:—Malvern Hills, Worcestershire (III. 160.); Ampthill, Bed-

fordshire (IV. 466.); near Londonderry (IV. 270.); and to be common on the northern coast of Donegal (V. 583.).

When does the Cuckoo leave Britain? — Relevant notices are communicated in III. 154.; IV. 172. 270. 275. 466.; VII. 342. note *.

Whither does the Cuckoo, on its leaving Britain, go? — A question to this amount is asked in III. 193. The Rev. W. B. Clarke has contributed two facts relative to it in VII. 342. note *, and has farther elucidated it in the following communication: —

Migration of the Cuckoo. — On referring to a journal kept by my brother, during his late journey in Russia and over the Caucasus, I find he mentions his having pursued a cuckoo, in the end of Aug. 1833, when travelling between Vladimir and Moscow. Does this fact add any information to what is known of the retreat of the cuckoo? (See VII. 342. note *.) It would indicate a longer stay in Russia than with us: or, was it on its passage south or west? Vladimir is in the latitude of Edinburgh. Gilbert White, in his *History of Selborne*, part 2. ix., mentions that it had been observed by old Belon, then 200 years ago, that hawks and kites were seen, "in the spring-time, traversing the Thracian Bosphorus from Asia to Europe." The cuckoo arrived, in 1827, in the neighbourhood of Stockholm, on May 7. (*Ekstroem*, in the *Isis*); at Kuopis, in Finland (lat. 63°), on May 24. (*Wilhelm* and *Wright; Bull. des Sci. Nat.*, xxii. 116.); and at Carlisle, in England, on April 28., five days later than in 1828. (*Phil. Mag.*, xxvii. 196.) The date of departure from Sweden is not known. — *W. B. Clarke. Stanley Green, near Poole, Dorsetshire, Dec.* 6. 1834.

ART. VIII. *Retrospective Criticism.*

THE Nest of the Carrion Crow. (VI. 209., VII. 514.) — My remark, in a former Number [VI. 209.], that "not a particle of the nest is ever seen betwixt the eggs and the eye of him who has ascended the tree to take a view of them," was made after a personal examination of many crows' nests, during a long lapse of years; and the remark was strengthened by the conviction acquired during more than thirty years' attention to the incubation of birds, that not one of those birds, the young of which come blind out of the egg, ever covers its eggs with any part of the materials of which the nest is formed.

Now, the carrion crow is numbered amongst those birds whose young are hatched blind.

Mr. Jones's discovery [VII. 514.] of a carrion crow's nest, containing two eggs covered and two uncovered, is important to ornithologists, provided nothing had occurred to interrupt the ordinary process of incubation; but this gentleman does not tell us that he spent any length of time in paying attention to the nest after his discovery. Had it fortunately engaged his subsequent attention at intervals, we should have known how much of this mystery to have attributed to the crow, and how much to chance. If he had satisfied himself that the crow did actually cover even part of her eggs, then my statement, quoted above, would be worth nothing at all. If, on the contrary, he had any suspicion that the two eggs might have been covered by accident, then my statement would still be valid. At the time I made it, I took it for granted that I should be considered by the reader as describing the habits of a bird which had the entire management of its own nest; and I was very particular as to what I wrote, having a professor for my opponent, who had given us the novel information, that carrion crows cover their eggs on leaving the nest.

I beg to observe, that the nest which Mr. Jones had found might possibly have had a visiter before his arrival, and that visiter might have disordered the lining. Again, the nest might, perchance, have been deserted by its rightful owner; and, in this case, the long-eared owl or the windhover hawk might have been in it, to look out for a tenement. Moreover, if the crow had been suddenly surprised by Mr. Jones's unexpected appearance, she might have ruffled the lining with her feet as she left the nest. If none of these things had occurred, and Mr. Jones is quite satisfied that the covering of the two eggs was the voluntary act of the crow herself, then we have the curious fact, that half of the contents of the nest were designedly covered, and half left uncovered; a fact militating against the universal process of incubation; a fact hitherto unobserved in the annals of ornithology. I am at a loss to comprehend why the crow only covered part of her eggs with the lining of the nest. Her covering two, and her leaving two uncovered, argues a slovenly, and, apparently, an unnecessary act.

Far be it from me to doubt the veracity of Mr. Jones's discovery; but I must confess that, though it fails to convince me that I am wrong concerning the carrion crow and her eggs, still it puzzles me confoundedly. Would that Mr. Jones had told us more about it! His merely telling us that he found the nest and examined its contents, without adding that he watched the nest for two or three successive days, in order to be sure that he had discovered a new and important phe-

nomenon in ornithology, brings to my mind the recollection of a passage in the story of poor Lefevre: "Thou hast left this matter short, Trim," said my uncle Toby. — *Charles Waterton. Walton Hall, Jan.* 7. 1835.

REVIEWS.

ART. I. *Titles of Works on Subjects of Natural History, published recently.*

Meijer, H. L.: Illustrations of British Birds. In monthly Numbers; size, quarto. Price to subscribers, 10*s.* 6*d.* each Number, coloured; plain, on India paper, 8*s.*: to non-subscribers, 12*s.* 6*d.* and 10*s.*

An abstract of the prospectus is given in our p. 128. We received the first number on March 18.: too late for notice in our Number for April. It contains five plates, in which are depicted as follows: — In the first, the sandpiper; in the second, stonechat, whinchat, and spotted flycatcher, with their eggs; in the third, the hawk owl; in the fourth, the wryneck and its egg; and, in the fifth, the eggs of the sandpiper and hawk owl. An ornithologist has informed us that the figures "are correctly drawn, carefully coloured, and characteristic of the species." He has added: — "I think the wryneck would have appeared more natural if it had been placed in a climbing position upon a tree, as it is seldom seen on the ground:" on which latter place it is represented, standing upon a frond of lichen, on the disk of which ants are depicted; a plant of Campánula rotundifòlia is flowering near. It is part of the author's plan, to accompany the figures of the birds with accessary figures of objects which relate to the bird's history: at the foot of the plate short notices are added. For example, the sandpiper is placed in a landscape in which water is displayed; and at the foot of the plate is this inscription: — "Sandpiper, Totanus hypoleucus (*Temminck*). Length 7½ in.; weight about 2 oz. Food insects; for which it frequents the pebbly margins of rivers or lakes. Eggs four or five; either deposited among the stones, or in a slight nest upon the grass. Migratory; arriving in spring, departing in autumn." One plate is given to the egg of the sandpiper and the egg of the hawk owl. We complain of this. With just as much congruity, and with more convenience to the purchaser of the work, the eggs of a score species of birds might have been given in the same plate.

Gray, George Robert, M.E.SS. of London and France, and Author of "Entomology of Australia:" Synopsis of the Species of Insects belonging to the Family of Phasmidæ. 8vo, 48 pages. London, Longman and Co., 1835.

Technical, elaborate, and doubtless of very high value to scientific entomology. 126 species are described or indicated; and, out of these, several new genera are instituted. "In forming my table of divisions," and in characterising the genera and species, "I have used only external characters. The cibarian organs of species belonging to distinct divisions bear so great a similarity to each other, that it is impossible to make use of them as divisional characters." 50° N. and s. of the equator bounds "the geographical extension of these insects." Of them N. America has 3; W. Indies 8; S. Europe 3; Africa 2, and, probably, many more yet to be discovered; India, China, and Malay Islands, 41; Polynesian Islands 3; S. America 29; N. Holland 27, doubtful 10. They who would preserve specimens of Phásmidæ, in the colours respective to them when alive, should open a longitudinal slit on the under surface of the abdomen, and take out the entrails; stuff the cavity with soft cotton; and allow the insect to dry in an airy situation. "A milky fluid exudes from the thorax, when the pin is passed through it, which is capable of staining the adjacent parts yellow and other colours."

Anon.: Botany; Parts III. and IV., which include a Treatise on Physiological Botany, by, it is understood, Dr. Lindley, Professor of Botany in the London University. The Parts are Nos. 184. and 185. of those of the Library of Useful Knowledge. 36 pages, 22 woodcuts. The Parts 6*d.* each.

See in our p. 247. The positions are clearly enounced, the facts cited in illustration of them well chosen and assorted, and the style of relation is polished.

A Systematic Catalogue of British Vertebrate Animals, by the Rev. L. Jenyns, M.A. F.L.S., &c.; 8vo, Cambridge, 1835, Longman and Co. This has been published.

Human Physiology, Part I., containing General Physiology and the Organic Functions, within which is included much of the elementary part of the *Institutiones Physiologicæ* of Blumenbach; 8vo, 302 pages and numerous woodcuts; fifth edition, 1835; by John Elliotson, M.D. Cantab., F.R.S. The remaining part will appear at midsummer.

THE MAGAZINE

OF

NATURAL HISTORY.

JUNE, 1835.

ORIGINAL COMMUNICATIONS.

ART. I. *Notes of a Natural History Tour in Norway.* By EDWARD FORBES, Esq. [Continued from p. 251.]

WE spent a week at Bergen. In Norway it is a proverb, that "it always rains at Bergen;" and we found it a true saying. The town is built of wood, and has a very handsome appearance; many of the houses are very fantastic in their decorations. The national costumes of the Norse peasantry are seen to perfection on a market or a fair day, each parish and district in Bergenstift having a different dress. The most frequent was a blue jacket without a collar, and bordered with red, short full trowsers to match, and a small scarlet skullcap, barely covering the head. The scarlet of these caps (in some parishes they wear jackets of the same hue) is procured from the roots of the *Gàlium vèrum* by the peasants themselves. It is a very bright and beautiful colour, and apparently stands well. Bergen, like most of the Norwegian towns, is at the head of a fiord studded with islands. The mountains, at the immediate base of which the town is situated, are about 2000 ft. above the sea level. Their sides are silvery with the beautiful foliage of the *Alchemilla* alpìna; and *Rùbus* Chamæmòrus, *Arctostáphylos* (*Arbutus*) alpìna, Oxycóccus palústris, *Vaccínium Vìtis idæ'a*, Lycopòdium *Selàgo*, Andrómeda *polifòlia*, and *Càrex* leucoglòchin, abound towards their summits. *Sèdum ánglicum* is very plentiful on the walls and rocks about the town. In a salt-marsh I found *Cingula úlvæ*, *Nerìta* littoràlis, Tròchus cineràrius, *Mỳa* arenària, *Cárdium* edùle, *Mỳtilus* edùlis, and fragments of *Vènus exolèta*.

Amongst my Bergen treasures I especially value a quantity of shell sand, which I found in a spitting-box in my lodgings. As yet I have only examined a small portion; but I expect

many minute curiosities in the shell way from it. Several species hitherto only found in Britain have rewarded my search already. Bròchus glàber of Brown's *Illustrations* (the Dentàlium glàbrum of Montagu) is rather frequent; Rotàlia Beccàri*a* and inflàta?, Lobátula vulgàris and concameràta?, are plentiful; a single specimen of an Orthócera, and two undescribed species of Lagénula, have also occurred.

The steam-packet in which we had come remained a week at Bergen, and one day made a trip to Lysfiord, about twenty miles distant, for the amusement of the inhabitants. We joined the party, and were well rewarded by the sight of some very beautiful scenery at Lys; where we found Convallària verticillàta (*P*olygónatum verticillàtum *Desf.*) in great abundance, along with Gymnadènia conópsea and Habenària álbida. The tide retires a considerable way at ebb in this district; and on the muddy shore, at low water, I found Vènus aúrea, and pullástra, Cytherè*a* exolèta, *My*a arenària, Anatìna compréssa, *B*úccinum reticulàtum, and Cíngula rupéstris (nova species *mihi*), all alive. Near this place the gneiss rocks appeared to be composed of embedded balls, resembling that globular structure which is often seen in basaltic and other trap rocks. The country around Bergen is wholly composed of gneiss.

On the morning of Monday July 3. we left Bergen for Oes, a small village on the Hardargerfiord, about twenty miles distant. It was our first decided tramp under the knapsack in Norway; and what with our bags, and hammers, and botanical boxes, and books, we were pretty well loaded, not forgetting boards enclosing the paper to dry our plants in. We passed through much fine lake scenery, and as we advanced the country became better wooded. Digitàlis purpùrea, *L*ysimàchia Nummulària, and *L*ìnum cathárticum, were frequent; as also the *S*enècio Jacobæ`*a*, in Norway rare and much prized by the botanist. *N*ymphæ`a álba decorated the margins of the lakes. Near Oes, mica slate appeared, enclosing beds of chlorite slate. We had expected to get something to eat at the village, but were disappointed, though very hungry: indeed, it is very difficult to buy any thing in the way of eatables at the villages in this part of Norway. We were rowed to Sandvig, about ten miles distant, by a man and two women, amid incessant rain; though the weather was so calm, and the water so clear, that we could see the shell-fish on their native beds, and the urchins sticking to the rocks at a very considerable depth. The scenery of the fiord was very beautiful. At Sandvig we put up at the wooden hut of an old peasant, and made a hearty meal on cold fish, oat

bread, and sour milk. Not only the clothes we had on, but the changes in our knapsacks, were wet through; yet it was with much difficulty the people of the house could be persuaded to light a fire, which, when lit, was insufficient to dry them.

Next morning at five, we prepared to start again on our journey, though much annoyed at wearing damp clothes. The boatmen laughed at us, saying that dry clothes were of no use at Hardangerfiord as it always rained there; and they said truly. For the four following days, which we spent on the fiord and its coasts, we had not a dry shirt to wear. The continual excitement of travelling prevented any evils, which such an inconvenience might otherwise produce. From Sandvig, our course lay through a long and narrow ravine into the main stretch of the Hardangerfiord, the sides of which were formed of stupendous perpendicular precipices, whose dark surfaces were starred with the splendid flowers of the *Saxífraga Cotylèdon*, the most beautiful of its tribe. The peasants style it Berg kongen, the king of the rock; a most appropriate name for this magnificent plant. Rhodìola *ròsea* grew beside it. The view of the fiord and its mountains, as we sailed through this ravine, was very fine; but a storm soon overcast the scenery with gloom, and we took shelter on the Island of Tiroe, where we found a good inn, a sort of depôt for every thing saleable on the fiord.

(*To be continued.*)

ART. II. *An Attempt to ascertain the Animals designated in the Scriptures by the Names Leviathan and Behemoth.* By THOMAS THOMPSON, Esq., One of the Vice-Presidents of the Hull Literary and Philosophical Society; being the Substance of a Paper read at a Meeting of that Society on Jan. 17. 1835. [Continued from p. 197.]

ALREADY we have seen reason to assert that the *than* of the Scriptures is the crocodile. Then the leviathan could not also be the crocodile; for both animals are distinctly mentioned in the same portions of Scripture; as in Psalm lxxiv. ver. 13, 14.: "Thou breakest the heads of the *than*im in the waters. Thou breakest the heads of *leviathan* in pieces." Also, in Isaiah, ch. xxvii., "The Lord shall punish *leviathan*, and he shall slay the *than*im."

Now, though I deny the leviathan to be the crocodile, yet, if the *than* be that animal, I should from etymology alone be inclined to expect that the leviathan was of the crocodilian family; the name being compounded of this same word "than,"

a crocodile, and "levi," which, in Hebrew, signifies "joined, lengthened, or extended," it would imply an animal a *than* in form, but equal in size or extension to several *thanim*. At all events, the root *than*, which Hurdis interprets a crocodile, occurring in the name of levia*than*, will rather confirm the opinion I mean to maintain; viz., that the leviathan was that animal of the crocodilian family known to geologists by the name of megalosaurus, an animal proved to have once existed even in this country; of immense size, even 70 ft. long, with limbs exceeding in size those of the elephant.

In order that such of my hearers as have not paid attention to geology may properly understand my argument, I will here extract a description of the megalosaurus from the works of Professors Buckland and Cuvier; and, having thus given them an idea of the megalosaurus from authors who had no theory like mine to maintain, we will next proceed to examine the Scripture accounts of the leviathan, to see how they coincide with the size, form, habitat, manners, and general description of the megalosaurus; in the course of which I will show why they do not tally with that of the crocodile. Buckland says, "The megalosaurus was oviparous, and belonged to the order of saurians, or lizards; in length from 60 ft. to 70 ft., and of a height equal to our largest elephants: it was an amphibious animal." Cuvier says, "We cannot hesitate to pronounce it a lizard. It appears assuredly to have exceeded in size the largest crocodiles known, and approached the size of a whale: from the trenchant form of the teeth it was exceedingly voracious. All that accompanies its remains announces that it was a marine animal. Judging from the femur (sent to him), the dimensions of the animal must have been (had it the proportions of the monitor, to which its teeth are allied,) of the length of about 40 ft.; but, from some of the other bones, a much greater length might be calculated for this animal, even up to 70 ft." Thus it is pretty certain the megalosaurus was in figure, &c., like a crocodile from 60 ft. to 70 ft. long; that is to say, nearly three times the length of the largest crocodile.

Let us now turn to the Scripture account of the leviathan in the 41st chapter of the Book of Job, and analyse it as we proceed. It is the Almighty who is addressing Job upon the wonders of the creation.

"Canst thou *draw out* leviathan *with a hook?* or his tongue with *a cord*, which thou lettest down? Canst thou put *a hook in his nose?* or *bore* his jaw through *with a thorn?*" It seems to me perfectly evident, that what is here put interrogatively is intended to imply the impossibility of doing the

acts referred to; and thus it is understood by all those commentators who maintain that the leviathan is *the common crocodile:* but, in order to maintain their argument, they all are obliged to assert that Herodotus was misinformed, when he spoke of catching crocodiles by the jaw with a baited hook, and drawing them out of the river; those commentators contending that it is, in point of fact, *impossible* to do so. In that they make, however, a gratuitous and erroneous assumption; for that it is possible, and usual so to do, is proved by its being the mode still practised by the South American Indians: and there is a gentleman now living in this county (Yorkshire), Mr. Waterton of Walton Hall, who has in his house, near Wakefield, the stuffed skin of a cayman (a large species of South American crocodile), which he assisted at the taking of in this very way. The account of the transaction in Waterton's *Wanderings* is familiar to every naturalist. [J. Bateman, Esq., of Knypersley Hall, has given, in the *Gardener's Magazine*, xi. 1—7., a brief account of the botanical researches in Guiana of Mr. Colley, whom he had sent thither to collect native plants for him: from that account we quote (p. 5.), that "Mr. Colley met with an Indian, who had accompanied Mr. Waterton, and who was one of the heroes who figured in the never to be forgotten conflict with the cayman."]

This mode of capturing the than, or crocodile, was also alluded to in the before-quoted passage from Ezekiel: "I will put a hook in thy jaws," &c. (Ezekiel, ch. xxix. ver. 4.) That mode of taking crocodiles was, therefore, not only possible, but it is evident, as I have before shown from Herodotus, that it was practised in ancient times. The piercing his jaw through with a thorn has, evidently, allusion to the mode of capturing crocodiles mentioned by M. Bosc as practised in Egypt and Senegal, by means of a piece of iron, or strong wood, *pointed at both ends*, thrust in an upright position into his mouth when he opens it.

This verse, therefore, "Canst thou?" &c., may be paraphrased thus:—"You capture the crocodile with a baited hook, fastened to a cord, or by a spike placed upright in his mouth, when he opens it to bite; but canst thou so take leviathan? no! it is impossible." Now, if the leviathan were that mighty, large, and powerful animal the megalosaurus, it is evident that he could not be drawn out of the deep, nor, indeed, held, by any hook or cord which could have been fabricated; and that that which would be sufficient to capture a than, or crocodile, would be of no avail to hold a leviathan or megalosaurus. Now, since the megalosaurus, or leviathan,

was similar in form and manners to the fierce and formidable crocodile, though far exceeding it in magnitude, power, and ferocity, what so likely to occur to the descriptionist as a contrast, a comparison between the two? Thus, without expressly mentioning the than, or common crocodile, but relying on the familiarity of his hearers with the known practices and arts used in their capture, and with the similarity in figure of the crocodile and megalosaurus, the speaker, in the Book of Job, bursts into an allusion to those devices as practised on the crocodile, to illustrate by their futility, when applied to the leviathan, the immensity of the size, strength, and power of the latter animal.

He then alludes to other modes of destroying the one animal, equally futile when applied to the other; thus:—"Canst thou fill his skin with barbed irons? or his head with fish spears?" (Job, ch. xli. ver. 7.) From the description given of the megalosaurus, you will at once perceive it was impossible (if that were the animal alluded to, as I doubt not it was) to pierce his skin with barbed irons, though we have learned from M. Bosc that the crocodile, after having been captured by the upright spike in his mouth, is despatched with spears; and though we have not an account of that mode of attack in any ancient author I am acquainted with, yet, in Griffith's Cuvier's *Animal Kingdom*, it is mentioned that in modern Egypt they spear the crocodile to death, when he is met sufficiently far from the water to prevent his escaping to it.

To proceed, however: "None is so fierce that dare stir him up." (Job, ch. xli. ver. 10.) Who, indeed, durst have attacked a megalosaurus, or could hope for success if he did so? Yet, we have seen, there were those who voluntarily irritated the crocodile to make him open his mouth, in order to assist them in his capture. You will remember Pliny says of the Tentyrites: after they have mounted his back, when he opens his mouth they thrust a club across, and so ride him to shore, *as if with bridles:* and, let me ask, is not this mode of taking the crocodile referred to here and in the next verse? "Who can come to him with his *double bridle;* who can open the doors of his face? his teeth are terrible round about." (Job, ch. xli. ver. 13, 14.) As much as to say, "True, you do all this to the crocodile; but who can, or dare, so treat a leviathan, or megalosaurus?"

For the remainder of this description I will, for variety's sake, quote Mason Good's translation, where we have a glowing description of the leviathan; but which no one can fail to see answers, in every respect, to what the megalosaurus must have been. "The plates of his *scales* are triumph, a

panoply, an embossed munition. The one is so compacted with the other, the very air cannot enter between them. Each is inserted into its next. They are riveted, and cannot be sundered." This description, true, in part, of the crocodile, must have been immeasurably more so of the megalosaurus; and the coincidence only serves to show how similar the animals were in some respects.

"His snortings are the radiance of light, and his eyes as the glancing of the dawn." The iris of the crocodile's eye is said, in Griffith's translation of Cuvier's *Animal Kingdom*, to have some analogy to that of fishes, in the metallic tints with which it shines; and also to resemble that of the cat. He also says that crocodiles have a terrific aspect, which principally proceeds from the fierce glances of their eyes: but how much more ferocious would the glances of an immense megalosaurus be? let me ask; for it is fair to presume, that, as he so much resembled, yet surpassed, the crocodile in other respects, he would do so, also, in the brightness and fierceness of his eyes.

The translation proceeds: "Out of his mouth issue flames; flashes of fire bound away." Virgil uses similar figurative expressions concerning a spirited horse, to indicate his terrific aspect.—"From his nostrils bursteth fume, as from a seething pot or a cauldron." Dr. Young observes thus: "The crocodile, say the naturalists, lying long under water, and being thus forced to hold his breath, when he emerges, the breath, long repressed, is hot, and bursts out so violently that it resembles fire and smoke." The same would, on a larger scale, occur in the case of the megalosaurus: "His breath kindleth coals. Raging fire goes from his mouth. In his *neck* dwelleth *might*, and destruction exulteth before him. The flakes of his flesh are soldered together; it is firm about him; it will in no wise go away. His heart is as firm as a stone; yet it is firm as the nether millstone. *At his rising* the mighty are afraid; they are confounded *at the tumult of the sea*." At the rising of an immense megalosaurus well might the most courageous be afraid, and confounded at the tumult in the waters occurring in the whirlpool his rising would occasion.

"The sword of his assailant cannot stand; the spear, the dart, or the harpoon: he regardeth iron as straw," (The iron nets used, as Diodorus says, to catch crocodiles, would be as straw when a megalosaurus encountered them.) "brass as rotten wood. The bolt from the bow cannot make him fly. Sling stones are turned back from him like stubble; like stubble is the battle-axe refracted; and he laugheth at the

quivering of a javelin." All this is illustrative of a most powerful animal: it bears allusion to the modes in which some other known animals were attacked; but we can see at once that they would all be futile against a megalosaurus. "His bed is the splinters of flint, which the broken rock scattereth on the mud. He maketh the *main to boil like a cauldron*." Would not an animal the size of the megalosaurus, 70 ft. long, and thick in proportion, in rapid and powerful motion, do this?

"He snuffeth up the tide as a perfume. Behind him glittereth a pathway;" or, as the Scripture translation runs, "He maketh a path arise after him." In the pathway of the megalosaurus in the sea, by night, such a luminous mark or path as is often seen in the wake of a ship in the sea would, we may presume, occur. Is not this the earliest reference to the luminosity of the sea on record? The description proceeds thus: "The deep is embroidered with hoar." That is, from the foam the motions of the megalosaurus would make. This describes the appearance of the wake in his path in the *day* time, as the luminous path did that which would be seen at night.

"He hath not his like upon earth." As far as we know, for strength, size, and ferocity, there never has been the like of the megalosaurus upon earth.

"This creature without fear." Of whom, indeed, need a megalosaurus have been afraid? "He dismayeth all the boastful. He is a king over all the sons of pride."

Under these figurative expressions, it strikes me that we have the description of a large amphibious animal of the crocodilian family, much larger and more fierce, however, than the crocodile; one which cannot be taken by the usual devices for taking that animal; one which dwells in the sea, and sleeps at times on its flinty shores; in short a perfect megalosaurus. We have seen that there were four, we may say five, modes of capturing the crocodile used in Egypt; these five modes, viz. by the baited hook, the upright spike, the spear, the club used bridlewise, and the iron nets, are here referred to as unavailable in capturing the leviathan; then it is clear the leviathan was not the crocodile, but some animal more powerful than he; that animal, too, in all other respects, seems to have resembled the crocodile, except its size and strength being greater: then, since such description tallies with what the megalosaurus must have been, may we not safely infer that by "leviathan" the megalosaurus was intended?

As to the Behemoth, I will now give, from the 40th chapter of the Book of Job, the description of the behemoth: "Behold

now behemoth, which I made with thee; he eateth grass as an ox. Lo, now, his strength is in his loins, and his force is in the navel of his belly. He moveth his tail like a cedar; the sinews of his stones are wrapped together. His bones are as strong pieces of brass; his bones are like bars of iron. He is the chief of the ways of God: he that hath made him can make his sword to approach unto him. Surely the mountains bring him forth food, where all the beasts of the field play. He lieth under the shady trees, in the covert of the reed, and fens. The shady trees cover him with their shadow; the willows of the brook compass him about. Behold, he drinketh up a river, and hasteth not: he trusteth that he can draw up Jordan into his mouth. He taketh it with his eyes: his nose pierceth through snares." (Verses 15. to 24.)

The opinion I have formed as to the particular animal intended by the Hebrew word "behemoth" is, that it was the now extinct saurian animal known to geologists by the name of iguanodon, found in a fossil state in the same situations as the fossil megalosaurus.

As I mean to pursue the same course, in giving my reasons for this belief, as I did in explaining why I have thought the leviathan to have been the now extinct megalosaurus, I shall extract a description of the iguanodon from authors who have written on the subject, and then contrast that description with that of the behemoth mentioned in the 40th chapter of Job. The following description of the iguanodon, extracted from Griffith's translation of Cuvier's work, *Fossil Remains*, may answer our purpose.

"The sandstone of Tilgate and the Wealden deposits contains a quantity of organic remains of various kinds; amongst others, teeth of an unknown *herbivorous* reptile (the iguanodon), differing from any hitherto discovered either in a recent or fossil state." Griffith, in his translation, says, "So great is the difference between the teeth of the crocodile, the megalosaurus, and plesiosaurus, and so much do they differ from other lizard tribes, that it is scarcely possible to commit an error in their identification. But some other teeth were discovered, in the summer of 1832, in the sandstone of Tilgate, which, with an obvious indication of *herbivorous* characters, exhibited other peculiarities of so remarkable a kind as to arrest the attention of the most superficial observer, and announce something of a very novel and interesting description. Mr. Mantell made a comparison of these teeth with those of existing lizards in the museum of the Royal College of Surgeons. The result of this comparison proved most satisfactory: They found in the iguana teeth decidedly analogous to the

fossil in conformation and structure. [See in our III. 14. figures of a tooth of the recent iguana, and of teeth of the fossil iguanodon. A figure of the animal, the crested guana, and a notice of its habits, are given in the *Penny Magazine*, No. 41.]

"From the character of the fossil remains which more immediately surround those relics of the iguanodon, it is concluded that this animal was amphibious, a native of the fresh water, and not of the ocean: calculating on the proportions of the living animal, and supposing the same relative dimensions in the fossil as in the [iguana in relation to its] teeth, the individual which possessed the teeth we have been describing must have been upwards of 60 ft. in length. A similar deduction has been made by Dr. Buckland respecting the size of the iguanodon, from a femur and other bones in the possession of Mr. Mantell.

"It would appear, from the researches of Mr. Mantell, that the iguanodon bore on its head a remarkable horny appendage, as large as and similarly formed to the small horn of the rhinoceros. What he discovered of this is externally dark brown; some parts of the surface are smooth, others furrowed, as if for the passage of vessels. Its structure is osseous, and there is no external cavity. It does not appear to have been joined to the skull by a bony process, like some horns of mammiferous animals. The horned species are by far most abundant among existing iguanas. The *Iguana cornuta* of St. Domingo is like the common species in magnitude, colours, and general form; but upon the point of the head, between the eyes and nostrils, are found four large and bony tubercles; behind them rises an osseous and conical horn, which is enveloped by a single scale. The fossil horn, of which we have been speaking, was beyond all question a dependency of this description: there were even found upon its surface impressions of the tegument by which, in all probability, it was connected with the cranium."

Such is the description we find given of the iguanodon. [Particulars of additional discoveries, by Mr. Mantell, on the iguanodon, are given in p. 99—102. of our current volume. Information on it is given in III. 13, 14, 15. 366.]

I will now give you, for variety's sake, Harris's translation of that part of the 40th chapter of Job, where the behemoth is described (it differs but triflingly from the Scripture one); and I may premise that Harris, being of opinion that the behemoth was the hippopotamus, cannot be supposed to have humoured his translation at all, so as to make it fit the description of so totally a different animal as the iguanodon m[illegible] have been:

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"Behold now behemoth, whom I made with thee. He feedeth on the grass like the ox. Behold now his strength is in his loins; his vigour in the muscles of his belly. He plieth his tail, which is like a cedar; the sinews of his thighs are braced together; his ribs are like unto pipes of copper; his bone like a bar of iron. He is the chief of the works of God. He that made him hath fastened on his weapon. The rising lands supply him with food. All the beasts of the field there are made a mock of. He sheltereth himself under the shady trees; in the coverts of the trees and in ooze. The branches tremble as they cover him; the willows of the stream while they hang over him. Behold, the eddy may press, he will not hurry himself: he is secure though the river rise against his mouth. Though any one attempt to take him with a net, through the meshes *he will pierce* with his snout."

Here is clearly the description of an immense amphibious animal, and, had not former writers on the subject been under the impression that the crocodile was the only saurian of sufficient size to answer the description, and that the leviathan was the crocodile, I doubt not they would have concluded that the behemoth was a saurian animal, not the hippopotamus. Assuming it, then, to have been a saurian or lizard-formed animal, let us see how Job's description tallies with the iguanodon.

I have, in discoursing on the leviathan, noticed that the descriptionist, presuming that that common saurian, the crocodile, was well known to his Hebrew readers, dwelling so near the Nile, would naturally enough describe the saurian he designated by the name of leviathan, by contrasting it with the better known crocodile, pointing out the most striking differences between the two; and accordingly, he, alluding to the mode in which crocodiles are ensnared, commences with showing their futility when applied to the leviathan; thus contrasting the size and strength of the crocodile with that of the leviathan or megalosaurus, and so conveying an idea of the power and size of the latter animal to his reader's minds. In the same way, I think, he proceeds to contrast the behemoth or iguanodon with better known animals, to convey an idea of it to his readers. And first, its form being that of an immense *lizard*, he commences with noticing a remarkable circumstance in which the behemoth differed from all the large lizards known to his readers, namely, in the nature of its food: the crocodile and leviathan were carnivorous saurians; but the saurian called behemoth, on the contrary, was herbivorous. "He feedeth on grass like the ox." You will have noticed

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Mantell and Cuvier, who seem never to have dreamt of

the iguanodon and behemoth being identical, pursue the very same course in pointing out, from the form of the iguanodon's teeth, this remarkable circumstance relative to *it*, as contrasted with other large fossil saurians, namely, *that it fed on vegetables.*

The speaker in Job having pointed out the peculiarity of its food, and that it was similar to that of the ox, he next describes the great strength of behemoth. "Behold now his strength is in his loins; his vigour in the muscles of his belly." Such, we may fairly presume, was the case with the iguanodon from what is known of its anatomy and size.

He next remarks upon the size and pliability of the tail of the behemoth. "He plieth his tail, which is like a cedar." The pliability of the iguanodon's tail, if it resembled that of modern iguanas, would be remarkable, as contrasted with the tail of the crocodile, which, from being not so easily bent, has given rise to the fable that the way to escape his jaws is to turn frequently, as from the stiffness of his tail he cannot turn so fast as the person pursued. The present race of iguanas have very flexible tails; we may, therefore, from similarity of construction in the iguanodon, presume its tail to have been very free in its motions, and thus in contrast with the tails of most other saurians in its pliability. Now, the size and shape of the behemoth's tail is represented to be *like a cedar tree;* and so in size and shape must that of the fossil iguanodon have been in every respect. When we notice this resemblance, we cannot but smile at those authors who have disputed whether the little tail of the elephant, or the small one of the hippopotamus, was *most like* a cedar tree, as they maintained one or the other animal to have been the behemoth.

Next follows a description of the behemoth's size and strength in other parts. "The sinews of his thighs are braced together; his ribs are like unto pipes of copper; his back bone is like a bar of iron. He is the chief of the works of God." Nothing can be clearer than that the above description was applicable to the immense iguanodon.

And now follows an account of a peculiar feature, which seems to have distinguished the iguanodon from all other saurians with which the Hebrews were familiar; it is intimated in these words: "He that made him hath fastened on his weapon." I entertain no doubt that allusion is here made to the *horn*, which, in the description of the iguanodon that I have recited [in p. 314.], you will remember is stated to have been placed near the eyes; and that such was the situation of the *weapon, or horn*, of the behemoth, I think, will appear from the two last lines of the Scripture description of that animal: "Though any one attempt to take him in a

net, through the meshes he will pierce *with his snout.*" And the iguanodon, or behemoth, if armed with a horn upon the snout, would, no doubt, with it readily tear any net in pieces, even the iron ones used, as Diodorus says, to capture crocodiles. That the horn of the iguanodon is here alluded to, under the description of the weapon of behemoth, I cannot doubt.

The remainder of the account of the behemoth in Job is descriptive of his places of feeding and of rest; and of his size and power, which enabled him to retain his situation even against the most powerful streams. Have we not here, also, particulars corresponding with the account of the iguanodon, both in habitat and size? "He sheltereth himself under the shady trees; in the coverts of the trees and ooze. The branches tremble as they cover him; the willows of the stream while they hang over him. Behold the eddy may press, he will not hurry himself: he is secure though the river rise against his mouth." Does not all this well correspond with the haunts and description of the iguanodon quoted from Griffith's Cuvier, where he states that the iguanodon inhabited the mouths of freshwater rivers?

The 17th verse of the 40th chapter of Job seems to me descriptive of the place of the behemoth's, or iguanodon's, feeding, and also of the confidence with which the harmless nature of his food inspired other animals, as contrasted with the terror they felt at the sight of the crocodile and megalosaurus. "Surely the *mountains* bring him forth food, where all the beasts of the field do *play*." Thus in every particular do the iguanodon and behemoth tally in description. May we not, therefore, fairly presume that they were the same animal?

Geologists tell us that the crust of the earth is composed of a regular succession of strata, lying one over another, like the coats of an onion; and that each of these (except a few of the lowest of all) is characterised by the remnants of animals or vegetables peculiar to itself: those which are formed in any particular stratum will not be all found, perhaps none of them, in the stratum next above it, and so on. Geologists are enabled, from these animal and vegetable remains, to form a tolerable estimate of the condition of the earth at the successive periods at which each stratum (however lowly buried now) was the upper stratum of our earth.

Nearly the last formed (perhaps, in many parts of this country, the last formed) of the rocky strata, prior to the diluvium and alluvium which form the soil we cultivate, was the cretaceous or chalk formation, and existent about the same

period with this would appear to be the Wealden deposits of Tilgate Forest.

Many of my hearers will remember that, when that able and entertaining lecturer, Professor Phillips, last lectured at Hull, on geology, he told us that there was no appearance *before* the cretaceous formations that in any way indicated that the world had been previously fitted for the habitation of man.

The chalk itself was a formation in the *seas* of those days: the Wealden deposits, according to Mantell, were formed in *an estuary*, or the outlets of some immense river; most probably such river emptied itself into the said sea. There are, however, indications, from the vegetable and animal remains of those formations, that the dry land at that period (wherever it might be) had then become fit for the habitation of man; though, as no human remains have yet been found in those strata, it is impossible to say to a *certainty* that man had then become an inhabitant of our planet.

If, however, the earth, at the period of the cretaceous formations, was *fit* for man's residence, it seems to me consistent with the goodness and wisdom of Him who makes nothing in vain, that man would be then created. True it is, that the not finding his remains amongst the fossils of that period deprives us of *positive* proof of his then existence, but furnishes *no proof* that he *did not* then exist in the world. If the chalk indicates the bed of the sea of that period, what stratum, I ask, then formed the dry land? for that is the place to search for the remains of the human beings of that day, and not in the bed of the then sea, nor in that of the nearly contemporaneous Wealden deposit, which was the bed of an estuary, or arm of the sea: these, at most, could only include a few of the accidentally drowned; and, in the midst of the crocodiles and megalosauri of that day, so tempting a mouthful as a human being would not be allowed, I think, to rest in peace in the bottom of the waters, there to be found after many days.

It is not yet known where the dry land of that period is to be found; but, probably, when the bed of the then sea was raised, the dry land became the basin that holds the present seas.

However, in the Wealden deposits it is that the remains of iguanodons have been found, and the period of this formation is, we have seen, the time when man might, and probably did, first appear upon the earth. Now, is not that probability heightened (if the behemoth were identical with the iguanodon) by the first words the Almighty addressed to Job in speaking of the behemoth? "Behold now behemoth, which *I made with thee.*"

Hence it would seem that, whatever was the period in a

first creation, the same was probably the period of behemoth's creation; for, speaking to man of behemoth, he says, "Behemoth was created with thee." Now, the iguanodon, we find from geologists, was first created about the time of the date of the cretaceous formations, and that at the same period the earth had become fit for man's existence. I have shown that at that period it is probable man was formed; and it is certain that the iguanodon was then; so, then, do not these words, "Behold now behemoth, which *I made with thee*," strengthen the idea of the identity of the behemoth and iguanodon?

But it will be said that these animals, the megalosaurus and iguanodon, have only been found in a fossil state: how, then, is it probable they would be found existent contemporaneously with Job? This deserves our attention. First, then, I observe that the period of Job's existence is not certain; but most biblical critics think that he lived long prior to Moses: possibly, even, before the flood. Now, from Mantell's observations in his *Geology of the South-east Coast of England*, it seems perfectly clear that the Wealden stratum was the bed of an estuary, or mouth of a large freshwater river; and, from the land deposits washed down into it, and from its own productions, it is certain that at that period this country then enjoyed a temperature very much higher than is known in these latitudes at the present day. The fossil remains of elephants, lions, tigers, rhinoceroses, &c., found in England in the strata above the chalk, show that, for some time afterwards, the climate continued to be the same. How that climate became subsequently cooled down to its present temperature, it would be out of place here to enquire; but I think we may safely conclude that that cooling rendered it no longer fit for the residence of those intertropical animals which we are certain once inhabited it, most probably by destroying those vegetable productions upon which the herbivorous animals then in this country chiefly subsisted; which animals furnished in their turn food for the carnivorous ones of that day.

There is, however, great reason to believe that such cooling down of the temperature of this climate was not a *sudden* catastrophe, but, at least, so gradual, that many animals retreated southward, where, from the superior warmth of climate, they still found food suited to them. In this way, it would be fair to presume that iguanodons and megalosauri would be able to exist in Syria, Egypt, &c., long after the climate of England was unfitted for them, and would gradually retreat southwards as the northern climates grew too cool for them. [illegible] is reason to believe that even the intertropical climates [illegible] cretaceous cooler than the climate of England was during the [illegible]n period. Egypt is still warm enough to be fitted

for the residence of crocodiles, although no longer fit for that of iguanodons, megalosauri, and many other animals which were contemporaneous with crocodiles in England. The inter-tropical climates would, however, be fitted for a long period for the residence of iguanodons, and megalosauri, after those animals had ceased to exist in England; and I think that, in that view of the matter, it may be fair to suppose that a few of the last remnants of the race would be found in the southern latitudes which Job inhabited, after they had ceased to be known in these parts, especially as the more hardy crocodile, their contemporary here, still exists there, although no longer found here. Should the climate of Egypt grow gradually cooler (as some suppose it does), most probably the crocodile itself will at some time cease to inhabit the Nile: certain it is that it is now a rare animal there compared to what it formerly was. [Mr. Bakewell has suggested, in his *Introduction to Geology*, and in our VII. 246., that "the great American sea serpent," noted as occasionally seen, although not yet identified by men of science, may prove a saurian, of, perhaps, the genus Plesiosaúrus: see VII. 246.]

To sum up, then, I trust I have shown you that there is good ground for supposing that the leviathan of the Scriptures is the same animal as the now fossil megalosaurus; and that the behemoth was identical with the iguanodon.

[*Hull, January*, 1835.]

[Mr. Thompson illustrated his lecture by a drawing which represented the animals, man, the crocodile, and the megalosaurus delineated to a scale; also the living iguana enlarged, with the addition of the horn, and drawn to the same scale, so as to be of the proportion of 70 ft. in length, and thus present the greater semblance to the probable appearance of the iguanodon. Man was represented 5 ft. 10 in. high, the crocodile 20 ft. long, the megalosaurus of such an enlargement of the crocodile's proportions as to be 70 ft. long, and of consistent height.

"Even the sea-monsters draw out the breast: they give suck to their young ones." (Lamentations, iv. 3.) The Hebrew word, of which the English word "sea-monsters," used in the words quoted, is meant to be a translation, is, we have been told, "tannin or thannin." As the saurians had not a breast, nor gave suck to their young ones, the "thannin," or "sea-monsters," could not be, in this case, saurians.

To the interesting information on fossil saurians which the preceding communication supplies, we would add a reference to a notice in VI. 75. of a "new species of enormous fossil reptile," which Mr. Mantell had then recently made known.

From the context, it appears that this was a saurian, although this is not expressly stated. On the living cayman and iguana, the object of Mr. Thompson's discussion has not led him to give more than incidental information. We would here add, not in relation to Mr. Thompson's argument, but in contribution to the history of these animals, two short notices on their habits, which are incidentally given in an account of "An Excursion [in Demerara], in search of Orchideæ, up the River Masseroni, which falls into the Essequibo about a Hundred Miles from its Mouth. By Mr. John Henchman." This account is published in *The Gardener's Magazine*, the Number for March, and includes mentions of some other animals.

[*The Cayman.*]—"Look towards the muddy bank of the river, and you will see what you would mistake for a log of wood; but, as the canoe approaches, it rolls sluggishly into the water, and you perceive it to be an alligator, or cayman. The Indians shot several of these animals, while basking in the sun, with their arrows: the largest of those shot might have been from 6 ft. to 7 ft. long. They appear to sleep exceedingly sound; as it twice happened that I shot a bird in a tree immediately above a cayman (which we did not, at first, perceive) without disturbing the monster; for we afterwards pulled in, and shot both."

[*The Guana.*]..."Or, passing under some overhanging tree, observe crouched, on one of the branches, the guana, which is of the lizard species, about 3 ft. to 4 ft. from the nose to the end of the tail, and which possesses a coat composed of scales nearly as strong as those of the alligator. Paddle now, with great caution, to a position favourable for shooting the guana: for the least noise will cause it to drop into the river, and the chance is lost. Take a steady aim with your gun at the belly, and fire: the guana, shot dead, falls from the tree into the river; and again you would be deprived of your prey, did not one of the Indians dart out of the canoe, and, diving with the speed of lightning, recover the fast-sinking body. The guana affords a delicious meal; and, when roasted Indian fashion, with the skin on, the flesh is more white and tender than that of any kind of animal I have ever seen, not excepting a barn-door fowl." See also VII. 583.

"The spider taketh hold with her hands, and is in king's palaces." (Proverbs, xxx. 28., not 25.) In I. 375. is an abstract of Dr. Scott's reasons for deeming "spider" a mistranslation for "lizard;" and in IV. 151., a mention of other authors who have held an opinion to the same amount.]

ART. III. *Notes on the Habits of the Tawny Owl.* By CHARLES WATERTON, Esq.

OF all our British owls, this is by far the greatest favourite with me, and I take great interest in its preservation.

Whilst temperance societies are rising up in all directions to warn the thirsty sinner that gin and godliness are not in unison, I could wish that some benevolent person would instruct the ignorant on the true nature and habits of many poor dumb animals, which undergo a perpetual persecution, under the erroneous idea that they are inimical to the interests of man. I would willingly go twenty miles on foot, over the flintiest road, to hear some patroness of infant schools tell her little pupils that, nowadays, there are no old women who ride through the air on broomsticks, with a black cat in their laps; that ravens, owls, and magpies have long since dropped all dealing with people in the other world; and that hedgehogs are clearly proved never to have sucked a cow; though our silly farmers, almost to a man, would fain persuade us that these little harmless creatures are guilty of the preposterous act. Notwithstanding the apprehensions of the dairy-maid, I now and then venture to purchase a captive hedgehog, and turn it into the park; there to live and die in peace.

It was but the other day that a neighbouring young lady complained to me of an owl which had been hooting, for three or four successive nights, far too near her bedroom windows; and she wished indeed that it were shot. I startled as she uttered this, for it instantly occurred to me that the bird of which she complained might possibly be one which was bred here last summer; and that its propensity to night-errantry, had brought it into a scrape. So, I tried to persuade her that nothing but sheer curiosity could have induced the owl to take the undue liberty of peeping in at her window; and I was sure that it could have seen nothing there to displease it.

I have never heard an owl, either in Europe or in America, that utters sounds so nearly resembling the human voice as those which our tawny owl sends forth. Here, where all is still, and every thing to be found that is inviting to the feathered race, this bird will hoot at intervals throughout the day, both in cloudy and in sunny weather. Were you to pronounce the letter O in a loud and very clear tone of voice, and then, after a short pause, repeat the same letter in a drawling, tremulous accent, you would have a tolerably just idea of the hooting of the tawny owl. It will sometimes produce a sharp cry, which sounds not unlike the word quo-ah; both male and female utter this cry.

Though the tawny owl generally takes up its abode in dark and gloomy woods, still it occasionally settles very near the habitation of man. In a hollow sycamore, within a dozen yards of this house, there had been the nest of a tawny owl, time out of mind. Here the birds would have remained to this day, had not a colony of jackdaws, which I had encouraged, by hanging up wooden boxes for them in the next tree, actually driven the owls away, in order that they might get possession of the hole. Before this misfortune befel them, a servant once robbed their nest, and placed the young ones in a willow cage, not far from the hollow tree. The parent birds brought food for their captive offspring; but, not being able to get it through the bars of the cage, they left it on the ground on the outside. This food consisted of mice, rats, small birds, and fish, which I myself saw and examined. At the present time, I have a tawny owl, sitting on four eggs, in a large ash tree, close to a much-frequented summer-house. The male stays in a spruce fir tree, and hoots occasionally throughout the day. I have found by dissecting the ejected bolus of this species, that it feeds copiously upon different sorts of beetles.

Were I just now requested to find a hollow tree in the woods of the neighbourhood, I should say that it were useless to go in quest of one; so eager have the proprietors been to put into their pockets the value of every tree which was not "making money," according to the cant phrase of modern wood-valuers. No bird has felt this felling of ancient timber more than the tawny owl. To the extreme scarcity of breeding-holes, and to the destructive measures of the gamekeepers, I attribute the great rarity of this bird in our own immediate neighbourhood: add to this, that it sometimes rests on the ground, under covert of a bush, where it is flushed and killed by sportsmen while in pursuit of woodcocks. Were it not for my park, I believe that the tawny owl would be extinct in this part of Yorkshire. Some ten years ago, it was so scarce, that I seldom heard its voice. Once or so, in the winter, I could catch the hooting of a solitary owl as I was after the midnight poachers; but that was all: and, then, whole weeks would elapse before I could hear the pleasing notes again. At present, however, this favourite *warbler* is on the increase.

He who befriends the tawny owl, and loves to have it near his mansion, may easily make a habitation for it, provided there be a wood at hand, with full-grown ash trees in it. But, no wood, no tawny owl; *Point d'argent, point de Suisse*, as the saying has it. On examining his ash timber, he will occasionally find a tree with a particular fungus on it; yellow when

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growing, and black when ripe. But more of this, perhaps, another time, should I ever offer to the public a short paper on the cause and prevention of *dry rot:* a misnomer, by the way. When this fungus falls to the ground, after the rains of winter have set in, the bark on which it has grown shows such faint traces of a change, that an eye not accustomed to look for these things would scarcely notice the distempered part. By means, however, of a hammer and a chisel applied to the spot, you are soon let into the secret: and you find the wood, in the quarter where the fungus appeared, of a texture soft and altered, and somewhat approaching to that of cork. Here, then, you can readily form an excavation large enough to contain a pair of tawny owls.

In the year 1831, I pointed out to Mr. Ord (the elegant and scientific biographer of poor Wilson) just such an ash tree as that which I have described. It was above 2 ft. in diameter, and there was a fungus on the western side of it. After I had excavated nearly half way through the tree, I found a portion of the wood more tainted than the rest: so, putting a longer handle into the socket of the chisel, I worked in the direction which it took; until, most unexpectedly, I came to the nest of a titmouse. The bird, like the Portuguese at Mindanao, had evidently taken possession of the tenement through an aperture from the eastward, now closed up with living bark; while I, like the Spaniards, had arrived at the same place, by pursuing a course from the westward. If I might judge by the solid appearance of the bark, I should say that, some fifty or sixty years ago, a branch must have been blown off from this eastern side of the bole; and there the rain had found an entrance, and had gradually formed a cavity. The titmouse, judging it a convenient place, had chosen it for her nidification; and, probably, had resorted to it every year, until the growing wood at the mouth of the orifice had contracted the entrance, and, at last, closed it up for ever: leaving the nest hermetically sealed in the bole of the tree. A thousand people might gaze on this tree, in passing by, and still not see a blemish. I myself can just perceive it, by means of a few concentrated lines still visible on the bark; but, had not the discovery of the nest drawn my attention to the place, I should never have perceived that the eastern part of the tree had formerly received an injury. Mr. Ord was enraptured at the exposition of the ornithological treasure; and noted down in his pocketbook every thing worthy of record. The tree still stands: and long may it stand, to gratify the curiosity of naturalists. Last year, a pair of barn owls reared their young in it; and, just now, there are eggs

in the same place. [In VI. 460. is recorded an instance of a bird's nest, with eggs, being found, in the centre of the trunk of a larch tree, by sawyers in their sawing of the trunk.] I made another excavation, in an ash tree about two hundred yards from this; and, last summer, it gave me an increase of three tawny owls. Throughout the winter, I could, at any time, find them reposing in some neighbouring fir trees.

The tawny owl generally lays four snow-white eggs in the same hole which it had chosen for its winter quarters. I am satisfied in my own mind that no owl in the world ever gathers materials to form the lining of its nest. Indeed, there is no necessity whatever for it to take that trouble: nature makes a sufficient provision for the lining of the hole to which the owl resorts, long before the breeding-time sets in. Every species of this bird ejects from the stomach all the indigestible parts of their food, in the shape of a dark-coloured oblong bolus; which, when dried, is soon reduced to fragments by the superincumbent body of the bird. On this the female lays her eggs; nor could she well procure a better or a softer substance for them.

Trifling as an attention to the feathered tribe may seem, still it has its sweets for those who love to lead a rural life. I generally observe that visiters who come here are always anxious to have a sight of the birds which take up their abode in this sequestered valley; and they listen with evident signs of pleasure to the cries of the nocturnal wanderers of the air. It is not above a week ago that I heard the heron screaming, the wigeon whistling, the barn owl screeching, and the tawny owl hooting, in rapid succession. The moon was playing on the water at the time, and the air was nearly as warm as summer. I thought of times long past and gone, when I was enjoying nature's richest scenery in the interminable forests of Guiana.

Walton Hall, April 3. 1835.

ART. IV. *Observations on the Cuckoo.* By EDWARD BLYTH.

IT is a fact very far from being creditable to the naturalists of Europe, that, whilst a single individual (Wilson) has been able to furnish us with a most satisfactory and detailed account of the peculiarities of that very remarkable species, the cattle bird, or cow-bunting (Molóthrus *pécoris Swainson*), of North America, the only bird, not a cuckoo, which is known to deposit its eggs in another bird's nest, the history of the Euro-

pean cuckoo itself, which in this part of the world is every where sufficiently abundant, and which, for so many ages, has been universally known always to confide its offspring to the care of strangers, should still continue to be involved in so much doubt and obscurity; and this although, perhaps, every person at all interested in the pursuit of natural history has at least devoted some little passing attention to the subject.

I am, therefore, very glad that, in the last Number [p. 283. to 301.], an endeavour was made to collect into one general focus a great number of scattered remarks, and of well authenticated observed facts, relative to the history of this curious and highly interesting bird; and the more so, as I had myself purposed to attempt something of the kind: not that I have much that is new to offer upon the subject, for my own observations are, for the most part, merely parallel to much that appeared in the last Number, and corroborative only of what has been already ascertained; but I certainly can establish some facts which at present are not generally known, and fancy that I can do something towards subverting certain theories; propounded, too, by persons whose great experience in matters of natural history entitles their opinions to be regarded with much deference and respect. I wish, also, that, by penning a few words on the subject, I could anyhow induce those who may have opportunities and sufficient leisure for the undertaking, to attempt further the elucidation of one or two particulars which I shall have occasion to point out as I proceed, and upon which at present our information is incomplete.

It would seem, in the first place, not to be so absolutely necessary as is generally supposed for the cuckoo to deposit its egg in the nest of an insectivorous species; although, without a doubt, the egg almost invariably is found in the nest of an insect-eating bird. A highly interesting fact, bearing on this, is related in the *Field Naturalist's Magazine* for January, 1834: "a cuckoo was found, just feathered, in the nest of a hedge chanter. It was immediately taken from thence, and placed in a cage containing a hen canary. The birds agreed perfectly well; but, what is most singular, when the proper food for the cuckoo (small caterpillars, &c.) was placed in the cage, the canary fed its young charge with that, although she herself kept to the hempseed, &c., to which she had been accustomed." A case also is mentioned in this Magazine, VIII. 287., of a green grosbeak, and another, in 288., of a linnet (without doubt Linària Linòta, if a linnet at all, and not a hedge chanter, which it is possible a common observer might have mistaken for a linnet), bringing up young cuckoos in a state of nature. Now, it must be borne in mind,

that all the more typical finches (as the linnets, siskins and goldfinches, canaries, and true grosbeaks), which, in the adult state, subsist wholly and solely upon vegetable food, always bring up their own young exclusively upon semi-prepared vegetable diet ejected from their own craws; and, therefore, that any of these birds should ever feed a young cuckoo upon insects and caterpillars, which themselves never touch nor feed their own young with, is a far more extraordinary fact than that those finches which in the adult state are partly insectivorous (as sparrows, buntings, and chaffinches, to which last group the typical appellation *Fringilla* has been injudiciously restricted *) should do the same, as these latter birds naturally bring up their own young entirely upon insect food. I would recommend, however, those who may be fortunate enough to have the opportunity, to certify the fact more thoroughly by placing a cuckoo's egg in the nest of a goldfinch, linnet, or green grosbeak, and to leave the young cuckoo, when hatched, entirely to the care of these non-insect-eating birds.

It would certainly be one point gained, if we knew, as at present we have every reason to believe, that any sort of small bird will hatch and bring up the cuckoo; and this would seem to render it more especially remarkable, that only one or two particular species (namely, the ground pipits, water wagtails, and somewhat less frequently the hedge chanter, all insect-eating birds, by the way) should so usually be selected for this purpose, that the occurrence of the cuckoo's egg in the nest of any other sort of bird may almost be considered an exception to a general rule. Is it, however, because the nests of these birds are particularly easy to find ?† for such is certainly the case; and yet the cuckoo's egg has never (that I am aware of) been found in a chaffinch's nest, which is frequently also a very easy one to find.‡ I know this fact, however, from repeated experiments, that the chaffinch will not unfrequently turn out any small egg that has been placed *along with her own;* but, whether she would so serve the cuckoo's egg, remains to be ascertained. Mr. Denson remarks (in p. 293.), that " it may be that the instances, never known of by man, of the cuckoo depositing its eggs in nests from which the owners of that nest discarded it, may be more nu-

* *Coccothraústes* I conceive to be the most typical form among the finches.

† Mr. Yarrell informs me that he is of this opinion.

‡ Since writing this, I have been so fortunate as to obtain a well authenticated instance of the cuckoo's egg occurring, alone, in a chaffinch's nest. The nest was robbed. Why, therefore, does it not more frequently occur in the nest of this species ?

merous than those instances known of by man, in which the owners retain it." This I am inclined to doubt; but the fact may be easily ascertained by a few experiments; and skylarks', or any other similar eggs, would answer this purpose quite as well as those of the cuckoo. Let those, however, who would try the experiment upon a chaffinch's nest, remove all the chaffinch's eggs, and leave that which they introduce *alone* in their place; for this I have never hitherto done.* The American cattle-bird, which belongs to the natural family *Stúrnidæ*, is, as might be supposed, a much more omnivorous species than our cuckoo, and it would seem also to be even more indiscriminate in its choice of the foster-parents for its young; yet there are one or two particular species which certainly appear most frequently to be selected, and the chief of these is a little bird called the Maryland yellow-throat (Trìchas personàtus *Swainson*), which, it is worthy of remark, approaches nearer, both in structure and habits, to our hedge chanter (Accéntor modulàris) than to any other species of European bird. M. Temminck speaks also of thrushes, and even shrikes, as being sometimes foster-parents of the cuckoo; and I am myself credibly informed, by different persons, of two instances of the cuckoo's egg being found alone in blackbirds' nests, and once, alone, in a song thrush's; in which latter it was hatched and reared. I am informed, also, of its having occurred in the nests of the skylark [p. 288.], yellow bunting [p. 288.], reed bunting [p. 288.], and sedge-warbler.

The American cattle-bird has been well ascertained to be polygamous, or, rather, to live in a promiscuous state of concubinage; and there is certainly every reason to believe that our cuckoo does the same. To speak from my own observation, and from that of one or two of my friends, I should say, decidedly, that they form no attachments amongst themselves: yet I am told by two very close and accurate observers, that they have noticed them very often to remain in pairs. It is not, however, the slightest proof of their being monogamous that the male cuckoo is frequently seen to pursue the female; on the contrary, throughout the season, it is not at all unusual to see even two or three males following a single individual of the other sex, and quarrelling and buffeting each other as they fly. For what purpose, may I ask, does nature prompt monogamous birds to form permanent seasonal attachments, but for the due and proper maintenance of the young?

* Since writing the above, however, I *have* performed this experiment; but I find that I must do so again and again, before I can venture to deduce any general conclusion. I am now inclined to suspect that, as Mr. Denson suggests, the cuckoo's egg is not unfrequently turned out.

And why, therefore, should the cuckoos pair, which are exempt from the ordinary duties of incubation? In nature nothing is superfluous, nought is ordained without a purpose; and what possible advantage would be derived from the pairing of birds which never rear their offspring? Upon a due consideration of the foregoing reflections, I think there is every reason to infer that which is certainly borne out by all appearances, that the European cuckoo never does pair, nor according to the common acceptation of the word, is strictly polygamous, but lives (like the American cattle-bird) in a state of general concubinage.

The reader will observe that I offer no kind of theory to account for the many peculiarities of this interesting bird. I have certainly read many notions on the subject, but cannot say that I feel the least inclined to adopt any that I have hitherto met with. It is sufficiently obvious, though few seem to have given this their consideration, that no explanation of the cuckoo's habits can ever be admitted as satisfactory, unless it will equally apply to those of the North American cattle-bird.

Both sexes, I believe, utter the call "cuckoo;" and both, I know, repeat the other note, which, in VII. 348., I have designated "full and melodious." This is, indeed, in my opinion, one of the most musical sounds to be heard in the British woods, and closely resembles one or two notes in the nightingale's song, which are, however, inferior to it; it may be expressed, as nearly as writing can do it, by the monosyllable *cūl*, or *cuil*, repeated several times in quick and continuous succession; and it is invariably uttered either immediately as the bird takes wing, or the moment before; sometimes the one, and sometimes the other. The common and more generally known note, *cuckoo*, is alike repeated either when perched or on the wing; and, I am fully confident in my own mind, by both sexes*; but I will not speak quite positively on this point till I have myself examined a female which had been heard to sing. It is the decided opinion, however, of several observant persons of my acquaintance, for the accuracy of whose observations I have the highest regard, that this note *is common* to both sexes; and one even tells me that, as, with a gun in his hand, he was once talking to a friend, a cuckoo alighted upon a tree close by, and several times repeated its call: he was desired to shoot it, and did so; and, a day or two afterwards, his friend told him it was a pity he had shot it, for it

* Mr. Yarrell also inclines to the opinion, that this call-note, "cuckoo," is alike uttered by both sexes.

had an egg almost ready to lay.* I give this upon unquestionable authority. It is worthy of remark, also, that the note of the cuckoo is very much affected by the state of the weather. During a period of drought, it gradually becomes more and more hoarse, till at length the first syllable of it is often broken into two or three; but no sooner does a breeze arise from the south-west, than, before even a haze obscures the sky, it immediately softens, and is pronounced quite musically and distinct.

I very much suspect that cuckoos have never any fixed abode, like other birds, but are ever wandering about from place to place: this can only be satisfactorily ascertained in situations where the cuckoo is comparatively a rare bird.

Another particular, upon which it is most desirable to obtain correct information, is the precise manner in which the cuckoo deposits its egg. Mr. Hoy's very valuable information (quoted in p. 294.) shows, most conclusively, that, sometimes at least, it is certainly *laid* into the nest; for the bird was noticed to be "a few minutes" in the hole; and it was also seen, upon its reappearance, to be carrying away something in its bill, which proved to be the wagtail's egg. Now, it has been suggested that the cuckoo may not always be able to find a suitable nest, exactly when she wants to lay; and that, therefore, in all probability, she must sometimes deposit her egg upon the ground; and afterwards, until she can find a proper nest to place it in, carry it about in her mouth, which, for this special purpose, is large and capacious: and this has been deemed a most satisfactory explanation of the reported fact of the egg having been found in situations where it could not possibly have been *laid*. I rather think, however, that, if the hen cuckoo were thus in the habit of carrying about an egg *in* her *mouth*, this one would not have been carrying the wagtail's egg between her *mandibles:* very little, however, can in either way be deduced from this circumstance.

There certainly are some reported instances, which seem to rest upon good authority, of the cuckoo's egg having been found in situations where it was physically impossible for the bird to have laid it. For example, Montbeillard's case, in a wren's nest; and especially that of Dr. Jenner, who is said to have found a cuckoo's egg in the nest of a wagtail, in a

* May 8. I have just been told by a young friend, that, this morning, as he was fishing, he observed a male cuckoo pursue the female, and both of them shortly alighted upon the tree under which he was sitting. In this case, only the male bird uttered the call *cuckoo*. What the swift performs in the air, and the martin in its nest, was observed, in this species, upon the tree.

hole under the eave of a cottage. This is mentioned, in the last edition of Montagu, as being "rather a singular place for a wagtail to build in;" but I have known several wagtails' nests in similar situations. Moreover, it seems Le Vaillant found the egg of at least one species of African cuckoo, more than once, in nests of small birds having a domed construction. It is obvious, therefore, that, in these cases (if correct), it could never have been introduced in the ordinary manner; still, we are very much in want of a *new* and well-authenticated instance of the occurrence of the European cuckoo's egg in a situation where it would have been decidedly and totally impossible for the bird to have laid it. In all the cases which have fallen under my observation, and in all that I have ever heard of, from direct observers (and these amount to a very considerable number), the nest was invariably so situate that the cuckoo could have *laid* its egg into it.

Besides, there is another consideration, which does not appear to have occurred to those who have written on the subject. How, in a domed nest, is the young cuckoo to get rid of any companion which it may happen to have? From this single circumstance alone, I feel justified in doubting, at least till farther proof can be adduced, the assertion of Montbeillard concerning the European cuckoo: it is possible he was misinformed; or the egg might have been introduced into the wren's nest surreptitiously, by other and very different agency from that of the cuckoo.

Female cuckoos may not unfrequently be seen prowling about, as if hunting for birds' nests. These, it is possible, may always have an egg which they want to dispose of. It would therefore, perhaps, be worth while to shoot a few of them while thus engaged; and, if they should then happen to have an egg just ready to be deposited, to observe whether it is ever carried in the mouth. I must confess, however, that I do not myself believe that it is ever so carried.

Those who are of the opinion of Montagu, that the female cuckoo is endowed with the anomalous and extraordinary power of retaining her egg, until, in consequence, it is sometimes quickened and partly advanced before it is laid, do not appear to have duly considered the important fact, that the cuckoo never places her egg in the nest of a bird which has begun to sit (how could she?); and that unless she were, in this case, to do so, it would most inevitably perish. Of course, every one must know that, after the vital action within an egg has once commenced, a very short suspension of the necessary heat is sufficient to destroy the embryo. No instance, however, that I am aware of, has ever yet been recorded of the discovery of an addled cuckoo's egg.

For my own part, I see no cause whatever to have recourse to so extraordinary a phenomenon, to explain any facts with which we are at present acquainted. There is reason to believe, I think, from the appearance of the *ovarium* of a cuckoo, that the eggs are not laid on consecutive days, as is the case with birds in general, and that usually but one *set*, comprising only about five or six, is laid in a season* (which, by the way, are quite as many as are ordinarily produced by the nightingale); and I think that this view is further borne out by the very small number of cuckoos' eggs, and of young cuckoos, which are ever found. I also do not imagine, with some people, that the hen cuckoo ever experiences any great difficulty in finding a sufficient number of suitable nests to lay in, more especially on the supposition that more than a day intervenes between each successive laying: her season for laying is when birds' nests are found in greatest abundance; and I think it not very improbable, that, whenever she has found one which will answer her purpose, she continues in the immediate vicinity of the spot until ready to lay into it.† I am

* Will any reader mention the latest time in the season at which he has known a cuckoo's egg to have been found?

† Since writing the above, I have again been reading carefully over Wilson's admirable description of the American cow-bunting, which, not being so shy and solitary a bird as our cuckoo, permits its habits to be more easily and closely watched. The following passage occurs, in which Wilson relates the result of an informant's researches:—"By a minute attention to a number of these birds, when they feed in a particular field in the laying season, the deportment of the female, when the time of laying draws near, becomes particularly interesting. She deserts her associates, assumes a drooping sickly aspect, and perches upon some eminence where she can reconnoitre the operations of other birds in the process of nidification. If a discovery suitable to her purpose cannot be made from her stand, she becomes more restless, and is seen flitting from tree to tree, till a place of deposit can be found. I once had an opportunity of witnessing a scene of this sort, which I cannot forbear to relate. Seeing a female prying into a bunch of bushes in search of a nest, I determined to see the result, if practicable; and, knowing how easily they are disconcerted by the near approach of man, I mounted my horse, and proceeded slowly, sometimes seeing and sometimes losing sight of her, till I had travelled nearly two miles along the margin of a creek. She entered every thick place, prying with the strictest scrutiny into places where the small birds usually build; and, at last, darted suddenly into a thick copse of alders and briers, where she remained five or six minutes, when she returned, soaring above the underwood, to the company she had left feeding in the field. Upon entering the covert, I found the nest of a yellow-throat, with an egg of each.... In the progress of the cow-bird along the creek's side, she entered the thick boughs of a small cedar, and returned several times before she could prevail on herself to quit the place; and, upon examination, I found a" [species of] "sparrow sitting on its nest, on which she no doubt would have stolen in the absence of the owner." Now, much of this corresponds exactly with what I have often observed of the Europeancuckoo. I have seen her sit as if watching the operations of the small birds around her; have noticed her to become restless, and (as

a little inclined to suspect, also, that, whilst the generality of wild birds mostly lay their eggs early in the morning, at least before ten o'clock P. M., the cuckoo does not lay hers till much later in the day, which, in general, would prevent her from being surprised by the owners of the nest; for, from the time when a nest is finished, to that when the bird begins to sit, the latter is but rarely seen, during the day, about the place, as this would not unfrequently only lead to its discovery. Should these remarks, however, be so fortunate as to meet the eye of Mr. Hoy, I hope he will favour us with the exact time of day in which he actually observed the cuckoo to lay.

The cuckoo most usually (probably always when undisturbed) *destroys whatever eggs there may be in a nest into which she introduces her own;* and, therefore, whenever any other eggs are found in the same nest with that of the cuckoo, they were not laid, in most instances, until after its deposition. Of this fact I have such multitudinous evidence, and from so

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observed in the text) have frequently seen her flying about from bush to bush, and from thicket to thicket, as if hunting for birds' nests; but, in an enclosed part of the country, it is no very easy matter to follow her up as Wilson's informant did the American bird. Upon consideration, I think the two species proceed very much in the same manner; and, judging from my own past exploits in the way of birds'-nesting, I cannot conceive that the cuckoo is ever very long in finding a proper receptacle for her egg. For an hour or two, undoubtedly, all birds have a voluntary power of retaining or expelling an egg; and so, of course, the cuckoo has among the rest: but to suppose that she can retain it in the oviduct till quickened by the heat of her own body, appears to me to be entirely out of the question. — May 20th. I have since had some conversation with Mr. Yarrell upon this subject, a gentleman whose opinion is a very high authority in all matters connected with natural history. He has informed me that there are cases in which a common fowl has been known to retain her egg for several days on being removed to a strange yard, even though she were in the middle of a set; but the like of this cannot well take place in a state of nature. On the other hand, I have known instances wherein both fowls and pigeons have been compelled to drop their eggs even whilst upon a perch. I also remember to have seen a sparrow hovering for a long time over a particular spot in the Surrey Canal, and, upon going to see what was the object of its attention, I was surprised to find that it had dropped an egg into the water. A day or two ago, also, I found that a skylark had laid an egg upon the bare ground, upon a spot whence her nest had been removed the day before. However, in ordinary cases, I suspect that a bird has much the same power over the functions of the *oviduct* as we have over those of the *rectum* and *vesica*. Mr. Yarrell is of opinion that the vital action in an egg cannot commence whilst it remains within the oviduct, however long it may there continue; upon the principle that all contact with the external air is there as completely shut out as if the shell had been covered over with a coat of varnish. I have now, however, some experiments pending, the results of which will throw some light upon this subject. In the meantime, we must not entirely forget the case of *ovo-viviparous* animals.

many different observers, that it would be mere tautology here to repeat it all: one person alone, who was long a game-keeper, and whom I know to be a most correct observer, not at all addicted to making out wonders, assures me that he has found the cuckoo's egg *alone*, as many as six or seven times, in various nests; and, in all the cases I have ever known of its being found together with other eggs, these latter were invariably below their average number.* I select, however, the following cases to be placed beside that of Mr. Hoy (p. 294.): the first is upon the authority of a gentleman in this neighbourhood. A meadow pipit's nest was found with four eggs in it; and, on my friend going to look at it two or three days afterwards, the pipit's eggs had all disappeared, and a cuckoo's egg was in their place. The broken shells of the others were found at a short distance. The next was made known to me by a birds'-nesting boy, of whom I purchased the cuckoo's egg. He found a meadow pipit's nest with two eggs in it; and, going to look at it the next day, these had disappeared, and a cuckoo's egg was in the nest alone: the following day the pipit laid an egg to this, and the day after that another, when he took the nest, and brought it to me. I do not conceive it necessary to mention any more similar facts, of which I have several, for these I consider to be conclusive; but I may here fairly ask the question, whence could the common and very prevalent opinion of the cuckoo sucking birds' eggs have been derived, if not from repeated observation of this fact, of her usually destroying the other eggs of a nest into which she deposits her own?†

In those cases which would appear to militate against the above, as in that of Montagu, where "the hedge chanter had four eggs when the cuckoo dropped in a fifth," [and those in p. 285. 287., in which the wagtails had the usual number of their own eggs, besides the cuckoo's,] and especially in those where two cuckoos' eggs have been found in the same nest (p. 289, 290.)‡, it is highly probable that the cuckoo had been disturbed, perhaps by the rightful owners of the nests, before

* I have since heard of one instance of six young meadow pipits being taken in the same nest with a young cuckoo: all were, of course, but newly hatched.

† Goldsmith, it may be remarked, was fully aware of this fact. See his *Animated Nature*.

‡ A person has since informed me, that he once found two cuckoos' eggs in a blackbird's nest which he took: there were no other eggs with them. From this and other instances, it would therefore seem, that the cuckoo knows the egg of her own species, and does not destroy it; a further proof, also, that she never destroys (hardly looks at, probably,) the eggs of her dupe before depositing her own: otherwise it would appear very strange that she should ever lay another egg beside the one belonging to her own species.

she had had time to finish her operations. I have myself seen a meadow pipit attack most resolutely, and drive away, a cuckoo from the vicinity of its abode, I think I may safely say from off its nest, as the cuckoo rose from the ground (and this happened, by the by, about six o'clock in the morning, which is not very confirmatory of an opinion I just now advanced). We might have imagined, indeed, that the cuckoo would always clear the nest *previously* to introducing her own egg, if Mr. Hoy's direct observation [V. 278., and quoted VIII. 294.] had not satisfactorily proved the contrary.

The other remark of that gentleman, to the amount that it appears to be usual for the birds in whose nests the cuckoo may have deposited an egg, before they may themselves have begun to lay, to cast out the cuckoo's egg [VIII. 294.], may be true in some instances, and not in others, and may be coupled with the following passage from Wilson:—"It is well known to those who have paid attention to the manners of birds, that, after the nest is fully finished, a day or two generally elapses before the female begins to lay. This delay is, in most cases, necessary to give firmness to the yet damp materials, and allow them time to dry. In this state it is sometimes met with, and laid in by the cow-bunting; the result of which I have invariably found to be the desertion of the nest by its rightful owners, and the consequent loss of the egg thus dropt in it by the intruder." Experiments on this subject may easily be tried by any one who can spare the time, as it is obvious that any sort of small egg will answer the purpose equally as well as that of the cuckoo. According, however, to my own observations, deduced chiefly from experiments in which larks' eggs were employed, as being somewhat similar to those of the cuckoo, the nest is sometimes forsaken, and sometimes the alien egg is cast out.

As no further light can now be thrown upon the well-established fact [295, 296.] of the young cuckoo always ejecting from the nest whatever companions it may chance to have, it will be needless for me to say here a single word upon this subject; at least, further than that I am fully able to corroborate it. Nests upon the ground, however, may sometimes be so situate, as to render it impossible for the young cuckoo to turn out its fellow-nestlings; of which I have been told an instance, wherein four callow wagtails were found dead, apparently starved, beneath the usurper of their abode.

Most small birds exhibit a marked hostility towards the young cuckoo, as well as to the old, and no sooner does it leave the nest, than the place of its retreat is sure to be made known by a concourse of swallows and other small birds, endeavouring, as much as they can, to annoy it; amongst all

which turmoil, its foster-parents continue to feed it with the most exemplary and indefatigable perseverance. It is remarked of the individual described in VIII. p. 286., that "it was seen again on June 12th, on the top of a wall near to the nest; and, while it was sitting here, an amusing and instructive sight presented itself. A thrush, which, probably, had a nest close by, in an adjoining garden, evinced the most passionate and marked antipathy towards the young cuckoo, by approaching it with feathers ruffled, beak open, and uttering an earnest cry: some small birds, too, drew near, as if to exhibit their dislike, and abet the thrush." This I know to be an ordinary fact.

Yet it would appear that, when quite young and helpless, small birds will sometimes take pity upon the nestling cuckoo, and bring it food, as in the case mentioned in p. 297. of wrens actually leaving their own nest with eggs in it to tend a young cuckoo; but this fact is so very remarkable, that, before it can be considered as general, I think it ought to be corroborated. Those who may possess a nestling cuckoo may very easily try the experiment of placing it near to the nest of some bird which has not begun to sit (or even of one that is sitting, or that has young of its own), and notice the result. I know that many small birds, in confinement, will tend and feed any young nestlings that are put to them, however dissimilar the species; of which, last year, I had a remarkable proof in a brood of ten young bottletits being brought up by a tree pipit in my possession; but this is a very different case from that of a bird which has a nest of its own.* The sight of a brood of helpless gaping nestlings, however, operates wonderfully upon the instinctive feelings of most birds, even of those which have hardly begun to feed themselves, as was long ago observed by Buffon in his account of the skylark. The Hon. and Rev. W. Herbert, in one of his notes to the quarto edition of White's *Selborne*, even states, speaking of a nest of willow wrens which were in a cage together with other young birds, that "one of them, more than a week before it could feed itself, took to feeding two wood wrens which were ten days older than it, and able to feed themselves, though still very willing to be fed by another. It showed exactly the same discrimination that an old bird does in leaning

* I once, however, put a nest of young goldcrests into a large cage containing several insectivorous birds, in the hope that one out of the number would have brought them up: a coletit descended, seemed very much interested, and looked, I thought, as if he would have fed them; when, lo! he seized one of them by the neck, placed it between his claws, and began very deliberately to eat it. There is, therefore, a little of the magpie even in this tiny delicate species.

over the one it had last fed, notwithstanding its clamorous entreaties" [This remark of this author negatives our conjecture expressed in VIII. 296.—*J. D.*], in order to give the food to the other.* No importunities from the brown wrens could obtain a morsel from it. There was sagacity even in this; for the brown wren is a much less nearly allied species, and is now referred to a separate genus. Its own fellow-nestlings did not importune it for food. It was a cock bird; and three weeks after it beat the cock wood wren so, that it was necessary to separate them."

Another very remarkable fact in the natural history of the cuckoo is, that, unlike every other British bird, except the swift, chimney swallow, and, perhaps, the night-jar, neither the old nor the young birds undergo a moult before they leave us in the autumn. I have a very fine young specimen, which was shot in the month of September, but upon which there is not the slightest indication of a change of feather. It will be observed, that the plumage of the young cuckoo is very firm and adult-looking in its texture; and, as some of the individuals which arrive in spring have traces of the immature markings about the neck and throat, it has been suggested that they do not moult at all the first season, but undergo, like the ptarmigan, a gradual change of colour during the winter. This, however, is not the case; for, independent of observations made on them in a state of confinement, it appears that Montagu met with three specimens in spring, which had then "not entirely thrown off their nestling feathers," but in which "the thirteenth and three succeeding quill feathers, and the three greater coverts impending them," were unlike the rest, and "barred with brown and ferruginous." These, no doubt, were very late individuals of the preceding year; and, as all our common birds have completely finished their change of plumage some time before the winter sets in, and as those migratory species even which moult again in spring (as the tree pipit and yellow field wagtail) have generally quite finished their vernal moult *before* they arrive, it seems almost to follow that the cuckoo's change of plumage does not take place till after mid-winter; though, probably, from its very great quantity of feather, its moult occupies a longer period than that of most other birds. The

* The contrary to this, however, is stated by Montagu, in his account of the goldcrest. "There appeared to be no regularity in the supply given by the parent bird; sometimes the same was fed two or three times successively; and I generally observed that the strongest got most, being able to reach farthest, the old one delivering it to the mouth nearest her," &c.

above-mentioned traces of barred markings about the neck and throat, which are observed in some individuals that are shot in spring, I take to be the adult livery of the female bird; for I have never met with them except in this sex; and I have never noticed this sex to be without them, although Mr. Selby says, "the female differs in no respect from the male." Very old females, perhaps, do not.

There is much which I am anxious to learn, and which I believe is at present quite unknown to science, respecting certain changes of appearance which take place in the plumage of many of our common birds; and although, perhaps, a little digressing from the subject in hand, I shall take the present opportunity to propose one or two queries, which may possibly stimulate some to attempt their solution. The young of the common shrike (Lànius Collùrio) moults all but the wing and tail primaries almost immediately after it leaves the nest, and acquires a second plumage very similar to the first, but closer and more adult-looking in its texture, more inclining to rufous, and having the bars upon the upper parts farther apart; in this state both sexes are alike, and one is figured by Bewick for the adult female woodchat. When they arrive in spring, all are in mature plumage; and I wish, therefore, to know whether they moult again in the interim, or whether their plumage undergoes a gradual change of colour? I have reason to believe the former. But do the old birds also acquire in autumn a winter plumage, similar to that of the young? I suspect not; but, if not, do they also moult in spring? The young willow wrens and chiff-chaffs, also (I do not know the young wood wren), are at first very like the old birds; but, at the autumnal moult, whilst the adults acquire a plumage very similar to that which they throw off, the young of the year assume a livery of much brighter yellow: yet all are alike when they reappear in spring. Now, do the young of these species moult again during their stay abroad, or gradually change their colour? And, if these moult, do not the old birds also undergo a vernal change? for I can hardly conceive that so great a call upon the system should be exclusively confined to the young. The best way of ascertaining the facts would be by keeping the birds for some time in confinement; but it is necessary, I think, here, to guard the more inexperienced enquirer against what might possibly prove a source of error: insectivorous birds, in confinement, are very apt to lose, during the winter, a considerable number of feathers, from disease and other causes; and these, early in spring (generally about February), are redeveloped so simultaneously all over the body, as to present the appearance of a vernal change of plumage:

a very slight inspection, however, is sufficient to show that this is not a regular moult. There is much, also, yet to be learned, if I am to judge from all the more recent publications which I have seen on the subject, respecting the seasonal changes of our various *Anátidæ* (duck family): there seem to be specific peculiarities in the changes of almost every species; and I earnestly request those who may have opportunities of making the enquiry, to bestow some attention to the subject. The cuckoo's changes, I think, I have pretty clearly made out.

But, to return to the cuckoo. Does this bird subsist entirely on insect food? I think not; but am of opinion that, towards the close of its short stay in this country, it often feeds upon the smaller fruits. White of Selborne, in describing the contents of the stomach of one (letter xxx.), observes: — "Among this farrago were also to be seen maggots, and *many seeds*, which belonged either to gooseberries, currants, cranberries, or some such fruit; so that these birds apparently subsist on insects and fruit," &c. [It is a pity that these seeds were not sown: their passing through the stomach of the bird would not destroy their power of germinating; and the plants produced from them would have been means of identifying the species to which the seeds had belonged.] I have not, myself, noticed vegetable food in the cuckoo's stomach; but I know an instance of a man concealing himself within a short distance of a cherry tree, for the purpose of shooting the blackbirds, jays, &c., that came to feed upon the ripe fruit, who there shot two or three cuckoos; but immediately as they alighted, without giving them a moment's time to feed. The form of the cuckoo's bill would certainly seem to indicate a partly baccivorous species; and many of the tropical *Cucùlidæ* are well known to be great fruit-eaters. Wilson observes, also, of the Coccỳzus carolinénsis, that "they are accused, and with some justice, of sucking the eggs of other birds; like the crow, the blue jay, and other pillagers. They also occasionally eat *various kinds of berries.*" I do not much think, however, that the European cuckoo ever *feeds* upon birds' eggs; though, at the same time, I am not prepared to assert the contrary.

Buffon says, "Though cunning and solitary, the cuckoo may be given some sort of education. Several persons of my acquaintance have reared and tamed them. They fed them on minced meat, either dressed or raw, insects, eggs, soaked bread, and fruit. One of these tamed cuckoos knew its master, came at his call, followed him to the chase, perched on his gun, and, if it found a cherry tree in its way, it would

fly to it, and not return till it had eaten plentifully: sometimes it would not return to its master for a whole day, but followed him at a distance, flying from tree to tree. In the house it might range at will, and passed the night on the roost."

When first taken, young cuckoos are always extremely savage and voracious; but I have myself seen a pair that were tolerably tame, and which were allowed the free range of a large kitchen, where they commonly used to sit upon the fender, warming themselves by the fire. The larvæ of lepidopterous insects undoubtedly constitute the principal and main food of this species in a state of nature; and they may very frequently be seen, in spring, upon an apple or other fruit tree, deliberately picking out the *blight* [small caterpillars]. This has given rise to a very common opinion, that the cuckoo "sucks the blossoms," if any meaning can be attached to this phrase.

Respecting the cuckoo's migration, a very accurate observer informs me that, in the north of Scotland, near the north-eastern extremity of the Grampians, he once saw a flock of *sixteen cuckoos*, in September, flying in a south-easterly direction, towards the German Ocean, which was distant about half a mile: it was in the afternoon; and my informant is quite positive with regard to the species, as they passed very close to him: it is not, indeed, a bird that those who know can very easily mistake. Of course, these were young individuals, as the old ones leave us about the latter end of July, or beginning of August.* In answer to the question (p. 301.), "Whither does the cuckoo, on its leaving Britain, go?" I may remark that M. Temminck speaks of having received specimens from Egypt, but does not state the time of the year. The nightingale and the whitethroat are well known to abound in Egypt during the winter months; and there can be very little doubt but that Egypt and Syria, and the countries bordering upon the Red Sea, are the general rendezvous, in winter, of all the small migratory birds (the cuckoo among the rest) which enliven our summer walks with their presence; and which, warbling their delightful melody amid the blossoms and opening leaves, constitute one of the principal charms of a European spring.

Tooting, Surrey, May 6. 1835.

* Another person, also, whose authority in these matters I have reason to respect, tells me that the old cuckoos, also, congregate in flocks of twenty or thirty, towards the close of summer, just before they leave the country. This is, at least, worthy of being further enquired into. Has any reader ever known a cuckoo to alight upon a vessel, in the course of its journey across the sea?

ART. V. *Illustrations in British Zoology.* By GEORGE JOHNSTON, M.D., Fellow of the Royal College of Surgeons of Edinburgh.

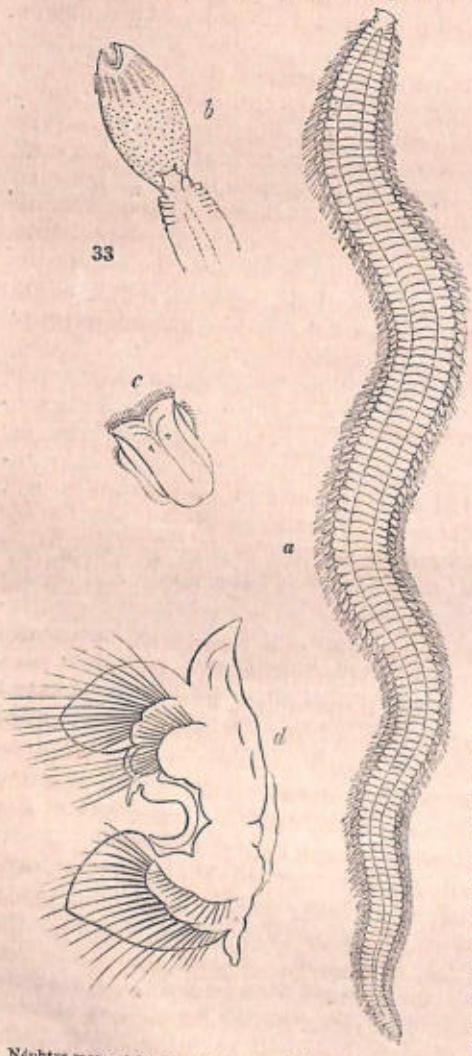
37. NE'PHTYS *Cuvier.*

CHAR. — Body vermiform, flattish, with numerous segments. Head distinct, truncate anteriorly, with four minute antennæ; one at each outer and anterior angle, and a pair beneath. Eyes none. Palpi none. Tentacular cirri none. Proboscis double; the outer sheath garnished, near the extremity, with several series of papillary tentacula: the inner closed with tentaculiferous lips, and armed within with a pair of small jaws. Feet all alike, large; of two widely separate branches, each furnished with a foliaceous process placed perpendicularly, setigerous tubercles, a short conical cirrus, and the upper with a curved branchial filament underneath. Tail with a single style.

1. N. margaritàcea. Body of a uniform pearly lustre; superior cirrus wanting; lamellæ of the feet ovato-cordate. (*fig.* 33.)
   Hab. In sand near low-water mark; plentiful in some parts of Berwick Bay.

Description. — Body from 6 in. to 10 in. long, tapered slightly towards the anterior, and more so towards the posterior, extremity; flattish, three tenths of an inch in breadth; of a beautiful pearly lustre and colour all over, smooth, without spot or stains. The feet yellowish; ventral surface flat, perlaceous, with a purplish furrow down the centre. Head distinct, square, truncate in front; where there is a very short apparently unjointed antenna on each outer angle, and a similar pair beneath. Mouth inferior, evolving a very large proboscis, sometimes of a pink colour, greyish, in others rough, with miliary granules, and its outer end crested with numerous short papillary tentacula, arranged in longitudinal series: it contains a cartilaginous tube formed of eight equal pieces, which is closed with two semicircular lips or valves continuous with the outer sheath, and fringed with a double series of longish tentacula; and, within this inner proboscis, there is a pair of small pointed horny brown jaws. Segments narrow, convex dorsally; the lines of separation indistinct in the centre, but strongly marked along the sides; about 140 in number (in two specimens, of average size, 143 were counted), the anterior streaked with pale lines across the base of the feet. Feet greatly developed, increasing gradually in size to about the middle of the body; whence they again decrease towards the tail, very deeply divided into two branches: the dorsal branch rather less than the ventral, furnished with a perpendicular lamellated somewhat ovate process, with a small

appendage of the same character at its base, a small cirrus, and an elongate branchial filament, curved like a reaping hook; the setigerous processes obtuse, broad, shorter than the lamellæ; the inner armed with a row of long, and the outer with a row of short, bristles: ventral branch much like the dorsal; the lamellæ larger, with a small cirrus at its base. Bristles dusky, longer than the processes, very slender, setaceous, smooth, unjointed, each of the longer series with an acute retractile brown spine in their centre: the short bristles look as if they were abruptly broken off; but they are uniform on all the feet, and appear to be pointed under the microscope. Anus terminal, superior; the segment small, apodal, terminated with a slender filament or style.



Néphtys margaritàcea: *a*, the worm of the natural size; *b*, the proboscis extended, of the natural size; *c*, the same opened; *d*, a foot viewed laterally, magnified.

This worm is remarkable for the splendour of its colour, which is exactly similar to that of mother-of-pearl; but the silvery lustre is almost confined to a space down the back and belly, for the sides and feet are of a yellowish hue, the inner base of the feet reddish, and the bristles dusky. When the foot is removed, and placed under a magnifier, it has a sort of resemblance to a horse's hoof; and is a very wonderful and beautiful

piece of mechanism. The creature lives in the sand; in which it burrows by means, principally, of its strong proboscis, which, used as a wimble, opens up the way, the body being held steady with the aid of the setigerous feet. It thus buries itself with almost incredible velocity: nor is it less active in the water, should it accidentally be removed from its furrow, and cast in the open sea; swimming rapidly, with a serpentine wriggling motion, and propelled, unquestionably, by the lamellæ which project from each side, like a double bank of oars.

From Néphtys Hombérgii our species differs very much, in the construction and form of the processes of the feet; while, in the shape and colour of the body, they seem very nearly to agree. (*Ann. des Sc. Nat.*, xxviii. p. 257. pl. 17. fig. 1—6.) No other species has been yet accurately defined; but ours may be conjectured to be the Nèreis clàva of Leach: relative to which, however, I have no means of deciding; and Blainville has, it appears, introduced such an almost inextricable confusion into the nomenclature of that species, that it might be scarcely advisable to restore the name, should it prove identical with the one now illustrated.

ART. VI. *Notices of* 184 *Observations on Aurora Borealis, made during a Period of Thirteen Years, with the State of the Weather immediately subsequent; being contributive to the further Elucidation of their Effects on the Atmosphere.* By W. H. WHITE, Esq.

THE corroborative testimonies of my remarks on auroræ (p. 99.), by Mr. Conway and Mr. Gardener (p. 92—97.), have induced me to condense my observations during a period of thirteen years, not only to show upon what grounds I made the remarks just alluded to, but, if possible, to ascertain how far the effects of auroræ may be depended upon, from the intensity of their luminous manifestations, and whether any material advantage to mariners can be pointed out.

As I always carefully register, not only the commencement of changeable weather, and other atmospheric phenomena that come within the reach of my observation, but also the variations, duration, &c., of whatever changes may occur; so I have given, as under, the average times, duration, &c., of the several changes; carefully classing the various auroræ according to the intensity of their luminous manifestations, durations, changes, &c. The result is as follows:—

Thirty-nine observations, on luminous appearances, rather faint, were followed with rain in about thirty-six hours; wind, generally s., very brisk.

Forty-two manifestations, more vivid than the preceding, with very brisk winds, principally s. w., and moderate rain in about thirty hours.

Sixteen still more vivid appearances, attended with coruscations and agitated motions, were succeeded with strong westerly winds, and rain in thirty hours.

The average continuance of rain, succeeding the above ninety-seven observations, was about eight hours.

Twenty-four very vivid and brilliant appearances were followed by strong gales of wind from s. w. in about twenty-six hours, but no rain: the atmosphere mostly cloudy.

Eleven exceedingly brilliant and beautifully coloured auroræ, with beautiful streams of variegated light, reaching up to the zenith, were succeeded in about twenty-six hours with very hard gales of wind, principally from the w., accompanied with very massy nimbose clouds, but no rain: these gales continued about six hours in the above thirty-five observations.

Twelve magnificent displays, with luminous arches, columns of various colours darting sometimes to the zenith, and sometimes to the s. of the zenith, spreading themselves from N. E. to N. W., attended by occasional flashes of lightning, meteors, and shooting stars; wind varying from S. W. to N. W., were followed, in about twenty hours, with violent gusts of wind, and heavy rains resembling thunder-showers; the average continuance of the wind and rain being about four hours.

Four still more magnificent displays than the preceding twelve, attended with almost every variation of colour, motion, &c., were succeeded by very strong gales of wind; namely, one from the w., a very hard gale; two from s. w., still more powerful, the wind being more by gusts; and one from the N. W., a perfect hurricane, tearing up trees, &c. These were all succeeded on the following days by thunder, lightning, and torrents of rain, for about four hours.

Sixteen other manifestations, resembling the dawn of day, the wind w. or N. W., were followed on succeeding days by frosts.

Twenty still more faint resemblances were not succeeded by any apparent change of weather, which was generally mild and calm.

Hence it appears that the wet and changeable weather that succeeds auroræ is, to the dry and unchangeable, as 164 to 20, or $8\frac{1}{5}$ to 1; a ratio which must go far to prove that auroræ

have a considerable atmospheric influence in those places where they are manifestly conspicuous.

The situation where the above observations were chiefly made was a slight eminence, nearly surrounded by much higher grounds, lat. 52° 8′ N., and nearly on the meridian of Greenwich; and, as I am very much inclined to think that the high grounds which surrounded the spot where my observations were made had considerable influence on the currents of wind as they descended into the valley, I shall feel greatly obliged, if Mr. Gardener would favour me with an account of the prevailing winds during his observations in 1833 and 1834 (p. 94—96.): for I feel persuaded that, by continued and comparative observation, as frequent as it may be expedient, much may still be done in illustration of the arcana of nature, and many beneficial conclusions may be brought to light, in illustration of those scientific researches, which continually occupy the minds of intelligent enquirers; notwithstanding that we are told by Cowper, that

> "God never meant that man should scale the heavens,
> By strides of human wisdom."

Old Kent Road, Feb. 20. 1835.

ART. VII. *A Report on the Quantity of Rain which has fallen at Kendal, in Westmoreland, during the last Thirteen Years, and a Notice of some Local Circumstances deemed Influential on the Quantity, and on the Climate.* By SAMUEL MARSHALL Esq., and J. S. M.

THE annual average quantity of rain taken at Kendal, in a rain-gauge kept by me, during the last thirteen years, is 56·918 in. These are some of the details: — In 1822, 62·726 in.; in 1823, 62·749 in.; in 1824, 62·762 in.; in 1825, 59·973 in.; in 1826, 43·06 in.; in 1827, 58·006 in.; in 1828, 54·816 in.; in 1829, 46·173 in.; in 1830, 58·03 in.; in 1831, 61·416 in.; in 1832, 49·688 in.; in 1833, 55·418 in.; in 1834, 65·122 in. The monthly details for 1834 are, in (first month) January, 14·758 in.; in (second month) Feb., 5·723 in.; March, 5·171 in.; April, 1·043 in.; May, 1·637 in.; June, 6·699 in.; July, 5·048 in.; Aug., 6·167. in.; Sept., 4·908 in.; Oct., 4·715 in.; Nov., 4·206 in.; Dec., 5·047 in.

The town of Kendal is situated in a valley bounded on the east and west by two ranges of hills, the former running parallel to the great chain called the Backbone of England, or the English Apennines, beginning a little north of Cross Fell,

in Cumberland, and terminating in the Derbyshire hills. On the north of the town is the mass of mountains in the lake district; and the only opening into the valley in which the town lies is to the south. The winds in this district being chiefly from the south-west and west, and being loaded with aqueous vapours from the Irish Sea and the Atlantic Ocean, they are arrested in their progress before they pass this natural boundary, and occasion an extraordinary deposit of rain. That this place will be the one where an unusual quantity of rain will be taken in the rain-gauge, is obvious from its being bounded on the north by mountains of a greater elevation than any south of it till we arrive at the Welsh mountains. Many other local circumstances might be pointed out, to account for the quantity of rain taken in this neighbourhood; but, perhaps, this is the chief cause of so much more being measured here than in any other place in England where a rain-gauge has been kept.

Remarks by J. S. M. — The situation of Kendal, nearly in the centre of the basin of the Kent, which flows rapidly to the sea, is a circumstance, additional to those noted by Mr. Marshall, which seems peculiarly to favour the great deposition of rain there. Its geology assists greatly in preventing the climate being rendered hurtful to its inhabitants. On one side of the basin of the Kent, in which Kendal is situated, is limestone of the carboniferous order; on the other, the eastern side, the greywacke rocks. Both these kinds of rocks are very fissury, and open in their joints; and they consequently afford a rapid passage downwards to the descending rain. Little moisture, therefore, remains on the surface to evaporate and render the climate unusually humid. The river Kent, which receives all the waters of the basin, has a considerable descent to the sea, and speedily hurries off to the ocean all superfluous waters that have fallen from the atmosphere. From such causes, and, perhaps, from others that might be named, the climate of Kendal is far from unhealthy, though, perhaps, no where else in our island a greater quantity of rain falls within the year. At few places can more aged persons be found than at Kendal.

It is curious to observe that, while at Epping, near London, the average quantity of rain that falls at that place in the year is about 20 in., at Kendal nearly 60 in. is the average annual quantity. Should less than 50 in. fall at Kendal, a great failure happens in the hay crop and other crops, as happened in 1826, in which year only 43 in. of rain fell.

ART. VIII. *Particulars on the State of the Weather at Columbus, in Franklin County, Ohio, United States of America, in January and February,* 1835; *with a Notice of the State of Temperature on Jan. 5.* 1835, *in various Places in the United States.* By Mr. GEORGE E. HARTWELL, of the Firm of Lazell and Hartwell, Nurserymen at Columbus.

MR. HARTWELL has appended the following particulars to a letter on other subjects, to the end that these particulars may prove of what interest they may. We print them in the same feeling. Mr. Hartwell has not presented deductions of any kind on the facts detailed; and the facts themselves extend only, it may be seen, to two months of time, and nearly all of them to one place. Notwithstanding these things, we cannot doubt that the facts themselves, so far as they go, will be interesting to those to whom subjects of meteorology are so. Upon the character and soil of Ohio, Mr. Hartwell has expressed, in his letter, these remarks: —

"We are situated in a state the most fertile, perhaps, of any in the Union, and which is frequently styled 'the Queen of the West.' The soil, so far as I have seen, is, for the most part, a rich loam, with here and there patches of a black alluvial, and, upon an average, at least 2 ft. deep."

State of the Weather in various Parts of the Union, on Monday, Jan. 5. 1835.

At New Haven, Connecticut	—23°	At Albany, New York -	—32°
Lowell, Massachusets	—24	Utica, New York -	—34
Concord, Mass.	—27	Elizabeth Town, N. J.	—18
Northampton, Mass.	—32	Belleville, N. J. -	—20
Woonasocket Falls, R.J.	—24	Montreal, Canada -	—35
Providence, R. J.	—26	New Lebanon, Vermont	—39
Poughkeepsie, N. Y.	—33	Columbus, Ohio - -	+1

Mr. Hartwell's table requires a page to itself: the vacancy left here gives space for the following notice on the

State of the Weather at Boston, in New England, in the United States, in March, 1835. — The memory of the oldest person living bears no record of such a cold, wet, blustering, disagreeable month as this of March, 1835, which leaves us to-day. It came in with the mercury three or four degrees below zero, and is likely to bid us good-by in a snow storm: wind east. Charles River has been frozen over more than one third of the month. There is ice in the streets of our city, which first covered the pavements in November. Last week we heard one of our neighbours threatening to plant peas on the first day of April. We should like to witness the operation. He may make holes for the seeds with a crowbar; but how he can contrive to cover it with earth, is more than we can conjecture. (*Boston* (*America*) *Courier*, as quoted in the *Morning Chronicle*, May 8. 1835.)

JANUARY, 1835.

Day.	Forenoon. Thr.	Wd.	Remarks.	Noon. Thr.	Wd.	Remarks.	Afternoon. Thr.	Wd.	Remarks.
1	26°	S.W.	Clear, brisk air.	40°	S.W.	Cloudy, mild brisk air.	34°	S.W.	Cloudy, brisk air.
2	32	N.E.	Cloudy, brisk wind.	36	N.E.	Cloudy, cutting wind.	36	N.	Clear, brisk air.
3	18	N.E.	Cloudy, brisk wind.	24	N.E.	Cloudy, cutting wind.	16	N.	Cloudy, brisk air.
4	8	N.	Clear, biting air.	26	N.	Clear, biting brisk air.	13	N.	Clear, biting air.
5	1	N.	Clear, pinching cold air.	21	N.	Clear, biting brisk air.	12	N.W.	Clear, biting air.
6	6	N.E.	Cloudy, piercing cold w.	28	N.E.	Heavy atm., sym. of snow.	26	N.E.	Cloudy, heavy atmosph.
7	24	N.E.	Clear, brisk air.	30	N.W.	Clear, pleasant light air.	18	N.	Clear, brisk air.
8	10	N.	Clear, keen brisk air.	25	N.E.	Clear, p'easant light air.	14	N.	Clear, brisk air.
9	9	N.E.	Clear, keen brisk air.	30	N.E.	Clear, pleasant light air.	16	N.E.	Clear, brisk air.
10	10	N.E.	Clear, keen brisk air.	30	N.E.	Clear, pleasant light air.	17	N.E.	Clear, brisk air.
11	10	N.W.	Clear, keen brisk air.	42	S.W.	Clear, warm, no wind.	26	S.	Clear, brisk air.
12	21	S.	Clear, cutting wind.	42	S.	Sq. of r. and sleet; mild.	36	S.	Cloudy, squally.
13	37	S.	Cldy, mild rain, brisk w.	46	S.E.	Warm showers, brisk w.	42	S.E.	Brisk w., warm, steady r.
14	40	S.W.	Mild showers, strong w.	39	S.W.	Warm showers, brisk w.	36	S.W.	Showery, brisk wind.
15	32	S.W.	Showery, cold, strong wind.	44	W.	Showery, mild, wind increasing.	40	W.	Squally; wind a gale; heavy squall, 4 P.M.
16	31	W.	Cloudy, keen, half gale.	34	W.	Cloudy, wind, half gale.	32	W.	Cloudy; half a gale.
17	22	N.W.	Clear, brisk wind.	36	N.W.	Clear, brisk air.	24	N.W.	Clear, brisk air.
18	21	W.	Clear, brisk wind.	36	W.	Clear, brisk air.	23	N.E.	Clear, brisk air.
19	20	N.E.	Cloudy, brisk wind.	45	N.E.	Clear, pleasant, still air.	39	W.	Cloudy, still air, app. of rain, sun set for wind.
20	39	S.E.	Cloudy, brisk wind.	55	S.	Clear, pleasant, clouds in w., brisk wind.	44	W.	Cloudy, squall of wind and rain at 4 P.M.
21	46	W.	Steady r., mild, brisk w.	56	W.	Steady r., warm brisk w.	36	W.	Clearing, brisk frosty air.
22	27	W.	Clear, brisk wind.	36	W.	Clear, pleasant, still air.	36	W.	Flying clouds, windy.
23	35	W.	Cloudy, no wind.	45	W.	Clear, pleasant, still air.	28	S.W.	Clear, windy.
24	22	S.W.	Cloudy, still air.	44	S.W.	Clear, pleasant, still air.	36	S.W.	Cloudy, sun set for wind and rain.
25	48	S.W.	Cloudy, mild air.	58	S.W.	Flying clouds, warm, app. of rain, windy.	46	S.W.	Clear, squall of w. and rain at 2 P.M.; windy.
26	38	S.W.	Cloudy, brisk air.	48	S.W.	Cloudy, mild, brisk air.	42	S.W.	Cloudy, still air; shwrs. about sunset.
27	36	S.W.	Cloudy, brisk wind.	50	S.W.	Flying clouds, warm, brisk air.	42	S.W.	Flying clouds, thunder showers; muggy.
28	36	S.W.	Gentle rain, brisk wind.	46	S.W.	Fly. clds., warm, brisk air.	42	S.W.	Clear, warm, windy.
29	31	S.W.	Cloudy, brisk wind.	46	S.W.	Flying clouds, warm, brisk air.	45	S.W.	Thunder, rain, and sq., 3 P.M. gale, 7 P.M. cldy.
30	50	S.W.	Warm rain, still air.	47	S.W.	Rain, stormy wind.	36	S.W.	Cloudy, ceased raining, half gale.
31	27	S.W.	Cldy., sty. w., quart. gale	27	W.	Cloudy, stormy wind.	24	W.	Cloudy, stormy wind.

FEBRUARY, 1835.

1	24°	N.W.	Snowing, piercing stormy wind.	30°	N.W.	Same as morning.	20°	N.W.	Cloudy, a gale; new moon glimmered.
2	12	N.W.	Clds. break., w. lulled.; p.	28	N.W.	Flying clds., brisk wind.	18	N.W.	Cloudy, brisk wind.
3	6	N.W.	Heavy atmos., cutting w.	16	N.W.	Fly. clds., snapping cold.	8	W.	Flying clouds, stormy w.
4	2	W.	Cloudy, piercing cold.	13	S.W.	Clear, snapping cold.	18	W.	Flying clouds, windy.
5	20	S.W.	Flying clouds, keen wind.	28	S.W.	Clear, still air; warm in sun.	20	S.W.	Clear, sun set stormy; windy.
6	18	S.W.	Snowing, stormy wind.	12	W.	Heavy misty air, stiff breeze.	4	W.	Boreas hurricanus furiosus, misty.
7	—6	N.W.	Misty, sleet falling.	0	N.W.	Misty; wind piercing.	2	N.W.	Misty, stiff gale.
8	2	N.W.	Clear, piercing wind.	18	W.	Clear, windy.	4	N.W.	Worse and worse.
9	—2	W.	Cloudy; too cold to express.	26	S.W.	Flying clds., stiff breeze.	12	N.W.	Warm weather coming, misty.
10	6	S.	Flying clouds, keen; not very unpleasant.	30	S.	Clear, still air; delightfully warm.	20	S.	Misty; halo round the moon; windy.
11	18	S.	Misty, stiff breeze.	30	S.	Clear, mild breeze; thawing in sun.	20	S.	Clear, mild breeze; misty in south.
12	20	W.	Misty, keen wind.	36	S.W.	Light clds., warm, thaw.	28	S.W.	Misty, keen wind.
13	28	S.	Snowing fast, brisk air.	38	S.	Snow. and thaw., still air.	33	S.	Snowing, air still, frosty.
14	22	S.W.	Heavy atmosph., brisk air.	30	W.	Same as morning.	20	S.W.	Snowing, keen air; good sleighing.
15	27	N.	Snowing, 6 in. dp.; windy	27	N.	Same as morning.	27	N.	Same as morning.
16	32	N.	Misty, sn. 10 in.; windy	36	N.W.	Misty, keen brisk wind.	28	N.	Misty, sharp stormy w.
17	26	W.	Clear, brisk wind.	34	W.	Clear; fine sleighing.	32	S.W.	Clear, sharp stormy w.
18	32	S.W.	Clear, air soft.	45	S.W.	Clear, thawing, air soft.	30	S.W.	Clear; sleigh-bells rattling; pleasant.
19	28	W.	Clear, keen, fine sleighing.	38	W.	Flying clouds, rather pleasant	14	N.W.	Clear; a thorough-bred nor'-wester.
20	20	W.	Misty, keen air.	32	S.W.	Clear, thaw. in the sun.	28	S.W.	Clear, keen air.
21	32	S.	Misty, showery, brisk air.	48	S.	Showery, light breeze.	46	S.	Showery, thawing fast, mild.
22	46	S.	Fly. clds., thaw. rapidly.	54	S.	Clear, pleasant; sn. gone.	34	S.	Clear, brisk wind.
23	32	N.	Flying clds., stiff breeze.	46	N.	Clear, biting wind.	33	N.W.	Flying clouds, piercing wind.
24	32	N.W.	Misty, stiff breeze.	50	S.W.	Clear, pleasant; qu. warm	36	S.W.	Clear, stiff breeze.
25	30	W.	Clear, brisk wind.	48	W.	Clear, pleasant; quite warm.	24	W.	Clear, blowing hard; more cold.
26	18	N.W.	Misty, brisk wind.	32	N.W.	Misty, biting wind.	14	W.	Clear, a gale: another pincher.
27	0	W.	Flying clouds, half gale.	14	W.	Clear, raw cold, windy.	9	W.	Clear; house-rocking, tree-splintering wind.
28	6	W.	Clear, brisk wind.	16	W.	Clear, raw cold, windy.	10	W.	Clear, stiff breeze.

ART. IX. *A Synoptical Table of some of the Mineral Substances, and of the Organic Remains, found in the Gravel at Stanway, Essex, and the neighbouring Localities within a Radius of Fifteen Miles.* By JOHN BROWN, Esq.

I SUBMIT a list of some of the minerals and organic remains which I have found in searching the gravel in this and the adjoining parishes, within a radius of about fifteen miles from my residence [Stanway, Essex]. Professor Sedgwick has observed to the members of the Geological Society, that "the study of diluvial gravel is not only one of great interest, but peculiar difficulty, and of nice discrimination." Still I submit this list with that confidence as to its accuracy which a love of truth and science dictates.

Much the largest proportion of mineral matters which composes our gravel consists of flints from the chalk, in a broken state. The specimens of the primary and trap rocks, with all the conglomerates or breccias, except No. 6. and its variety, are found in the form of boulders or pebbles mixed up in the mass. No. 6. and the variety of it are found in large irregular masses, are from 3 ft. to 6 ft. in length, occur near the surface, apparently *in situ*, and are of a different structure from the former breccias. This difference I have endeavoured to particularise in the list. The whole of this debris I have stated to be about 35 ft. in thickness upon an average, within the specified range, and it is highly coloured by the oxide of iron. I need scarcely repeat what I have stated in VII. 438., that the substratum is London clay. In the accompanying paper I have given the particulars.

Primary Rocks. — Granite: in boulders the size of the fist. Several varieties of granite. — 1. Gneiss: in boulders, one the size of the head. —2. Mica schist: in boulders, one the size of the head. — 3. Grauwacke: in boulders, one the size of the head. — 4. Quartz: in boulders, milk-white, and highly crystalline, from the size of the head to that of marbles; and identical with that variety which I have seen in large blocks, scattered over that flank of Snowdon which we descend into the Pass of Llanberris. — 5. Quartz: in granular and crystalline boulders, like that variety called Druid sandstone; scattered in blocks over the Wiltshire Downs, &c.

Trap or overlying Rocks. —1. Hornblende rock: boulders the size of the fist. — 2. Hornblende schist: boulders the size of the fist. — 3. Porphyry: a compact felspar base or matrix, with crystals of felspar and quartz. —4. Porphyry: with a clay base, with hollow irregular cavities left by the decomposed minerals. —5. Porphyry: a paste of compact felspar, red

colour; with light-coloured crystals of felspar, and fragments of crystalline quartz, in a boulder. — 6. Porphyry: a paste of felspar of a brown colour, with numerous embedded crystals of black hornblende and crystals of felspar. This is one of the old porphyries of Dr. Maculloch. — 7. Basalt: black, with cavities occupied with zeolite and other minerals peculiar to the trap rocks. — 8. Basalt: very similar to that kind called Rowley rag, from near Dudley; the outside of the boulders is the colour of iron rust. They are very hard to break; the inside is of coal-black colour. Very common. — 9. Basalt: hornblende and felspar, with minute crystals of hornblende or augite. This appears to be a part of a basaltic column: the meeting of the two plane surfaces shows an angle of 95°. — 10. Basalt: amorphose hornblende. — 11. Basalt: compact felspar, with minute crystals of hornblende or augite. — 12. Basalt: clinkstone. — 13. Basalt: compact felspar, with a fine laminated structure. — 14. Compact felspar of a coal-black colour, with numerous crystals of hornblende. Basalts Nos. 9, 10, and 14. all have iron in their composition, as the magnetic needle testifies: the needle is never active before No. 10. Compact felspar: in large and small boulders, with crystals of felspar embedded: the stones are in a state of decomposition; the paste of them is much like a decomposing basalt brought from Ireland, in the London Geological Society's collection. Felsparthic breccia?: in boulders apparently composed of the preexisting materials of granite subsequently recompounded: these consist of quartz and mica cemented into a felsparthic paste, different from the porphyries, the minerals having lost all crystalline form. Lydian stone: in boulders, reticulated by veins of milk-white quartz, some as fine as hairs; and these are pleasingly contrasted by the glossy black colour of the stone: very numerous.

Conglomerates or Breccias. — 1. A very hard crystalline paste of a beautiful deep blue colour; with angular fragments of white quartz, from the size of peas to that of walnuts, regularly disseminated throughout the mass. — 2. Small rounded black and brown flints, with a boulder of porphyry, united with finely triturated quartz in a highly crystalline siliceous cement. — 3. Angular fragments of the size of the former, of a crystalline and granular brown quartz; cemented firmly together by a black and hard crystalline paste, apparently hornblende or augite. — 4. Angular fragments of milk-white quartz, from the size of a pin's head to that of a pea, cemented by a red crystalline paste. — 5. Rounded fragments of white quartz, the size of peas, mixed with quartz sand, both rounded and angular; the whole firmly united into a reddish

highly crystalline and siliceous cement. — 6. A crystalline sandstone of fine texture, interspersed with small fragments of white quartz, rather less in size than those of No. 4.; both sand and fragments have been rounded by friction, previously to their being united into one mass by a siliceous cement. — 7. A black crystalline paste of hornblende, with rounded pebbles of quartz and angular fragments of felspar. — 8. Puddingstone: the usual association of sand and common gravel stones, united by a ferruginous or iron cement. This occurs in large irregular masses, and in such abundance, that, formerly, it was employed in building the walls of some of our village churches. — 9. A variety of the puddingstone. A beautiful variety of this stone is formed by a collection of the small round and nearly uniformly sized black flints and white quartz pebbles, firmly united by a cement formed by finely triturated flint, and cemented by silex. This variety is often cut and polished by the lapidary, and used for ornamental purposes.

The breccias Nos. 1, 2, 3, 4, and 5. appear to have been transported from a considerable distance; being in round smooth boulders, and in every way different from No. 6. and its variety; and so extremely hard, as to require a round-faced hammer of 3 lb. weight, and a strong arm, to break them. Hence it is but natural to conclude that they, when first broken from the parent rock, had rough and sharp asperities; which a rolling action, long continued, has reduced to their present shape and condition.

Chert. — In large and small boulders; in some of which are good specimens of E'ntrochi, or screw encrinite (figured in *Mag. Nat. Hist.*, iv. 376.), from the mountain or transition limestone.

Chlorite slate. — In laminated boulders, very much like the Westmoreland slate.

Green or Chlorite Sand. — Two boulders only of this stone met with: those very hard and compact, yet with all the mineral properties of the rock called Kentish rag.

Sandstone. — In numerous boulders of fine and coarse textures; some with mica, others without it: in some are found casts of bivalve shells.

Organic Remains of the Chalk in Flint and Chalcedony from the Gravel. — *Pólypi:* Ventriculites Bennéttiæ Mant., Geol. Suss., tab. 15. fig. 3.: chalcedony. Ventriculites; in shape like the former, but larger: flint. V. radiàtus *Geol. Suss.*, t. 14. V. radiàtus: radical process of, or stirps, *Mant.* Geol. Suss., t. 13. f. 2. and 3. cal. V. quadrangulàris, *Mant.*, t. 15. f. 6. [We may here observe, for the sake of the

novitiate reader on geology, that useful information on the anatomy of the Ventriculites is given in this Magazine (II. 332—341., III. 269, 270.]

Radiària. —Ananchites, figured in *Mag.Nat.Hist.*, iii. 278.: flint, numerous. Galerites Cónulus *Mag. Nat. Hist.* iii. 278. Spatángus cordiformis *Woodward's* Geol. of Norfolk, t. 5. f. 6.; *S.* plànus *Geol. Suss.*, t. 17. f. 9.; *S.* excéntricus *Woodward's* Geol. of Norf. t. 1. Cidaris corollàris *Geol. Suss.*, t. 17. f. 2. Echinital spines in flint. *Spóngia*: numerous specimens, similar to those figured in *Mag. Nat. Hist.*, iii. 268.

Conchíferæ. — Inocéramus Crípsi Geol. Suss., t. 27. f. 11.; I. undulàtus *Geol. Suss.*, t. 27. f. 6.; I., fragment of a large variety in flint, "with siliceous casts of cells formed by some parasitic animal." (t. 27. f. 7.) Inocéramus *Geol. Suss.*, t. 19. f. 20. Plagióstoma brightoniénsis *Geol. Suss.*, t. 25. f. 15.; P. áspera *Geol. Suss.*, t. 26. f. 18. *Pécten* nítida *Geol. Suss.*, t. 27. f. 9. Belemnìtes *Geol. Suss.*, t. 16. f. 1. Hamìtes baculöides *Geol. Suss.*, t. 7. f. 23.

The greater portion of mineral matter composing our gravel are flints, generally in a broken and shattered state; and the whole are embedded in a ferruginous and siliceous sand. In some pits there are partial beds of almost pure sand; and, in most of the pits in this parish, the bottom beds are composed entirely of that mineral: the whole thickness of sand and gravel averaging about 35 ft., as stated in p. 349.

Although the flints are generally in a broken state (as above noticed) in the gravel of this [Essex] and both the neighbouring counties of Suffolk and Norfolk, yet in one direction hence, namely, north-east, they are found to occur larger and larger as we approach the chalk formation. This is manifested in a striking manner within about three miles of Sudbury, where the chalk is found *in situ*. At this place there is a considerable hill, which consists of an accumulation of large whole flints embedded in sand, with a small portion of chalk rubbish. As this hill is quarried for the flints for building rough inferior walls, cottages, &c., a good opportunity is afforded for surveying its contents. These consist of flints of the largest size: many of them are like those in the chalk near Norwich, termed, by Professor Buckland, "Paramoudras." From these flints being so near their native bed (the chalk), they are as angular and as whole as those taken fresh from their native matrix, and present a striking contrast to the broken state of the flints found at a greater distance from the chalk. The construction of this hill is contrary to the laws of gravitation, as many of the largest flints occur near the top as well as at the bottom.

Knowing the contents of the gravel in this locality to be such as are shown in the foregoing list, previous to my excursion into the counties of Suffolk and Norfolk, last summer, I will add, as the result of that excursion, that, from what I could observe of the gravel pits around Ipswich, Norwich, Cromer, and other parts of those counties, I found the same miscellaneous collection of primary and trap specimens, with broken flints embedded in ferruginous sand. In all the localities, with the exception of the one above mentioned where there is such a collection of whole flints, the mineral contents of the gravel of the three counties seem so analogous, that there appears to be nothing to discountenance the idea of a contemporaneity of deposition of this gravel, whatever difference there may be in the ages of the different rocks composing it.

In conclusion, I beg to say I do not advance this as anything original: still I am not aware that anything has hitherto been written on the mineral properties of the Essex gravel.

In Suffolk and Norfolk, the geological position of the gravel is superior to the shelly beds of the "crag;" and, in Essex, to the London clay.

As rocks of the same chemical properties as many of the boulders and pebbles which are found in our gravel are abundant in countries to the north of the localities where this gravel is now found, northerly currents of water are, it has been said, the agents employed in transporting it to its present resting-place; but, as we have rocks in Devonshire and Cornwall, and in that direction, of the same mineral composition, currents of water from the south-west would bring together stones of a very similar nature, if not identical, with those which are now found.

Stanway, near Colchester, Essex, April 2. 1835.

ART. X. *A Notice of a new Locality of specified Fossil Bones of the Elephant and Deer, and of the Geological Conditions of this Locality.* By JOHN BROWN, Esq.

BEING at Ballingdon, in Essex, a few days ago, collecting some rock specimens, which some think interesting as to the geological history of our planet, and which are plentifully found in the transported materials composing Ballingdon Hill, and which hill is now being removed for the purpose of improving the London road, I had not been long employed in looking over this great accumulation of the debris of the various geological formations, before I was informed that some bones

had just been discovered in a gravel pit in the valley of the Stour close by. On going to the spot, I saw some of the bones lying in the bed of gravel, and others which had been very recently removed from it.

The bed of gravel whence the bones, &c., were taken is composed of flint gravel, with boulders of various other rocks embedded in a whitish drift sand; and is about 10 feet above the river Stour, 100 yards from it, and on its right bank as we descend the stream. The following is a section of the deposit, and faces the north: — Ferruginous gravel, with flints, &c.; 3 ft. Brown clay, with rounded fragments of chalk interspersed; 2 ft. Fossil bones, in sandy gravel; 7 ft. Coarse drift sand; depth unknown.

Fossil Bones of the Elephant. — A tooth of a full-grown elephant. A tooth, apparently, of a young elephant; the tooth being only 5 in. long on the face, by 2½ in. wide. A fragment of a tooth, the same width as the last; viz. 2½ in. Tusks of elephants: several having been found; but in such a forward state of decomposition, that they perished on the first attack of the atmosphere. A tibia of an elephant, 1 ft. 11 in. in length; truncate at both ends. Part of a femur, 7 in. in diameter. Several other large bones in fragments; the substance of several of these fragments 1 in. thick.

Fossil Bones of the Deer. — Horns of a large species; teeth of a large species; a scapular, and a phalangial bone; leg bones, 9 in. long, 2 in. in diameter.

All these bones are in the possession of the proprietor of the estate on which they were found; except the full-grown elephant's tooth, which has been presented to a friend in the neighbourhood: and it is but justice to the proprietor to add, that he most readily meets the wishes of every enquirer after these interesting relics; and affords every information and facility to strangers visiting his grounds for the purpose of surveying the natural beauties of this interesting glen. I am not aware of any fossil bones of the elephant having been found previously in this part of Essex.

Stanway, near Colchester, Essex, April 11. 1835.

[In the bed of blue clay near Western Road, Brighton, workmen employed by Mr. Lambert in digging a well found, in Jan. 1835, at 20 ft. or 30 ft. deep, a cylindrical fragment, 1 ft. long; which was, under Mr. Lambert's direction, preserved, and presented to Dr. Mantell, who pronounced it to be a portion of the tusk of a young elephant. Bones and teeth of elephants have occasionally been found in the same bed of blue clay at Hove brick-works. (*Bury and Suffolk Herald*, Jan. 28. 1835.)

ART. XI. *A short Account of an interesting Deposit of Fossil Shells at Burlington Quay.* By Mr. WILLIAM BEAN.

BEING on a geological excursion ten days ago [from March 30.], in the neighbourhood of Burlington Quay, Mr. Walter Wilson, an intelligent lapidary of that place, directed my attention to a deposit of fragile and broken shells which the late high tides had exposed on the north side of the harbour, and near the pleasure-ground called the Esplanade. Ere I visited the place, I expected to find one of the lacustrine deposits so very common on this coast. On arriving at the spot, a heterogeneous mass, only a few yards long, and as many high, presented itself, composed of sand, clay, marine shells, and pebbles of every description; chalk and flint were, as might be expected, the most abundant. I hastily procured a few specimens of shells, and was delighted to find my anticipations in this instance had not been realised.

The colour and appearance of this shelly bed resemble the London clay, but the fossils have the character of those found in the crag formation: [the shelly bed contains] a greater number of species than have been at present obtained, and much caution will be requisite ere its geological position can be truly determined. Thus much, however, is certain, that these shells are coeval with, if not of higher antiquity than, the crag. Mr. Phillips, in his excellent *Illustrations of the Geology of Yorkshire*, mentions a somewhat similar deposit near Hedon: but all the shells he has recorded are at present inhabitants of our seas; whereas more than half of those I have procured cannot be referred to any existing species. I intend shortly to publish a more detailed account, with a list of all the species, and figures and descriptions of those that are undescribed.

Shells of the following genera have occurred: Dentàlium, *Bá*lanus, Phòlas, *My*a, Córbula; Saxícava, a large rugged shell; Psammòbia, *Te*llina; Astárte, four species; Cýprina, Cytherèa, Venericárdia, *Cá*rdium; Nùcula, two species, one large and beautiful; *My*tilus; *Pé*cten, two species; *O*strea?; Nática, two species; Scalària; Túrbo, a fine pearly shell; Littorìna, Turritélla; *Fù*sus, four species.

I have again visited this place in company with Dr. Murray; we reaped a rich and abundant harvest, and I was rejoiced to find the opinion I had previously formed immediately assented to by so able and experienced a geologist.

Scarborough, March 30. 1835.

ART. XII. *Observations on the Strata near Woolwich.* By JOHN MORRIS, Esq.

THE pit near the entrance of the town, which has so long afforded the best section of the plastic sand formation of the London basin, is so well known, that it would appear almost useless to describe it again, had not some recent excavations unfolded to us a few more facts concerning its organic contents and physical structure.

The following beds are displayed, in an ascending order, about the middle of the pit: — Chalk, with flints, green sand of the Reading oyster bed with flints; 1 ft. Ash-coloured sand, 35 ft. Greenish sand, with flint pebbles; 8 ft. Iron-shot coarse sand, without shells or pebbles; 9 ft. Blue and brown clay, containing *O*strea, Ceríthia, Cytherèa, *B*úccinum, &c.; 6 ft. Brown and red clay, containing Ceríthia, Pótamis, Cyrèna, Melanópsis, &c.; 6 ft. Small black flints and sand, containing rolled fragments of Ceríthium, Cyrèna, Melanópsis, Neritìna, &c.; 10 ft. Layers of large flints, with various fossils of the chalk and green sand; 2 ft. The fossil shells of this deposit are chiefly to the blue and brown clays; the marine shells, as *O*strea, Ceríthia, *B*úccinum, &c., predominating in the lower part; and, though these occur again in the brown clay above, they are mingled with evident fluviatile shells, as Neritìna, Pótamis, Melanópsis, Cyrèna *, &c. Upon these clays rests an accumulation of sand and pebbles, containing shells of the species found below; but in a very different state, being much worn and broken. Above this, again, is a layer of larger flint pebbles, amongst which are found various fossils of the green sand and chalk, as Ammonìtes, *O*strea, Terebrátulæ, &c.

As a connecting circumstance with this part of my subject, I may mention that, at Bromley, in a similar stratum above the pebbles and sand, there frequently occur fragments of oysters, as well as perfectly rounded pieces of white chalk.

If we now examine another section of the pit, which the recent excavations have disclosed, a very different appearance is presented, remarkable for the absence of that regular stratification observed in the other portion; beginning from the west side, where there is an abrupt termination to the regular

* These shells have generally been confounded with Cyclas, which are stated to be found in this deposit: they, however, differ from them in having the lateral teeth striated, which Cyclas has not, and are also much stronger. Four species of Cyrèna occur at Woolwich; Cyrèna obovàta, tellinöides, depérdita, and cuneifórmis: the latter is particularly characterised by having the lateral teeth striated obliquely to the umbones.

beds, as well as a deep fissure in the ash-coloured sand filled with pebbles, &c. The whole mass consists of layers of sand and pebbles, containing irregular traces of the ironshot and greenish sands, and patches of the blue and brown clays, having a considerable inclination to the east and north.

Upon a general view, this pit affords two interesting facts: first, a period of quiet deposition; secondly, of more violent action.

During the first, the causes then in action must have been favourable to the quiet deposition of the ash-coloured, greenish, and ochreous sands; to the accumulation of the blue and brown clays; to the developement and existence of marine animal life, as the *O*strea, Cerithia, &c. To account for the gradual mingling with these marine remains, the fluviatile Testàcea, we must infer, from the living habits of the recent genera *, that they also inhabited tidal rivers and estuaries.

To the second period belong the pebbles and sand containing the fragments of shells, as well as the irregular beds at the north side of the pit: in this case, the various horizontal strata seem to have been torn up by violent action, as well as mixed with other detritus, and spread over the various surfaces in the neighbourhood. The inclination of this gravelly debris towards the north may be observed in other places, as in the lanes leading to Plumstead Common, Bexley Heath, Erith, &c.

Kensington, Jan. 14. 1835.

[We thank the author for the expressive sketches which he has sent us in illustration. The description supersedes these, we think.]

REVIEWS.

ART. I. *Titles of Works on Subjects of Natural History, published recently.*

MUDIE, Robert, Author of "The British Naturalist," "Guide to the Observation of Nature, &c.:" Natural History of Birds. London, 1834. 4*s.* 6*d.*

Mr. Mudie, well known to every ornithologist as the author of the *Feathered Tribes*†, has produced a clear, compendious,

* Cyrèna, rivers of China; Pótamis, rivers of Africa, estuaries; Melanópsis, Danube, Levant.

† The *Feathered Tribes of the British Islands*, by Mudie, 2 vols. 8vo, 1*l.* 8*s.*, and the *British Ornithology*, by Selby, 2 vols. 8vo, 1*l.* 1*s.*, are perfectly indispensable to every admirer and student of the birds of Britain:

and highly interesting little volume on birds, the title of which is given above. It contains upwards of 400 pages, replete with interest and instruction, is beautifully got up, plentifully besprinkled with spirited woodcuts, and is prefaced with a specimen of "printing in oil colours." This is, we think, the worst thing in the volume. It represents a golden eagle (*A*quila aúrea *Willughby*) clutching her prey, and assuming a threatening attitude towards a vulture (*V*últur) soaring above. We far prefer the vignettes to *The Feathered Tribes*, representing a pair of dippers (*C*inclus) and nest, and a pair of river grebes (Pódiceps fluviátilis) and nest, which, especially the latter, give a very pleasing air to the beginning of the work, and seem to welcome one, as it were, at the very threshold. The preface to this little volume prepossesses one in favour of whatever the author may have to say; and the introduction, which we earnestly recommend to the attentive perusal of our readers, discusses points of great moment. In the body of the work are detailed, in a fascinating manner, the structure, classification, and external parts of birds, with reference to their habits. As is the case with all the previous works of Mr. Mudie, this volume is perfectly original, not only in the manner of expressing the ideas, but also in the ideas themselves: and, in fine, we feel disposed to agree with the author, when he says, of the volume, that "it is the cheapest work that ever issued from the press."—*S. D. W. Burton on Trent, April*, 1835.

[*The Representation of the Nest and Eggs of the Water Ouzel* (*Dipper*) *in Mudie's* Feathered Tribes, *referred to in our* VII. 543.]—I need only, perhaps, observe that the nest is completely out of character, representing an open structure with the eggs exposed to view, and placed upon the ground; all of which are at total variance with the description given in the body of the work.—*J. D. Salmon. Thetford, Norfolk, Dec.* 8. 1834. It is also at variance with the description given, from observation, by our correspondent, in VII. 542.

Russell, Rev. *Michael*, LL.D.: History and Present Condition of the Barbary States: comprehending a View of their Civil Institutions, Antiquities, Arts, Religion, Literature, Commerce, Agriculture, and Natural Productions. With a Map, and Eleven Engravings by Jackson. Vol. xvii. of the Edinburgh Cabinet Library. Small 8vo, 453 pages. 1835. *5s.*

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the one as containing a full account, delightfully narrated, of our feathered guests; the other for a masterly system of classification, and concise yet clear notices of the habits, nidification, characteristics, &c., of the birds treated of.—*S. D. W.*

A superficial sketch of certain objects of natural history in the region treated of, occupies 30 pages at the end of the book.

Clark, G. T., Editor: The West of England Journal of Science and Literature. To be continued quarterly. No. I. January, 1835. Bristol. 8vo, 124 pages and some woodcuts. 2*s.* 6*d.*

The first Number is high in character, and of the treatises contained, these are of valid interest to naturalists:—Essay introductory to Geology, by the Rev. W. B. Conybeare; 19 pages. "An Introduction to Zoology, in illustration of the Zoological department of the Museum of the Bristol Institution," by the editor and others; 25 pages. This is an outline of the modes of structures found in the different orders of animals; the subject is to be pursued. "On the formation and growth of coral reefs and islands, by S. Stutchbury, being a paper read before the Philosophical and Literary Society of Bristol;" 12 pages.

Jenyns, Rev. *L.*, M.A. F.L.S.: A Systematic Catalogue of British Vertebrate Animals. 1835. 8vo. Longman and Co., London.

"Whilst it offers a condensed view of the present extent of our [vertebrate fauna], it will enable collectors to mark off more readily such species as they possess or desire to obtain. It is, however, principally intended to serve as a companion to [*A Manual of British Vertebrate Animals*, by the same author,] in which will be given detailed descriptions of all the species here enumerated." Of the *Manual* it is announced that it is "in the press," and that upwards of 600 species will be noticed in it, of which, "it is believed that at least 60 are not embodied in any other work treating of the British Vertebràta:" besides 70 of domesticated, naturalised, and extirpated species.

Bryce, James, Jun. M.A., F.G.S., &c.: A Manual of Zoology, being a Tabular Arrangement of the [Genera of the] Animal Kingdom. For the Use of the Students of Natural History in the Belfast Academy. 1834. Small 8vo, 36 pages, and interleaved for additions.

Vigors's system of birds has been adopted; Cuvier's system in all the other departments: "the new genera of Mammàlia and birds, established by the English zoologists since the [publishing of the 1829, Paris, edition of Cuvier's *Règne Animal*] are inserted at their proper places: they have been chiefly collected from papers by Messrs. Vigors, Horsfield, Gray, Bennett, Yarrell, Ogilby." "In teaching conchology

in the Academy, the system of Lamarck is followed. A tabular view of it was printed in [the author's *Tables of Simple Minerals, Rocks, and Shells*] . . . and has not, therefore, been inserted into the present work."

Burnett, Gilbert, F.L.S., Professor of Botany in King's College, London: Outlines of Botany; including a General History of the Vegetable Kingdom, in two vols. 8vo, 1190 pages. Price 1*l.* 14*s.* illustrated with several hundred engravings on wood by Branston and Wright.

Much interesting matter has been gathered into these volumes, appertaining to the numerous species of plants treated of in them: for the sake of this matter in itself, as connexible with the individual objects to which it relates, we should value this work: the author's system we have not weighed.

Art. II. *Literary Notices.*

Outlines of Comparative Anatomy, by Robert E. Grant, M. D. &c. Part I., containing Osteology, Ligaments, and Muscles, illustrated with 65 woodcuts, 1835. Baillière, London. A notice of the preparation of this is given in our VII. 656. It is noticed as published, and is highly commended, in *The Entomological Magazine for April*, No. XI., whose own contents are of high interest: Newman, on the transformations of insects; Haliday, on parasitic Hymenóptera; Walker, on British Tephritites and Chalcidites; and a long list of rarer insects found on Hampstead Heath, by W. E. Shuckard, are the richest of these.

A Manual of Entomology, from the German of Dr. Hermann Burmeister, by W. E. Shuckard, M.E.S., with original notes and additional plates. In 18 Nos., 1*s.* each. No. I. has been published, and is accompanied with 2 plates, illustrating the eggs, larvæ, and pupæ of insects. (*Ent. Mag.*, April.)

A Guide to an Arrangement of British Birds; being a Catalogue of all the Species hitherto discovered in Great Britain and Ireland, and intended to be used for labelling cabinets, or collections of the same; by the Rev. F. O. Morris, B.A. Worcester College, Oxford, — in April was stated to be "nearly ready."

A work on *The Fossil Fruits and Seeds of the London Clay*, by J. S. Bowerbank; with numerous plates by J. D. C. Sowerby, is in preparation for publication.

THE MAGAZINE

OF

NATURAL HISTORY.

JULY, 1835.

ORIGINAL COMMUNICATIONS.

ART. I. *Notes on the Habits of the Wigeon.* By CHARLES WATERTON, Esq.

FROM the month of May to that of October, we know nothing of the haunts and economy of this cheerful and familiar stranger; for he always takes his leave of us in spring; at which time he is supposed to proceed to distant regions of the north, where ornithologists have never yet dared to venture.

I am satisfied in my own mind, that the wigeon does not stay here to breed. All my endeavours to find its nest have hitherto been ineffectual; nor can I recollect to have met with one well authenticated account of the wigeon's eggs having ever been found in England. [VI. 384.]

Formerly, I used to consider the wigeon as one of those migratory birds of which little could ever be known, as it merely came here to spend the winter months amongst us, in order to avoid the dismal tempests which were raging in its own native land. Under this erroneous impression, I always availed myself of every opportunity to get a shot at the wigeons. Of course, this made them exceedingly shy and wary; for persecution soon shows to birds the danger of placing themselves within the reach of man. Hence their visits here were few and transitory; and sometimes weeks elapsed without my seeing a single wigeon on the water.

Since I have shut the temple of Janus, and proclaimed undisturbed repose to those of the feathered race which come to seek for shelter here, the wigeons are in great abundance; and, from the time of their arrival to the period of their departure, they may be found here every day, whether in a frosty, a snowy, or an open season. A stranger, on observing

them, would hardly suppose that they are wild fowl; for he will often see nearly one hundred of them congregrating with the tame ducks, not sixty yards from the kitchen windows. Protection has restored to them their innate familiarity; and now I am enabled to say something on certain parts of their economy, which our ornithological writers seem never to have noticed.

The wigeon is a much more familiar bird than either the pochard or the teal. While these congregate on the water, beyond the reach of man, the wigeon appears to have divested itself of the timidity observable in all other species of wild fowl, and approaches very near to our habitations. A considerable time elapsed before I was enabled to account satisfactorily for the wigeon's remaining here during the night; a circumstance directly at variance with the habits of its congeners, which, to a bird, pass the night away from the place where they have been staying during the day. But, upon paying a much closer attention to it than I had formerly been accustomed to do, I observed that it differed from them all, both in the nature of its food, and in the time of procuring it. The mallard, the pochard, and the teal obtain nearly the whole of their nourishment during the night. On the contrary, the wigeon procures its food in the day time, and that food is grass. He who has an opportunity of watching the wigeon when it is undisturbed, and allowed to follow the bent of its own inclinations, will find that, while the mallard, the pochard, and the teal are sporting on the water, or reposing on the bank at their ease, it is devouring with avidity that same kind of short grass, on which the goose is known to feed. Hence, though many flocks of wigeons accompany the other water fowl in their nocturnal wanderings, still numbers of them pass the whole of the night here; and this I know to be a fact, by their singular whistling noise, which is heard at all hours.

On Jan. 26. 1832, for the first time, I satisfied myself beyond all doubt of what I had long suspected, namely, that wigeons feed upon grass, exactly after the manner of geese. A flock of them was then feeding opposite the windows. I took the large telescope, and distinctly saw them feeding voraciously on the green short blades of grass. Whilst I am writing this (Jan. 12. 1835) the ground is covered with snow, except under some large elm trees; and at the root of these there are, just now, above one hundred wigeons and thirty coots, all feeding on the grass which is not concealed by the snow.

In other places, where persecution is the wigeon's lot, no

doubt it will be very shy in frequenting pastures during the day; and, of course, it will be compelled, contrary to its natural habits, to seek for food throughout the night, in company with its congeners.

As the ordinary food of the wigeons is evidently grass, perhaps there may not be a sufficient supply of it in those high northern regions, whither the water fowl are supposed to repair when they leave us in spring. Should this conjecture prove well founded, we can account for the wigeon remaining with us till the beginning of May, at which period all the migratory water birds (saving a few teal, which are known to breed in England) must be busily employed, far away from us, in the essential work of incubation.

Though we are quite ignorant of the manner and place in which the wigeon makes its nest, and of the number and colour of its eggs, still we are in possession of a clew to lead us to the fact, that it hatches its young long after its congeners the mallards have hatched theirs. The mallards return here, in full plumage, early in the month of October; but the wigeons are observed to be in their mottled plumage as late as the end of November. Again, as the old male wigeon returns to these latitudes in mottled plumage, we may safely infer that he undergoes the same process of a double moulting as the mallard; on which, perhaps, a paper hereafter.

I offer to ornithologists, these few observations and speculations on the economy of the wigeon, to be approved of, or reproved, or improved, just as they may think fit. Every disquisition, be it ever so short, will help a little to put the science of ornithology upon a somewhat better footing than that on which it stands at present. From reviews, which I have lately read with more than ordinary attention; and from representations of birds, which I have lately examined very closely, I pronounce ornithology to be at least half a century behind the other sciences. I say nothing of the stuffing of birds for cabinets of natural history. Were I to touch upon the mode now in general use, I should prove it to be a total failure, devoid of every scientific principle; a mode that can never, by any chance, restore the true form and features of birds.

But to return to the wigeon. I will just add, in conclusion, that I penned down the remarks on its habits, after many very close and often repeated inspections of the bird, during its winter residence amongst us. I fear, however, that we must be contented to remain in absolute ignorance of many important parts of its history, until some bold and hardy na-

turalist shall penetrate into those distant regions of the north, where this pretty bird, in company with myriads of other wild fowl, is supposed to pass the summer months in undisturbed security. — *Walton Hall, Yorkshire, April* 22. 1835.

ART. II. *A Notice of a very remarkable Individual of the Common Shrike (Lànius Collùrio* Lin.), *with some Observations on this Species of Shrike.* By EDWARD BLYTH.

THE variable chilly spring of the present year (1835) has been remarkable for the late appearance of most of our summer migrants: here and there, in the more frequented localities, the voice of a solitary individual was heard about the usual time; but the great mass of most of the species did not arrive until at least ten days or a fortnight after the usual period of their first becoming plentiful.

Of the Common, or Red-backed, Shrike (*Lànius Collùrio*) several individuals did appear about the usual time (the second week in May); but, in this neighbourhood, the species is by no means so abundant this season as it was last summer. In general, it is rather a common bird in this part of Surrey; so much so, that a dozen or more specimens might often be obtained in the course of one morning's excursion.

The first individual that came under my inspection this season was a very remarkable bird: it was a female, partly in the male plumage; but the ovaries were perfect, and contained eggs; and it was in company with a partner of the other sex at the time it was shot. [Mr. Hoy has made known, in IV. 344., a stronger case than this: the female was "in the full garb of the adult male;" yet contained "eggs much enlarged, and one nearly ready for exclusion.] We find, therefore, that *barrenness* is *not* [as Mr. Hoy has remarked in IV. 344.], as we have hitherto had reason to suppose, the *sole* cause of the assumption of the male plumage by a female bird. I have reason to believe that this was a young individual; that is to say, a bird of the preceding year. The crown of its head and nape are ash-coloured, as in the male; throat and upper part of the breast, like the male, pale blush, deeper as we descend; ear-coverts much darker than in the female, but not black; back and wings like an ordinary female; rump feathers more inclining to ash-colour than in a common female; tail feathers intermediate, not so dark as in the male, but having the basal part of the four outer ones on one side, and two outer ones on the other, marked with white, though not so far down

the feather as in the male bird (an ordinary female has no white upon the tail); there are a few traces of the female transverse markings on the sides of the neck; which increase in number as we descend, till the lower part of the breast and the belly are the same as in an ordinary female. There are also, in this bird, some very faint indications upon the back and scapularies (chiefly the latter) of the barred markings which characterise the young of the year, at the time they leave this country; but, as I have never found any sign of these in any other specimen which was shot in spring, I will not hence too hastily conclude, only from this singular individual, that the adult livery is gradually acquired by a change of colour in the feathers themselves. The bright colours of the mature cock bird are too unlike those of the *second* plumage of the young (which I have described in p. 338.) to render it at all likely that the change took place otherwise than by a general moult: the fact may, however, be conclusively ascertained by keeping them in confinement through the winter.

I rather regret that I did not preserve the ovary of this very remarkable individual; but I exhibited it to several persons. The eggs were small, and very little advanced; but they were much too distinct to be mistaken. I have preserved, however, the skin of the bird, and have it now in my possession.

It has been said of this species of shrike, that the female bird is always larger than the male; but this does not accord with my observation: I have certainly noticed both sexes to vary in size rather more than is the case with birds in general, but I can say decidedly that there is no fixed difference between them in this respect.

In this part of Surrey, a few of the red-backed shrikes frequent furze brakes and the margins of woods; but the great majority of them are found chiefly about tall and thick maple or hawthorn hedges; where they may be commonly seen, perched like chats, upon the topmost twig; or, like fly-catchers, upon the bare branch of some tree growing out of the hedge, or sitting upon a post or paling, always in a conspicuous situation, where their vision can extend over a considerable range, and whence they often dart after the larger passing insects, or upon any small quadruped or bird which lucklessly comes within the sphere of their downward leaping flight; or they slowly hover along the hedges, often remaining a long time fixed over a particular spot; moving their wings rather quickly, but making no progress forward; then, perhaps, advancing two or three yards, and again remaining

fixed in the air: and at length, when they do alight, generally hovering for some time around the branch upon which they are about to settle.* On these occasions, the whitethroats and other little birds quietly penetrate, as the shrike approaches, into the thickest part of the hedge; but the larger coleopterous insects appear to be what it is principally in search of: and whilst the May chaffer (*Melolóntha vulgàris*) lasts, this seems to constitute almost its sole food; as it also does that [VII. 268.] of many other birds which, at other seasons, subsist very differently.

The whole of the *Córvidæ* [the rook, and relatives of it,] feed, during the month of May, chiefly upon these insects: the kestrel and the brown owl devour great numbers; the sparrow feeds its young almost exclusively upon them; and a cuckoo, that was examined here the other day, had its stomach quite full of them. The manner in which the shrike eats them is curious, and has never (that I am aware of) been noticed by any writer. Having captured one with its bill, it flies with it to a perch, takes it in one foot, which it holds up to the mouth like a parrot, and picks off a piece with its beak; still holding up the foot with the remainder, till it is all finished. When its appetite is nearly sated, it becomes more dainty, eats only the abdomen, and impales the still-living body upon a thorn. I have frequently seen living beetles and humble bees thus transfixed upon the thorns of a sloe or hawthorn, and have invariably found them to be deprived of the abdomen.

This habit of the shrikes, of impaling their superfluity of food, I am of opinion, is precisely analogous to the hoarding instinct displayed by the *Córvidæ*, the true titmice, and the nuthatches, that they may thus sometimes furnish a resource against future need; or it may be that Providence has thus intended them to regulate more effectually the numbers of those creatures upon which they were appointed to feed. I do not believe that any of the feathered race ever hoard up a long supply of food, as is the case with bees and many rodent Mammàlia, to provide instinctively against the winter season; because this would be altogether superfluous in creatures which are endowed with such wonderful locomotive power, and which, in general, are so very omnivorous as birds are: they merely conceal what they cannot immediately eat, or place it where they will remember to return and look

* Mr. Hoy observes (IV. 341.), "I have occasionally seen the ash-coloured shrike suddenly stop in its flight, and balance itself on the wing, in the manner of the kestrel, probably looking out for mice, of which it is very fond."

for it; in case, when they next become hungry, they should not be successful in finding a sufficiency of food. Amongst other species, I have observed that the tawny wood owl (*Ulula strídula*) will scratch up the ground with its claws, and bury the remainder of a meal; and I have also known it to return to the spot when hungry, and avail itself of its instinctive foresight. White of Selborne also notices this fact, in his eleventh letter. Speaking of the brown owl, he says: "when full, like a dog, it hides what it cannot eat."

The red-backed shrike, in confinement, when it has fully satisfied the cravings of its appetite, always fixes whatever it cannot eat between the wires, upon the wooden crossbars of its cage; but never (as is the common opinion) fastens up its prey for the purpose of tearing it to pieces. Small food, such as insects or pieces of meat, if more than it can conveniently take in a single mouthful, it usually holds in the manner aforesaid [p. 366.], with one foot, like a parrot; a bird or a mouse it carries in its bill to a perch, holds it firm to the perch with one foot, and tears off mouthfuls with its beak; swallowing, like a regular bird of prey, a good deal of fur or feathers, which are afterwards ejected in pellets by the mouth.

This latter is common to many more birds than is generally supposed: I have ascertained that the cuckoo thus casts up the skins of caterpillars, in pellets about the size of a robin's egg; the evejar thus ejects the elytra of beetles and the wings of moths; and the nightingale, the robin, and the redstart also cast up the indigestible parts of the insects upon which they have been feeding. [See VII. 514.]

This species of shrike never (like the Lànius excùbitor) attacks a bird upon the wing *; but pounces down upon those which happen to be on the ground, or upon a branch beneath it; in the latter case, bearing down its prey to the ground. There is immediately, of course, a great deal of squeaking and struggling, and feathers are made to fly in all directions; but the shrike very soon expands its wings, and spreads its tail over its victim, in exactly the manner of a falcon; and despatches it (not, in the cases which I have observed, by strangulation, but) by biting and compressing the head, and picking a hole in the skull. It then seizes it with its bill, and flies off with it to the horizontal bough of a tree, where the greater part of it is finished at a single meal. I have known it, in this manner, to attack whitethroats; and have been told

* "When pursuing its prey," says Bechstein, "the shrike" (L. excùbitor) "makes a particular movement, in order to seize it on the side; but it does not always succeed, as it cannot use its claws like birds of prey, and often only carries off a beakful of feathers."

of an instance of its thus seizing an adult cock chaffinch, which, on the sudden approach of my informant, it relinquished before it had much injured. I have also known several cases of its being taken in the nets of birdcatchers, whilst endeavouring to seize upon their brace-birds, the nets having been spread under a tall hedge.

Most of the smaller birds, from the missel thrush downward, exhibit a marked hostility towards the common shrike, more particularly at the time of its first appearance in the spring; and they seem to be instinctively aware that it only attacks them from above, as, except when it is hovering along, they do not appear to be much alarmed at its presence, but keep up a continual chattering noise around; the missel thrush even boldly attacking it, and driving it away from near its nest. After a time, however, its more immediate neighbours appear to get a little accustomed to its presence, and forbear to notice it. Indeed, it is not, perhaps, very often, except when after a long continuance of rain the various larger insects have become scarce, that this species of shrike attacks the smaller vertebrate animals: its principal and main food consisting usually of the larger coleopterous and hymenopterous insects, and, towards the autumn, grasshoppers. They devour vast numbers of wasps; and early in the season, when the large female wasps are prowling about, I have taken as many as four or five of these from the stomach of a single bird. In confinement, they are very fond of the common house fly; and will soon clear a room of these, if they are turned loose into it. They seem, however, even at a very early age, to be very partial to warm-blooded prey; and they will attack most eagerly, and kill, a bird as large as themselves, almost immediately upon quitting the nest, and long before they have cast their first plumage.

Still, however, in a state of nature, it is not very often that an opportunity occurs of seeing this species of shrike attack a living bird; and, consequently, some observers have even doubted whether it ever does so, having always found insect food in its stomach, and never having noticed it to display any hostile feeling towards the smaller birds around. I have myself found the nest of this species, and that of the whitethroat, in adjoining bushes. But nothing could be deduced from this; for Sir W. Jardine found a wild duck sitting within ten paces of the eyry of a peregrine falcon; and Mr. Waterton furnishes us with an instance of a pair of wood pigeons selecting for nidification the very tree on which a couple of magpies had already built their nest. The truth is, most predatory animals in a state of nature do not usually seek their food in the immediate vicinity of their abode. In

places where magpies are abundant, a pair generally locate themselves close to every farmyard; but these, if unmolested, are never known to attack its inmates. If a duckling or a chick be missing, and the depredator (as is often the case) be a magpie, that sinner is sure to be one from a distant nest: the pair close at hand are always quite innocent of the charge; and this is a fact very well known to many farmers. But, only take the eggs, or the young of the pair that have thus confided themselves to your protection, and your own fowls will be sure to suffer for it. When the magpies are deprived of their progeny, they will no longer range far and wide for their food, but will prey close at home till they recommence the labour of nidification.

All this, perhaps, may appear very strange to those who have little practical knowledge of ornithology; but it is nevertheless a decided fact; and, as none of the instincts or ways of animals are ever without a purpose, the reason of this appears to be (though, of course, I do not give the birds credit for knowing it), that the prey, which is always at hand, is thus preserved against a time of scarcity, or is still always obtainable, should sickness or any accident disable the preyer from seeking its subsistence elsewhere.

I have generally found the red-backed shrike to nidificate in large bushes of maple or hawthorn, sometimes in a sloe bush: the nest varies considerably in neatness of construction, but is always easily enough distinguishable from that of any other British bird. A very fine one, now before me, is externally composed of the dry stems of plants, compactly worked together with a little moss and some soft feathers, and is very beautifully lined with small fibrous roots, and a few soft downy feathers. They usually lay five or six eggs, of about the size of those of the skylark; but these vary in appearance very considerably, both in size and colour, in markings and in shape. Those of the same nest are generally pretty much alike; but I never saw specimens from different nests which much resembled each other. Some of them are very oblong, others are as round as a hawk's; some are of a clear, others of a brownish, greenish, or reddish white; most have a zone of spots at the large end, a few have it at the smaller, some round the middle, and others have no zone at all; sometimes they are much speckled, sometimes very little, sometimes the spots are large, amounting to blotches, sometimes small; most have the spots of two different colours, ash-coloured and rufous, whilst some have them only of the latter hue. I have, also, some eggs of this species which it would be impossible to distinguish from those of the robin.

The young are hatched after about a fortnight's incubation,

and are brought up by their parents upon insect food. They accompany the old birds for some time after they leave the nest, and are then extremely clamorous and noisy, so much so, that they may in consequence be often traced for two or three hundred yards; and the sound of them is remarkably deceiving, appearing close at hand, though the birds may be at a considerable distance: it may generally, however, be traced to the nearest tall hedge, especially if a few small trees grow out of it; and there the young shrikes may be seen, together with their parents, perched on the most conspicuous places, and ever and anon darting, like flycatchers, after the numerous winged grasshoppers which at that season are always very abundant, and which they capture with a loud snap of the bill. In about a fortnight or three weeks they separate, just as they begin to cast their nestling feathers, and about the close of the month of August, or a little after, the whole of them, both old and young, leave the country; at least, I have never heard of one being shot late in September. The young are at this time in a very different dress from that in which they reappear in spring; and I *suspect* they undergo another moult during their absence.

Bechstein says, "This bird does not rank low among the singers; its song is not only very pleasing, but continual. While singing, it is generally perched on a lonely bush, or on the lower branches of a tree, but always near its nest. Its warbling is composed of the songs of the swallow, goldfinch, fauvette, nightingale, redbreast, and lark, with which, indeed, it mixes here and there some of its own harsh notes. It almost exclusively imitates the birds in its immediate neighbourhood; and very rarely repeats the song or call of those which merely fly past it: when it does, it seems only in mockery. There are, however, some songs which it cannot imitate: for instance, those of the chaffinch and yellow-hammer, its throat not seeming to be sufficiently flexible for these. In the house, its song is composed of the warbling of those birds whose cages are hung near it." I have not, myself, ever noticed this species to utter anything at all worthy of the name of song, having merely heard from it a few harsh chattering notes, which I could not well express in writing, intermingled sometimes with a sort of *conk*, and a chirp something like that of the sparrow. When its nest is approached, it expresses its anxiety by continually repeating a note resembling *chack*, somewhat similar to, but louder than, that which the blackcap utters in a similar case. Bechstein, however, relates also of the Lànius excùbitor, the L. mìnor, and the L. rùtilus, that all of these imitate the notes of other birds, and with

wonderful facility; but his observations seem to have been chiefly made upon caged individuals.

He also says, of the common species, "If a room is to be cleared of flies, one of these birds set at liberty in it will soon effect it: it catches them flying with great skill and agility. When a thorny branch is given it, it impales all its flies, making at the same time the drollest and most singular movements. This species easily and quickly learns to whistle airs, but it forgets them with the same facility, in order to learn new ones." If, therefore, in a wild state, the various shrikes do really thus imitate the notes of other birds, for what purpose in the economy of nature can this faculty have been bestowed upon them? Observation alone can decide.

Mr. Selby also says of the large species (L. excùbitor), that "its voice is capable of variation, and it possesses a power of imitating the notes of many of the smaller Passeres; in which respect it shows an approach to the mocking thrushes," (*Orpheus*) "of the family Merulidæ." The same gentleman observes of the L. *Collùrio*, that "the notes of this species are varied, and its song is pleasing."

The common shrike is universally known to the peasantry of Kent and Surrey and some of the adjoining counties by the homely appellation of "Jack Baker."

Tooting, Surrey, June 3. 1835.

[In p. 413. of the present Number is some additional information on the red-backed shrike. "Observations on the British species of shrikes, their habits, nidification, &c.; by J. D. Hoy, Esq.;" are in IV. 341—344., VII. 53. A mention of the occurrence of a pair of the Lànius excùbitor in Tynemouth, Northumberland, and a few facts on them, are in V. 569. "There was a great quantity of the elytra of beetles scattered on the ground near the place which they seemed chiefly to haunt." In Oct. 1833, two or three of L. excùbitor were repeatedly seen in the immediate vicinity of Carlisle. One of them procured on Oct. 29., dissected, proved a male, "and had all the appearance of being an old bird, notwithstanding the breast and under parts were marked with numerous fine dusky curved lines, which are stated by almost all writers to be peculiar to the female. The stomach of this specimen was completely distended with coleopterous insects: amongst others, we were able to recognise with certainty specimens of Helobia brevicollis, Agonum parumpunctatum, Pœcilus cupreus, &c. &c." (*Phil. Mag. and Annals of Phil.*, third series, vol. iv. p. 337.)]

We here repeat, from I. 276., an engraving on wood (*fig.* 34.) of Geoffroy's shrike, there given for comparison with the engraving on copper in Griffith's *Animal Kingdom*, from which the engraving on wood is copied, in proof of an assertion adduced with it, that an engraving on wood is sufficient to express the characters of such a bird, without the cost of the engraving of it on copper. As parties please in this matter. We repeat the engraving on wood here (*fig.* 34.), to the end of placing Geoffroy's shrike near to anecdotes on some of its kindred; and we quote from Griffith's *Animal Kingdom* this account of Geoffroy's shrike itself. "Lastly [this is at the end of a long list of species of shrikes], some have the bill straight [the hook at the end is meant to be excepted] and slender, and are remarkable for a crest of recurved feathers. — The genus Prionops of Vieillot. — Geoffroy's shrike, *Lath. H.* 22. Lanius plumatus *Shaw.* Vail. O. A., t. 80, 81. Prionops Geoffroyii Vieillot, Gal. 142. — Blue-black, middle of the back, tips of quills, and beneath white; back of head and orbits dusky; two outer, and tips of other tail-feathers, white; 7 in. long?" (*Griff. A. K.*, vi. 286.) As Vaillant's work is quoted, we suppose Geoffroy's shrike to inhabit Africa.]


34

ART. III. *Particulars on a caged Pair of Siskins', or Aberdevines', building Nests and rearing a pair of young Siskins in Confinement; and a Statement of the Fact that the Siskin, wild, has bred about Dundee.* By WILLIAM GARDINER, Jun., Esq.

DURING the present season [1834], a friend of mine in this town [Dundee], Mr. James Butchart, has succeeded in breeding that interesting little songster, the siskin or aberdevine (Fringilla *Spinus Linn.*, *Carduelis Spinus Cuv.*); and I feel much pleasure in communicating the following particulars, which may, perhaps, be welcome to ornithological readers.

About the 18th or 19th of June, 1834, a pair of siskins, which my friend kept in a common breeding-cage commenced

building their nest of moss and cotton, with which materials he supplied them. But they evinced a decided preference for the cotton; for, on a considerable quantity of this substance being introduced into the cage, when their pretty structure was nearly finished, they tore it down, and immediately began to rebuild it with their favourite material. When completed, it was an elegant, warm, and cozy little habitation, similar in construction to that of the chaffinch, but of smaller dimensions. In it the female deposited an egg, which my friend abstracted, with the intention of treating in the same manner as those of the canary; but the siskins did not seem to understand this kind of treatment, and viewed it in the light of an improper interference in their domestic concerns; for they instantly demolished that beautiful fabric which they had formed with so much care and neatness, and in the afternoon of the same day they were again at work upon a new dwelling, which they finished early next morning. The female then laid a second egg, and a third on the following day. During the period of incubation, which lasted fourteen days, she never once left the nest, so that no opportunity occurred of returning the egg that had been previously abstracted. At the end of the period mentioned, two young birds were hatched, both males; and never did infant progeny meet with more assiduous attention and affectionate regard. It was, indeed, truly delightful to observe how admirably these little songsters fulfilled their parental duties; the female constantly watching over her callow charge with unwearied patience and unceasing fondness, and the male participating in her sympathies, cherishing her with his tenderest love, and abundantly supplying her and his tiny offspring with food, so that she needed not to disturb herself nor be absent from the nest for a moment. Their food consisted of hemp-seed, a little loaf-bread, and bruised yolk of egg, with an occasional lettuce, of which they appeared very fond.

The young birds were fully fledged in fifteen days after they had left the egg, and in a week more totally abandoned the nest. In the beginning of September they were in full song, and their notes were excellent imitations of the rich and spirited melody of the canary, with which species they were caged. They are at present in good thriving condition, and my friend looks forward with the pleasing anticipation of rearing two broods of siskins next season, and of communicating his success to Mr. Loudon and his readers.

For a number of years past the siskin has been a regular winter visitant of ours, and occasionally a pair or two linger with us during the breeding season, and produce their young.

Near the end of May, in the present year, a nestful of young ones was found in Camperdown Woods, situated close to the trunk at the insertion of a branch of a spruce fir, about six feet from the ground. It was composed of materials similar to those used by the chaffinch, and contained three birds, covered with a black down. The old ones were also taken.

These birds generally arrive here about the latter end of September, or beginning of October, in large flocks, and may be seen during the winter hovering about the ragworts and nettles that shoot up here and there among the snow; and when the vernal breezes begin to scatter around the fragrant essences of flowers, and the forests to put forth their green garniture of leaves, they take their departure for their own sweet homes in the north. — *Dundee, Sept.* 27. 1834.

ART. IV. *Notices of the Affinities, Habits, and certain Localities of the Dipper* (*Cinclus aquáticus*). By the Rev. FRANCIS ORPEN MORRIS, B.A.

I HAVE lately had several opportunities of observing the habits of the dipper (*C*inclus aquáticus), and a few observations on that bird, I hope, will not be unacceptable to some of your readers.

The dipper has, lately, been most properly removed from the place it formerly held among the ouzels, to which genus of birds it bears not the slightest affinity, either in general appearance, formation, or habits. In its general habits and modes of life, it has, in my opinion, a much nearer relation to the kingfishers; and, though I would be far from placing it in the next genus to those birds (although at present it seems to have no *relative* place of its own), yet, I imagine its place to be much nearer to them than is generally supposed. Its wings, which are very short, and totally unlike those of the ouzels, have a very strong resemblance to those of the *Alcé*dines; its flight, in consequence, as I suppose, of the formation of its wings, which naturally are adapted to its habits, is, therefore, straight forward, strong, and exceedingly like that of the kingfisher, though perhaps not so rapid, for which bird, were it not for the difference of colour, it might easily be mistaken in its flight. Its tail also is stiff, and much shorter than that of the ouzels, as are its thighs, which are placed very fa back. Since forming the above opinion, I have been informars,

ders.

* By Walter Gisborne, Esq., brother to Thomas Gisborne, f siskins, for North Derbyshire.

ommenced

that in Scotland, in the shires of Inverness and Sutherland, and probably, therefore, elsewhere, the dippers are commonly known by the name of *kingfishers*, and so much per head is given for the destruction of them, as they are there supposed to destroy the salmon spawn [but unjustly supposed, a correspondent has opined, see VII. 541.].

Their habit of walking underneath the water is too well known and authenticated, to need any additional confirmation from me. I have seen them dart sidewise a few yards from their station in the middle of the brook, and dash into and under the water in pursuit of their prey. They will remain for a long time quietly fixed on their rock, attentively watching the brook, or often engaged in preening their feathers, or oiling* them? They generally choose a rock which slants gradually into the water, a few inches from the surface of which they take their post. They are usually found in rocky or mountain streams, their presence at which may be easily augured ("perfacile est signis"); and if the sportsman is, as he may be, thereby directed to their haunts, the old adage, "turdus *malum* sibi cacat," would be fulfilled, allowing them for the moment to retain their old position among the ouzels, and taking one of the other significations of the word "malum." They appear to choose, in general, a rather low stone or rock in the middle of the brook, though they are, of course, often seen in other situations. Where they are found, they are, I think, tolerably common, and on some of the mountain streams of Scotland abound very much. I have seen them in tolerable numbers on the Axe, the border stream between Somersetshire and Devonshire; and also on the Goit, the border stream between Derbyshire and Cheshire; also in some parts of Yorkshire they are not rare.

The note of the dipper, as far as I am acquainted with it, is harsh, unmusical, and monotonous; and it is heard, more usually, on its first taking flight from its rock, when disturbed by the approach of any intruder,

> "Arcens sede suâ quot accessere profani,
> Quotque movent intra fana vetusta pedem."

Its name of dipper is commonly supposed, I believe, to have been assigned to it from its ambulo-diving properties;

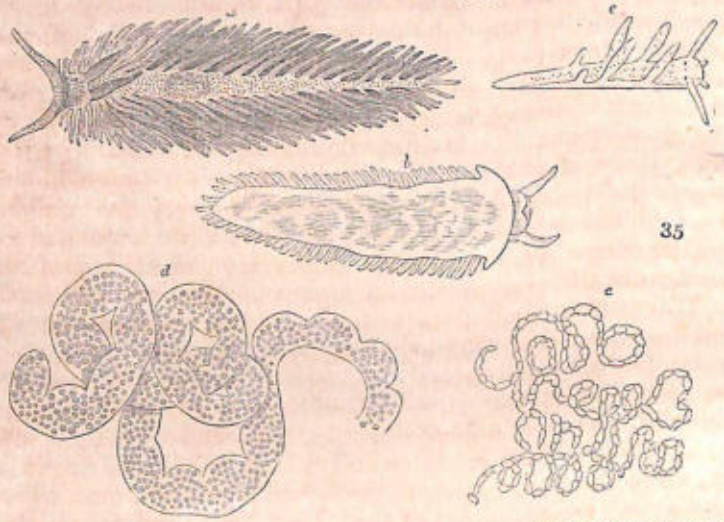
* Mr. Waterton will not, I believe, allow that birds ever oil their feathers; but I would wish to ask of him how he accounts for the fact that, his saith, the feathers of a thrush or robin, if they have only fallen into the water for a few minutes, become totally spoiled, as far as the purposes of winter vis concerned, those of the dipper may remain half an hour or with us dui water without receiving any damage?

but it may, I think, with equal propriety (if it, indeed, be not hence already derived), attach to it from a very odd way it has of jerking its body up and down with a *dipping* motion, on its first alighting on a stone.—*Lendal, York, Nov.* 10. 1834.

[*On the Dipper*, information has been contributed, besides in the instance above, in II. 301. 400., V. 734., VII. 183. 540—543., VIII. 358.]

ART. V. *Illustrations in British Zoology.* By GEORGE JOHNSTON, M.D., Fellow of the Royal College of Surgeons of Edinburgh.

38. EOLI'DIA PAPILLO'SA. (*fig.* 35.)



Eolídia papillòsa, natural size: *a*, upper side; *b*, under side; *c*, a portion of the spawn, of the natural size; *d*, the same magnified. *e*, Eolidia despécta.

Synonymes.—"Dòris Bast., Opus., subs. i. 81. tab. 10. fig. 1.," copied into Encyclop. Méthod., pl. 82. fig. 12. *Limax* papillòsus *Lin.*, Syst., 1082. Dòris papillòsa *Montagu*, in Lin. Trans., xi. 16. pl. 4. fig. 3. D. vermígera *Turt.*, Brit. Faun., 133. Tritònia papillòsa *Fleming*, in Edin. Encyclop., xiv. 619. Eólida papillòsa *Flem.*, Brit. Anim., 285.

Description.—Body, when fully extended, between 2 in. and 3 in. in length, and more than half an inch in breadth; limaciform, slightly narrowed at the tail; of a freckled purplish-brown colour, with grey or cream-coloured shadings, the brown disposed in some places in darker patches. Middle of the back naked; the smooth space dividing the branchial

processes, which are very numerous, and arranged in close indistinct rows along the sides, sloping backwards: they are slightly compressed, lengthened, but unequal, those next the foot being the shortest. When examined narrowly, they are seen to be mottled by the configuration of their interior structure; and, when compressed between plates of glass, it will be found that there is always a transparent circular spot at the apex. Head depressed; the mouth terminal, subinferior, encircled with a dilatable lip; and furnished with a very short proboscis, which contains a pair of rather large, thin, oval corneous jaws, twisted into a tooth-like process at the apex *; and between them lies a thick fleshy tongue, compressed laterally, and armed on its outer and upper edge with a series of transverse narrow corneous laminæ, finely pectinated on the free margin; a structure very different from that of the Tritònia or Dòris. Tentacula four, conical, nearly equal, very contractile; the inferior originating at the sides of the mouth; the superior placed on the back, and annularly wrinkled: from the bases of the inferior a dark line runs backwards to the superior, and forms a triangular mark above the mouth; but this is often absent. In the centre of the back there is a tumid spot, indicating the position of the heart, the pulsations of which are often very perceptible. Foot white, clear, with a thin rather broad undulating margin, prolonged at the anterior angles into an acute process. Orifices of the excrementitious organs anterior and lateral.

This curious snail crawls slowly, feeling its way with the inferior tentacula. The superior cannot be used for this purpose; but they are in constant motion during the animal's progress, and appear to be of essential service: they are often shortened, so as to appear like mere tubercles; but there are no sheaths for their recession and protection. If the finger is placed in the plate, about an inch before the creature, when active and creeping, it will stop, turn back, and agitate the tentacula, and then pass on to a side. The fæces are discharged in pellets, like those of mice; and, when the animal is dying, a small quantity of an orange fluid sometimes escapes from one of the lateral apertures. It is not common in Berwick Bay; but, in spring, a few specimens may generally be found lurking under stones between tide-marks. They seem to have left the deeper water to shed their spawn; which is laid on the under side of stones, in white gelatinous masses; each mass being formed of a chain-like, or beaded, thread, convoluted in every direction, and firmly attached by a colourless

* In shape, they may be compared to the shell of a Sigarètus.

jelly. If unravelled, the chain would measure many inches; but the separate links are only about one tenth or one eighth of an inch long, and contain, each of them, numerous ova. (*fig.* 35.) These are roundish or oval, with a rough irregular outline; two, or at most three, contained within their own little pellicle of jelly, which again lies immersed in the common mass.

Eolídia papillòsa is the largest species of its genus. According to Dr. Fleming, it is common on our shores, among sea-weeds, near low water; but it appears, nevertheless, to have been seldom seen or described. It was first ascertained to be a native by the Rev. Mr. Cordiner, a Scotch clergyman, whom Pennant engaged to travel among the Western Isles of Scotland, to delineate their romantic and rugged scenery. Dr. Turton next noticed it "on the Mumble Rocks," and introduced it into his compendium of our fauna, under the name of Dòris vermígera; and it will be found among Professor Jameson's list of the *V*érmes of the Firth of Forth. (*Wern. Mem.*, i. 556.) Montagu detected it on the shores of Devon; and has described it, with his usual accuracy, in the 11th volume of the *Linnæan Transactions*, adopting the name which Müller had applied to this snail, under the conviction that it was identical with the *L*ìmax papillòsus of Linnæus. That synonyme has been erroneously referred by Lamarck to his E`olis Cuvièr*ii*; which is quite distinct from the one before us, and has not been observed on the British coast.

39. Eoli'dia despe'cta. (*fig.* 35. *e.*)

E. despe'cta. — Corpore minimo, lacteo, limaciformi; papillis dorsi utrinque tribus, clavatis; tentaculis quatuor.

Hab. — Berwick Bay, between tide-marks; rare.

Desc. — Body 2 lines long, limaciform, watery-white, truncate anteriorly; tentacula four, simple, cylindrical, the superior or dorsal long, the inferior much shorter; eyes two, distinct, placed behind the bases of the superior tentacula; back with three pairs of clavate branchiæ, the two first pairs large, and nearly equal, the posterior minute; foot linear-oblong, tapered behind.

40. Eoli'dia Embletòni. (*fig.* 36.)

E. Embletòni. — Corpore limaciformi, lacteo; papillis branchialibus numerosis, utrinque tri-seriatis, coccineis apice albis; tentaculis quatuor.

Hab. — Berwick Bay, between tide-marks; rare.

Desc. — Body half an inch long, limaciform, truncate in front, gradually tapered to a point behind; of a pellucid



a, Eolídia Embletòni, of the natural size; *b*, the same magnified; *c*, a view of the ventral surface; *d*, a few of the branchiæ, magnified.

white colour, with scarlet branchiæ tipped with white. Mouth terminal, subinferior, wide. Tentacula four, nearly equal, conical, rather long, white: the anterior marginal, the dorsal annulated. Eyes minute, black, one at the base of each dorsal tentaculum; and before these organs there is a dusky spot, produced by the opacity of the oral apparatus, which consists of a pair of large corneous jaws, and a filiform spinous tongue. Branchiæ numerous, elliptic-oblong, round, arranged in three series along each side; but the rows are indistinctly marked, and divided at intervals into four companies or patches; the first separated by a distinct interval from the second, the others almost coalescing: they are of a fine scarlet colour, with white apices, which appear to be perforate, and from which a minute conical point can be extruded. Foot smooth; enlarged and rounded in front, where the corners are produced into acute angular points.

The transparency of the body permits us to observe that the branchiæ arise from a large vessel, or, perhaps, a membrane, which runs in a wavy manner down each side, and is somewhat branched. Each branchial filament consists of a red central part, and a soft mucous skin which envelopes it. The eye, when magnified, shows a transparent centre, like a pupil, encircled with an opake black ring.

I have dedicated this delicate and beautiful creature, the pride of its family, to my friend Mr. Robert Embleton, president of the Berwickshire Naturalists' Club. It is active; and, if disturbed when in motion, it contracts itself together only for a moment, and then again resumes its walk; or, turning on its back, it glides along the surface of the water in a reversed position. The structure of the branchiæ seems to ally it to the genus Tergipes [VII. 490.]. I have seen it *adhere* to foreign bodies by means of these organs, the apices of which seem to act as suckers. They are evidently cupped or perforated; but the animal seems to have the power of pushing out this depression, until the point assumes the appearance of a small conical papilla.

Berwick upon Tweed.

[Dr. Johnston has described, in V. 428, 429., another species, which he has there named E'olis rufibranchiàlis. He has there remarked that the generic name is variously written E'olis, Eólida, and Eolídia. A figure of E'olis rufibranchiàlis *Johnston* is presented in V. 428.: we present it also here (*fig.* 37.), that the semblance of this species may be seen in company with the semblances of the three species described above: it "exhibits the animal considerably magnified."]

37



Art. VI. *Short Communications.*

Birds. — *Habits of the Cuckoo.* (283—301. 325—340.) — Although I am not able to elucidate much of the history of the cuckoo, I can add another species of bird to the list [in p. 288. and in p. 328.], of those species in whose nests the cuckoo has been known to deposit its egg. During last summer, near Harrow, as I was passing by a shallow dry ditch on the edge of a close plantation, I observed a willow wren (Sýlvia *Trochilus Selby*) fly out of a little patch of low herbage on the other side of the bank. On looking closer into this, I discovered the nest, which was rather large and loose, composed chiefly of withered leaves: it contained two small eggs, white, dotted with brownish red, principally at the thicker end, and *one* much larger, though small for that of the cuckoo, being almost exactly the size and form of some of the eggs of the pied wagtail which I possess, and very near the colour of the latter, but the spots somewhat larger and redder. As I was wanting specimens of the egg, and doubting whether I should again be able to find the nest, I did not leave it for further observation. Cuckoos were plentiful in the neighbourhood, and several particularly resorted to the plantation near which I found the above nest. I may also state, as relating to the subject, that the only birds I have ever seen in that part of the country pursuing the cuckoo are the swallows and swifts; I should, therefore, favour the idea of their taking the cuckoos for hawks (p. 289.), as, in the instances at least, I should imagine it could have nothing to do with the cuckoos having laid eggs in their nests. — *W. G. Pelerin. May* 14. 1835.

[*The Young of the Cuckoo are severally committed to the Hatching and Rearing of Foster-Parents, from the Inability of the Parent Pair of Cuckoos to Support their own Young collectively.*] —You have stated, in p. 294., that I have "alluded, in V. 675., to the cuckoo's destroying the eggs of the pied wagtail, as a matter known to" me. You will find, on reference to my communication in V. 674, 675., that it does not warrant such a conclusion; nor has my experience led me to believe in the prevalent notion of the cuckoo sucking the eggs of other birds, although it is very probable she might have abstracted an egg of the pied wagtail to make room for hers, as instanced by my friend Mr. Hoy. (V. 278.) The pied wagtail often lays *six* eggs. [The remark on which I based my inference is this: — "I was led to suspect that she [the cuckoo] had destroyed their [a pair of pied wagtails'] eggs." This suspicion of this case, in this instance, I had deemed indicative of an experience of this case in previous instances. — *J. D.*]

I cannot think the cuckoo ever makes use of the eggs of other birds as an article of food, it being entirely insectivorous; and I suspect that it is owing to this circumstance, that it is obliged to abandon the care of its offspring to foster-parents; for it would be utterly impossible for a pair of cuckoos to collect anything like the quantity of food sufficient for a family of four or five of its own young, when the quantity of food that is required to promote the rapid and unparalleled growth of a single individual is so enormous, as to require the greatest exertions of its foster-parents to furnish a sufficiency. — *John D. Salmon. Thetford, Norfolk, May* 18. 1835.

[It is pleasant to set oneself right with one's friends. I had drawn on Mr. Salmon for a larger amount than he wills to sanction; although those equivocal things, words, did seem to warrant the amount of my draft. Mr. Blyth has cited, in p. 327, 328., and note *, a remark of mine: it will be safe to note, timely, that my remark is scarcely my opinion; the remark arose out of consideration of the facts cited, and not out of a course of experience favouring the opinion suggested in the remark. — *J. D.*]

Materials of the Food of the Adult Cuckoo. (298, 299. 339, 340.) — "A cuckoo, that was examined here the other day, had its stomach quite full of individuals of the May chaffer (*Melolóntha vulgàris*)." — *E. Blyth*, in p. 366. of the present Number. "The cuckoo casts up the skins of caterpillars in pellets about the size of a robin's egg." — *Id.* in p. 367.

In p. 413. of the present Number, in the remarks on the red-backed shrike, is various information on the cuckoo.

[*The Pied Wagtail is the Foster-Parent of the Cuckoo, per-*

haps more frequently than is any other Species of Bird. (288. 327.)—Being at the Fryers, Winchilsea, Sussex, on June 3., the gardener told me he had often seen young cuckoos sitting on the fences, fed by [pied or] water wagtails. He mentioned three years (two successive, and the third at the interval of a year, within the last five) in which he had, and others had, seen this. His words were,—"I have often thought it strange that such a great beast should be fed by such a little one."—*W. B. Clarke. Stanley Green, near Poole, Dorsetshire, June* 18. 1835.

Facts and Remarks on the Habits of the Cuckoo.—I had, a few summers ago, the full means of ascertaining the fact that both sexes of the cuckoo not only utter the call "cuckoo," but also repeat the note described by Mr. Blyth, as "full and melodious." (VIII. 329.)

The individual cuckoo whose unusually late departure (on July 28. 1829) I have noticed in III. 154., IV. 466. [Mr. Sheppard has heard the note of the old cuckoo as late as the last day of July; see in VIII. 413.] regularly stationed herself every morning, for several weeks, about 5 o'clock (or probably earlier, as that was the time at which I usually visited my garden), in the top of an elm, on the opposite side of a field adjoining my garden, which tree grew on the bank of the Ouse; and on this tree the cuckoo would remain an hour, or sometimes considerably more, uttering, at intervals, the call "cuckoo," ten or twelve times in succession; and then she would pause for a short time, and repeat the call again. She generally uttered the other note on taking her departure from the tree, and, as far as I can recollect, always on the wing; but then, I generally observed, she was pursued by two, three, and sometimes more small birds. She generally took her station in the same tree every evening, and again repeated her call as in the morning.* She was sometimes answered by a male bird from a distant tree, and sometimes by two; and these were the only three birds of this species in the vicinity of the town. I have sometimes seen both the male birds pursue the female, appa-

* Whether this particular choice of situation was in consequence of a beautiful echo, formed by the bridge of five arches which crosses the Ouse and the buildings on the margins of the river, I must leave to further observation. This echo repeated any given sound twice distinctly. I think the cuckoo is fond of hearing her own voice repeated; for I observed a similar fact, some years ago, of a cuckoo (whether male or female I will not pretend to say), which daily, during my stay of a fortnight in Derbyshire, regularly took its station in a low tree or tall shrub at the entrance of a deep jungle which produced a distinct echo, and which repeated the sound only once. This had a beautiful effect on a fine, still, moonlight evening. [VI. 200., the note.]

rently as rival lovers; and I have had more than one proof that her pursuers were both males; a fact which proves the bird polygamous; and I think (although it may be difficult to ascertain, where they are numerous) that it may be justly inferred, that the females live in a "state of general concubinage."

That these were the only three birds in the neighbourhood, at the period alluded to, I have every reason to believe, as I could readily, from daily observation, distinguish them by their respective tones, although they greatly resembled each other: the voice of the male bird was rather more shrill and clear than that of the female; and one of the males, too, when on the wing, would very often repeat the first syllable of the call two, sometimes three, times, as if he was in great agitation. One of the males disappeared early in June (probably shot), and the other remained till the beginning of July, when he departed, and left the female alone. Although these two birds were the only pair of the same species, they did not live, as a pair of doves live, in matrimonial harmony, but only visited as impulse prompted. I endeavoured to find out where the female deposited her eggs*; but I never could detect her visiting any nest, although I have frequently watched her gliding along the hedgerows, in situations where her favourite nests were likely to be met with. Yet I have every reason to believe she did lay eggs, as two young cuckoos were observed in the neighbourhood, early in July, one of which was caught by a gentleman, and caged; but he was not successful in rearing it.

From what I have observed of the habits of the cuckoo, I believe that both sexes do utter both notes above alluded to, and also that they oftentimes repeat the first syllable two or three times; that they are, also, attached to particular localities I have more than once witnessed; but whether from that particular situation producing them a greater abundance of food, or from hearing their notes repeated by an echo, I do not pretend to determine. That they also live in pairs, I have, too, witnessed, but not, as I have before observed, like doves, in matrimonial harmony. — *W. H. White. Old Kent Road, June*, 10. 1835.

[*The Cuckoo utters two Kinds of Notes.* (IV. 270. 415. note*;

* I was very anxious to obtain a cuckoo's egg, as I was then making a collection of birds' nests and eggs, with the branches in which they were built. I made a collection of upwards of forty specimens, which I presented to the museum on my removing from Bedford to London. I should be happy to hear of some gentleman making a good collection of nests, eggs, and birds in pairs: they, of themselves, form a very pretty museum.

VIII. 299, 300. 329, 330. 413.) *Does each Sex of the Cuckoo utter both of them?* — The evidence adduced by Mr. Blyth, in p. 329, 330., is almost positively equivalent to the answer, yes. Mr. White's evidence (p. 382.) is equivalent to the positive answer, yes. In a quotation by S. D. W. from a communication by Mr. Sheppard, published in the *Linnæan Society's Transactions*, presented in p. 413. of our present Number, Mr. Sheppard's opinion appears to have been, that it is the male cuckoo that utters the more usual cry of "cuckoo" (or "cu-coo," as S. D. W. would rather it should be written: see p. 256. note *), and that it is the female cuckoo that utters that less usual note, which Mr. Shepherd has stated "resembles that of the common gallinule;" which H. N. has described, in IV. 270., as "a curious chatter like [that of] the blackbird, but much louder and stronger;" which Mr. Main has described, in IV. 416., the foot note, as "a loud liquid, guttural, quickly shaken note, somewhere about A in alt;" which Mr. Blyth has designated, in VII. 348., as "the full melodious note, which the cuckoo often utters on the wing," as he has since taught, in VIII. 329., that he had implied the note we speak of by the words of his we have cited, and where he has additionally stated that "it may be expressed, as nearly as writing can do it, by the monosyllable *cûl* or *cuil*, repeated several times in quick and continuous succession."]

Plants. — [*Viola imbérbis* Leighton (277—279.): *Dr. Lindley's Opinion upon.* —The dried specimens of this form of *Viola*, which Mr. Leighton had committed (p. 278.) to us for distributing to botanists, we imparted to Dr. Lindley; Dr. Johnston, Berwick upon Tweed; Wm. Christy, jun., Esq., Clapham Road; and Mr. G. Francis, 55. Great Prescott Street. Dr. Lindley has since contributed the following remarks upon the affinities and characteristics of the kind]: — Mr. Leighton's *Viola* imbérbis is the *Viola* suàvis; first distinguished from *V.* odoràta by Marshall von Bieberstein, who found it common in the orchards of the Ukraine. It is described as having the petals white only towards their base; but my authentic specimens, from groves and bushy places near Odessa, are the same as Mr. Leighton's plant. Reichenbach admits *V.* suàvis into the flora of the southern provinces of the Austrian empire. I cannot doubt that the sweet-scented *V.* hírta of the French is the same thing; as *V.* epípsila of Ledebour undoubtedly is. What claims the plant may have to the rank of a species, it will be for experiment to determine. For my own part, I doubt greatly whether the pubescence of the petals ought to separate plants so extremely similar as this and *V.* odoràta; even

if it were certainly a permanent character, which I doubt: for my Altai specimens of *V.* hírta have their petals perfectly beardless; and *V.* collìna has them in a state so intermediate between bearded and beardless, that one can scarcely say whether they are the one or the other. *V.* suàvis, being an adopted name, will take precedence of Mr. Leighton's *V.* imbérbis; which has, moreover, been already applied to a different species. — *John Lindley* [*Professor of Botany in the London University. Received June* 4. 1835.]

V. suàvis *Bieb.* has been figured, and described detailedly, in Sweet's *British Flower-Garden*, second series, t. 126.; which t. 126. occurs in No. 32.; and No. 32. is dated Jan. 1. 1832. In G. Don's *General System of Gardening and Botany*, in vol. i., diagnostics of *V.* suàvis *Bieb.*; *V.* epípsila *Ledebour*, in Link's *Enumeratio;* and *V.* imbérbis *Ledebour*, in *Flora Altaica;* and of 167 other species of Viola, and of some varieties besides, are presented. On *V.* suàvis *Bieb.* some particulars are quoted in *Gard. Mag.*, viii. 16, 17., from Sweet's *British Flower-Garden*. Mr. Leighton may prefer to this reference to descriptions of *V.* suàvis *Bieb.* reference to living illustrations of it in a plant or plants of it, of exotic origin, alive in Britain. Should he, the following notices may avail him: — It is stated, in Sweet's *Brit. Flow.-Gard.*, in the account of *V.* suàvis *Bieb.*, that "our drawing of this interesting addition to our sweet violets was taken, at the Chelsea Botanic Garden, last spring. Its flowers are very fragrant, and produced in great profusion; and the plant is readily increased by parting the roots, or by seeds. We observed what we considered the same species in the nursery of Messrs. Allen and Rogers [Chelsea and Battersea]." *V.* suàvis *Bieb.* was living in the botanic garden at Bury St. Edmunds, in Nov. 1829; where it had been raised from seed, doubtless exotic, received from Mr. J. Hunneman, 9. Queen Street, Soho, London, in 1825. In relation to the degree of affinity which may obtain between *V.* suàvis *Bieb.* and *V.* odoràta *L.*, I may remark, from my recollection of the aspect of both as I have seen them living in the last-named garden, that they seemed sufficiently dissimilar to be specifically distinct. This summary of the points in which *V.* suàvis *Bieb.* differs from *V.* odoràta *L.* is given in the account of *V.* suàvis *Bieb.* in Sweet's *Brit. Flow.-Gard.* "Distinguished from *V.* odoràta by its paler green herbage, and by its larger and paler flowers, with the four upper petals longer and narrower, and the lowermost broader and more distinctly emarginate. The stipules are also narrower." The petals are there described to have "the upper part pale blue, the lower white."

V. suàvis *Bieb.* was first cultivated in Britain, in, according to G. Don's *Syst.*, 1820; according to Sweet's *Hort. Brit.*, the 1830 ed., in 1823: which date is the correct one?—*J. D.*

[*Remarks in relevance of the Question of the Indigenousness of certain Species of Plants reputed to be aboriginal in Britain.* (p. 84—90. 117, 118.)]—Can any of your botanical readers inform me whether they have ever met with the snowdrop (Galánthus nivàlis) in a "truly wild situation;" I mean, in situations and under circumstances which would convince Professor Henslow (see his judicious remarks, p. 84.) that the plant is a genuine native of Britain?

Nothing can be more common than the snowdrop in orchards, groves, and other appendages to houses; and, accordingly, it finds a place in almost all our English floras and local lists: yet I am disposed to think it is not originally a native; and ought to be referred to the professor's second head, viz. "to such as have *evidently* been introduced by the agency of man;" or, at any rate, to his third head, "such as may be *suspected* of having been so introduced." The circumstance recorded by the above botanist (p. 87.), of his having "once observed *Í*ris fœtidíssima and *P*olýgonum Bistórta" (these two species I should consider unquestionably natives) "growing together, in a small patch, in a copse where *H*elléborus fœtidus abounded, and a few plants of *R*òsa rubiginòsa," with "some straggling shrubs of *B*úxus sempervìrens," to tell (as he shrewdly imagines) the story of their origin, reminds me of what occurred to myself in regard to the snowdrop. In February, 1834, I discovered a profusion of this plant occupying a considerable space on a high sloping bank at Beausale, in the parish of Hatton, in this county [Warwickshire]. I do not know that the sight of this charming harbinger of spring ever before afforded me so much pleasure: for, now, I said to myself, I have met with the snowdrop perfectly wild and in a state of nature. The bank formed the outside boundary of an old enclosure adjoining to a piece of waste land untouched by the hand of man; no village was near the spot, and no house within a quarter of a mile or more. I may add, there were no "straggling shrubs of box" to tell tales; the snowdrops, too, it struck me, had more the appearance of spontaneous growth than any others I had elsewhere observed: they were, for the most part, growing, not in thick patches, as we commonly see them, but by twos and threes, and even by single roots, scattered about, as if by Nature's hand, among the rough herbage, from the top of the bank down even into the ditch; and occupying, as I have said, a considerable space in extent.

I, therefore, dug up some roots, to take home and plant in the garden as representatives of the true native snowdrop of Britain. But, alas!

——— " Ibi omnis
Effusus labor." *

On enquiry of a neighbouring farmer, I was informed that a house had formerly stood close to the favoured spot; and, no doubt, the snowdrops were but the surviving relics of cottage horticulture.

Among the plants usually recorded as British, which Professor Henslow would be disposed to reject, or to suspect, as not being truly native, the following, probably, ought to be enumerated: — *A*nemòne apennìna, Adònis autumnàlis, *S*cándix odoràta, *H*ésperis matronàlis, *S*enècio squálidus, *I*nula *H*elèn*ium*, *D*elphínium Consólida, *G*eràn*i*um pyrenàicum, *N*arcíssus poéticus, *L*eucòjum æstìvum, and *C*hrysánthemum ségetum. *S*cándix odoràta and *I*nula *H*elèn*ium* I never met with but in suspicious situations: the latter near houses or deserted gardens, and the former in the vicinity of some monastic ruin. The monks were, probably, among the greatest horticulturists of their day. *S*enècio squálidus having escaped from the physic garden at Oxford, runs wild about all the walls of the city and the colleges. In like manner, from my garden, it has established itself on the banks and walls of this village, and even on the roofs of some of my neighbours' houses. Two summers ago, I found many specimens of *I*bèris umbellàta in a barley field near the village: and sometimes I have seen *D*elphínium Consólida, and even Campánula Spéculum, in similar situations; the last unquestionably an exotic, and the other evidently not wild in this neighbourhood. *C*hrysánthemum ségetum, though now a troublesome weed, is a plant which bears somewhat of a foreign aspect, and may very likely have been originally introduced among seed of corn from abroad. Perhaps even *C*entaurèa *C*yànus and Agrostémma *G*ithàgo may not be excluded from Professor Henslow's class of doubtful natives. All plants, indeed, that grow among corn, and in such situations only, are to be regarded with a suspicious eye.

Certainly, our native flora needs purgation; and it is hoped that Professor Henslow's remarks will call the attention of botanists to the subject: at the same time, it should be borne in mind that many undoubted natives have become extremely scarce, or entirely extinct, in consequence of enclosures,

* " There all my labour vanished into air."
VIRGIL, *Trapp's Trans.*

draining, and other agricultural improvements [V. 197—200.] — *W. T. Bree. Allesley Rectory, March* 6. 1835.

The Snowdrop wild in Dorsetshire. — Our correspondent John Reynolds Rowe, Esq., of Wimborne, Dorsetshire, has, in a contribution to the Magazine lying by us, dated Jan. 24. 1834, this notice of a Dorsetshire habitat of the snowdrop. He has noted the phases exhibited by certain species of plants at Woodstock, about six miles to the north-west of Wimborne, and on the skirts of a wood in a chalky district, on Jan. 3. 1834: in the short list of those seen flowering there then, are "a few specimens of Galánthus nivàlis, though near a garden, apparently wild. On enquiring of the cottagers respecting these last, I was told that, on a hedge-bank two fields off, they grew in abundance. I considered myself amply repaid for a dirty and slippery walk, by finding the place pointed out to me thickly studded with those beautiful and elegant flowers. From the disposition of the ground immediately around, I think there must formerly have been a cottage there, though no remains of it are now discoverable; nor could I ascertain that such was the case from those living near. — [*J. R. Rowe.*]

[*Íris fœtidíssima.* (p. 386.)] — "Near these [the first-observed few specimens of Galánthus nivàlis] were numerous plants of the *Í*ris fœtidíssima, with their green sword-shaped leaves and open capsules; some empty, but the greater number loaded with their rich orange-coloured seeds." — [*J. R. Rowe.*]

[In the *Gard. Mag.* for July, 1835, are published some notes, by the Conductor, on gardens and country seats visited by him. It is noted, in p. 332. of the No., that "*Í*ris fœtidíssima is abundant by the road side" from Wimborne to Blandford, both in Dorsetshire.]

Geránium pyrenàicum is deemed by Mr. Bree (p. 387.) not aboriginally British. Mr. William Scott, foreman in the Cambridge Botanic Garden, once, in 1830, showed me plants regarded as of this species, apparently truly wild, in a habitat two or three miles or so about south-east of Cambridge.

Camelìna sativa. — In 1833, and, perhaps, the end of 1832, the turf was pared off parts of Kensington Gardens, that a better turf, or better state of turf, might be induced over these parts. That pared off was reduced to soil, some of it by burning, and some of it by packing it into heaps, and mixing with it mud out of that part of the Serpentine River which is in the gardens. The soil obtained was spread down over the bald places, on which were sown seeds for the production of fresh turf. In the crop present to sight in 1834, plants of the white-flowered clover (*T*rifòlium rèpens) were the more numerous: here and there was a plant of Camelìna sa*t*iva, in

all very few so far as I saw, but still striking as being here at all. Had not these plants of this species arisen from seeds of it mixed with the seeds of the clover or other seeds purchased? When the clover and grasses, or other plants, which, together may form the new herbage, shall have, as they doubtless will shortly, spread and interlaced each other, and invested the earth's face as if with a carpet, they will, it is not to be doubted, prevent the Camelìna satìva and other annual plants from growing, and from maintaining an existence there.

Lepídium satìvum, I have seen a plant of, upon which was young fruit, at the foot of a wall in Friars' Lane, Bury St. Edmunds.

Tussilàgo fràgrans, plants of, are in a state of health and growth, on the outside of a garden wall in Bayswater, and in a meadow.

The three last instances relate to the establishing wild in Britain species of plants habitually exotic to Britain. — *J. D.*

T. F. has communicated in I. 378., that he had found the Linària Cymbalària on the lower part of a rock near Barmouth, North Wales. Mr. Dovaston has made known, in II. 400. 401., that he had previously sown seeds of it there. The late Rev. Lansdown Guilding had written the following remarks relatively to T. F.'s notification of his discovery: he has identified their connexion by "378. [of Vol. I.] Note on Snapdragon."

"So many plants have followed man in his travels over the globe, that we must already be cautious in fixing their proper region. In the woods of the interior of St. Vincent, I have stumbled in amazement on the inhabitants of Asia, and the beautiful products of the South Seas, growing luxuriantly among the lawful occupants of the soil, while all traces of the labour of man, who introduced them there, are obliterated, and the mosses and creepers have hidden the very foundation of his dwelling. These plants point out the gardens of former settlers, who selected these elevated solitudes from their coolness, and for change of air; but a century hence they will perplex the botanists who do not call to mind the confusion which attends the benefits we derive from the commerce and wanderings of the human race. Much dispute has arisen as to the propriety of placing in local floras and faunas species only once observed, or of suspected origin. Where insects, for instance, are found about hot-houses, or plants discovered in cultivated grounds, great caution must be observed: but we may carry this caution much too far. There may be some reason for excluding Acheróntia Átropos from the British fauna, as having probably been introduced

with the plants on which it feeds; but, without very strong proof it would be imprudent to do so. Most of these volcanic islands which have been raised from the bosom of old ocean, must owe their plants and animals to *accidental* arrivals, if any thing can be referred to mere accident, which is under the controul of that omnipresent Guardian without whose knowledge the meanest seed could never vegetate.

It will perhaps be proper to record,

1. All plants found in unfrequented places, especially if having winged seeds.

2. Insects likely to be borne to us by the all-overpowering currents of the higher atmosphere, from the shores of far off continents exposed to storms.

3. Plants from seed-vessels which may have floated on the currents of the ocean; as well as

4. The numberless tribes of epiphytes, timber and bark devouring insects, which we know to be sometimes washed, together with aged trees, from the banks of rapid rivers, and which, after a tedious voyage, haply find a resting-place on some distant shore, where their kinds are totally unknown. I can at this day trace the increase of animals and plants which I do not believe existed on any of our shores a few years before I write. — [*Lansdown Guilding, St. Vincent, May* 1. 1830.]

[An essay "On the dispersion and distribution of plants. By J. E. L." is in V. 522—532.]

Málva sylvéstris, with Corolla white, I found, in July, 1834, by the road side at East Milton, near Gravesend, Kent.

Oríganum vulgàre, with Corolla white, I found, in July, 1834, at Lydden, near Dover, Kent. — *G. E. Dennes. Frith Street, Soho, London, March* 16. 1835.

Ajuga réptans, with Corolla pink-coloured, I found at Highgate, Middlesex, about a fortnight ago. I cannot find such a variety mentioned in any botanical book. — *Id. June* 5. 1835.

Centaurèa Scabiòsa, three Varieties of. — This species is quite plentiful in the vicinity of Dundee, and three beautiful varieties of it are found on Will's Braes: one with white [heads of] flowers; a second with rose-coloured [heads of] flowers; and a third with the radial florets [radial flowers of the head] rose-coloured, and those in the disk [of the head] purple. — *William Gardiner, junior. Dundee, Oct.* 4. 1834.

[In I. 392, 393.; II. 70. 268, 269.; III. 161. 190.; IV. 71, 72.; are notices of species of plants wild in Britain, of which varieties, each with a corolla different in colour from the colour of the corolla of the species, have been found wild, with a statement of the colour of the corolla of each variety,

and, in some instances, a statement of the soil in which it had been found growing, and, perhaps, other particulars. A perusal of these notices, collectively, will supply the peruser with a store of facts kindred to those which Mr. Dennes and Mr. Gardiner have contributed above; and he will, we think, be profited by studying (reading merely, perhaps, will not suffice), either in connexion with the above indicated store of facts, or independently of them, the chapter on "colours," which is presented in part iv. on botany, published by the Society for the Diffusion of Useful Knowledge, of whose *Library of Useful Knowledge* it forms No. 185.]

GEOLOGY. — *Fact and Situation of the Occurrence of Seeds, and certain Species of Shells, in the Lower Freshwater Formation of the Isle of Wight.*—The seeds are found in a stratum of calcareous marl about 3ft. above the beach in Colwell Bay, resting on a greenish clay containing *V*ènus, Ceríthium, *B*úccinum, &c.; besides the seeds, the marl also contains shells of the genera Paludìna, Planórbis, Melanópsis, Melània, Cyrèna, &c. This stratum may be observed for some yards in Colwell Bay near to Warren Point, where it is obscured from view by an accumulation of debris fallen from the cliff above; but, rounding the point, it may be traced for some distance extending into Totland Bay. I know not whether this fact has been before noticed: it is an interesting one, as Mr. Webster discovered seeds, some years ago, occurring in the freshwater strata of Hordwell Cliff, on the opposite coast. — *J. Morris. Kensington, Feb.* 1835.

Mr. Morris sent some of the seeds with his communication; and of these we submitted a portion to Dr. Lindley, one of the authors of the *Fossil Flora* now in progress; who has favoured us with these remarks upon them: — "The seeds are not in a state for satisfactory determination. I think, however, that we are justified in concluding that they contained an embryo without albumen, and that the radicle was bent upon two folded cotyledons, in whose convexity it lay: if so, I see no reason why the seeds should not be those of radish, or of some orthoploceous plant nearly related to it."

[The orthoploceous condition of cotyledons is explained in I. 144.

The natural order Crucíferæ includes the radishes, the mustards, and most, perhaps all, of the species of plants which have their cotyledons orthoploceous; and a still greater number of species which have them otherwise. All the species of Crucíferæ have in their seeds, when these are bruised, a greater or less degree of mustardy odour and flavour. The seeds sent by Mr. Morris had this odour in an obvious degree.

Must the seeds of all plants that are immersed in soil, to any depth that is below that at which they can be acted upon by the common stimulants of vegetation, become, sequently, subject to either fossilisation or decomposition? Cannot the seeds of some species of plants, when buried below the range of the action of the common stimulants of vegetation, remain throughout many years unfossilised and undecomposed, and possessed of the power of germinating when brought within the action of the common stimulants of vegetation and germination? A gentleman I have known has more than once expressed opinions, his own, equivalent to yes, to the first of these questions, and to no, to the second; although he was not uninformed of most of the facts extant, which rather respond yes to the second question; but he could argue an abatement of the force of these. The remaining point in his views has been, that all perfect seed within the action of the common stimulants of vegetation must germinate. Particulars and remarks by the Rev. W. T. Bree, in II. 70, 71., on the "spontaneous appearance of *Epipáctis latifòlia*," had led the late Rev. Lansdown Guilding to write the following note, which is relative to the subject rather than to the instance, and aptly applicable to the subject of my questions above.]

[II. 70.] "The sudden and unexpected appearance of plants may sometimes be easily accounted for. While walking on the banks of the Berkeley Canal, near Gloucester, I observed many plants not common to the neighbourhood. A farmer remarked to me, that, before the canal was excavated, they were never seen, and must have been brought up with the soil in which they had lain concealed since the creation or the deluge! The fact seemed to be, that, by digging far beneath the surface, a poor blue clay was turned up, just as favourable to the new visiters, as it was ill calculated for the plants of the rich meadows on its sides. Birds had, of course, brought the original stock of seeds; though it cannot be denied, perhaps, that the seeds of plants in ground once used have for a long time been buried from the air, and again made their appearance under favourable circumstances, when disturbed and brought near to the surface and the light. — *Lansdown Guilding. St. Vincent, May* 1. 1830."

In the fens of Cambridgeshire have been instances of a copious crop of plants of a species of mustard (*Sinàpis* ? *álba*) being produced upon soil thrown out of new drains excavated. In more dryly situate loamy soil, in Suffolk or in Norfolk, a plentiful crop of plants of henbane (*Hyoscyamus nìger*) has arisen upon soil cast up in recent excavation (of a ditch or some-

thing of the kind). In both kinds of instances the crop has, I think, been produced in the first season of growth (spring, summer, autumn), which has succeeded the time at which the soil was exposed; and if it have been produced so shortly subsequent, the agency of birds would be insufficient to convey to the soil seeds numerous enough for the production of the plants.

In V. 196. is a communication by J. A. H., in which is noted the fact of plants appearing on ground off whose face turf had been pared, and these plants distinct in kind from those which had occupied the ground before the turf had been pared off. W. C. Trevelyan, Esq., has made, in a communication lying by us on a certain *Fumària*, which, with *F.* capreolàta and *F.* officinàlis, grows on the Calton Hill, Edinburgh, this remark, pertinent to the subject of that by J. A. H.: — "These plants [the three fumarias] appear on the Calton Hill only after the soil has been recently turned up: how long the seeds may have been buried under the surface, it is difficult to say. If the spot has never previously been cultivated, they must have been deposited at a very distant period by plants which had been growing there before the appearance of the grass which lately covered the hill, the growth of which soon destroys [? suspends that of] the *Fumàriæ*." — *W. C. Trevelyan. Wallington, Newcastle on Tyne, Sept.* 22. 1832.

[*Ampléxus corallöìdes* Sowerby. — Our correspondent, H. B. of Blois, sent us, in the early part of 1833, a drawing of a fossil object present in the pillars of black and white marble of his room at Chambord, France; on which he thus remarks: — "The figure [object] is white on the black ground, and so very clear and distinct, as to show evidently that it had retractile powers [corrugations are depicted], and that it was armed with spines. The after part seems as if it had been crushed." The drawing we submitted to Mr. J. D. C. Sowerby, who informed us that it was of the Ampléxus corallöìdes. He very kindly added, that this species, which was, when published in the *Mineral Conchology*, deemed a shell, has been found to be a coral, related to the madrepores, and that it is constant in the lower beds of carboniferous limestone (that is, the black marble) in Lancashire and in Ireland. Mr. Gilbertson's communication, in p. 119., enables us to add the Isle of Man to the list of localities. Mr. Sowerby remarked that the possibility of this fossil proving not a shell one is bespoken, as it were, in the names Ampléxus corallöìdes. We have since observed that Mr. R. C. Taylor has set it down as a "coralloid rather than a multilocular shell?" in a note in II. 35.]

Art. VII. *Retrospective Criticism.*

Corrections. — *Mr. Hartwell's Particulars on the Weather at Columbus, in* p. 348. — We have omitted the words "seven o'clock" from before the word "forenoon;" and the words "nine o'clock" from before the word "afternoon:" each of the words stands at the head of the table. Our omission has much lessened the definiteness of the author's communication: this we regret.

Mr. Brown's Communication on the Minerals and Fossils in the Gravel about Stanway, Essex, in p. 349—353.—In p. 350. line 20. for "the needle is never active," read "the needle is very active." In p. 352. for "*Conchíferæ*" read "*Conchífera.*"

The Cuckoo. — In p. 327., in the last line of the text, for "discarded" read "discard."

The Species of Crustaceous Animals discovered and described by Mr. Hailstone, and illustrated and annotated on by Mr. Westwood (261—276.). — From Mr. Westwood's remarks upon my communications, I find there are two statements of mine which require confirmation.

The middle-sized Porcellàna [fig. 28. p. 265., and note * in p. 270.] *was* found with spawn, which I cleared from its abdomen in preparing it for preservation.

The Hippólyte? has only two filaments in its superior antennæ. At the time I found this animal, I examined this point repeatedly with the greatest care, being struck with the general resemblance of the crab to the genus A'thanas. Since I read Mr. Westwood's remarks, I have repeated my examination, and have come to the same conclusion. I may possibly be mistaken; but having, at my first trial, had fresh specimens of the A'thanas nitéscens to compare the Hippólyte? with, I think I cannot have overlooked the third filament which I found so readily in these animals. In my copy of your Magazine, whether from a misprint, or a defect in the engraving [in the latter, as we have found on comparing it with Mr. Hailstone's drawing], I cannot say, the scale at the base of the antennæ is omitted; a stroke of the pen to join the inferior and superior antennæ near their apices would set the matter to rights.

Upon the specific names which Mr. Westwood has applied to the Porcellàna and the Hippólyte?, I must take leave to remark, that they seem to me singularly inappropriate. Having been fortunate enough to discover and describe the animals in question, I think I am at liberty to claim the insertion of trivial names, which seem to me more adapted to them.—*S. Hailstone, junior. May* 19. 1835.

Mr. Hailstone, in a communication dated May 21., has given these names: — "Pontóphilus trispinòsus *Hailstone* (p. 261.); P. bispinòsus *Hailstone* (p. 271. 273. 274.); for, of course, no other name can be given it; Hippólyte macrochèles *Hailstone* (p. 272. 274.); Porcellàna Linneàna Leach (p. 265. 268—270.)." Mr. Hailstone has noted in the same communication that "The Porcellàna I find in Leach's collection in the British Museum with the name 'Linneàna' attached to it: this must be noticed, and both Mr. Westwood's and my own name superseded."

[We claim all the blame of not giving Mr. Hailstone an opportunity of applying these names, or what names he would, before our publishing his communications on these Crustàcea, by our sending him a proof of them. Had Mr. Hailstone hinted a wish, or had Mr. Westwood, when he kindly undertook the farther identification of the forms of Crustàcea which Mr. Hailstone had described, received from us an intimation that Mr. Hailstone was wishing to have the denominating of them, Mr. Westwood would, we are certain, have left the opportunity open.]

A Rejoinder, by Mr. Dale, to Mr. Stephens. — Mr. Stephens says, in a late number [of his own work] that "the remarks of Mr. Dale, in Loudon's *Mag. Nat. Hist.*, vii. 177., upon the latter part of this note, I shall merely observe, are totally *at variance with truth*, and the offspring of malicious opposition." I have merely to request a reference to Mr. Stephens's catalogue of his *own* sale of *British* insects, by Mr. Thomas, on Friday, May 20. 1825, p. 6., and *lot* 73.: one copy of which I have, as *proof* of my assertion, in *my* possession (if not to be seen *elsewhere*); and it will appear very obvious whether *my* statement or that of *Mr. Stephens* is the *more correct*. — *J. C. Dale. Glanville's Wootton, Dorsetshire, April* 23. 1835. [We have omitted the retort on "malicious opposition."]

ART. VIII. *Queries and Answers.*

Is not the Jumaire the Gnu? Information on the Gnu. — In some of the late Numbers of the *M. N. H.*, there have been remarks on hybrid animals [VII. 598., VIII. 198—201.]: I should be glad to be informed, by any correspondent, whether a remarkable hybrid, mentioned by some travellers as existing in Italy (the offspring of the bull and the mare), be entirely a fabulous creation. If I mistake not, it is mentioned by Arthur Young, and called the jumaire. I had no oppor-

tunity, when in the north of Italy, of making any enquiry respecting it; but several intelligent agriculturists, in Savoy, declared their belief in the existence of such an animal, though none of them had seen it. It is, indeed, scarcely possible to admit that two orders of animals, so distinct in their digestive organs as the ruminant and non-ruminant herbivorous Mammàlia, could, by intermixture, produce living offspring: though our knowledge on this subject is very limited. It has occurred to me that the animal called the jumaire may, in reality, be the gnu; which, in external appearance, combines the two characters of the horse and the buffalo, and is justly called by Cuvier "animal fort extraordinaire, qui semble, même au premier coup d'œil, un monstre composé de parties de différens animaux." According to the same naturalist, this animal was known to the ancients, and is mentioned by Pliny and Ælian. May not some of the race have remained in Italy to the present day? as all the rare animals of Africa were transported into that country, by the Romans, to exhibit in the amphitheatres. Two individuals of this species of antelope (the gnu) have been several years in the zoological gardens, and are in good health: they were formerly the property of his late Majesty George the Fourth. There appears, therefore, no reason why they might not breed and increase in the south of Europe: their native country is near the Cape of Good Hope. In a future Number, I may probably propose some queries and offer some remarks on hybrid animals. — *Robert Bakewell. Hampstead, May* 13. 1835.

[In Nos. 75, 76, 77, 78. of the *Penny Cyclopædia*, nineteen species of antelope are figured, and sixty-six species are described. The gnu is figured, and its person and habits described there.]

The Rhinoceros has, it has been stated, an elastic ball at its foot, which enables it to spring like a deer. —*A Correspondent.*

The Elephant's Foot. — I am told that the foot of the elephant, massive and senseless as it appears, will crack a nut without breaking the kernel. — *Id.*

[Information on the anatomy and functional action of the parts spoken of in the two animals would be properly valued.]

Shells and Insects: what Works on, are fittest to help a Student of them to identify the Species of them which he may find in Britain? — A correspondent has requested information on the names and prices of the works that will enable him to "decide regarding the genus and species of a butterfly or shell, with as much certainty as I can those of a plant." It seems, from the context of his query, that it is not of butterflies alone which he is desirous to obtain systematic cognisance,

but insects of other kinds as well. We believe our querist's desire to be not peculiar; and have, in consequence, sought an answer to his questions: and insert these, that they may avail others who may have a like desire.

On Shells we have not asked counsel; though, indeed, it would have been better to do so. For the land and freshwater species, Turton's *Manual* of them has been repeatedly commended by correspondents: it is reviewed in V. 175. Swainson's *Elements of Modern Conchology*, noticed in VIII. 127., contains characteristics of genera, marine ones as well as land and freshwater ones. Brown's *Conchologist's Text Book*, noticed in VI. 355., must avail to the same end. It appears to be shown, in II. 40., that Wood's *Index Testaceologicus* enumerates 2893 species of testaceous Mollúsca. Notices of Sowerby's *Genera of Recent and Fossil Shells* are in I. 56, 57.; VII. 228, 229. Sowerby's *General Conchology* is named with commendation in IV. 555. In this Magazine, information on certain species of shells is given here and there; see I. 424—429., II. 292. 303., VIII. 350. 379. 493.

The late Rev. Lansdown Guilding had written the following note in connexion with the notice of Sowerby's *Genera of Recent and Fossil Shells*, which is made in I. 56, 57.: —

"Nothing can exceed the value of this interesting work, or the general accuracy of the remarks made by the zealous author on the inhabitants of the shells he has noticed. One can only lament that the numbers are not more regular in their appearance. My residence in the tropics has enabled me to draw and describe the animals of very many genera which could not be known to Mr. Sowerby, or but imperfectly described from individuals preserved in spirit. Among his genera which need further illustration, I have lately fully investigated the genus O'vulum (a little egg), of which he has given so full an account in the *Zoological Journal*. The drawing which represents a West Indian species in various positions, I shall send immediately to Mr. Wilson of Edinburgh, who has promised to engrave, in his splendid work, my drawings of the more interesting subjects of the Antilles and Caribbean Sea. The conchologist must look forward with great anxiety for the appearance of Mr. Sowerby's *Species Conchyliorum*. No artist in Europe is better qualified for the task of engraving shells: from his intimate knowledge of the subject, and his talents as an engraver, it will doubtless be a production unrivalled in its kind, and well worthy of the support of the learned and wealthy patrons of the sciences; without whose liberal aid, an undertaking of such extent, cost, and labour can never be carried on. I purpose, in some

future Numbers, to send you notes on the work of Sowerby, as well as all other books on natural history which I have had the means of procuring in this distant country. So many of my drawings have remained useless in London, for years, from the expense attending coloured engravings, that I am induced to proceed with my illustration of molluscous and other animals without them; giving only sketches of their characters, as Hooker has done among the mosses. These will be sufficiently perfect to instruct the European student, even when done in lithographic outline; and will cost but little to the publishers." — [*Lansdown Guilding. St. Vincent, May* 1. 1830.]

Mr. Guilding had thus remarked on Wood's *Index Testaceologicus*, noticed in II. 40.: — "The student must not suppose that the *Index Testaceologicus* of Mr. Wood contains all the shells known at the present day: the cabinets of Sowerby and others are of immense extent, and rich in undescribed species." — *Id.*]

Insects, Works on. — We have asked of Mr. Westwood information for the use of our correspondent. Mr. Westwood has thus replied: — "Your correspondent asks for the name of a work to supply him with the generic and specific descriptions of all kinds of British insects. [So we had represented to Mr. Westwood.] No such work, adapted to the present state of science, or within the last thirty years, exists. Stephens has completed Coleóptera, Lepidóptera, and Orthóptera; but it is an expensive and extensive work. Perhaps the best plan would be, to get Stephens's *Catalogue*, containing all the species and references to every English author, and to purchase the chief works upon species. As for Coleóptera and Lepidóptera, Stephens's work or else Gyllenhall's *Insecta Suecica*, and Haworth's *Lepidoptera Britannica;* as for *T*enthredínidæ, Saint Farglau's *Monograph; I*chneumónidæ, Gravenhorst's *Ichneumonologia;* bees, Kirby's *Monographium Apum Angliæ;* Díptera, Meigen's work in six volumes. But this plan would, perhaps, be exceptionable, from extent of price. Then, I can only say, get Stephens's *Catalogue*, and the *Systema Naturæ;* and the chief old species of all orders are there described. — *J. O. Westwood. The Grove, Hammersmith, June* 13. 1835.

[On this subject, also, we have remarks, by the late Rev. Lansdown Guilding, lying by, which at this time are, we think, worth printing; at least, if only as part of the writer's biography. He had made them in relation to a mention made in I. 407., by a correspondent, of the insufficiency of Kirby and Spence's *Introduction* to enable him to classify insects.]

" The entomologist, wherever he may reside, cannot fail to regret that the celebrated authors of the *Introduction to Entomology* should have omitted to give us the genera of insects, with their types and characters, brought up to the present day. We have now not only to wade through the valuable system of Latreille, but a hundred other works, to discover what *they* were so well qualified to lay before us in a connected form. At present, your correspondent cannot do better than follow the plan I have long adopted. Let him procure or copy the article " Entomology," written by Leach for Brewster's *Edinburgh Encyclopædia;* and, after interleaving it, insert all the published genera and divisions, with a short reference to their authors, and an illustrative figure. [We know an eminent naturalist who collects all the figures he can, and traces copies of those not to be otherwise acquired, of subjects in the departments of natural history which he studies.] He may then, in an instant, turn to any group of insects which have been separated from their congeners by the learned. But still a library of no mean value is requisite for his use. It is to be hoped Mr. Kirby will still undertake the task, difficult and tiresome as it must be, and prepare a supplement, which the book already requires. We should then see his *Introduction* translated in foreign countries, and serving to fix the terminology of our favourite science. I would not, however, be supposed to detract from the merits of this unrivalled work: it is, indeed, a most remarkable memorial of labour, perseverance, and genius; to Mr. Kirby, as a clergyman, it is particularly creditable. It forms a series of sermons on the wisdom and works of God, better calculated than any thing I know to raise our gratitude and admiration of the Creator, and to put to silence the unfounded accusations and the mad clamour of infidelity. — [*Lansdown Guilding. St. Vincent, May* 1. 1830.]

Mr. Guilding had noted the following remark on the mention, in II. 368., of certain " *Leaf Insects.*" " The insects which most resemble the leaves and stalks of plants are the Mántidæ and Phásmadæ; but I forbear enumerating any particular instances, till I send to the conductor my commentary on the work of Kirby and Spence." The latter portion of this remark shows that Mr. Guilding had purposed the producing of a commentary.

A Question on the Possibility of cultivating the Rice Plant in Germany. — In Loudon's *Encyclopædia of Plants*, p. 288., it is stated that rice is cultivated in Westphalia; which, to myself at least, who have not visited that part of Germany, is a

novel piece of information. Can any correspondent tell me in the neighbourhood of what towns rice fields may be seen; what is the extent of land employed in rice fields, the quality of the grain, and the season for getting in the crop? I had always imagined, till lately, that the culture of rice did not extend in Europe beyond 46°, under which parallel, in Hungary and Piedmont, I had known it was grown to a large amount, but was not prepared to hear of the production of it in the north of Germany. Surely it cannot succeed only in very warm and favourable seasons. If the account is correct, it teaches another wonderful instance of the Cereàlia adapting themselves to diversities of soil and climate.—*W. A. Bromfield, M. D. Hastings, March* 3. 1834.

[*Vegetation relatively to Elevation.* — In the *Foreign Quarterly Review and Continental Miscellany* for January, 1828, is given an elaborate table of the state of cultivated and spontaneous vegetation in Switzerland, at different elevations and in different districts.]

ART. IX. *Some Instances of the State of Natural History in Britain.*

THE Facilities available to Londoners in the Pursuit of Natural History. — How few of the inhabitants of this large city study natural history! and yet how many advantages do they enjoy in the pursuit! Our societies, public museums, and private collections are aids in procuring and seeing authentic specimens, and consulting every description of books, which a resident in the country wishes for in vain. To London also are brought natural curiosities from every part of the world. Around us is found abundance of chalk, sand, clay, gravel, and other soils, distributed in woods, bogs, heaths, streams, &c. Under these various circumstances, need I add that a very large proportion of our plants, and numberless insects, are discoverable? On Hampstead Heath, Wimbledon Common, and Clapham Common, are numerous curious bog plants. The Thames and its tributary streams abound with the water species. Blackheath, Charlton, and, still more, North Fleet, are rich in the chalk plants; while Gravesend affords many of those which are peculiar to the coast. At a very short distance from this place we get into the famous orchis woods around Rochester: and how often do Londoners go to Margate, to Herne Bay, to Southend, to Sheppey, &c., and wander about for days and weeks without an object! The

coast from Margate to the Reculvers is particularly rich in marine *Algæ*. I have found there many of our rarer species. Then Brighton, Hastings, Tunbridge Wells, Twickenham, Boxhill, are all places of public resort, and all abound with curiosities. As to Boxhill, it is a botanic garden of itself. In regard to the grasses, the mosses, and the lichens, those men who collect such materials for the birdstuffers, and who travel to all parts, will suffer any one to inspect their baskets.

The above remarks may be applied to other parts of natural history as well as to botany. As to the insects, they will, of course, be found upon the plants which afford them food. In the collection of other specimens, the Londoner also has superior facility. Many curious fish are caught on our coasts, and brought to the London market in the fishermen's boats; while most of the freshwater fish are plentifully exposed for sale, particularly in those quarters of the town inhabited by the Jews, who, at certain seasons of the year, eat scarcely any other animal food. The fishing-boats, with lobsters from the eastern coast, with crabs from Cornwall, and with oysters from the Nore, bring with them many zoophytes, *Serpýllæ*, and other parasitic genera. As to the birds and small animals, they are brought to Leadenhall and Newgate markets purposely for stuffing, and are sold at about the following prices: a heron, about 2*s.*; common owl, 1*s.* 6*d.*; squirrel, 1*s.*; ruff, 1*s.*; gulls, 1*s.* 6*d.*; hawks, 9*d.*; small birds, 3*d.* or 2*d.* Chalk fossils may be procured cheaply at North Fleet; crag fossils at the Isle of Sheppey; others at Mussel Hill, Woolwich, and Charlton, &c.

Thus I have run through the chief heads of my subject, and I flatter myself in some degree proved that the negligence of natural history does not depend so much upon want of opportunity as upon want of inclination. The causes of this apathy I will consider at some future period. That it does exist, every naturalist has reason to lament. Instead of meeting in his rambles persons following similar pursuits, and feeling for them that certain degree of friendship which unity of amusement always produces, he cannot even get a mite to his collection from his best friends. Shells they will collect because *they look pretty*; but if he beg for plants from a distant part, the reply he gets upon their return is, "Oh, I did not see any thing worth bringing you. The sea-weeds are so wet and dirty that they would have spoiled my things; and as to plants, there was nothing but a few ugly weeds; but I did not forget you:" and forthwith appears a nosegay of full-blown double pæonies or dahlias. I once asked a young lady to bring me some Salicórnia from Stroud, where it is

abundant; it was brought cut up in pieces ready for pickling. I hope and trust that this state of things is changing, and that the present altered mode of education, as well as the multiplicity of cheap and useful books constantly issuing from the press, will shortly diffuse a spirit of rational enquiry and of desire for innocent amusement. — *G. Francis. 55. Great Prescott Street.*

A gentleman desirous to acquire some of the Bognor fossils, had made a very urgent application to a highly respectable tradesman in Bognor to employ some persons to collect specimens: he received the following letter in reply: — "Dear Sir, I have made every enquiry amongst the fishermen and others that are well acquainted with this shore to collect me, if possible, some specimens of shells or petrifactions, but they cannot collect any thing worth sending. There are no shells to be picked up on the coast, and as for the petrifactions, they are nothing but a mass of coarse and common shells mixed with sea sand, not worth carriage, possessing neither novelty nor beauty. Could I have fulfilled your commission to my satisfaction, I should have felt proud in being able to have obliged. I am, dear Sir, your obedient servant."

A second application had no better result. (*The possessor, Nov.* 1834, *of the original copy of the letter*).

Do not we, the naturalists, ourselves cause, in our misapprehension, and by our pedantry, that abortion of useful service which intention so kind as that which would prompt to the bringing to us double pæonies or dahlias, Salicórnia cut ready for pickling, and shells and petrifactions, might render us?

> "Suppose (when thought is warm, and fancy flows,
> What will not argument sometimes suppose?)
> An isle possess'd by creatures of our kind,
> Endued with reason, yet by nature blind.
> Let Supposition lend her aid once more,
> And land some grave optician on the shore:
> He claps his lens, if haply they may see,
> Close to the part where vision ought to be;
> But finds that though his tubes assist the sight,
> They cannot give it, or make darkness light.
> He reads wise lectures, and describes aloud
> A sense they know not to the wondering crowd;
> He talks of light, and the prismatic hues,
> As men of depth in erudition use;
> But all he gains for his harangue is — Well!
> What monstrous lies some travellers will tell!"

This is an allegory of Cowper's, applied by him to a subject distinct from technical natural history: see his poem of "Charity."

Are not we in our communings, or, perhaps, rather attempts to commune, with the uninitiated in the technicalities of the sciences of natural history, too prone to express ourselves too much in the manner of the optician in the allegory?

The Worcestershire Natural History Society held on May 25, 1835, the anniversary of its formation. It was formed on April 8. 1833. "They had chosen to link themselves to the immortal name of Linnæus, by holding their anniversaries on his birthday." The anniversary "has this year been rendered peculiarly important and interesting, from the circumstance of its having been chosen as the period for laying the first stone of the Worcestershire Museum, now erecting in Foregate Street."

At a meeting antecedent to the laying of the stone, the report of the council for the past year was read, and the names of the gentlemen who had been appointed as the officers and council for the ensuing year were announced. Lord Lyttelton, Lord Lieutenant of Worcestershire, patron of the Society, was chairman. Speeches were made. Their predominating sentiment was eulogy, and this was applied to the science of natural history; to the Worcestershire Natural History Society, and to the nobility, gentry, public, and, neither last nor least, and properly so, to the several enterprising officers and leading members: from the contributions and exertions of all these parties has arisen the present most prosperous state of the Society.

Mr. Lees (Edwin Lees, Esq.) in acknowledging, "on behalf of his worthy colleagues and himself, ... the thanks of the meeting to the honorary secretary, Mr. Evans; and to the honorary curators, Mr. Lees and Mr. Walter," introduced this

Sketch of the Scope, Offices, and Excellencies of Natural History. "If there was any study that exalted the powers of the human mind and led them on to reflection and investigation; if there was any pursuit that, innocent in itself, tended to purify the mind and renovate the heart; if there did exist any charm by which they could obtain "divine oblivion of low-thoughted care," and look up from the wonders exhibited by intelligent design to some idea of an eternal and omnipotent Power; if there was any study that gave present pleasure, and was productive of retrospective and future enjoyment; that study was natural history. In its most extensive sense, natural history embraced all the objects, animate and inanimate, that presented themselves to our daily notice and observation. In this its widest latitude, astronomy itself, and all

the splendid machinery of suns and systems that sublim[t talent, embraced; the atmosphere and its constituents; pneu[us fix- which related to the density, compressibility, and elasti[knew, aerial fluids; meterology, which embraced all atmosp[eously phenomena; hydrology, or the doctrine of water; and hydra[hence and hydrostatics, which related to its motion, pressure, a[Ma- gravity; were all important branches of natural history. If, however, we confined the subject to its more popular acceptation, as embracing a knowledge of the earth and its productions; even here was employment for a devoted life of research, in the collection, arrangement, and classification of these productions, which were the more legitimate province of natural history. Even if confined to the museum, zoology, botany, and geology, all presented their united productions to enchain and fascinate the attention of the student. He should not here stop further to enter upon the definition of the various branches of that study, which was developed in detail by the members of that Society to which he had the honour to belong; but he asked them, looking upon Nature with a "poet's eye," to glance one moment with him at that view of the subject which of necessity came home to all their hearts, he meant the poetry of natural history, or that pictorial delineation of natural objects which, like the breeze upon the aching forehead, came to reanimate and refresh all their faculties. This was the charm of poetry: without it all the pomp and circumstance of war and pageantry were vain, and fiction itself became tiresome unrelieved by those descriptions of natural objects, which were like the sparkling jewels to the metal in which they were set. All true poets, from Homer to Byron and Scott, had felt and acted upon this principle. Hence the beauty of those images which recalled the recollections of our father-land, when rolling oceans or distant regions intervened; and the sight of a single natural object, or a passing sound, was sufficient to effect this. But the man of genius took a higher flight; he gazed upon the objects of nature with an anxiety to subject all their powers to the dominion of man, and render them subservient ministers to his manual designs, or to the stores of his knowledge. Hence the philosopher would quit the earth if it were possible, to follow the comet in its erratic career, return along its orbit with the speed of thought, and lay down rules for its governance and guidance. Thus the systematist, in his catalogues, developed the animation of the world; and the extended observer of Nature stored up all her images in his breast for his descriptions, and was thus, in effect, monarch of all he surveyed. For him the sun rose in radiant pomp above the snowy peaks of the Alps. For

thing be silver rivulet tinkled down the rocks amid delicate indivisory flowers. For him the cataract thundered the voice glories d amid the thousand echoes of the hills. He buried est Carf in the deep woods, and there, amidst the impenetrable ruin vs a host of birds charmed his ear with their melody, a posts and insects, as their wings reflected the straggling rays of light, pleased his eye; to him their language was not unknown, and as he rested on the soft moss beneath the shade of vegetable columns, he enjoyed a delicious elysium. What were his emotions as the sun set in the billowy main? Heaven, earth, and ocean smiled, as he feasted his eyes on the beauteous prospect. Even midnight beheld him travelling with the moon, and listening to the ceaseless song of the nightingale. When the winds arose, when the forests moaned, when the hurricane rolled along with devastating fury, and ocean, lashed into madness, poured all her angry billows on the rocks, still he looked out; a solemn delight pervaded his soul; he perceived the wisdom of the Deity even in this elemental turmoil, and patiently expected that hush of savage wildness, which he knew would succeed. Thus, every season had its charms for the naturalist. His were joys which the thoughtless could not know; his were emotions which the unobservant had no conception of; till, by the formation of societies like these, the recorded observations of the dwellers in the wilderness, the publication of their ideas, and the collection of the specimens in museums, they were made known alike to all. Could the labours of the naturalist then, ever become threadbare; the beauties of Nature ever become extinct? Never. They were a perpetual fountain of delight; and hence a society founded on such an extended basis was secure from decay, because it called up pleasing emotions in every breast, it inflicted no pang upon any individual. The love of nature that burned within the breast of the naturalist might be said to resemble that sacred fire, which, derived from heaven, was ever to be kept burning on the altar, and never to be suffered to go out. When all Jerusalem slept, and nought was heard but the heavy tramp of the sentinel upon the battlement, or the clank of arms as the guards relieved each other at the brazen gate of the temple, then, that sacred flame, fed by the white-robed priest, flickered upon the carved cedar-work, the palms and the cherubim, and lighted up at intervals their mystic glories in one brilliant glow, anon shrouded in the ebon robe of night. So this fire that animated us resembled *that* in its purity, its lustre, its indestructibility. It would animate their efforts while life endured, it would ever be burning, it should never go out."

Laying the first Stone. The honour of this operat talent, committed to Lord Lyttelton, who expressed these sen us fix- on the performance of it: — knew,

"Of public buildings the noblest undoubtedly are eously which are erected for the immediate worship of the Alm hence the next such as are subservient to the relief of huma Ma- firmities; but next to these, and scarcely second to them, are edifices intended to be subservient to the diffusion of know- ledge, and which lead the mind of man more immediately to the contemplation of the works of God, and to the intellectual and moral consequences which must necessarily flow from that contemplation. In laying the first stone, then, of this intended Museum of Natural History, I have acquitted my- self of a duty particularly grateful to my feelings, and have laid the foundation of a structure which I trust ere long to see reared to its full height, and stored abundantly with spe- cimens of whatever is most useful and interesting from the lap of this, our charming county. I trust also that the mem- bers who assemble within its walls will be enlightened by men of learning and genius; that it will become delightful by the congregating of amiable society, and resorted to through many generations by an improving race of intelligent, inqui- sitive, learned, and pious men. Let this structure then speedily stand in your streets, not only one of the best ornaments of your city, but let it prove a full, copious, and overflowing fountain to your fellow-citizens, of light and knowledge, and diffusive instruction. So shall the best hopes of all good men of all parties in the country be realised, and so shall I look back to the duties which I have this day performed with in- expressible and unmingled satisfaction."

The Dinner. "Upwards of 100 gentlemen sat down to dinner in the large room at the Bell inn." J. Williams, Esq., presided. Of the toasts and speeches proffered, the notice of which occupies in the *Worcester Herald* of May 30. more than a column and a half, it only consorts with our object to notice those which follow.—"On the withdrawal of the cloth, the president gave in succession, the King, with three times three; the Queen, and the Princess Victoria. He had next to request that they would drink to the memory of that prince of naturalists Linnæus," whom he eulogised. The toast was drunk standing and in solemn silence.

A succinct History of the Rise, Progress, and Present State of the Worcestershire Natural History Society. We present two extracts from the speech of Mr. Lees, which seem to us to justify our titular head; and this embraces, we conceive,

thing be[illegible]ts the most interesting and the most instructive to individu[illegible]ho have pleasure in contributing to extend, or in witglories [illegible] the extension of, the adoption of the science of natural *est Car[illegible]*.

ruin w[illegible] had been his pleasing duty last year to trace the origin poste[illegible]e Worcestershire Natural History Society, and in so doing he hoped he had with even-handed justice stated the merits of all parties concerned. He had observed that they were indebted, for the commencement of the vessel that was to carry them upon the ocean of science, to the active efforts of his unassuming friend, Mr. John Evans, their worthy and indefatigable honorary secretary. He had pointed out the obligations they were under to Dr. Hastings, without whose tact and judgment as a pilot, they would have been unable to steer clear of the shoals and quicksands that lay round the entrance of the harbour, and he had adverted to the aid they had derived from an able paper that simultaneously appeared at that time from the pen of Dr. Conolly [see in our VI. 428—430. a review of Dr. Conolly's Essay], who might thus be called, from the extensive survey he had taken, their harbour-master. They all knew, from the transactions of that day, that they could not have had a more skilful commander of the fleet than the Noble Lord Lyttelton, who had presided over their proceedings this day. It was known to all of them that, with the aid of able lieutenants, they had put to sea, and again safely returned into port after a prosperous voyage.

"He had been often asked the cause of the great and acknowledged success of this Society, which had rung throughout the empire; while other similar provincial societies had only crept along timorously, like the snail, or like the woodpecker, taken uncertain flits at lengthened intervals, from tree to tree, without daring a continuous flight upon the wing. He would not say that gentlemen of talent and energy had *not* been among them; he would not say that they had *not* had professional skill, and that business-like and continuous exertion, which was only to be found among practical men of the world; he would not say that they had not had the patronage of the great and the good; they *had* been thus favoured. Still, he considered that it was to the constitution of the Society, and its liberally administered code of laws, that they principally owed their success. Here was the grand foundation stone of their prosperity. From the beginning they had never assumed an austere exclusive appearance; they had never been limited to any grade of society. It had been, it *was open* to all who had talent, integrity, and a love for the pursuit of Natural History, whatever was their external station.

Here was the secret of their strength. They sought talent, observation, and intellect, from every class, secure of this fixing their structure upon an imperishable basis. They knew, indeed, that in Britain no institution could advantageously flourish without the countenance of her nobility, and hence they had early sought and obtained the patronage of His Majesty's representative in this county, Lord Lyttelton; a nobleman who, in his private capacity, would have been no mean support. They had also the efficient countenance of the clergy; for, if these had been neglected, Science must have condemned them, since she would have asked if any profession had produced names more devoted to their cause than those of Ray, Gilbert White, Conybeare, and Kirby, each unrivalled in his respective department; and he would never refuse to the clergy the praise justly due to their descriptive skill, their observant talents, their learning, and their active benevolence. But he must confess, they had a tower of strength in the medical profession. In every age, from Machaon to Sir Charles Bell, from Dioscorides to Linnæus and Sir James Smith, from Hippocrates to Halford, the medical profession had distinguished themselves by acuteness of research, and an adaptation of scientific inference to useful purposes, equalled perhaps by no other men as a body; and they all knew, that in Worcester they had been aided by names ever to be honoured and respected, and the kind help and wishes of many others in the vicinity, their honoured visiters that day. But in thus paying due honour to medical skill, he knew the legal profession ever had amongst its ranks ornaments alike to human nature and to science, and they had members whose skill in drawing up a case in natural history proved them alike ardent votaries of the laws of God and man. He now approached the base of the obelisk or column, that important part that ever bore the inscription, and without which, the ornaments of the plinth and capital would be useless, uninscribed, unacknowledged, prostrated in the dust. But firm was their base, the stones of which it was composed were of ample dimensions, its inscription was fair and legible, its materials mounted up insensibly into the plinth above it, and its lowest stones had coins and medals worth searching for amongst them. Yes, they had also the extensive assistance of the middle classes, and excluded none who had a love of Nature, and of Nature's God, integrity, research, and talent. This, then, he would again contend, was the secret of their success. Should the day ever arrive, when an exclusive test was demanded for admission among them, if the Society should be ever attempted to be confined to any particular rank or profession, should any

thing be ever introduced inconsistent with the rights of any individual as a member of the republic of science, then the glories of this now prosperous Society would fade, "*Delenda est Carthago*" would be inscribed upon its walls, and a splendid ruin would be all that remained to indicate its existence to posterity. But, no!" observed Mr. Lees, "I will not believe for a moment that any member will seek to restrict its usefulness, or circumscribe its boundaries. We have gone on without a check; let but unanimity, cordiality, forbearance, urbanity, and, above all, a continued industrious persevering application, proceed in every department of our pursuit, and unlimited prosperity lies before us. Prosperity without a check, prosperity without a stain, because our principles and code of laws are such as to cast no stigma upon any order of society, or inflict the slightest pang upon any individual. As members of this Society, we have one common object, one common aim in view, one common purpose, as coequal workers, to fulfil. We honour all who lend us their aid; and, if no reward should ever wait upon our efforts, we may at least console ourselves, on our dying pillows, that our humble efforts have left behind us an institution tending to develope the astonishing perfections of the great Designer of Nature to succeeding generations, when our sleep shall be too profound to be disturbed, but when we may, perhaps, be permitted fondly to anticipate that, as the first friends of this Society, our memories will not be entirely forgotten."

The Cuvierian Natural History Society of Edinburgh.—The progress of natural history is attested not more by the almost daily publication of interesting works in promotion of this science, than by the existence of the societies and museums established by naturalists in various parts of the country. It is one of these that I now notice.

The Cuvierian Natural History Society, designated after the illustrious Baron Cuvier, was instituted here [Edinburgh] in October, 1833, by a few young men who wished to improve themselves in the various branches of natural history. Since that time it has gradually increased the number of its members, and, countenanced, as it has been, by several eminent and influential individuals here, little doubt is now entertained of its entire success.

The Society meets once a fortnight, and its business consists in attention to communications and original papers on natural science in all its departments. Every alternate night is devoted to noticing any new discovery connected with nature, or to any observations made by the members of the Society during the preceding month, and conversation and

discussion are held thereon. A president, two vice-pr[illegible] talent, and a secretary compose the office-bearers. It is allus fix- sessed of the embryo of a library and of a museum, knew, which I consider peculiarly calculated to advance this seously

The subjects of natural history presented in the enbence of our city are admirably calculated to call forth the exerMa- of every naturalist; and I hope that this undertaking may attract the notice of the lovers of nature, and obtain the same success as kindred institutions have done elsewhere. — *M. C. S. Edinburgh, April* 4. 1835.

The Norfolk and Norwich Museum. — The subscribers to this institution held their annual meeting in *their new building* on Nov. 22. 1834.

The Natural History Society of Newcastle. — A donation of 100*l.* had been presented by the corporation of the town to the Society's building fund previously to the Society's first meeting for the session, on Oct. 21. 1833; when it was resolved, in consequence, "that each mayor of Newcastle shall, by virtue of his office, be a vice-president and member of this Society."

The Watt Institution, Dundee, Forfarshire. — A subscription has lately been entered into here for the purpose of erecting a lecture hall and museum for this Institution, and some progress has been made in the collection of objects in natural history, &c.; so that we are in a fair way to wipe off the stigma so long attached to our bustling town, for its want of encouragement to science. — *Wm. Gardiner, junior. Dundee, Oct.* 4. 1834.

ART. X. *Obituary.*

DIED, on the night of Jan. 20. 1835, *Robert Sweet*, F.L.S., aged 52 years, author of the work entitled *The British Warblers*, and of several botanical works of high interest (see a list of them in *Gard. Mag.* March, 1835) to those who, to a botanical attention to plants, add the practice of cultivating them. Mr. Sweet was the prototype of the genus of leguminous plants, Sweèt*ia*, instituted and denominated by De Candolle, in 1825, in his *Mémoires sur les Légumineuses*, with just praise of Mr. Sweet's works. Mr. Sweet was a contributor to the earlier volumes of this Magazine: II. 88. 101. 113.; III. 434. 448. 461.

We should register in this Magazine, also, the fact of the death of *Mr. Douglas* the distinguished botanical collector for the Horticultural Society of London. He collected, besides

thing be[illegible]her objects of natural history. He met his death about
individu[illegible]as-day, 1834, by falling into a pit made by the natives
glories [illegible]andwich Islands for catching wild bulls: one of these
est Car[illegible]at the time. A short sketch of the biography of Mr.
ruin [illegible]as is printed in *The Gardener's Magazine* for May, 1835;
post, [illegible]., 271, 272. Mr. Douglas was only 36 years of age.

REVIEWS.

ART. I. *Titles of Works on Subjects of Natural History, published recently.*

BAKER, T. B. L.: An Ornithological Index, arranged according to the *Synopsis Avium* of Mr. Vigors. 8vo, 187 pages. Wood, London, 1835.

"I some years ago began to write an index of this description; but ere I had waded through ten pages I discovered that I had neither time nor patience for such a labour. Finding, however, considerable difficulty in searching for the description of any bird through two quarto volumes of Vieillot, arranged according to one system; two of Spix, in a different order; ten of Latham, still different; innumerable numbers of Temminck, arranged according to the fancy of the purchaser; and Wilson's *American Ornithology*, not arranged at all; I put my books into the hands of Mr. Prince, who undertook to finish it, though without an idea of publication; but, as some of my friends thought that a work of this description might be of use to science, I have printed it, less in hopes of its being useful in its present crude and unfinished state, than of its serving as a stepping stone to something better. The principal drudgery of the work is over; and any good ornithologist, possessing far more perseverance and science than myself, might, I think, by amending the errors and making some additions, set a stamp on the paper and render it truly valuable. Were there, for instance, two or three columns placed on the right hand of each page, one giving the length in inches, another the prevailing colour, and a third the habitat, it would add but little to the bulk," and "might still further assist the student in discovering the object of his search."

"Space is left at the end of each genus" for scope for "adding the references as they appear."

"I trust that Mr Prince's labours, for I will not call them my own, may have the effect of calling forth some better work from abler hands. Certes, should they be instrumental in easing the labours, and facilitating the progress of one student

of the most fascinating, and, perhaps, least perfectly d[illegible] talent, branch of natural history, I shall be overpaid." (Pr[illegible]ius fix-

This most welcome work is supplied with a "Tabul[illegible] knew, to the orders, tribes, &c.;" and with a "General Ind[illegible]ceously ranged alphabetically; two additions of the greatest o[illegible]hence to novitiates.

[illegible]t.Ma-

Cage Birds, their Natural History, Management, Habits, Food, Diseases, Treatment, Breeding, and the Method of catching them; by J. M. Bechstein, M.D., Author of "Ornithologisches Tassenbuch," &c. Translated from the German, with notes by the Translator. 1835. 10*s.* 6*d.*

Next to plants, birds are the most universally popular and courted objects in the whole range of natural history. The inhabitants of crowded alleys and dusty apartments, although debarred from enjoying woodland rambles, contrive to domesticate one of the great charms of the woodland, the feathered minstrels. Nor is this at all wonderful; for the joyous songs of birds, independently of their own sweetness, bring vividly to mind the buttercup and daisy-spangled meadows, purling streamlets, and embowered valleys clad with nature's brightest vesture, and redolent of beauty, verdure, and perfume.

Caged birds being productive of all these advantages, it becomes highly desirable to ascertain by what means our little prisoners can be best compensated for the loss of the sweets of liberty, and their sojourn in their wire prisons rendered as little irksome to themselves as possible, and like advantageous to their keepers. Such has been the object of the author of the work before us, and success, as might have been expected from so enthusiastic and experienced an ornithologist, has crowned his endeavours. We will, however, let him speak for himself: — "If long experience and minute observation on the subject of his work is calculated to gain an author credit, I flatter myself that this will not be denied me, since from my earliest youth I have delighted in being surrounded with birds, and am so accustomed to them, that I cannot write at my desk with pleasure, or even with attention, unless animated by the warbling of the pleasing little creatures which enliven my room. My passion is carried so far, that I always have about thirty birds around me; and this has naturally led me to consider the best and easiest mode of procuring them, as well as of feeding and preserving them in health. Few amateurs, therefore, are better fitted than myself to write on this subject, and I hope I have done it to the satisfaction of the public. I have described all the indigenous European birds with which I am acquainted that are capable of being tamed, and are pleasing in the house. As to foreign ones,

thing be[illegible]ly spoken of those I have occasionally seen in Ger-
individu[illegible]d which can be procured without much difficulty."
glories [illegible] p. iv.)

est Car[illegible]reatment of two hundred species is detailed in this
ruin [illegible]; many, it must be confessed, are such as would hardly
poste[illegible]ive the name of *cage* birds in Britain, as the gallinule, the
duck, and the crow; others, again, are no very desirable
companions in an aviary, as the following anecdote will show:
the author is speaking of

The Red-backed Shrike (*Lànius Collùrio*) [treated of in p. 364. to 371. of this Number]. — "In the house, it must be treated like the former (the red-headed shrike [Lànius pomerànus *Lin.*]), and kept in a wire cage; for it would soon kill its companions, as I experienced some years ago. The bird I refer to had been three days without eating, although I had offered him a great variety of dead birds and insects. On the fourth day, I set him at liberty in the room, supposing him too weak to hurt the other birds, and thinking that he would become better accustomed to his new food if I left him at liberty. Hardly was he set free than he seized and killed a (hedge) dunnoc [hedge-chanter or hedge-sparrow], before I had time to save it; I let him eat it, and then put him back into the cage. From this time, as if his fury were satisfied, he ate all that was given him." (p. 44.) That even so fierce a bird as the red-backed shrike is susceptible of affection towards other species of birds, appears from the following passage, extracted from an article by Mr. Sheppard, in the *Linnæan Transactions*:—"On July 31st, 1816, we observed a pair of red-backed shrikes very busy in feeding a young cuckoo which was perched on an oak. This fact confirms Temminck's remark, who says that the cuckoo will sometimes lay its egg in the nest of the above-mentioned shrike. It also contradicts Montagu, who asserts that "the yellow-hammer's (yellow-bunting's) egg is larger than that of any other bird in whose nest the cuckoo chooses to lay [see this assertion by Montagu, and some of his context quoted in our p. 291.]. We have heard the note of the old cuckoo as late as the last day in July. The note of the female cuckoo resembles that of the common gallinule [see in p. 384. of the present Number]. A cuckoo has been observed to enter the nest of a common pie, probably for the purpose of devouring the eggs, which, according to Temminck, constitute part of its food." This last conjecture, we may remark in passing, is opposed to Mr. Blyth's opinion, p. 339.; but Mudie, speaking of the ovivorous propensity of the cuckoo, says: "Though it is a very wary as well as a shy bird, we have caught it in

the fact" of eating the eggs of other birds. (*Brit. Nat.*, vol. ii. p. 133.)

To return to the work before us. The classification employed, as might be expected from the time when it was written (the preface to the third edition is dated 1812), is none of the best. Thus the black redstart is classed with the wagtails, while the common or tree redstart is placed with the warblers, and the whole work abounds in errors equally flagrant. The translator, moreover, in lieu of correcting these defects, has added to them, by giving the worst and least appropriate of the vernacular names. Two papers, inculcating sound principles of ornithological nomenclature, will be found in that excellent periodical the *Analyst*, No. x. p. 238., and No. xi. p. 305. However, in other respects, he has acquitted himself creditably, and has added some interesting particulars in the shape of notes. The work will be a great acquisition to the lovers of our feathered minstrels. — *S. D. W. Burton on Trent, June*, 1835.

Taylor, Emily; with Designs by *Landseer, Thomas.* The Boy and the Birds. Small 8vo, 194 pages, 22 engravings. London, Darton and Harvey, 1835.

The habits of the skylark, puffin, chimney swallow, greater tit, blue tit, long-tailed tit, golden eagle, osprey, rook, willow wren, goldcrest, green woodpecker, redbreast, and cuckoo, wren, fern-owl, eider duck, and gyr falcon, are treated of; and sixteen of them severally relate their own biography to a boy anxious to acquire a knowledge of it. In sixteen of the pictures, each of this number of species of birds is introduced, accompanied by certain associations coincident with the habits of that species, as a tree to the woodpecker, a rock to the golden eagle, cliffs to the puffin, &c.; and into each of this number of pictures the enquiring boy is introduced in some attitude, different in every picture, indicating attention to the communication which the species of bird is making to him. The ideas and language which the writer has given to the birds to deliver are of a cultivated order. The writer is subject to one inconvenience in the application of the plot or mode of relation adopted: it is this, that, as every bird must be supposed familiar in the whole of its own history, the writer must relate in the sufficient style of one whose knowledge has not imperfection; still, the work is a pleasing and a superior one.

Royle, J. Forbes, F.L.S. & G.S., M.R.A.S.: Illustrations of the Botany and other Branches of the Natural History of the Himalayan Mountains, and of the Flora of Cashmere.

In 4to parts, 20*s.* each. Part V. January; Part VI. April. To be completed in 20 parts.

The scope of this work has been noticed in VII. 285, 286. 480. 608. In parts v. and vi. there are supplied, besides a proportion of coloured pictures of species of plants, and treatises on the species which have been discovered in these regions, in a proportion of the natural orders into which the whole have been assorted, a plate, in part v., of Himalayan fossils; and in part vi., a "View of the Himalayan Mountains, from the vicinity of Almorah, elevated 5000 ft;" and figures of Pítta brachyúra, Eurylaímus Dalhoúsiæ, and Cérthia goalpariénsis, three "tropical forms" of birds "in northern India and the Himalayas during the rainy season."

ART. II. *Literary Notices.*

THE Cyclopædia of Anatomy and Physiology, being a series of dissertations on all the topics connected with human, comparative, and morbid anatomy and physiology, edited by R. B. Todd, M.B. &c., and R. E. Grant, M.D. &c. To be published in parts; part i. to be published on June 1. The publishers, Sherwood and Co.

The Linnæan Society's Transactions, part ii., price 15*s.*, of vol. xvii., has been recently published. — The subjects treated of in this part are these: — A commentary on the 4th part of the *Hortus Malabaricus;* by the late Dr. Hamilton, p. 147—252. Memoir on the degree of selection exercised by plants, with regard to the earthy constituents presented to their absorbing surfaces; by Dr. Daubeny, p. 253—266. Review of the order Hydrophylleæ [and of the genera and species included in it]; by G. Bentham, Esq., p. 267—282. On Diopsis, a genus of dipterous insects, with descriptions of twenty-one species [and figures of sixteen of them]; by J. O. Westwood, Esq., p. 283—312. See a figure and some description of Diópsis macrophthálmia *Dalman*, in our V.; the fig. in p. 320., the description in p. 319, 320. and note *, and p. 591, 592.

Sketches in Natural History; by Mary Howitt. — "The excellent writer tells us, in a short preface, that the pieces of which the volume consists were written for her own children. We should state that the subjects are illustrated by some capital woodcuts; and, altogether, the book is quite a bijou for young people." (*Berrow's Worcester Journal*, April 16.)

The known Species of Bears are treated of, and figures of most of them presented, in numbers 215, 216. of the *Penny*

Cyclopædia; and any one can now, for the sum of twopence, attain a store of authentic and useful information on them. The treatise on bears published in Partington's *Cyclopædia of Natural History* is included in part vi., price 1*s.*; but this part includes treatises on numerous other subjects incidental to the alphabetic series.

Sowerby's *Small Edition of the English Botany.* — Part iii. of the supplementary plates has been recently published. They exhibit Aspérula arvénsis, *G*àlium cinèreum and aristàtum, Isnárd*a* palústris, *P*otamogèton acutifòlium and zosteræfòlium; *M*yosòtis rèpens, cæspitòsa, sylvática, and arvénsis; *E*`chium itálicum, and Prímula scótica.

Lichenes Britannici, or, *Specimens of the Lichens of Britain, with Descriptions and occasional Remarks;* by J. Bohler. In monthly parts, 3*s.* 6*d.* The first number has been advertised to be published on June 1., and to contain Endocárpon miniàtum, Squamària crássa; Squamària muròrum, a plate; Solorìna saccàta, Sphæróphoron corallòides, Cladònia rangiferina, Scyphóphorus grácilis, S. filifòrmis.

The Earth, its Physical Condition, and most remarkable Phenomena; by W. M. Higgins, F.G.S. and Lecturer on Natural Philosophy in Guy's Hospital. This is to be "in small 8vo, with numerous illustrations."

Dr. Hastings's Lecture on the Salt Springs of Worcestershire, recently delivered before the members of the Worcestershire Natural History Society, is to be published, without curtailment, in the *Analyst* for July; and illustrated with a lithographic section, exhibiting the different strata encountered in boring for the salt springs at Stoke Prior.

A Manual of Mineralogy; by R. Allan, F.R.S.E. &c. 1834. 8vo, 351 pages, 174 figures; 10*s.* 6*d.* At this late date we register the title of a work so likely to be useful to our readers.

W. Westall's *Views of the Lakes of Cumberland.* — Four views, the number for 1835, 3*s.* 6*d.* each, are about to be published. A notice of this fact is not wholly out of place, rightly speaking not at all so, in this Magazine; and may be welcome to those of our readers who have visited the lakes, or may purpose visiting them. One view exhibits "Keswick Lake, from Friar's Crag:—Evening;" another, "Bowness Bay, Lake Windermere, from above the Vicarage Road;" another, "Lake Windermere, from Low Wood Inn;" and the remaining one, "Bassenthwaite Lake, from the Keswick Road, near the sixth Milestone." The more obvious of the features in each view are designated by names written at the foot of the plate, opposite the features called by these names.

THE MAGAZINE

OF

NATURAL HISTORY.

AUGUST, 1835.

ORIGINAL COMMUNICATIONS.

ART. I. *On certain recent Meteoric Phenomena, Vicissitudes in the Seasons, prevalent Disorders, &c., contemporaneous, and in supposed connection, with Volcanic Emanations.* No. 7. By the Rev. W. B. CLARKE, A.M. F.G.S. &c.

"Quid sit, unde sit, quare sit. . . . . quod ipsum explorare et eruere sine universitatis inquisitione non possumus, cum ita cohærentia, connexa, concatenata sint." — M. MINUTIUS FELIX, xvii.

As the occurrence of meteors on November 12—13., during the last four years, has engaged much notice, and caused on my part considerable discussion in this series of papers, I think it but fair to the defenders of the hypothesis which I have opposed, to myself, and to those who have read what I have advanced upon the subject, to devote this paper to a consideration of the statements which have been lately made respecting the last appearance of the phenomenon in the United States.

The *American Journal* for January, 1835 (vol. xxvii. No. 2.), recently received, contains three papers on the subject of the meteors and the zodiacal light.

1. The first (art. xx. p. 335.) details "Meteoric Observations made on and about the 13th of November, 1834, by A. D. Bache, Professor of Natural Philosophy and Chemistry in the University of Pennsylvania."

Mr. Bache states that, in consequence of a suggestion by Prof. Olmsted, he observed the sky from November 5th to 19th, the number and duration of observations being increased on 13th, A. M. "The conclusions to which my observations have led," (these are his words) "and in which I feel entire confidence, are, that, *at the city of Philadelphia, there occurred, on the 13th November*, 1834, *no remarkable display of meteors*

of the kind witnessed in 1833, *and that there was probably no similar occurrence on those mornings, which were clear, just before and after the* 13*th inst.*" (p. 336.) He gives the observations on which this conclusion is founded, from which it appears, that, on Nov. 9th he saw the zodiacal light at 3 A.M.; on the 10th, he saw one very brilliant meteor at 4 A.M. in the west, followed by rain from s. w. on 11th; 12th, meteors; 13th, no meteors at 12 h. 10 m. A.M.; *three meteors in ten minutes* to S.E. at 2 h. 40 m. 50 s. A.M.; *seven meteors in fifteen minutes* 3 h. 50 m. to 4 h. 10 m. A.M.; "*five faint meteors in half a minute, and then very rare. Three after those five in about fifteen minutes.*"

After this, two brilliant meteors were seen, but out of the line of the radiant of three of the before-mentioned five. "In reviewing," he continues, "the observation of this morning, the only remarkable occurrence of meteors is that noted between 5 h. 15 m. and 5 h. 30 m. A.M. But this was neither *in degree nor in kind like a portion of the meteoric phenomenon noticed in November*, 1833." (p. 337.) Professor Bache argues from the insignificance of the numbers seen, and the striking fact, that "the paths of two of the five meteors did not meet the approximate radiant of the other three." He next asserts, "*These meteors were similar both in degree and kind to ordinary meteors;*" and that the average of eight meteors in fifteen minutes, over one third of the hemisphere, was much below the average of what he and his coadjutor, Mr. Espy, had descried in the summer time over one fifth of the sky, where meteors are very rare. On the 14th, they saw two meteors in twenty minutes, followed by rain four hours after; by snow on the 15th and 16th, by hail on the 17th, and rain on the 18th.

2. The second paper (art. xxi. p. 339.) is headed, "Meteors on the Morning of November 13. 1834; by Alexander Twining, Civil Engineer."

Mr. Twining does not speak with the same confidence as in his former papers. He says, the zodiacal light was more brilliant than ever he saw it on the morning of Nov. 9. Between 1 and 2 o'clock, A.M. Nov. 13., he saw *one meteor* of considerable brightness, "*but nothing uncommon was visible at that hour.*" Soon after four, "there was evidently an unusual number of meteors; lower in altitude than 30°; in either quarter of the hemisphere; reddish; about the size of Mars; their flights were not more than 8° or 10°: but one, nearly in the zenith, shot through 20°. They were attended with trains of several minutes in breadth. One only continued three seconds. In twenty-five minutes, thirty meteors were counted,

and the estimated rate was four in a minute." Besides these, "*there were two or three which evidently formed part of the assemblage*," which were, however, different in colour, magnitude, direction, "*precisely like the multitude of common shooting stars without trains.*" Still, Mr. Twining refers the former to the same class as appeared in 1833, since they seemed, he says, to emanate from a *fixed point* in Leo, which was either the same as the radiant of last year, or very near it. He confesses, however, that, as the scale was so greatly diminished, he has formed no decided opinion whether this whole display is to be considered a slight recurrence of the meteoric phenomenon of Nov. 13. 1833, or not. The zodiacal light was visible, all the while, as high as the neck of the Lion, but not so bright as on Nov. 9. The place of observation was West Point.

3. The third notice of the phenomenon in question is contained in some miscellaneous remarks by Professor Olmsted on the zodiacal light. (p. 417.) The principal facts stated are, that the zodiacal light passed from the eastward to the westward about Nov. 13., according to prediction, and that on the morning of the 13th "there was a slight repetition of the meteoric shower." The particulars differ but little from those already given (*Mag. Nat. Hist.*, viii. 140.) in the *New York Journal of Commerce*. The radiant appeared to be "a little to the northward and westward of the place it occupied last year" (1833). In 1833, decl. 20°, r. a. 150°; in 1834, decl. 30° 15′, r. a. 144° 30′. The point did not vary for three hours, from which the professor concludes that "the source of the meteors was beyond the earth's rotation, and consequently beyond the atmosphere." Four meteors ascended from the radiant point; one *towards* it; three moved *horizontally* from west to east, south of Orion and Canis Major. The zodiacal light was seen extending from the horizon, and terminating near the radiant. These observations were made by Professor Olmsted, Mr. tutor Loomis, and Mr. pupil Haile, of Yale College.

Professor Olmsted states, further, that though decidedly inferior to the display of 1833, this display was more than any before or since Nov. 13. 1834, and that no remarkable fall was seen any where *south* of Yale College, although appearances at West Point, nearly in same latitude, and at Andover (Massachusets), to the *north*, were remarkable. Furthermore, we learn, that, in 1831, on Nov. 13., between 3 and 4 o'clock, A.M., Dr. Wright, living in Ohio, noticed an unusual shower of meteors in that state.

To the above information I beg to append the following remarks:—

It is certain, that, in 1799, a great display of meteors was seen in Cumana; in 1831, in Ohio; in 1832, in Arabia, Switzerland, and England; in 1833, in North America; in 1834, contemporaneously in North America and England; and that these phenomena occurred always on November 12—13. Professor Olmsted considers them the evidence of a cometic body whose motion is *eastwardly*. Now, it has been shown, that, in 1832, the phenomenon travelled *westwardly*, and, in 1834, that it was seen later to the west than to the east, implying a *westward* motion. (See VII. 386., and VIII. 141.) As witnessed in America in 1834, it is stated that the display was not seen more to the *south* than about 41° N. lat. in America; but it was seen (*M. N. H.*, viii. 97.) in the latitude of London 51° 30′ N., the difference in longitude being about 73° (if the meteors seen in England and America were the same); and they may have been seen much further to the northward.

Now, it must be deemed extraordinary that, on the same night, within 120 miles of the southern limit of this *supposed cometic* display, Professor Bache should have seen a display of common electric meteors, whilst the cometic display, according to Professor Olmsted, was in exhibition at a height "*above the earth's atmosphere*" (according to previous statements (see *M. N. H.*, vii. 387.) 2238 miles above the earth), and, therefore, within the range of vision of Professor Bache at Philadelphia. Mr. Twining also allows that there were two or three meteors which, though evidently forming part of the assemblage, did not belong to it, but were mere vulgar meteors that had intruded their trainless "minute white points" into the brilliant circle, crossing the paths of the celestial visitants without ceremony! Professor Olmsted, moreover, grants that the radiant had shifted its position to the northward and westward since 1833, and that some of the meteors disobeyed the general law!

It thus appears, therefore, that in America there were two distinct occurrences of meteoric phenomena of different characters at the same time, and seen from the same localities. As already stated by Mr. White (VIII. 97.) and myself (VII. 655.), we had in England a display partaking of the common character, yet still emanating from the constellation Leo, and agreeing in many points with the appearances alleged to be cometic, in colour, brilliance, trains, &c.

One fact is, at least, established by these seeming contradictions; viz., that *common electrical meteors* did appear, both in

America and in England, on the same night, whilst there is no direct evidence to show that any others also appeared; and it is surely more rational to conclude that all were electrical, rather than to assume the existence of a cometic body upon testimony which contradicts the conditions assigned to that body. The evidence of Mr. Bache respecting the meteors at Philadelphia is infinitely more strong against Professor Olmsted's theory than any thing I have advanced. But the zodiacal light is made to play a conspicuous part in these phenomena; and I can only suppose, from the way it has been introduced, that it is intended to be understood that that light is the tail of the supposed comet, and therefore that the meteors are to be considered as *celestial coprolites;* for the zodiacal light is said to have "extended from the horizon and terminated near the radiant" (*Olmsted, A. J.*, xxvii. 419.) whence the meteors issued.

Respecting the radiant itself, it does not appear that it is a fixed point, after all, either from the present notices in the *American Journal*, or from the former ones. But, if it be constant, will any of the Transatlantic professors take upon themselves to assert that the radiant is very far distant from the magnetic point (see *M. N. H.*, vii. 291.); or that, in displays of the aurora, the same point is not the focus of convergence of the pyramidal beams of light? During the display of the aurora, figured in my last paper, as seen from this place (VIII. 144.), I observed that at times the beams of the aurora converged to the very point in dispute, exhibiting at those times, at the point of convergence, the appearance of a thin cloud or film of vapoury light, not till then apparent, and vanishing with the brilliance of the beams. Moreover, I would ask the observers to satisfy themselves upon two queries: 1st, Whether in all displays of electric meteors, at any time of the year, whenever they are numerous, there is not always an apparent radiating point of similar character with that in dispute? and, 2dly, Whether they are quite certain that they have never mistaken an auroral * for a zodiacal light? (See *M. N. H.*, vii. 84.) I throw out these hints, not upon mere trifling conjecture, but from a conviction arising from observation, that the doctrines of electricity will solve many of the phenomena which these meteors have presented, and nothing else so well as electricity.

Having thus considered the difficulties which are presented by the hypothesis of Professor Olmsted, to account for this

* This is a bold query, as Sir J. Herschel says it is impossible to make this mistake. (*Astronomy*, § 626.)

periodical occurrence of meteors in November, I again venture to appeal to the volcanic theory for a solution; and, fortunately enough, another most striking coincidence occurs, to strengthen what has been advanced in my former papers.

Advices were recently received at Petersburg, from the Fort of Tsourou Kaitou, in the south-eastern frontiers of China, near the junction of the Amour and Argonna rivers, stating that, on Nov. 12. 1834, at 2 P. M. the air was suddenly darkened above the mountains, and so continued till the whole landscape was hid. On Nov. 13. there was only a dim light; the air appeared filled with smoke, without smell; about 4 P. M. a N.E. wind (i. e. a wind from the Polar Sea) arose, which gradually increased, clearing the air about midnight; there appeared afterwards upon the shore, and on the ice of the river Argonna, a brown dust, without smell, having a salt taste; it covered also the trees and the grass, and could be shaken off. The oldest inhabitant remembered nothing of the kind before. (*M. N. H.*, March, 1835.) Now, there is little doubt as to the origin of this phenomenon. Some tremendous volcanic eruption had taken place, and this deposit was the ashes and sand carried to a distance by the wind. The nearest known volcano * to the locality in question is in Kamtschatka or Japan, and it is probable that the dust in question indicates a most violent terrestrial convulsion in one of those countries. Now, the latitude of these localities agrees very well with that in which the meteors were most conspicuous on Nov. 12—13., and I shall, therefore, presume to consider, according to the principles hitherto developed, that this eruption is an index of the true *rationale* of the meteors.† The distance of these localities (say 1600 or 1700 miles) is nothing in objection to the supposition, because we have already seen how extensive are contemporaneous terrestrial and atmospherical derangements, and how generally the air is impregnated with electrical and combustible matter by agents continually at work. (See VII. 306.)

In Mr. Twining's former papers on the meteors of 1833 (see *M. N. H.*, vii. 613.), he argued against the terrestrial origin of those phenomena, because they did not conform to *geodesic* lines. I have attempted to show [VII. 613.] that this was not an argument against their terrestrial origin; but

* Earthquakes occur yearly near Lake Baikal, to the west; but there is no known volcano in that vicinity.

† It may be added here, that a most dreadful storm occurred off the coast, and in the interior of Ceylon, in the last days of November, doing great mischief. One river rose 42 ft. or 43 ft. above its usual level. (*Asiatic Journal*, May, 1835.)

it so happens, that there is, perhaps, sufficient evidence to conclude that the direction of the course of these meteors (if the same) in different years, connected with the electrical and volcanic phenomena which I have attributed as explanatory of their origin, does actually conform to geodesic lines, or rather, to curves, corresponding to circles of latitude concentric with the surface of the earth. Should the doctrine of *magnetic curves*, or *electrical currents* (see R. Were Fox on Irregularities of Magnetic Needle, *Phil. Mag.*, 3d series, i. 310.), turn out to be true, will not the facts connected with these meteors give and receive mutual illustration? The eastward or westward motion of the meteors must be understood only as referable to Professor Olmsted's hypothesis of a comet; because it is well known that meteors have been seen moving in either direction in their proper course. In Silliman's *Journal* for 1835 (xxviii. 95.), Mr. Loomis of Yale College has a paper on "Shooting Stars," in which he repeats the observations of Professor Brandes of Leipzig (*Unterhaltungen für Freunde der Physik und Astronomie*), upon the shooting stars seen from April to October, 1823, in various parts of Germany. These observations bear on our argument, since on Aug. 8. 65 meteors were seen at Breslau, and on Aug. 10. 140 were seen in less than two hours. The result is given in a "Table of the calculated Meteors," proved identical, as observed from different localities. It appears that of sixty-three observations during sixteen nights, thirty-four displays had a height under 50 miles, and only seven above 100, of which two were above 200, and one at 500 miles high. The greatest length run by any meteor was 180 miles, on Oct. 7. It is considered that, though one meteor on October 8. (No. 56. in the table) had a vertical downward course of 96 miles on the shores of the Baltic, that the direction of these meteors had an impelling power, independent of gravity. The prevalent direction in azimuth was 55° west from south. Professor Brandes calculated, also, that the point to which the earth's motion was directly opposed was 48° 10′ w. azimuth; and, subjecting all the observations recorded to this comparison, he found that so far as these observations go, *it is perfectly clear that the prevalent direction of the meteors is owing to the motion of the earth.*

In 1799, Cumana was within the field of observation; in 1832, Mocha, on the Red Sea. Now, the difference in latitude between these places is but 2° or 3°: the corresponding disturbances of the earth at that time lay also in the line of connection and continuation. So, in 1834, a line drawn from

Kamtschatka or Japan, through the Russian fort above named, and continued through England and that part of America in question (all within a very few degrees of the same latitude), will unite the sites of the terrestrial derangement and the atmospherical phenomena. In 1831 and 1833, the space visited lies immediately between the limits of the former tracts. But this, I will confess, is not much to be relied on as explanatory, for, whether it be correct or not, it is not actually necessary to the point in dispute; my argument being, that these meteors are nothing but the result of electrical or volcanic emanations chemically combined and ignited within what is usually denominated the earth's atmosphere, and resulting from the same agencies as those more common and decidedly electrical meteors which we call "shooting stars." My purpose has been to show that terrestrial derangements have occurred either contemporaneously with, or within a short period of, the time when these meteors have appeared; and, although the evidence upon this point must, of necessity, be scanty, because we cannot know how many volcanic eruptions or earthquakes actually occur, whilst the meteoric phenomena may be known and estimated (for they can scarcely escape observation), and consequently the line of argument which I have adopted must depend upon collateral proof and presumptive evidence; yet I still think, that, when all the various facts even yet adduced are duly weighed, it will be allowed, that many a man has been found guilty, condemned, and executed, according to law and *justice*, upon very much less proof than I have, in these papers, cited to establish the claims of this our globe to the production of phenomena which it appears to me quite as capable of producing as any harlequinading comet in the universe. It is, methinks, treating one of the most important (to us, at any rate) of the solar planets with little respect, to suppose it only a receptacle for the waste contributions of a body that keeps such a mysterious secrecy, and favours us but once a year with a notification of his existence, although, according to the theory of the Transatlantic professors, he comes into contact with our convenient atmosphere every six months. It is to be observed, that these remarkable displays of meteors have been always *north* of the equator: there is no evidence for them in the southern hemisphere, although they, doubtless, are occasionally seen there. But is the zodiacal light *also* confined to the north of the equinoctial? If not, how will the argument then stand for the existence of the comet? Or, are *all* southern meteors *allowed* to be electrical? It is singular, that this light, which is no novelty to astronomers, should never before 1799 have developed such propen-

sities; still more so, that its productions should have been imitated so admirably, as the constant occurrence of meteors, all round the earth, declares, without the aid of cometic digestion; and that no other comet, save this, should ever have suffered from the same calamity or disease, although their motions have been examined, at leisure, from the days of Pythagoras to the present hour, and some of them have advanced near enough to the earth to have whisked their tails in our faces had they been so unpolitely inclined.

My readers may, perhaps, think that too much attention has been given to these meteors; but, assuredly, it would be a brilliant and interesting discovery to make, if they are the evidence of a new comet; and the interest cannot be diminished should they be proved to be of the "earth, earthy." I would willingly congratulate Professor Olmsted on the establishment of his hypothesis; for, though I have presumed to make free with it, I do not despise his science or his ingenuity; and I am not so bigoted to my own conjectures, as to think them worth keeping, if they can be proved irrational or unsound. I crave, however, a little patience whilst I adduce two or three more facts in connection with the subject, whether for or against it, as the case may be allowed.

In 1833, it was observed, that the atmosphere in America became suddenly chilled*; and this I argued to be one proof of the true electrical character of that display (*M. N. H.*, vii. 290—300.): a similar result followed the meteors seen by Mr. Bache at Philadelphia in 1834, and those seen in England. (VIII. 142.) But it is allowed that the display of 1834 was every where of inferior brilliance, so much so, as to lead Mr. Twining to decline to come to any conclusion, to make Professor Olmsted almost doubt, and Professor Bache to deny the identity of the circumstances. Yet it appears that electrical phenomena, nevertheless, occurred upon a great scale, in some respects, especially as regards cold †, more than ever known. On this side of the ocean we have had frequent interruptions of a very early spring (now retarded) by cold winds of great intensity, frost, snow, and hail, with gales of wind, rainbows in the depth of winter, and frequent displays of the aurora; whilst in America the cold has been more intense than ever

* To afford another instance of the similar results of electric, meteoric, and volcanic agency, I mention here, that, on Dec. 27. 1831, Vesuvius was in great eruption, rain falling furiously at Naples; and the next morning the whole of the upper part of Vesuvius was covered with snow.

† Heat and cold can be considered only as different degrees of the same power: there exists between them no definite point of neutrality." See a clever article on electro-magnetism, *Q. R.*, 35. 237.

remembered. In January, for instance (4th and 5th), the snow lay deep upon the ground at Newhaven, "the air was quite calm, with a bright sun," yet the thermometer stood as low as 23° below zero at sun-rise on Jan. 5., never rising during that or the preceding day above zero; the lowest known cold before this year being in Jan. 1780, at —19°. At Hartford, the thermometer was —27°, and at one house in Newhaven at —26·5°. [Silliman's *American Journal*, P. S. vol. 27., Jan. 1835.] The weather in Canada has also been intensely cold and severe. But, although the American continent has been chilled to a degree almost unprecedented in the annals of history, the cold there has been, as in Europe, in some degree partial. For, whilst the temperature of places upon the sea, or near it, ranged from —4 to —17, inland it had a range from —19 to —43, upon the 4th and 5th January; so that it can hardly be safe to attribute this excessive cold to the ice floating on the Atlantic. It appears, also, that in the western states the cold has not been extremely severe*; these two facts point therefore to a line of cold between two lines of heat, as alluded to under the head of 1833, in *M. N. H.*, vii. 388. It is my intention to arrange in a tabular form, in a separate paper, the notices of this cold in America in January, 1835, and some previous years; and I shall, therefore, only observe here, that the records of the month of January, 1767, afford an exact parallel in all the circumstances of temperature, excessive cold followed by "a deluge of warm rain," to that of 1835 (*S. J.*, xxviii. 183.); and I may add, to make the reference more correspondent with my previous remarks, that the difference of 1767 and 1835 is 68, being just four times 17 years before mentioned as a natural cycle. (VIII. 158.) Hymettus, near Athens, was covered with snow at the same time in 1835; and at Odessa the snow lay deep, whilst parhelia and rainbows were daily descried there. It is probable that the cold last winter would have been universal, had not the agents at work produced great modifications in various parts of Europe. In those countries electric phenomena have been

* At Marietta in Ohio (39° 25′ N., 4° 28′ W. of Washington), the greatest cold was only 2° above zero on January 5th. On Jan. 25th, the mercury at Dartmouth College was at 8°, 25°, 27°; at Marietta the same day at 62°. In December they had only 1½ in. of snow, and in January none; so partial has been this extreme cold. (See Silliman's *Journal*, xxvii. 177. and 163.) The thermometer at Virginia University was not below +10°. During the whole of this period, the weather to the west of the Alleghany Mountains was quite mild. There was no ice for the ice-houses; and there was a fear lest the supply for 1836 should fail. *Generally the climate is much colder to the west than to the east of this state.* (Letter of correspondent in *Journal of Franklin Institute*, xv. 222.)

unusually numerous, and thunder storms of a most extraordinary kind, through the winter months, have continually occurred. At least 100 churches in Germany, Holland, and adjacent countries, have been destroyed by lightning. England, also, has experienced the same phenomena. The cold that has occurred in England, and the sudden falls of snow, have also been strikingly severe: but they have been partial in extent, and very limited in duration, and imply, strictly, not that there has been a severe winter (which would be contrary to the fact), but that electricity has been extensively at work, and, perhaps, that there has been a considerable disengagement of ice from the Polar Sea. These partial occurrences of cold point out, doubtless, the localities where the upper cold strata of air descend to the surface; but it is evident that such could not descend without a heating of the lower strata. If, then, the meteors are to be answerable for the winter of 1833, how happens it that, in 1834, we have had an excess of effect, and a decrease of cause? * It is to be replied, that the meteors are themselves only an effect, and, as I conceive, of the same cause as that which produced the other phenomena, the meteors being less magnificent from a different distribution of the producing matter.

That such notions as these are not conceived without certain facts to justify them, I will now, in conclusion of these remarks, show from occurrences within the present year.

In this volume (Essay, No. 6., p. 152.) I have incidentally alluded to the tide, gales, and earthquake of January (16—20.) 1835. On reference to my calendar, I find also that on 29th January there was a furious and destructive gale and tempest in Columbia, followed by gales in Europe from England to Italy, till Feb. 5.; and that about Jan. 26. a sudden snow storm came on off the west of Ireland, wrecking the fishing-boats, that were taken by surprise, and depriving 500 persons of life. Now, during this whole period most violent and ruinous volcanic eruptions and earthquakes occurred in Guatemala and Yucatan, the particulars of which are too interesting to be passed over.

It appears that several volcanoes erupted, one near San Vincent, close to San Salvador, on the Pacific, and others which have not been mentioned; that the convulsions lasted

* The winter of 1831, when the meteors were also on a small scale, as seen in Ohio, was dreadfully severe in America. See, amongst other documents, Mr. Taylor's account, *M. N. H.*, vi. 97—103., and evidence has been already adduced to show that in October, 1831, the earth was violently convulsed.

eight days; that thirteen or fourteen towns and villages were destroyed *; and that the cinders and ashes were scattered sixty miles; the volcanic dust being carried as far as Jamaica; where, at Kingston and St. Anne's (as well as at Truxillo, Omoa, and Sassodilla, on the mainland), it fell so thick as to cover houses, shipping, and trees, from Jan. 23. to 26. The noise was distinctly heard at Balize, 90 leagues off, at Truxillo, Valladolid, Merida, and Bacular; and so explosive was the sound, that at Balize guns were fired in supposed reply to signals of distress from a vessel on the reef; an officer was despatched from Bacular, and troops were elsewhere put under arms. The dust falling at Jamaica was supposed there to come from the eastward; but there is little doubt that it was from these eruptions, carried far beyond Jamaica, and also far above the trade wind, at first, and then brought by it after it fell from the effect of its gravity. (See other instances, VIII. 18.) This deposit of dust, 800 to 900 miles from its known origin, may justify what is advanced above respecting the dust on the Argonna from Japan or Kamtschatka. Now I adduce this eruption, not as any thing extraordinary, but to account for the gales and earthquakes of the same period in Columbia and Europe; for, doubtless, so extensive an eruption was preceded for several days by earthquakes, which might have vibrated to Chichester on or before the 12th, though the explosion from San Vincente began only on Jan. 22.

On Feb. 11, 12, 13., also, a violent hurricane occurred off Algiers, and throughout a great extent of the Mediterranean. On the 12th, at 10 h. 15 m. A. M., a severe shock of earthquake was felt in lat. 18° 47′. N., 61° 22′. W., by the ship James Cruickshank, Capt. Young, which lasted a minute, and which I consider sufficiently indicative of terrestrial convulsions to allow me to attribute the hurricane in the Mediterranean to some great convulsion which, though not known, seems pointed out as likely to have occurred.† On Feb. 15. there were violent thunder storms, injuring and destroying three churches

* It has been asked me, *cui bono*, these disquisitions on volcanoes and earthquakes? what is the use of volcanic phenomena? I beg my kind friend to read the following extract from the letter which announced the above events:—"So great was the darkness, that the inhabitants had to grope their way at noon by the help of torches; and so great was the terror of the inhabitants, that, at *Alancho, three hundred of those who had lived in a state of concubinage became married, that they might be, or seem to be, honest, before the day of judgment!*"

† A communication which is printed at the end of this essay will, perhaps, be received as illustrative of my positions, if the connection spoken of did occur; for, as shown in VIII. 25., about the time of the hurricane in Nevis, earthquakes were felt.

in Yorkshire, and numerous others in Germany; besides thunder storms on the 21st and 22d, and violent gales till the 27th. During the gale of the 26th (which commenced here in Dorsetshire with hail and rain), about ten at night, a number of detached clouds were rapidly propelled from W. to E., across a clear sky, each cloud discharging blue sheet lightning of a most vivid kind, without thunder, and offering a spectacle as interesting as unusual at the season; this was followed by heavy rain on the 26th and by a rainbow of peculiar brilliance on the 27th. If, then, the hurricane at Algiers were not in connection with earthquakes, perhaps some of these subsequent phenomena were.

The month of March also offered some striking atmospherical derangements. During the thirteen first days, there were continuous and most violent gales; on the 6th, a hurricane in Paris, doing great damage; and, on the 8th, a tremendous fall of snow in Westmoreland; whilst, on the 3d, all Suabia was visited by a tempest of unexampled fury, the lightning destroying at least forty churches. These gales varied from S.W. to N.W., and were everywhere attended by lightning, thunder, and hail. On the 13th, occurred also a violent tempest of thunder, hail, and wind, in Norfolk. On the 13th and 14th, Vesuvius commenced an eruption, which was renewed on the 25th, and which was followed by a most violent eruption on the 1st of April. On the 27th of March the ice broke up in the Néva *, at which time occurred violent gales and unseasonable cold in England and France, with the wind N.E.; and on the 2d of April occurred such a thunder storm at Oswestry as was never before remembered, continued with equal intensity at Walsall on the 3d, while a frightful storm, occasioning many wrecks, occurred in the Levant. The sudden chill, with ice and snow, in Canada, England, Russia, France, and Rome, from April 26. to 30., points to a most extensive derangement of temperature. At Rome, the weather never was so cold. (*Diario di Roma.*)

The last preceding facts have been introduced, not with a view to encumber these pages with additional examples from the present period, but to illustrate what I have advanced about the meteors as electrical, to the latest date which affords instances in point. My intention was to have stated the facts from the *American Journal*, and to have left them to the judgment of the reader; but it appeared better, at the risk of

* From 1726 to 1789, the ice never broke up before March 15., nor ever later than April 27. (*Tooke's Russian Empire.*)

being deemed tiresome, to make out the connection as clearly as possible.

Note on the Zodiacal Light and on Comets. — The following passages are reprinted from Sir J. Herschel's *Treatise on Astronomy* (in *Lardner's Cabinet Cyclopædia*), to show what his opinions are (art. 626.): — "It is called the Zodiacal light, and may be seen any very clear evening soon after sunset, about the months of April and May, or at the opposite seasons before sunrise, as a cone or lenticular-shaped light, extending from the horizon obliquely upwards, and following, generally, the course of the ecliptic, or rather that of the sun's equator. The apparent angular distance of its vertex from the sun varies, according to circumstances, from 40° to 90°, and the breadth of its base, perpendicular to its axis, from 8° to 30°. It is extremely faint and ill defined, at least in this climate, though better seen in tropical regions, but cannot be mistaken for any atmospheric meteor or aurora borealis. It is manifestly in the nature of a thin lenticularly-formed atmosphere, surrounding the sun, and extending at least beyond the orbit of Mercury, and even of Venus, *and may be conjectured to be no other than the denser part of that medium, which, as we have reason to believe, resists the motion of comets;* loaded, perhaps, with the actual materials of the tails of millions of those bodies, of which they have been stripped in their successive perihelion passages (487.), and which may be slowly subsiding into the sun." (*Lardner's Cyclopædia*, xliii. 407—8.)

"(Art. 487.) The tail of the great comet of 1680, immediately after its perihelion passage, was found by Newton to have been no less than 20,000,000 of leagues in length, and to have occupied only two days in its emission from the comet's body! a decisive proof this of its being dashed forth by some active force, the origin of which, to judge from the direction of the tail, must be sought in the sun itself. Its greatest length amounted to 41,000,000 leagues, a length much exceeding the whole interval between the sun and earth. The tail of the comet of 1769 extended 16,000,000 leagues, and that of the great comet of 1811, 36,000,000. The portion of the head of this last comprised within the transparent atmospheric envelope which separated it from the tail was 180,000 leagues in diameter. *It is hardly conceivable that matter once projected to such enormous distances should ever be collected again by the feeble attraction of such a body as a comet, — a consideration which accounts for the rapid progressive diminution of the tails of such as have been frequently observed.*" (*Lardner's Cyclopædia*, xliii. 311.)

Now it is evident, that, if Sir J. Herschel be correct in his

ideas (in art. 626.), Professor Olmsted can gain no aid in the manufacture of a comet from the zodiacal light, unless he intends to assert that the meteors result from the collection and condensation of the matter acquired by the medium which resists comets, from millions of other comets, and which they cannot again attract: but this would be to reduce the imaginary comet to the rank of receiver of stolen goods, and refute its claims to individuality. Again, has it been shown that there has been any diminution of the tail of the imaginary comet, either by a *decrease in the extension of the zodiacal light*, from what it always has been, or in the *existence of meteors* within the last few years? Or, rather, does not the fact stated above (in art. 487.) contradict at once the possibility of the supposed comet existing except after its own fashion, and as a being eccentrically eccentric?

Could we believe that a comet had any thing to do with these meteors, we might almost venture to suppose that Biela's would satisfy us; for "its orbit, by a remarkable coincidence, very nearly intersects that of the earth; and had the latter, at the time of its passage in 1832 *, been a month in advance of its actual place, it would have passed through the comet; a singular rencontre, perhaps not unattended with danger." (*Herschel's Astronomy, Lardner's Cyclopædia*, xliii. p. 309. art. 484.)

Unfortunately, however, Biela's comet has no tail, and no appearance of a solid nucleus (therefore, no pyrotechnic establishment within it), and its period is $6\frac{3}{4}$ years, nearly fourteen times the period of Olmsted's comet; moreover, though it did appear in 1832, it did not in 1831, 1833, 1834, or 1799: its next appearance is to be in 1838; perhaps we shall know more about it then.

Stanley Green, near Poole, Dorsetshire, May 8. 1835.

P. S.—The above observations had been committed to the press, when, by the kindness of the editor, I was favoured with the *Journal of the Franklin Institute of Pennsylvania* for the first four months of 1835 (vol. xv.). As those numbers contain a criticism on Professor Olmsted's hypothesis of the new comet †, I have deemed it more satisfactory to append here an abstract

* It is curious that it should have passed its perihelion on Nov. 26., just thirteen days after the meteors. (See *Conn. des Tems*, 1830.) Halley's comet will pass its perihelion Nov. 7—27. 1835.

† "Notes of an Observer. Remarks on Professor Olmsted's Theory of the Meteoric Phenomena of November 12. 1833, denominated Shooting Stars, with some Queries towards forming a just Theory. By James P. Espy."

of the arguments employed by Mr. Espy, by which it will be seen that there are other reasons, besides those advanced by me, why the cometic theory must be abandoned.

The facts quoted by Mr. Espy, upon which to found his refutation of Olmsted's theory, are those quoted by me in VII. 290. and 383. from Silliman's *Journal*, xxv. 363. and xxvi. 132. He says he cannot assent to the theory, because meteors could not fall on the sides of the earth most distant from the sun from any body moving in an orbit interior to that of the earth, which must have been the case with meteors falling at night. Again, if the distance of the comet be 2238 miles only, the whole comet must have fallen; and, even if it had been 29 times as far, the same result must have taken place. Again, gravity would have caused the meteors to have, in this case, fallen perpendicularly to the earth's surface.

Moreover, the radiant was not fixed. This radiant could not have been stationary amongst the stars, if in the comet, but must have revolved at a rate 5000 miles slower than the earth. No comet, he says, whose periodic time is 182 days, could, in *aphelion*, or perihelion, appear stationary, whether the aphelion be interior or exterior to the earth's orbit.

These objections are fatal to the theory. Besides, that theory does not pretend to account for the horizontal and upward motions of some of the meteors. Nor does it account for the fact, that the auroral light seen at many distant places was not seen at the intermediate places, which it must have been if 2238 miles from the earth. Facts are then quoted to prove, as I think they do, that the auroral light and meteors proceeded from the same cloud which appeared over the Delaware, and which was only 200 yards in apparent length, and *from which*, between the emission of the auroral light and the meteors, *there blew so direct and violent a wind, that the vessel in which the observer was was near dragging her anchors.* Many such instances as these occurred in different places. At Dover, New Holland, a similar phenomenon occurred. Capt. Parker, in the Gulf of Mexico, lat. 26° N., long. 85½° W., saw a cloud in the N. E., *behind* which all the meteors fell; but the first meteors appeared to come from it like lightning.

"Now, it is highly probable," says Mr. Espy, "that all auroral lights, the triumphal arch, the luminous, and even the non-luminous clouds, from which luminous flashes appeared to proceed on that night, were but variations of one and the same magnificent meteoric display." (p. 12.) Several luminous clouds were seen at Poland, Ohio, near Alioth, in Ursa Major. At Niagara Falls, also, there was seen a lumi-

nous cloud, like a square table, nearly in the zenith, from which were emitted large streams of light.

Professor Olmsted considers these auroral lights as proceeding from the tail of his comet. Why, then, were they not seen all over the United States? But the fact is, that these auroral lights were very low in the atmosphere in some places. At Philadelphia one was 15° high, and very faint; at Germanstown, not six miles off, it was 45°, and very bright. The upper part of this aurora was not, therefore, more than $2\frac{1}{10}$ miles from the surface of the earth. The curved appearance of some of the meteoric trains is also an objection to the theory of the comet: in that case all must have been straight.

Mr. Espy refutes Professor Olmsted's calculation about the condensation of the air by bodies falling, as he has supposed. That calculation is founded on Leslie's formula; but Olmsted, mistaking "*volume*" for "*weight*," has made the heat produced by the sudden condensation of the air to be 46080° centigrade, instead of 50°, nearly 1000 times too much! This, if true, would have involved another important result; namely, that, by rarefying and condensing air, a temperature might be produced many thousand times both higher and lower than has ever been obtained. (p. 14.)

Mr. Espy objects to Professor Olmsted, that his theory does not account for the change of temperature accompanying the phenomena. It is true he maintains that "the air descended in large quantities from the region of perpetual frost;" but he forgets the result from Leslie's formula, that air thus condensed would have a temperature of 46080° centigrade; upwards of 78000° Fahr. If Dalton's theory be correct, no change in temperature would be thus produced; if Ivory be right in his, a *small* increase would only take place. A sudden production of cold, therefore, is *not* an effect which would follow of course from the descent of large quantities of air from the regions of perpetual frost. Again, the fact undoubtedly contradicts this reasoning, because the temperature sank *previously* to the meteoric shower.

Professor Olmsted's explanation of the *west wind* is also refuted by Mr. Espy. It appears, Mr. Espy says, that the west wind *succeeded* the shower, and not, as Professor Olmsted says, *succeeded* it.* If large masses of a comet were to fall, they, being independent of the earth's motion, would incline to the west in their descent, and produce an *easterly* wind. Therefore, as the meteors fell over a large tract sloping actually to the N. W.,

* Here both may be right, for westerly gales did succeed the display.—*W. B. C.*

and as no S. E. wind was produced, "it is an absolute proof that no foreign bodies, of sufficient weight and consistency to drive the air before them down to the lower regions of the atmosphere, did fall from a comet, or any other body, into the air during that memorable night." (p. 17.)

A final argument is, that, if the bodies fell as asserted, and the air was consequently condensed as stated, there would have been an equivalent resistence from the ascending columns around the meteors, and from the reaction of the compressed air beneath, which would have retarded the meteors, and, perhaps, have thrown them up again, in the same way as mustard seed shot from a gun will sometimes fly back in the discharger's face; and, if the bodies fell 2238 miles by force of gravity, the velocity must have been eight or ten times greater than that of mustard seed. And, therefore, for these reasons, Mr. Espy infers that "*the meteors of November*, 1833, *were not bodies falling towards the earth by the force of gravity, neither from within nor from without the atmosphere.*" (p. 19.)

Mr. Espy further shows that in many places the meteors could not have been ten miles high. [The arguments he employs from examples are the same as that I have employed above respecting the meteors seen, on 13th November, 1834, at Yale College, but not at Philadelphia (p. 420.)]. It appears that the meteors of 1833, at forty leagues from Matanzas, in Cuba (where they fell perpendicularly), i. e. in lat. 32½°, long. 32°, "*seemed to follow the direction of the wind, which was E. N. E.*" (p. 86.) It does not appear, either, that the different observers saw the same meteors, which they would have done at an altitude of ten, or even five, miles high. The angular velocity of the trains would also prove that the meteors were not more than two or three miles high. Professor Olmsted quotes one meteor he supposes to have been thirty miles high, whose train moved eastward, equal to an ordinary cloud a mile high carried by the wind at the rate of ten miles an hour. Now, he says, such being the case, the *actual* motion must have been 300 miles per hour. Mr. Espy adds, that it must have been, in the upper part of the train, more than 600 miles per hour! Olmsted is, therefore, forced to admit that this meteor must have been near the earth. [Why not the rest?] There is a strong presumption that the meteors were not five miles high.

Mr. Espy argues, from the *explosions* heard and the *odour* elicited [mentioned in VII. 290., with a note on the latter phenomenon], that their distance must have been very little, for the noises heard were such as could only be heard a few hundred yards. The places where sounds were heard were

New Haven, New Britain, New York, Richmond, Charleston (S. C.), St. Maria (Mo. Ter.), Fort Jackson (Lou.), Fort Lavenworth (Ark.), Fort Oglethorpe (Georgia), Fort Moultrie (S. C.), Fort Jessup. The sounds heard there were such as could be only heard a few yards off, except those heard at Charleston and Fort Moultrie. At the latter place there were hissing noises heard, and some were like the discharge of a musket; and one was as loud as a six-pounder. This stands upon undeniable evidence; nor is there reason, from other well-known and similar atmospheric phenomena, to doubt it.

These positions, that *the meteors were not gravitating bodies, falling towards the earth by the force of gravitation*, and, secondly, *that they were of atmospheric origin*, seem, then, to be fully established. "I hope it will," says the writer, "be considered a matter of some importance to have these two points *established*, and not merely *conjectural*. For, the mind being freed from wild speculations and visionary theories as to their *celestial* or *volcanic* origin, will be left at liberty to seek their true cause in the atmosphere, where they undoubtedly take their rise." (p. 89.)

[As to the *non-volcanic* origin of these meteors, nothing that follows in Mr. Espy's criticism proves this, if the view I have taken of the subject in hand be considered in all its bearings; for atmospherical derangements are part of my argument, and, by the very principles developed in my previous papers, I should not be able to advance a volcanic hypothesis except I took into consideration the very hypothesis which Mr. Espy himself advances; for, as will be seen, he leaves the enquiry where I take it up. He establishes a connection between the aurora and the meteors, and the supposed zodiacal light of Olmsted, and alludes to an interchange of aerial strata, by rarefaction and vortices produced by a downward draught of air; and I have attempted to show that such downward draughts could not take place without a previous heating of the lower strata of air. If, then, Mr. Espy's hypothesis be correct, that these meteors were produced by this interchange of atmospherical strata, he will allow me to take up that position, and, showing how such an effect may be produced (viz., by terrestrial emanations), establish from his argument my own supposition, that these meteors were nothing but electrical, and induced by the state of the earth previous to the phenomena in question. The principal arguments adduced by Mr. Espy, to connect the aurora and these meteors, are the same which I have already mentioned; the comparative lowness of the aurora; the hissing and snapping sounds; the prevalence of meteors on the nights of auroræ;

and the prevalence of auroræ on the nights of these meteors (see *M. N. H.*, vii. 291. 294. 387.; and *Journal of Franklin Inst.*, xv. 90.)]. Evidence is adduced by Mr. Espy to show that, at Fort Gibson, the display was *intermittent*, alternating light and darkness at intervals of about thirty or forty seconds; and that, "at one or two of the military posts far west, *all* the meteors moved horizontally." (p. 91.) The radiant there was also in *the south-eastern horizon.* How, it is asked, does this "agree with Mr. Olmsted's?" (p. 92.)

Having thus upset Olmsted's theory, Mr. Espy proceeds to introduce his own. He begins by asking the following questions: —

"1. Do auroral arches always move towards some southern point?

"2. Do the streamers always lean in the direction of the motion of the arch?

"3. Is there always a sudden depression or elevation of the dew point about the time of a brilliant aurora?" (p 159.)

The first two queries, he says, may be answered in the affirmative, so far as his own and others' observations tend.

"4. Are clouds or haze in our [i. e. Pennsylvania] latitude generally formed behind the arch?" Facts, he says, have come to his knowledge to establish the affirmative of this; and it may account, if so, why in England and in America the auroræ are oftener seen in the north than in the south. He quotes the brilliant aurora of May 17. 1833, as an example. The wind had been north; but the lower current changed to to the s. w. below, whilst the upper current continued from the north.

"5. Are there also two currents in different directions, at the time of auroræ; and is the upper one generally from the north? Or, where the upper and lower currents are in the same direction, from the north, does the upper move fastest?" (p. 160.)

He thinks this will, some day, be answered in the affirmative. "Besides, many meteorological phenomena can easily be accounted for, on the supposition of an upper current of air from the north, at the time of their occurrence, even when this current is not indicated by clouds." Mr. Espy considers the sudden depression of the dew point as indicative of a north current at the time of its occurrence. The dew point on Nov. 12. 1833, was, at 1 o'clock, at 57° F.; at 6 P. M., at 40°. It rained a little during the day; the wind was s. w.; the evening was perfectly clear. An aurora was expected: none was visible. On the 12th, there were no clouds in the upper stratum; on the 11th, the lower air was from the east, and the

upper from the west, with rain, the dew point being 37°. On the supposition of a cold current from above, many phenomena of Nov. 12., and on the night of Nov. 13., may be accounted for. (p. 161.) On the 12th there was a gust in the Hudson, which upset a vessel, destroying all hands. On the 13th, A. M., there were similar gusts at New Haven, with an increase of meteors. [See *M. N. H.*, vii. 655., on the *freshening* of the wind, Nov. 13. 1834.] Captain Parker, in the Gulf of Mexico, as well as the vessel before mentioned, on the Delaware, eighty miles from Philadelphia (p. 432.), had the wind blowing directly from the cloud from which the meteors emanated.

Mr. Espy supposes that a very cold current of air from the N.W., overlapping a warmer current from a southern point, or an upper current from the north, moving faster than the lower southerly current, would produce many *vortices* of small extent, and, by intermixture of air, a cloud. Now, at Philadelphia, no cloud was seen, though it was seen 80 miles off; and, on the 12th, the air at the surface at Philadelphia was 17° warmer than on the 11th, and 21° warmer than on the 13th. If this position be allowed due weight, Mr. Espy considers that it will account for the fall of the dew point; the sudden blasts at the time caused by the downward vortices; the formation of the cloud; the change of temperature; and, if the fifth query be answered affirmatively, the *electrical nature of the aurora*. He considers the luminous clouds of the night in question, on this supposition, to have formed an interrupted conductor. He agrees, however, that it is not determined, whether there was an upper current on the night of Nov. 12. [1833] from the north-west, overlapping a *warmer* below (by which he means, containing more caloric to the pound), and asks whether there has never been an upper current of cold air overlapping an under one of warm air, since the Bonpland meteors of 1799? [I refer the enquirer, for an answer, to what I observed here on Nov. 12—13. 1834 [VII. 655.], and to Mr. White's observations on the same night near London. [VIII. 97. 343].] Mr. Espy considers that, judging from a variety of instances, these things must be supposed to be connected together as cause and effect.

On March 8. 1834, at 5½ P.M. the dew point was 59½° F.; and at 6 P.M., a shower having intervened, it had sunk 14°, and was then clear. Next morning, at sunrise, the dew-point was 15° above zero, having sunk 44¾° in 13½ hours. No aurora was seen; but, instead, "the tail of Mr. Olmsted's comet had been seen on that night with uncommon brilliancy." Again, from P.M. of March 29. 1834, to A.M. 30th, the dew

point had sunk from 47½° to 9½°: there was no aurora; but "the comet, or zodiacal light, of Mr. Olmsted comes to our aid." Now, on March 31. there was a strong wind from the s.w. The temperature was 40°, the dew point 13°; the upper clouds came from s.w., the middle from w., the upper clouds hidden. The lower current blew strong from s.w., but changed to N., on April 2., between 7 and 8 o'clock. The dew point rose to 56° until A.M. April 2.; it fell P.M.; and in the evening there was no aurora in north-west, and at the same time a faint aurora in the east. On April 3. the dew point fell 32°, in 24 hours, with three currents. An aurora followed. On April 4. there was an aurora under similar circumstances, the dew point, on 6th A.M., being down to 15°.

As these auroræ were not seen near Wilmington, Delaware, on any of these nights (nor on any night in March, April, May, or June), the presumption is, that they were not three, nor even two, miles high. Of fifteen auroræ seen at Wilmington, from July 10. 1831, till Dec. 15. 1833, only two were seen at Philadelphia. But there was in all these cases a sudden and unusually great change in the dew point, twelve falls and three rises. Of the three auroræ corresponding to the three rises, one (March 17. 1833) was seen as an arch in the zenith at Philadelphia.

The following dates mark periods of extraordinary *depression* of the dew point without an aurora at Philadelphia. [I have put them into a tabular form for convenience.] Whether an aurora occurred elsewhere to the north, is not yet known.

1832.	1833.	1834.	Notes.
Jan. 26.	Jan. 11,	Jan. 3,	
Feb. 21.	or 12.	or 4.	
24.	16.	13.	
March 14.	26.	21.	* Not mentioned, in Captain Ross's *Narrative*, as days of change in the weather. The only exceptions in 1832 and 1833.
18.	Feb. 7.	Feb. 12.	
27.	25.	26.	
April 20,	March 2.	March 3.	
or 21.	July 31.	8.	
May 21.	Aug. 8.	21,	
27.	*Oct. 3.	or 22.	There are no auroræ mentioned by Sir J. Ross under these dates: the promised scientific portion of the *Voyage* may, perchance, mention their occurrence.
Aug. 25.	11.	30.	
Sept. 5.	On Oct. 12. 1833,	April 11.	
*23.	there was a most bril-	27.	
Oct. 16.	liant display of aurora	June 2,	
24.	all over England, 60	or 3.	
26.	miles high. (*M. N. H.*,	11,	
Nov. 14.	vii. 50.)	or 12.	
20.		27.	
Dec. 19,		July 11.	
or 20.		Nov. 16.	

The above particulars may be rendered serviceable to a double end, and, therefore, I add another table of changes of the weather recorded by Capt. Sir J. Ross, in his *Narrative of a Residence in the Arctic Regions*, recently published. I cannot but think that Mr. Espy is generally correct in his views, but that, notwithstanding the general lowness, &c., of the aurora, and the descent of the air in vortices, &c., the derangements of the atmosphere are always on so extensive a scale as to allow a reference to other countries for coincident phenomena. The reader is, therefore, requested to compare Mr. Espy's dates of the *depression* of the dew point, as indicative of an *aurora*, or *electrical* action, with those of the following table; and if it should appear that there is a near agreement, I may perhaps be considered justified in taking so wide a field for my own speculations. Moreover, in the doctrine of vortices formed in Mr. Espy's hypothesis, if these notices be not close together and continuous; in other words, if they be not, as mathematicians would say, "at infinitely small distances," I do not see how the violent gales which *did succeed* the meteors are to be accounted for, extending over many hundreds of leagues in one entire sweep; and, if this succession of vortices be granted, Mr. Espy and I agree in our deductions, as far as hurricanes are concerned. It is clear, that, on this hypothesis, the vortex of Nov. 13. 1833 must have been commensurate with the display of meteors, and have extended over a space, in latitude, of 32°, and, in longitude, of 30°, a tolerably large vortex! On referring to my journal, I find that there are numerous coincidences of gales, earthquakes, and auroræ, in Europe, and distant places of America to the south, with the very dates given by Mr. Espy in 1832, 1833, and 1834; but, as his remarks are directed to a question affecting places *northward* of his locality, I think it better to confine my illustration to the northern parts of America. Capt. Ross, however, supplies no information later than the middle of October, 1833; of course, therefore, I have no means of ascertaining whether the meteors of Nov. 13. 1833 were seen in the arctic regions, or whether any derangement of the atmosphere occurred there at that time; but on Nov. 12, 13. 1832, there was a gale there of great violence. "Whether there was or not a great rain to the north-west in the United States, previously to Nov. 13. 1833," Mr. Espy may be able to learn: it is on this his hypothesis depends. But, if that be necessary to produce meteors, meteors ought to follow rain, and rain follows volcanic eruptions and earthquakes; in general, however, meteors also precede rain.

Dates of remarkable sudden changes of the weather, on the north coast of America, from Ross's *Narrative of a Residence in the Arctic Regions*, correspondent with depression of dew point at Philadelphia : —

1832.

Jan. 19—25. Violent storm from N.W., with cold; north wind followed. page 624.
Feb. 17—21. Stormy and cold. Storms afterwards on the 24th; temperature down. p. 627.
March 14—16. Strong north-west winds; thermometer down. p. 628.
19. Very rough weather. p. 628.
25. and 26. Gale till afternoon of the 26th. p. 629.
April 19—22. Snow; very cold, with wind; on the 21st, the thermometer at 18°. p. 632.
May 22, 23. North gale and drift snow. p. 642.
Aug. 25. Cold northerly wind and freezing. p. 660.
Sept. 4—8. Gradually colder, with snow and cold winds. p. 665.
Oct. 16. An uncommon storm; with intense cold from the 10th to the 16th, at noon. p. 680.
23, 24, 25. Continuance of storms. p. 681.
Nov. 12, 13. Blew hard; thermometer at 37°. p. 684.
20. Wind from E. p. 684.
Dec. 17—23. Thermometer fell to 43°; succeeded by fresh gale on the 23d. p. 687.

1833.

Jan. 11, 12. Stormy; raising the thermometer from 18° to 20°. p. 689.
13. Perfect storm.
20, 21. Blowing hard. p. 690.
27, 28. Blowing hard. p. 690.
Feb. 5. and 7. Violent gales; freezing the mercury. p. 690.
24—28. Thermometer suddenly rose from 36° to 6°, and then to zero; falling again to 23°. p. 691.
March 1—6. Dreadful gale and drift snow: temperature fell, on the 2d, to 40°; and, on the 4th, to 43°. p. 693.
July 30. Fog. p. 712.
31. Rain and sleet; east wind blowing hard. p. 712.
Aug. 8—15. Variable, north-east wind. p. 713.

N.B. The above are all mentioned, in the account of the *Voyage*, as *changes* from a quieter or milder condition of weather.

There is one case of depression marked by Mr. Espy (August 8. 1833), to which he has himself offered an illustration (p. 234). It is contained in a letter from Mr. Walker of Philadelphia, detailing observations by Mr. Riggs and Mr. Black of that city, on the night of August 7–8. The facts are most curious, and deserve to be registered.

The three gentlemen named above were observing, about midnight, the occultation of the star *m Ceti*: two saw with telescopes, the other without, numerous falling bodies before the moon, like flakes of snow or burned embers, or the white ashes of burning pine: they were light, and fell in a waving manner; they cast a slight shade over the moon, and were

falling nearly ten minutes: they were supposed to be meteors, which were obscured by the brightness of the moon, being only partially opaque. Now, whether these were meteors or not, the occurrence is singular. It is certain, that on Aug. 4. there were meteors in Hungary, with snow on the Alps succeeding (see *M. N. H.*, vii. 299.); and on the 10th, a display of meteors seen in Worcestershire (see *M. N. H.*, vii. 386.). The only thing which puzzles me in this account is, that the meteors should not have brilliance enough to appear bright out of the moon's disk, and yet should be opaque enough to cast a shadow over it. I presume the idea of an eruption in the moon is out of the question. The dew point, on the 7th, was 73°; in the night of the 8th, there was a great rain; the weather on that day was precisely the same as that of Nov. 12., with a westerly wind; and on the 9th, the dew point was 52°. Mr. Espy thinks a vortex of downward air took place s.w. of Philadelphia on that day, from the cold upper current. He also concludes, that, if *meteors are formed, as he has indicated, from a northern upper cold current, containing less caloric to the pound than the air below*, it will account for several remarkable phenomena, such as sudden cold in patches. Examples are furnished as follow, from the month of May 1830, which I also arrange in a tabular form: —

1830.	*Examples of severe Frost.*
May 9, 10—23.	At Cambridge, U. S.
10—22.	Albany, Hamilton,
9—21	Canandaigua.
9—22.	Fredonia.
10.	Canajoharie.
10—23.	Cherry Valley, Kinderhook, and Louisburg.
26.	Franklin: thermometer 24°; ice quarter inch thick.
22.	Franklin, Oxford, and Cazenovia.
9—20.	Lowville.
8—24.	Middleburg.
10.	Union Hall.
13.	Washington.
	Examples of Auroræ.
May 9.	At Canajoharie and Hartwick.
10.	Kinderhook.
11.	St. Lawrence.
13.	Delaware.
14.	Canajoharie, Hartwick, Pompey, St. Lawrence, Utica.
15.	Delaware, Kinderhook, St. Lawrence, Union, Cazenovia; and very bright at Utica.
19.	Fredonia.
22.	Union.

From these facts it would certainly appear that these auroræ were low in the atmosphere, and that they were connected with the sudden reduction of temperature at the times in question, occurring in the same insulated manner.

Mr. Espy considers that an upper current of cold air overlapping one near the surface, containing, under the same pressure, 30° or 40° less than the one below, would produce a vortex. He refers the enquirers, as to the mode of formation of this upper cold current, to a future number of the *Journal*, which is to contain an essay on hail, in which this question is resolved. The uppermost strata of the atmosphere are known to be in constant motion from the south-west, throughout the whole northern temperate zone. [Mr. Redfield has shown in Silliman's *Journal*, xxviii. 155., that the proportions of westerly surface winds in the state of New York are 647 in 1000, and, of the upper wind, 912 in 1000; and it has been demonstrated elsewhere that a s.w. wind blows constantly over the United States.] Now, "the caloric evolved by the condensation of vapour into rain causes about five times as much expansion in the air containing the vapour, as condensation by change of vapour to water." (*Espy*, p. 237.) In all rain, then, there is an expansion, and, of course, an upward motion; hence, an outward motion in the upper, and an inward motion in the lower, part of the cloud. Thus, a great rain in the north causes a surface current from the south, and an upper (not the uppermost) from the north. The overlapping part after the rain must be very cold; and an upward vortex may be caused by a sudden rarefaction of the air in some cases of rapid condensation. Mr. Espy considers this *upward* motion as the *cause* of atmospherical depositions.

I have been careful in giving a correct analysis of Mr. Espy's reasonings, because they illustrate many of the positions I have endeavoured to maintain in these essays, respecting winds, auroræ, and other connected phenomena. I must confess, however, that, if his notion of the formation of meteors be correct, with what more powerful reason have I a right to insist upon *volcanic* action, as instrumental in producing an *upward* vortex! If, then, my appeal to volcanoes be, as he seems inclined to consider, "a wild speculation, or visionary theory," in the general, thus far he must allow that I have reason on my side in assuming heat suddenly developed from the earth's surface as instrumental in the formation of those phenomena, which, however immediately produced, are, unless we deny the evidence I have already brought forward, intimately and inseparately connected.

Mr. Olmsted's cometic theory, against which I have written, must, whatever be the fate of the volcanic agency, be thrown away. That gentleman is not the first who has laid meteoric phenomena to the charge of a comet; nay, Riccioli, Gregory, Maupertuis, and others, have gone so far as to conclude that,

because comets have appeared in years famous for earthquakes, therefore those earthquakes were caused by those comets.* Leaving them and Mr. Olmsted to ride their comets through the heaven of invention, we may more safely trust ourselves to a volcanic steam-carriage, from which, if we be ejected, we have not far to fall; and, unlike Phaethon, who fell through a distance equal at least to the tail of the Olmstedian Pegasus, we must, after all, light upon *terra firma*.

I would by no means presume so far as to think that I must be right, because I think Mr. Olmsted is wrong: but I would appeal to the coincident and correspondent phenomena which I have quoted already, and to the many well-attested facts of the same kind not yet quoted, which I reserve for publication, if I live long enough to prepare my "rudis indigestaque moles" for the press, in the shape of tables of all natural phenomena from the beginning of history to the present era; and I ask, confidently, whether, when meteors have been known to emanate from the earth during its convulsions, and to appear in the air at a corresponding period; and when it has been demonstrated, as clearly as evidence can demonstrate, that all natural phenomena of the kind may be referred, indirectly or directly, immediately or inductively, to derangements of the terrestrial organism; and that no circumstance of electrical agency or electrical production has been found not capable of being proved to be, at some period or another, actually coincident and contemporaneous with volcanic convulsions; it be not a more natural and reasonable hypothesis to assume the volcanic origin of these occurrences, than to take second causes for first causes, or to soar up on the wings of absolute conjecture to the third heaven of the cometic paradise, where I confess myself too much of a geologic Sadducee to wish to enter.

If Mr. Espy's theory be correct as to the manufacture of meteors, *provided he can produce a vortex*, I will engage that he shall be supplied with materials for his use, and vortices in abundance, so long as Vesuvius, Etna, Hecla, the Andes, &c. &c., and the earthquake foci, continue to rarefy the lower strata, as they must invariably, whenever Enceladus under Sicily, or Peli under Owhyhee, or any other volcanic spirit or deity, kindles the subterranean fire; or whenever Neptune passes an hour in the boudoir of Terra, a notion equally poetical, but, perhaps, more scientific, than the other theories of the mythological geology.

As this paper will conclude my observations on meteors, I

* See refutation of this notion, in *Edin. Rev.*, No. cxxiii., April, 1835 vol. lxi. p. 82.

append a selection of examples of correspondences between terrestrial and atmospherical phenomena, in addition to those scattered up and down the previous essays. The former set (No. I.) are taken chiefly from Bertrand's *Mémoires sur les Tremblemens*, &c.; the latter (No. II.) from Muratori's *Annali d'Italia.*

No. I.

Instances in Switzerland, from Bertrand.

1001. Earthquake in Switzerland, doing great damage The chronicles state that many fiery meteors were seen at the same time; and that, in the winter following, the cold was excessive.

1021. May 12. Basle cathedral and many houses overturned into the Rhine; the springs throughout all Switzerland were troubled, and many appeared red as blood. In different parts of Switzerland were seen fiery meteors. There were also great floods in divers places. (*Buxtorf, Sermon sur l'Eversion de Lisbonne.* Basle, 1755, p. 50.)

1534. Oct. Earthquake at Zurich, contemporaneous with a frightful storm at Zurich and Lucerne.

1538. Jan. 28. Earthquakes throughout the canton of Berne. Many fiery meteors seen after these shocks.

1557. April 24. Earthquake at Zurich and Vinthertur. At the latter (1556), a fiery meteor was seen surrounding a tower. (*Ce Phénomène avait-il quelque rapport avec le tremblement qui devait suivre? — Bertrand.* The question is asked as if the writer thought it had.)

1614. Basle experienced two violent earthquakes on Feb. 17. and Sept. 24. Terceira was also shaken in the same year. In Basle there were seen, this year, fiery meteors (called dragons-ardens) in the air, on June 25., 9 A.M. (Y avait-il quelque rélation entre ces phénomènes? — *Bertrand.*)

1618. The Valteline, Pays de Vaud, and Neufchâtel. Many fiery meteors seen afterwards in the air.

1661. Jan. 8. or 9., 11 or 12 P.M. All Glaris shaken. Jan. 20., at 7 A.M., a globe of fire, very intense, appeared to fall from the sky in the canton of Glaris; seen also at Wedischwyll, at the same time. Besides other shocks, on March 27. there were violent tremblings at Aigle and in the Valais; followed, on the 28th, by thunder, and hail of an enormous size.

1668. April 20. Glaris agitated; noise under ground, and great vapour after the shocks.

1670. July 7. and Sept. 18. Glaris shaken; a murmur in the air.

1672. Dec. 12. Earthquakes at Uster, Eglisan, and Kybourg, and other places in Zurich. It had been cold; but the season became suddenly milder.

1673. Feb. 13. Shocks renewed in Glaris most violent on this day; followed by a great fall of snow.

1674. March. At Yverdun, canton of Berne, a noise in the air, followed by earthquake and vapour.

Dec. 6. Nearly all Switzerland and the neighbouring countries shaken; particularly violent at Basle. Hohen-Saa, in Zurich, and the canton of Glaris also, were greatly agitated, especially Nafels. A little after, two globes of fire, or fiery meteors, were seen to fall from the sky. In 1672, Jan. 24., a similar phenomenon was seen

at Zurich; and on Feb. 22. and March 21., in other places; and in 1676, March 29., at Turgovie, at 11 P.M.: supposed to be the ignition of sulphureous vapours in the atmosphere. [On March 21. (April 2.) 1676, a great meteor passed over Italy, making a great noise. (*P. T.*, 1714.)]

1680. July 24. Many places in Switzerland, particularly Neufchâtel, Yverdun, and Orbe, were shaken. At Orbe there was, for several minutes after, a long murmuring sound. The shock was immediately followed by storms of wind and hail storms, and extraordinary rains. Great inundations also took place; and so much water was never before seen near Orbe and Yverdun. [On May 22., this year, there was a great meteor all over Germany. (*P. T.*)]

1688. A year of storms and tempests, which desolated Switzerland nearly throughout. Naples and Smyrna were nearly overthrown this year.

[1692. Jamaica shaken; followed by a stinking vapour, which caused the sky to become as red as an oven. (*Relation, &c.*)]

1693. Jan. 9. Shocks felt severely at Lausanne, Orbe, Yverdun, &c.: lakes unusually high. The season was very cold; but it became warm all at once. Same day, Sicily and Lower Calabria violently shaken, and injured.

1704. Nov. 4. (between 4 and 5 A.M.) Zurich and its territory shaken. At the same moment, a violent wind, with lightning and thunder, and abundant rain, occurred at Basle.

1720. December 20. (5½ A.M.) St. Gall, Turgovie, and the Lake of Constance shaken. The shocks accompanied by noise, sulphureous vapours, and a hot wind. At St. Gall, on the 19th, there had been a stinking south wind, accompanied with dust. After the shock, a violent rain, S.W. wind, and hot air. The barometer at Zurich on the 19th was 26·5¼ in., and on the 20th at 26·3. Feb. 26. A trembling at Eglisau. Oct. 18. A shock at Neufchâtel, accompanied by a violent tempest. The springs were troubled.

1721. July 3. The whole canton of Berne was violently shaken. At Porentrui there was a great noise, and the shock was followed by a powerful odour. In Alsace, Lucerne, and Zurich, it was also sensibly and seriously felt. A piercing cold was felt immediately after, but it did not last long. Some days after the earthquake, there were great storms, which did much damage in Italy. That year, there appeared different phenomena in Switzerland and elsewhere; they were observed at Berne four following days in January. It may be remarked, that there were sensible earthquakes in Hungary on April 4.; in Persia, 9th, when Tauris was destroyed with many inhabitants.

1723. April 18. Glisau shaken, followed, in 1724, by tremendous floods there. The rain which fell in 1723, at Eglisau, was 31·1¼ in. (*Acta Berolinensia*, 1727, p. 108.)

1728. August 13. (4, 5 P.M.) Great earthquake at Berne, Zurich, Basle, Eglisau, Strasbourg, and in Rhenish Germany; the shocks continued till past midnight. At Berne and Geneva there was a terrible tempest, contemporaneously, the preceding day. The Rhine was, after the shocks, greatly swollen.

1729. January 13. (10, 11 P.M.) At Lausanne several shocks, with a smell of sulphur. At Berne, and especially on the Lakes of Thun and Brientz, they were also felt, and great mischief done. The shocks at Frontigue were periodical in their occurrence, 10 P.M. and 7 A.M. The night was very cold, but fine. A gentle wind blew from the south, which increased and ceased by turns; and

when it ceased, the shocks came on. These shocks were felt at Geneva, and there again, on January 18. (9¼ P.M.), on the Lake of Constance, in the Pays de Vaud and Zurich; at which latter place they were preceded several days by lightning as in summer. There were earthquakes this year in Italy and Sweden.

1739. Night of January 17—18. There arose such a storm in Switzerland as was never remembered; whole forests were torn up by the roots. It was felt by sea and land all over Europe. [Vulcano (Lipari) was in eruption in 1739, as well as Tobaltschink in Kamtschatka, which was violently agitated. In November, 1738, there were earthquakes in England; in 1737, in the Valais and Pays de Vaud, and Vesuvius was in eruption. The year 1738 was a rainy year.

1755. Nov. 1. The earthquake of Lisbon. At Augsbourg all the needles changed their position at the time of the shocks, as well as in other parts of Germany. There was also a strong S. E. wind at Augsbourg. The barometer at Berne was at 21·10 in., and fell in the evening to 25·6 in. Reaumur's thermometer, to the north, unattached, was, at 6 A.M., at 2½° above zero (say 37° F.); in the evening it was 6° (say 45° F.).* The mean height of the barometer at Berne is 26·2 in.; at Zurich, 26·5 in. (*Scheuchzer*); at Basle, 27 in. During the night there was an extremely violent west wind at Basle. The barometer was there at 26·2½. At Lisbon it was 27·7 in. It is seldom so low at Basle as then. There was a violent tempest there at the time. At Lisbon the thermometer was at 14° (64° F.); the wind N. N. E.

1755 and 1756. (Nov. 18. and 19., Dec. 9., Dec. 17., Dec. 27.) There were numerous earthquakes all over Italy, France, Germany, Switzerland, &c. The particulars are too numerous and long for extract here. (See *Bertrand, Mém.* iv. and v.) The accompanying phenomena were such as are before given. Some of them deserve notice now.† At Berne, Dec. 9. was the coldest day of the season: the thermometer suddenly fell from 8¾° above zero to zero (diff. 51° F.). The season became mild and moist afterwards. At Yverdun there was a smell of sulphur. In many places there was a sound as of a great hail, though there was none; and this was also heard as well where there were no shocks as elsewhere. In the valleys of Neufchâtel there was a great snow since October, without being cold. It fell again with an air much warmer than corresponded with the season or time. Dreadful rains followed; in Languedoc there was an impetuous north wind. All the lakes, rivers, and springs overflowed in Switzerland after Dec. 9. The rain could not have caused this. Subterranean waters were disgorged in the Pays de Vaud, after three years drought. No such floods ever known amongst the mountains of Basle (*Gagnebin de la Ferrière's Relation*), and never such storms as on Jan. 13. and 19. At Morat the magnetic needle declined to the west at the time of the shock; and elsewhere singular changes of the poles took place. ("Y a-t-il eu quelque changement dans le cours de la matière magnétique qui environne le globe? La chose n'est pas impossible.") At Aix, in Savoy, there was a smell of sulphur. The shock of December 27. was preceded, at

* Thermometer at Berne, Feb. 2. 1830, was 8½ F. below zero (*M. N. H.*, vii. 246.)

† Nov. 18. 1755, there were earthquakes in New York and Pennsylvania.

the foot of the Pyrenees by (une grande clarté rougeâtre), probably an aurora, from 23d. On the 27th it ceased at 3½ A. M., and was followed by shocks preceded by subterranean noises. On Feb. 18. 1756, the shocks were renewed at Aix; and many months afterwards the springs were more abundant and troubled. On Dec. 23. 1755, an extraordinary burning meteor preceded the shocks at Canigu and Roussillon in the Pyrenees. On Dec. 9., at Einsidler-Hoff and Linden Hoff, the shocks were succeeded by a smell of sulphur. In some places this was accompanied by a vapour, or thick fog, supposed to come from Mont Hütli. Wine was thickened in high places. At Basle the thermometer rose from 6° to 1½° (18° to 35° F.). Barometer at 27· 4 in. (*M. de Bavière.*) At Brienne there was a murmur in the air and under ground also (puffing off the waste steam?), as of a south wind. The springs were immediately thickened. At Lucerne, the night before, the lake was frozen, and the ice grounded; and a little after the shock the ice was dispersed by a hot wind, which turned to the S. W. At Lichtenteig there was a smell of sulphur, and a trembling after the shocks. On Oct. 1. 1755, there was an extraordinary fall of snow at Brigue, which suddenly melted by a south wind, causing dreadful damage. The snow was scarcely frozen. At Lucarno, Aug. 14. 1755, the air, after a violent wind, was all at once darkened, and the atmosphere became red all over. There fell such a quantity of rain in the valleys, which was snow on the mountains, that in fifteen days it amounted to 47 in., much more than falls there generally in the year. The Lago Maggiore rose 10 ft. This rain was also red, and deposited an earthy red matter an inch thick in every 9 in. of rain. The snow was also coloured red. This was *not vegetable* matter. In various parts of Switzerland there were sudden eruptions of water, where none had ever occurred before; and springs suddenly dried up. From Dec. 21. to 27., there were continued earthquakes at Brigue; and snow fell in different places at those times. At Brigue there were shocks on Jan. 2. 7. 12, 13, 14, 15. 18, 19. 21, 22, 23, 24, 25, and 27. On the 8th, the weather was intensely cold; on the 13th, a violent wind all night. The shocks occurred, on the 14th, at 2½ A.M. On the 19th, the air was very cold. On the 21st, snow and cold. On the 24th, north wind; dry and cold. [The weather was warmer on the quiet days.] From Feb. 6. to 13. there were, at Brigue, noises every day. On the 14th, slight shock; snow and cold. On the 15th, very violent shock; hard gale. On the 16th and 17th, quiet; but winds and fogs. On the 18th, several shocks, followed by a great storm. The Rhone was generally agitated before the shocks; during them it sometimes boiled, chiefly during the most violent. After sunset, long, dim, and rectilinear clouds traversed from the south to the north. Never was such a storm known at Brigue as during 1755. A south wind did incalculable damage. The days were very hot, the nights cold, whilst the agitations lasted. All the game driven away by mephitic vapours.

756. Feb. 18. Switzerland, Germany, all Holland, Flanders, greatest part of France, &c., shaken violently by repeated shocks, almost everywhere followed, a few hours after, by a frightful and destructive storm, from S.S.W. At Berne, the thermometer was excessively high, the barometer excessively low. The thermometer was 12° above freezing (59° F.) On the 19th, it was, at 6 A. M., 10½°,

or at 29° F.) The weather continued very hot for the season, the last week of Feb. and till March 12.

June 7. Shocks at Neufchâtel. On March 3. at Berne, in the Pays de Vaud, in Basle, and elsewhere, a fiery meteor between s. and w. At Vevay it was as big as the moon; it resembled a rocket with a globe at the end; it lasted a short time, but had an extensive course. (*M. Muratori*, &c.) The same meteor was seen at Aigle, the same day, and another on March 5. On 3. 5. and 7. the earth trembled at Brieg. (*M. de Coppet.*) On Oct. 23. 1755, meteors were seen in Sweden; Dec. 9. at Como; 23d, foot of the Pyrenees; March 3. and 5. at Avignon; all during the shocks of that year, &c. (*M. de Coppet*). More rain fell in 1756 than was ever remembered. Padua and its environs were visited by a most extraordinary storm on Aug. 17. that year. On Oct. 6. 1756, there happened a more violent hurricane than ever remembered in England. (*Polehampton*, iv. 246.) And on Sept. 29. there were violent inundations in the Neva, occasioned by gales in the North Sea. (*Tooke.*)

No. II.

From Muratori.

990. Aurora borealis twice; then earthquakes, which overthrew the houses in Beneventum and Capua. Authorities given by Muratori, tom. v. 487.

1117. Beginning of year all Italy shaken for forty days. Clouds of smoke and blood (?) near the earth, and strange sounds. (*M.*, vi. 385.)

1456. Aug. 22. Frightful tempest and wind in Tuscany, destroying life and vegetation, &c.

Dec. 5. Earthquakes for several days, destroying buildings. (*M.*, ix. 462.) Bertrand mentions that these earthquakes were felt in the Pays de Vaud, producing great floods, and also at Ancona, raising the sea. (p. 39.)

1693. Jan. 9. Earthquakes in Calabria and Malta. Etna in eruption. The lightning at this time burnt the powder magazine at Syracuse. See No. I. the same day. (*M.*, xi. 412.)

1698. June. Vesuvius in eruption. (*M.*, xi. 436.)

June 20. Powder magazine at Turin destroyed by fire; Muratori says, "fulmine *figlio della terre o delle nuvoli.*" (xi. 437.)

1726. Palermo destroyed; shocks preceded by murmuring in the air for a quarter of an hour, at the beginning of the night, when there was no wind. Two beams of fire were seen to arise or descend, mingling with the sea; then, at the fourth hour of night, the shock. (*M.*, xii. 145.)

Feb. 7. and July 7. There were shocks of earthquake at Eglisau, Hiltenberg, Berne, and in the Pays de Vaud, Froutigne, and Sibenthal especially. Springs became turbid. (*Bertrand*, p. 94.)

1727. Nov. 5—7. Vesuvius in dreadful eruption; much lightning and thunder, and so much rain, that Naples was overflowed. (*M.*, xii. 152.)

1731. Feb. Great earthquake at Basilicata. Waters rose 9 ft. and overflowed vineyards. (*M.*, xii. 176.)

1729. Oct. 12. Dreadful tornado and hurricane from Ferrara to the Po. Clouds hurled along by two opposite winds in thick darkness, with flashings of fire and hail. (*M.*, xii. 160.) See *Bertrand*, No. I. 1729, above.

1702. Beginning of great inundations of the Tiber, preceded by earthquakes

from end of January, which shook Rome through April, May, and June. (March 8. Etna erupted.) From Oct. 19. 1701, to Jan. 13. 1702, Glaris shaken throughout. In 1703, Nov. 26. occurred the famous great storm. (*Bertrand*, p. 85.)

1709. Spring so cold, that the Po and the Lagunes of Venice froze, and carts passed over. Vines and olive trees frozen through. (*M.* xii. 61.) Vesuvius was in agitation from 1704, more or less during the whole period, till 1737. (*Auldjo and Daubeny.*) From 1707 to 1709, Little Kameni was being formed. (*Lyell*, i. 386.) 1706, May 5. Teneriffe was shaken. 1707, Santorini was in eruption; on Jan. 24. (Feb. 18. O. S.) there was an aurora at Copenhagen; on Nov. 10. an aurora in Ireland. 1708, July 31. a meteor seen all over England (*P. T.*); and on Aug. 9. and 10. 1708, an aurora at London. On May 18. 1710, there was an extraordinary meteor in Yorkshire. (*P. T.*)

There were meteors also on March 19. 1718—1719; and all over Germany, on Nov. 7. 1623; in 1718, there were earthquakes in Switzerland, from July to December; and on March 6, 7. a violent earthquake at St. Vincent's; Vesuvius being in eruption (from June 6. 1717 till) 1718. El Pico was in eruption also this year; and on June 3. an extraordinary water-spout fell in Lancashire. In 1623, there were earthquakes all over Switzerland, and through Germany to Holland. The following coincidences may be also marked: —

829. Earthquakes, followed by boisterous winds; in 1180 by storms and rains; 1380, by storms; 1470, by snow and excessive cold; 1533, by storms; 1576, by great cold; 1584, by rains and thunder, and hail of stones and earth; 1601, by great rain and floods, and the drying up of rivers; 1607, on April 2., in the Pays de Vaud, followed immediately by storms; 1619, by violent winds and storms; 1622, the same; 1630, by great cold; 1645, followed instantly by a heavy gale from the west; 1648, ditto; 1650, Sept. 10., at Berne, preceded, Sept. 9., by a violent hurricane; 1652, preceded by fiery meteors in 1651; 1654, by storms.

I trust these instances will be sufficient to furnish proof that I have not advanced my position without ground to rest it on. The desire to establish it, as strongly as possible, has led me into a longer discussion than I had intended: but it is to be remarked, that, if Professor Olmsted's comet have any actual existence, some of my ideas are untenable; and that must plead an apology with the readers and correspondents of the *Magazine of Natural History.*

Stanley Green, June 18*t* 1835.

[Mr. Clarke had intended to insert the following addition to his essay into it, at the point immediately antecedent to the paragraph which is begun with the words, "The month of March," in p. 429.]

It would appear, that the electricity of the clouds met with

some opposing electricity from the earth, which prevented the ordinary effects of the atmosphere, or in some way modified or altered the ordinary electricity of the clouds. The earth, at this time, was certainly greatly agitated. The province of Chili was desolated, on Feb. 20., by an earthquake, which destroyed all the towns and villages within a circuit of 200 miles, including Talpa and Conception, the sea rising 33 ft. above its usual level. (See, amongst others, extracts from letters in the *Globe* of July 6.) About this time, or rather before, Groenloer, in Java, was in violent eruption, attended by inundations and other remarkable phenomena (*Journal de la Haye*); and from November to March, including the periods of both these events, such a drought existed in New South Wales, that vegetation ceased: the vines and trees were destroyed; the rivers dried up; lakes became nearly dry; and the downs took fire. (*Sidney Papers.*) It may be objected that this occurred in the southern hemisphere; but the evidence is good, nevertheless, since the earth was actually in agitation from Chili to the West Indies, between Jan. 22. and Feb 20.; and, for anything known to the contrary, the effects may have, from these agitations, extended still further north, even if they be not *indices* of a general commotion. One little fact must be here mentioned. About Rye and Hastings there has been no considerable quantity of rain since Feb. 1833. Romney Marsh is in a state of absolute ruin. Now, it has been observed, that, during this period, there have been immense "shows for rain;" but the clouds no sooner have advanced over the droughty district, than their character has changed, and they have been driven away without discharging a single drop. — *July* 10. 1835.

[*Corrections required in previous Contributions by Mr. Clarke.*] — In Vol. VI. p. 461. line 7. for "Rhine," read "Rhone."— In Vol. VII. p. 294. line 29. for "evening," read "morning;" p. 627. line 4. from bottom, for "the Carib sea," read "a wide tract of sea and land."—In Vol. VIII. p. 143. line 31. for "del due," read "delle due;" p. 152. line 6. from bottom, for "19th," read "12th;" p. 156. line 21. after "on," read "end;" p. 158. line 9. from bottom, for "danso," read "dancing;" p. 225. line 9. for "Rhine," read "Rhone."

[The following communication, by Mr. Brown of Thun, is that alluded to by Mr. Clarke in p. 428. note †, to whom we had submitted it, that he might place it in its point of fullest relevance to his views; and we cannot apprehend Mr. Brown's disapproving of the liberty we have taken.]

"Mr. Clarke having noticed (VIII. 130.) that extraordinary storms and inundations had occurred in Switzerland in 1817 and 1834, on Aug. 27. (and no one who was not in the midst of the last, can form any idea of it), I can add another instance of that being a day marked by the Fates, at least the dawn of it. Whether or not he may be able to connect the circumstance with the hurricane at Nevis, on Aug. 17. 1827 (VIII. 25.), I cannot judge.

"After a good spell on the Alps of Piedmont, I had worked my way back into the Valais, and promised myself a holiday on Aug. 25. 1827. This is occasionally necessary, not only to repose your aching bones, but to arrange your booty, and, by consigning to the care of the postmaster all such portions as may be in a state for travelling without injury, to lighten your knapsack, in the hope of soon charging it again with a fresh harvest. While employed in this pleasant occupation, near an open window, through which was seen a sky promising a long continuance of fine weather, I felt a sudden puff too strongly indicative of a change to be mistaken: in a few minutes my half-formed bundle was hasily tied up for the post, and, the remaining plants being strapped on my knapsack, I was soon again *en route* with a light heart, and no other regret than what arose from the impossibility of crossing the Alps on the same day. Next morning, the 26th, at the earliest dawn, I was but too happy to find that all continued fair; and I hoped for the best, as unfavourable changes seldom occur during the first few hours after sunrise. Starting for the Grimsel, I contrived as well as possible to keep one eye on the plants, and the other on the opposite chain of mountains; looking out for some malignant tuft of cloud, like a single black sheep in the middle of Salisbury Plain. On arriving at the Hospice, after five or six hours' good exercise, they thought me joking when I declared my intention of proceeding immediately onward in order to avoid the coming storm; as no change had been noticed in the atmosphere, and not a speck was visible in the sky. After a slight rest, I continued my course; and an hour and a half had scarcely brought me to the Handeck, when I saw that the part from which I had just descended was exposed to a raging hurricane, and that all was white with newly fallen snow. Away I went, and away came the storm, sweeping down the valley after me. I beat it as far as Hintere Urweid, where it pounced upon me with a vengeance: all danger was, however, past, as I was some leagues too low down to be exposed to any thing worse than a drenching rain. During the night which followed, the snow continued to fall in the elevated regions, and on the

27th was six feet thick on parts which I had passed the previous day, culling some of Flora's choicest gems. The frost on the morning of the 27th was so intense, that several persons perished. On the afternoon of the 26th, a man proceeded from Hospital to the St. Gothard, intending to sleep at the inn near the summit of the pass, and only three leagues from Hospital: he was found, the next day, by the postilion, dead and frozen. Two men (father and son), who had started from Wasen to pass the Susten, perished also when about half way up the zigzag road leading from the Hundsalp to the Steinengletscher. When found, next day, by the herdsmen, who were seeking their cattle, the father was quite dead; but the son, who was about a gun-shot in advance, showed signs of life, and was taken to a chalet, where he died about four hours afterwards. The son of a gentleman of my acquaintance, having taken his degrees in medicine, was enjoying an excursion previously to settling himself in practice. Being in the valley of the Vordere Rhein, he set off, on the 26th, for the Canton of Glarus, by either the Panix or Dodi pass (I am not quite certain which). Before starting, he purchased from the innkeeper, for five batzen (7*d*. English), an ugly young cur dog; without any assignable reason for possessing himself of so vagabond-looking a brute. He commenced his journey in company with two peasants who were going the same way; but having, when crossing a small bed of snow, trodden on a stone concealed beneath the surface, he slightly sprained his foot, and fell gradually into the rear: the pain increased, and he went still more slowly; till, being overtaken by the dusk and the storm, he sank down, became insensible, and, remaining in this state all night, was covered by the snow to a considerable depth. The dog remained by him, and, in the morning, seeing some men passing on the snow at a considerable distance, he barked, howled, ran towards them, and returned showing every sign of distress. They followed him, removed the snow, found his master unconscious of all that was passing, and, by bearing him to the nearest asylum, succeeded in restoring him to life.*

"On arriving at Thun, I found that up to Aug. 24. the temperature had been very variable, ranging from 81° to 66° in the day, and from 68° to 53° in the morning and evening, (8 A.M., 10 P.M.), but that no rain had fallen; on the 25th, it was 56° at 8 in the morning, 52° at 3 P.M., and 50° at 10 P.M.: the day rainy. The 26th, at the same hours, 51°, 54°,

* If, as is very likely, I gave a detail of the circumstances of this storm to my friend Mr. Carne, it is possible he may have spoken of it in his *Letters from Switzerland*, which, by some mischance, I have not yet seen.

47°, rainy. The 27th, 50°, 52°, 49°, rainy. The 28th, 53°, 59°, 50°, cloudy; after which the weather resumed its usual state and temperature. During the whole of this time, the barometer, which is, in general, very sensitive, although with a limited range, remained fully as high as is usual in fine weather, and its extreme variation was not more than the fifth of an inch."— *P. J. Brown. Thun, Canton of Berne, Switzerland, June* 22. 1835.

[The incident, related by Mr. Brown, of a dog's inducing the discovery of its master, buried in the snow, in a state of unconsciousness, but not dead, may be used to call to mind the affecting fate of the wanderer whose corpse was found, some years ago, half buried in the snow, "deep below the slippery ridge that separates Helvellyn from its lofty neighbours," from which he, it is concluded, had fallen in a terrific storm which had occurred twenty days before. His still faithful dog was found, alive, stretched out beside its master's corpse. This storm occurred at night, successive to a remarkably fine spring day. See the narrative entitled "The Wanderer's Fate," in *The New European Magazine*, vol. iv. p. 508—514; and see Scott's and Wordsworth's poems on the same subject.—*J. D.*]

ART. II. *Notes on the Habits of the Heron.* By CHARLES WATERTON, Esq.

OF all the large wild birds which formerly were so common in this part of Yorkshire, the heron alone can now be seen. The kite, the buzzard, and the raven have been exterminated long ago by our merciless gamekeepers. Ignorant of the real habits of birds, and ever bent on slaughter, these men exercise their baneful calling with a severity almost past belief. No sooner have they received from government their shooting license, than out they go with the gun, and, under one pretext or other, they kill almost every bird which comes in their way. Our game laws are at the bottom of all this mischief.

> —— "Illis, non sævior ulla
> Pestis, et ira Deûm, Stygiis sese extulit undis."
> Than these, a greater pest our statesmen never
> Sent from their old burnt house near London river.

Kites were frequent here in the days of my father; but I, myself, have never seen one near the place. In 1813, I had my last sight of the buzzard. It used to repair to the storm-

blasted top of an ancient oak which grows near the water's edge; and many and many a time again have I gone that way, on purpose to get a view of it. In the spring of that year, it went away to return no more; and, about the same period, our last raven was shot on its nest by a neighbouring gentleman.

In vain I now look for any of these interesting birds in our surrounding woods. They have been declared great destroyers of game; they have, in consequence, suffered persecution; and, like the family of poor Charley Stuart (God rest his soul!), they no longer appear on their own native land, in this district, where once they graced our rural scenery.

The heron, however, notwithstanding this hostile feeling, has managed to survive its less fortunate neighbours. Always on the look-out, it sees in time the threatened danger, and generally contrives to avoid it; for persecution has rendered it fully as shy and wary as the pie itself. Formerly, in this country, the heron was a protected bird, in order that it might afford pastime to the great; but, nowadays (as little or nothing remains of falconry, except a title which introduces the finger and thumb of the bearer into the public purse), the heron is abandoned to its fate; and the fishpond owners may waylay it with impunity, whenever an opportunity offers.

I attribute the bad character which the heron has with us, for destroying fish, more to erroneous ideas, than to any well authenticated proofs that it commits extensive depredations on our store-ponds. Under this impression, which certainly has not hitherto been to my disadvantage, I encourage this poor persecuted wader to come and take shelter here; and I am glad to see it build its nest in the trees which overhang the water, though carp, and tench, and many other sorts of fish, are there in abundance. Close attention to its habits has convinced me that I have not done wrongly. Let us bear in mind that the heron can neither swim nor dive; wherefore the range of its depredations on the finny tribe must necessarily be very circumscribed. In the shallow water only can it surprise the fish; and, even there, when we see it standing motionless, and suppose it to be intent on striking some delicious perch or passing tench, it is just as likely that it has waded into the pond to have a better opportunity of transfixing a water-rat lurking at the mouth of its hole, or of gobbling down some unfortunate frog which has taken refuge on the rush-grown margin of the pool. The water-rat may appear a large morsel to be swallowed whole; but so great are the expansive powers of the heron's throat, that it can

gulp down one of these animals without much apparent difficulty. As the ordinary food of this bird consists of reptiles, quadrupeds, and fish; and as the heron can only catch the fish when they come into shallow water; I think we may fairly consider this wader as not very injurious to our property; especially when we reflect for a moment on the prodigious fecundity of fish. Take the roach for example. It swarms here in multitudes sufficient to satisfy the cravings of every heron and every cormorant in Europe.

Should the lords of the adjacent fishponds ever read the contents of this paper, I would fain hope that their animosity against the heron will be diminished, and that they will order their gamekeepers to spare in future a bird which every body loves to see. Indeed, what can be more interesting to the ornithologist than to have it in his power to watch a dozen of these birds standing motionless on one leg, for hours together, upon some leafless branch of a tree; or to see them flapping their way over his head, on wings much more arched than those of any other bird that cleaves the liquid void?

The heron is gregarious during the breeding season; though sometimes a solitary nest may be found miles away from the place of general rendezvous. At other times of the year, the society seems to be dissolved; and the bird is seldom seen in this part of the country in parties of more than ten or twelve together. The nest appears like that of the rook, only often much larger; and it may be found on the willow, the oak, the fir, and the sycamore, and, probably, on many other kinds of trees, when they are in a place which affords security, and invites the heron to incubation. By the time that the young are ready to fly, the outside of the nest, and part of the tree which bears it, appear to the observer below as though they had been completely whitewashed: but the rains of winter cleanse the nest anew, and restore the branches to their former colour.

There is an old and vulgar notion, still current here, that, when the heron is sitting on her eggs, her legs appear hanging down on the outside of the nest. Probably the length of the heron's legs has given rise to this absurdity. A very slight inspection of the formation of the bird would suffice to convince the observer of his error. The thighs of all known birds are of a length exactly proportioned to that of the legs; wherefore, when a bird wishes to place itself in a sitting position, the bending of the knee causes the leg to recede sufficiently towards the tail to allow the feet to come to the centre of the body. This being the case, the heron places its legs in the nest with as much facility and ease as all other

birds place theirs. Indeed, it cannot possibly perform its incubation with its legs outside of the nest; and the admirable provision of nature, in always giving to birds a due proportional length in their legs and thighs, saves the heron from the necessity of attempting to place itself in such an unsightly posture. In fact, the formation of the parts would not admit of it; and were a bird, by any chance, to put itself in a position by which the legs would appear on the outside of the nest, we may rest assured that both great pain and great inconvenience would ensue, and soon force it to resume the common process of incubation. The thighs, by being stretched asunder, would be thrown out of their ordinary bearings; and the feathers, by coming in contact with the outer materials of which the nest is formed, would be forced into a direction quite opposite to that which they have received from the hand of nature. Hence we may safely conclude that neither the herons, nor any other birds of the creation, ever perform their incubation with their legs on the outside of the nest.

In the day-time this bird seldom exhibits any very extraordinary activity. Although it will fly from place to place at intervals, still it seems to pass the greater part of the time betwixt sunrise and sunset quietly on the bank of a stream, or on the branch of a tree, often with one leg drawn up under the body in a most picturesque manner. But, as soon as the shades of night set in, the heron becomes as anxious and impatient as a London alderman half an hour before the Lord Mayor's festive dinner. It walks up and down the bank, or moves from branch to branch with extraordinary activity, every now and then stretching out its wings, and giving us to understand, by various gesticulations, that it is about to commence its nocturnal peregrinations in quest of food. One loud and harsh cry, often repeated, now informs you that the heron is on wing, wending its way to some distant river, swamp, or creek. I suspect that this cry is never uttered but when the bird is flying.

Formerly we had a range of fishponds here, one above the other, covering a space of about three acres of ground. Close by them ran a brook, from which the water-rats made regular passages through the intervening bank into the ponds. These vermin were engaged in never-ceasing mischief. No sooner was one hole repaired, than another was made; so that we had the mortification to see the ponds generally eight or ten inches below water-mark. This encouraged the growth of weeds to a most incommodious extent, which at last put an end to all pleasure in fishing. Finding that "the green

mantle from the standing pool" was neither useful nor pleasant, I ordered the ponds to be drained, and a plantation to be made in the space of ground which they had occupied. Had I known as much then as I know now of the valuable services of the heron, and had there been a good heronry near the place, I should not have made the change. The draining of the ponds did not seem to lessen the number of rats in the brook; but, soon after the herons had settled here to breed, the rats became extremely scarce; and now I rarely see one in the place where formerly I could observe numbers sitting on the stones at the mouth of their holes, as soon as the sun had gone down below the horizon. I often watch the herons on the banks of some other store-ponds with feelings of delight; and nothing would grieve me more than to see the lives of these valuable and ornamental birds sacrificed to the whims and caprice of man.

I know, and freely avow, that the herons will catch fish (especially eels), whenever those fish frequent the shallow water; still these birds make ample amends for their little depredations, by preventing the increase of rats and frogs. Little, indeed, must be those depredations: for fishermen are allowed to come here, during the summer, in unrestricted numbers, and the herons have their nests in the trees which hang over the water; still there is always a most plentiful supply of fish.

If country gentlemen would grant protection to the heron, it would be to us, in some sort, what the stork formerly was, and is now, to our Continental neighbours; namely, an ornamental and a useful bird. Though it certainly would not be so domestic as the stork, still the protection afforded it would tend considerably to change its present habits. Nothing but the roar of guns, the prejudices of pond-owners, and the barbarity of gamekeepers, has rendered the heron a shy, degraded, and devoted bird.

Walton Hall, April 29. 1835.

["For many years Didlington Hall [in Norfolk] has been the only place in England, and almost in Europe, at which the ancient amusement of flying hawks at herns or herons has been practised. It has been customary to turn off the birds which were taken alive, with a ring attached to one leg, showing the time and place at which they have been captured. It is said that some of the birds have afterwards been killed in Germany. In a late Bristol paper there is an ac-

count of a heron having been shot near Caermarthen, in Wales, with a ring around one leg, having the inscription, "Major Wilson, Didlington Hall, Norfolk, 1822." (*The Bury and Norwich Post*, March 11. 1835.)

"The herons [of the common species] are abundant here in groups of from twelve to thirty. They seldom quit the same marshes except to roost. I observe that they feed on the large marsh ditch muscle, the individuals of which have been, from the dry season, much exposed. — *W. H. Hill. Southminster Vicarage, Essex, Feb.* 12. 1835. [The same correspondent has noticed, in a communication in VI. 452., "Of the heron I have counted twenty-three standing together in the marshes." The place of date is the same as above.

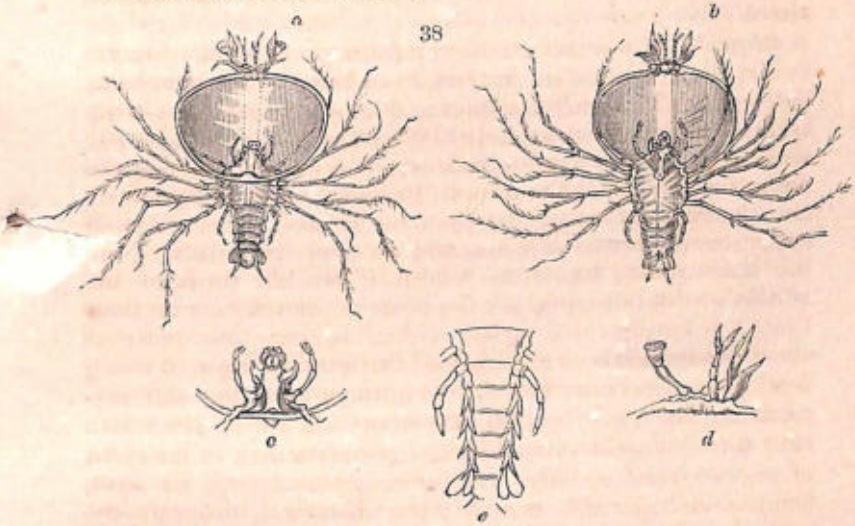
In VI. 515. is a notice of two fishing acts of the heron; and in V. 57, 58. is an extract from the *British Naturalist*, by Mudie, which includes information by this author on the heron's mode of fishing. In II. 206. a correspondent has noted that, "many years ago, an opinion was held among the fishermen of this neighbourhood [Bridgewater, Somersetshire], that the feet and legs of the common heron had something in them very attractive to fishes, and particularly to eels." He has there noted, too, that "most, if not all, birds of the *Ardea* genus, but especially the common heron, have on their breasts a considerable space void of feathers, the place of which is supplied by a well-defined dense tuft of down, to which is adherent a peculiar farinaceous substance, clammy and unctuous to the touch." Both these notices are in connexion with some remarks offered by our correspondent in the spirit of philosophical enquiry. A common heron, kept for some months in a garden, would, when disturbed, disgorge the contents of its stomach. (*J. G.*, in VII. 513.) One captured, carried in the arms, made a somewhat vigorous unexpected peck at the face of the person carrying it. (*J. D.*, VII. 514.) Herons, of the common species, may be bought, in Leadenhall and Newgate markets, at about 2*s.* each. (*G. Francis*, in VIII. 401.) We suppose dead ones, for stuffing. In VI. 387, 388., VII. 98, 99., are remarks, which incidentally supply some slight information on the ornithologic classification of the herons, and the kindred of these. It is shown in VII. 406, from Dr. Turton, that an allusion of Shakspeare's, which has been supposed to relate to the heron, relates to a very different object, an inanimate one.]

ART. III. *Illustrations of a Species of ? Phyllosòma* Leach and Latreille, *or of an undescribed Genus allied to Phyllosòma; and of Squílla Desmarésti Risso; as observed in a living Individual of each, taken on the Coast of Guernsey.* By F. C. LUKIS, Esq.

SINCE the date of the publication of Dr. Leach's *Malacostraca Podophthalma Britanniæ*, the list of British Crustàcea has been augmented by the addition of several genera. *Fig.* 38. represents a genus additional; andit may prove a genus not hitherto described.

Class Crustàcea, Division Stomapòdia *Cuvier and Latreille*, Legion 1. Podophthálma, Order 2. Macroùra *Leach*, Genus ? Phyllosòma *Leach and Latreille*, Species. (*fig.* 38.)

38



a, A representation of the animal, exactly of the natural size, and as seen walking; the aspect ventral. *b*, The aspect dorsal. *c*, The mouth and sternum, somewhat magnified. *d*, Antennæ and eye, somewhat magnified. *e*, Abdomen, magnified.

The singular animal represented in the figure was found alive, here, lately, and brought to me, from which I have taken the annexed figure and description.

The whole body perfectly transparent, and resembling a plate of the purest mica; depressed, and composed of two distinct portions.

1st, The carapace, bearing the eyes and antennæ (*d*), in the same manner as in the genus Phyllosòma of Leach and Latreille, attached by the posterior edge to, and covering the front of, the thorax and mouth. (The mouth and sternum are represented, and somewhat magnified, at *c*.) Margin recurved or thickened, the sides slightly bending upwards. Eyes, two

in number, seated on peduncles, and these attached to the front edge of the carapace, above the antennæ. The two exterior antennæ (if such they can be called) hornlike, not visibly articulated, divided into two strong spines; the first inclined downwards, the other straight in front: the two intermedial antennæ articulated, and divided at the third joint into two setaceous terminations.

The second portion includes the thorax and abdomen, both bright and transparent, and scarcely visibly distinct from each other. The thorax is oval, angular, and spined above and beneath the insertion of each leg. The abdomen (*e*) consists of six segments, terminating with two sharp spines on the caudal plate. The four upper segments furnished with two double spine-like processes beneath the edge of the abdomen. The penultimate segment has on each side two flat oval plates, serving as fins, and is succeeded by the caudal case, which is rounded at the margin, and bears two prominent spines on the upper side.

a and *b* represent the animal exactly of the natural size, and show the form and disposition of the limbs, fourteen in number. The first pair, situate near the mouth, of four joints, the last joint possibly didactyle; over the insertion of the first joints are seen two small tubercles, which in the remaining pairs are produced into sharp spines, inclined outwards. The second pair long, reaching to the antennæ, setaceous and ciliated. The four next pairs, alike, long and furnished with a single hook or nail, ciliated and spined at the joints; at the base of the third joint is a process consisting of two pieces, the last setaceous and jointed, not unlike the antennæ of some of the species of *Nóctua*. The last pair of legs short, of four joints, hooked, and placed horizontally near the first abdominal segment.

The mouth, situate beneath the carapace, is visible through it, minute, prominent, and provided with jaws appearing in the form of a ring, supported on each side by a crescent-shaped plate, spined beneath, and attached to the sternum, which connects it with the carapace.

The only marks on this singular crustacean were a few dark dusky blotches, near the eyes, upon the antennæ, and at the joints of the legs; the mouth and the last portion of the longest legs were minutely dotted with crimson.

To the genus Phyllosòma, as noticed in the *Dictionnaire des Sciences Naturelles*, this specimen bears a resemblance, but differs in the number of the legs, and in their termination. Five species of Phyllosòma are there described by Desmarest, first noticed by Leach and Latreille; since which Guerin, in his "*Monographie*," has mentioned others. They are all

from equatorial regions, except one discovered in the year 1815 by M. Risso, and described by him (although imperfectly), which he named Chrysòma mediterrànea; and he regards himself as the founder of this new genus. It was discovered near the coast of Nice. This species is figured by Guerin, in his *Mémoire sur l'Organisation Extérieure des Phyllosomes*," as P. mediterràneum.

My specimen lived but a short time after its capture, and appeared, when walking, as shown in *b*. Guerin, in his *Mémoire*, has figured twelve species: in all of them the flagelliform process is feathered at the last joint; this was but slightly the case with the one now described, and was only observable during life. This individual appears intermediate between P. Reynándii and P. mediterràneum. The horn-like antennæ approach those of the Reynándii; but the interior pair have the outer terminating article longer than the internal one, which is the reverse of the condition in the Reynándii: the description of that species agrees with my animal in other respects. In the P. mediterràneum, the peduncles of the eyes are much longer; the inflated margin of the carapace is wanting, and its form differs in being more regularly oblate than in mine.

The two spines bent downwards just below the mouth, at the commencement of the thorax, and the spines above the insertion of each leg, appear to supply a distinct character in this species.

All that is known of the habits of this singular genus is, that the animals are found on the surface of the water, and swim slowly, in which operation they move their flagelliform processes. This is nearly all that has been observed hitherto; and, as my individual came up in a bucket in deep water, it is probable that the species delights near the surface in calm weather, and sinks into the deep when the sea is ruffled.

The following are the names, and some particulars on the forms which have been discovered: —

Name.	Describer's Name.	Place in which found.
PHYLLOSO'MA.		
1. longicórne	Guerin, Lesson	New South Wales.
2. clavicórne	Leach, in 1818	Coast of Africa.
3. commùne	Leach	Africa, New Guinea.
4. affìne	Guerin, Lesson	New S. Wales and New Guinea.
5. Freycinètii	Guerin, 1823	New Guinea.
6. laticórne	Leach, 1818	Africa and New Guinea.
Cáncer cassídeus *der Naturforcher.*		
7. brevicórne	Leach, 1818	Africa and New South Wales.
8. punctàtum	Lesson	Under the Equator.
9. Duperrèyi	Guerin	Port Jackson.
10. Reynándii	Guerin	Indian seas.
11. mediterràneum	Risso	Coast of Nice.
Chrysòma mediterrànea *Risso*, 1815.		
12. lùnifrons	Latreille	Coast of Coromandel.

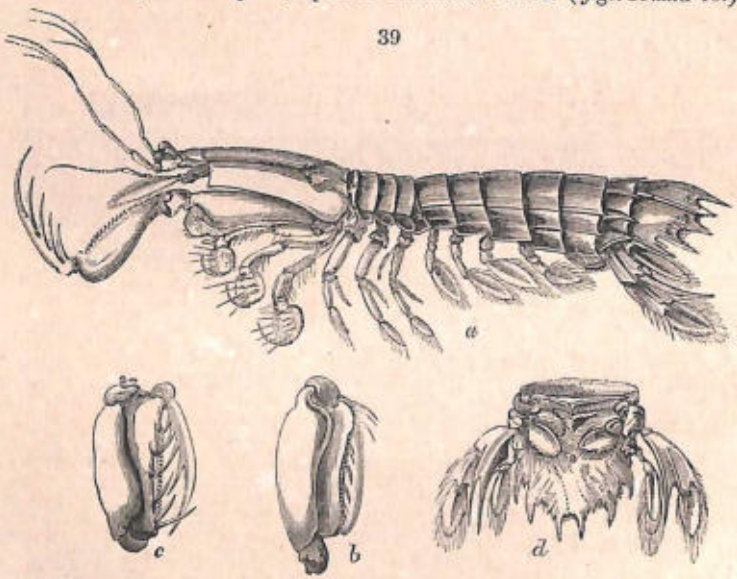
The rare occurrence of the genus Phyllosòma in European seas renders the one now described the more interesting; and I hope another opportunity will enable me to investigate its habits and peculiarities; an object the more to be desired, as the different forms above quoted have not been examined in a recent or favourable state: to this circumstance must be attributed the want of correct description which has appeared among authors, as well as the imperfect figures which have been published, particularly in the *Atlas* of the *Dictionnaire des Sciences Naturelles.*

[Will Mr. Lukis please to take an early opportunity of adding a specific epithet to designate the species he has described, so that, should it prove one previously unknown, it may stand denominated by himself, the first describer of it?

A figure of the Phyllosòma brevicórne, of Leach, is introduced into Kirby's just published work, entitled *On the Power, Wisdom, and Goodness of God, as manifested in the Creation of Animals, and in their History, Habits, and Instincts.* The figure is fig. 3. of plate x.: an incidental notice of the animal is given in vol. ii. p. 59.]

Class Crustàcea, Division Stomapòdia *Cuvier*, Legion Podophthálma, Order Macroúra, Genus *S*quílla, Species Desmarésti Risso. (*figs.* 39. and 40.)

39

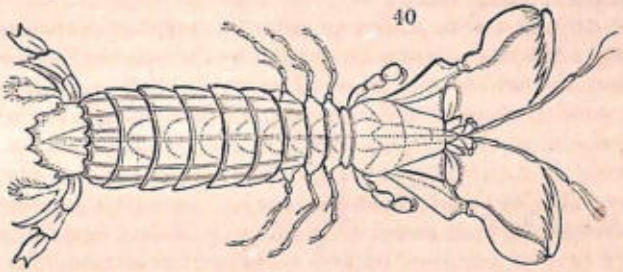


I send a representation (*fig.* 39.) of a species of *S*quílla, of which I possess a specimen, and which appears to me to be the same as that noticed by W. Yarrell, Esq., in an interest-

ing communication in VI. 230, 231., from one of two individuals captured on the coast of Cornwall by Mr. Couch of Polperro. I have preferred giving a lateral view (*fig.* 39.), in order to exhibit the various legs and processes beneath the body, and the animal's usual appearance when in the water.

In comparing my representation (*fig.* 39.) with that published in VI. 230., in illustration of Mr. Yarrell's communication, some differences will be seen, arising, perhaps, from inadvertence on the part of the engraver. [We here repeat (*fig.* 40.) the illustration published in VI. 230., and state that we happen to know that it had been delineated from a dead and dried specimen.] My specimen is full 3 in. long, which, I believe, is something longer than those from Cornwall. [*Fig.* 40. is, Mr. Yarrell has stated in VI. 230., "the exact size of the specimen, and measures 2 in. 4 lines in length."] Colour greenish brown, mixed with yellow, somewhat transparent, like a prawn.

40



The four thoracic segments have on each side an oblate depression close to the recurved margin. The abdominal segments have two depressions on each side, divided by a ridge: these become spinous on the fifth segment. In the penultimate, the marginal line, or ridge, unites with the intermedial, curves over the base of the processes, and forms the lower of the two *lateral spines* of that segment. There are also two dorsal spines, making the number six on this segment. It is in *this segment* [in *fig.* 40., and in the description in VI. 231., it is represented to be from the caudal one] that the articulated processes *take their origin*, which form, with the caudal case, the fan-like termination of the bodies of the crustaceans of the order Macroúra. The caudal case is terminated by six spines, and is serrated in the spaces intervening these, and is surmounted by a single dorsal ridge ending abruptly on the upper side; this ridge has a slight indenture near the base, observable in all the species of this family. *b*, *c*, in *fig.* 39., represent the anterior arms, grooved on one side,

so as to receive the next adjoining part: much in the same manner as the blade of a clasp knife is received into the handle. The pectinated joint is inserted into the first groove on the inside, and seems protected by a finely serrated edge on the outer side of the arm. In this groove each spine [of the pectinated joint] has a separate cavity to receive it; and when it is closed, the animal elevates three movable spines, which lie on the inner edge of the second joint in front, which in some measure supply the place of the closed hand, and are used as hooks or fingers. In *d*, in *fig.* 39., are shown the under side of the caudal case, and penultimate segment with its lateral processes, strongly spined and ciliated, which together form the fan-like termination of the bodies of the crustaceans of the order Macroúra. The exterior spines on the processes are movable.

This Squílla I kept alive in a basin of sea water for two days; during which time I had a fair opportunity of observing its activity and peculiar habits. It sported about, and, after a first approach, exhibited a boldness rather unexpected. When first alarmed, it sprang backwards with great velocity; after which it placed itself in a menacing attitude, which would rather have excited the fear of exposing the hand to it. The prominent appearance of the eyes, their brilliancy and attentive watching, the feeling power of the long antennæ, evinced quick apprehension and instinct. I brought a silver teaspoon near them, which was struck out of my hand with a suddenness and force comparable to an electric shock: this blow was effected by the large arms, which were closed, and projected in an instant with the quickness of lightning. An apparent anxiety to keep the head and claws in front made me suspect that the animal lodges its hinder part in holes or recesses, from which it can strike at its prey or other passing objects. The attitude represented in the figure (*fig.* 39.) was maintained during my observations; and I did not see any inclination to close its tail in a more compacted form.

In 1820, I mentioned the existence of this genus on our coast to M. Latreille; who remarked, *en passant*, "Oui, je les ai vus sur nos côtes:" but I suspect that this celebrated naturalist alluded to the Mediterranean coast, as I have not heard of their appearance on the Atlantic side of France.

I doubt not that that described by W. Yarrell, Esq., VI., 230., from Cornwall, will prove, on examination, to be the same as mine; although the caudal case and spines, the shape of the processes, and the want of feelers in the exterior antennæ, denote some differences. The publication of this notice may lead to clearing up the doubt. — *Guernsey, May*, 1835.

ART. IV. *Illustrations in British Zoology.* By GEORGE JOHNSTON, M.D., Fellow of the Royal College of Surgeons of Edinburgh.

THE figures of star-fish which have been given in our books of natural history in common use, will be found, by the out-of-door naturalist, insufficient for the humble purpose of merely identifying the species; and an attempt, therefore, to supply this deficiency may prove not unacceptable to some readers of this Magazine, although the subjects of the illustrations do not claim the interest of novelty. I shall begin the series by figures of two species of Ophiùra, one of them very common and well known, the other of less frequent occurrence, and which has hitherto been overlooked or confounded with its ally.

41. OPHIU`RA BRACTEA`TA. (*fig.* 41.)

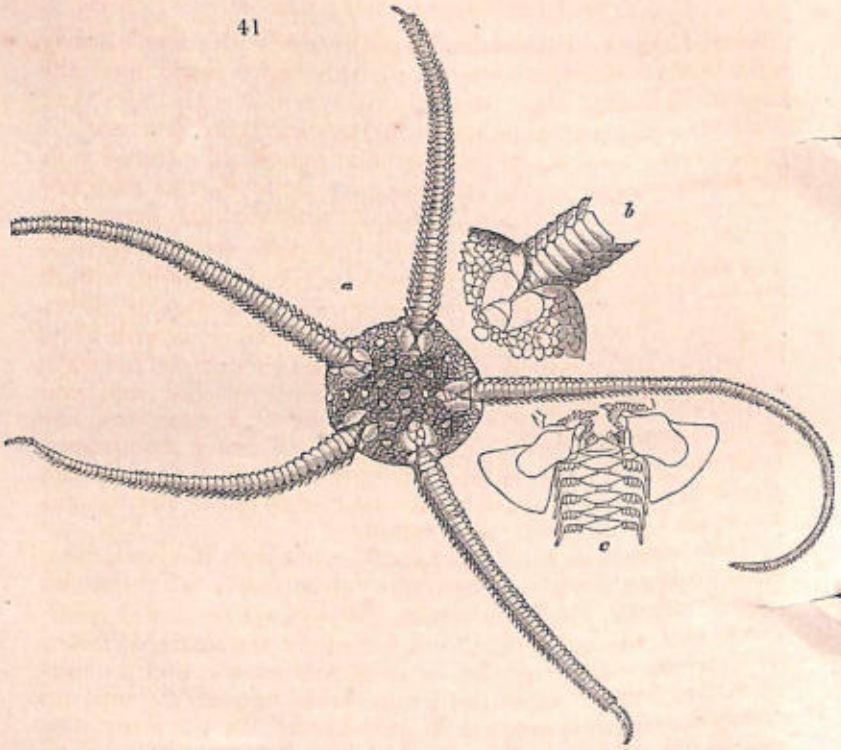
Spec. Char. — Body dorsally imbricated with smooth unequal scales; a large obovate scale above the base of the rays, and a pectinated one on each side.

Synonyma. — Ophiùra bracteàta *Flem.*, Brit. Anim., 488. O. lacertòsa *Stark*, Elem., ii. 403. pl. 8. fig. 2. O. texturàta *Lam.*, Anim. s. Vert., ii. 542. O. auròra *Risso*, l'Europ. Mérid., v. 273. pl. 6. fig. 29. *Astèrias* Ophiùra *Lin.*, Syst., 1100.; *Mull.*, Zool. Dan., Prod. 235. no. 2840.; *Fabr.*, Faun. Grœnl., 371.; *Barb.*, Gen. Verm., 87. pl. 10. fig. 9. pess.; *Turt.*, Br. Faun., 140.; *Stew.*, Elem., i. 401. *A.* lacertòsa *Penn.*, Brit. Zool., iv. 130. pl. 34. fig. 1.

Var. 1. Body square; rays 4; mouth quadripartite; tentacula 8.

Hab. — Common on the British coast, under stones near low-water mark, and also in deep water.

Description. — Body circular or pentagonal, flat, the back covered with unequal imbricate roundish and angular smooth scales, two of which, larger than the others, and of an obovate shape, are placed above the base or insertion of the rays and towards the sides, where there is a white semicircular one with a regularly pectinated edge. The large scales above the rays are separated by a series of smaller ones. Rays 5, rounded dorsally, gradually tapered to a point, covered with transverse imbricate scales, those of the middle row, on the ventral surface, oval and rounded on the distal edge; the lateral spines very short, blunt, smooth, placed in a line on each side of every articulation; in each series at the base of the ray there are six short ventral and two longer dorsal spines, but proceeding toward the apex, the number of the short ones gradually decreases until there is one only, and then we find three equal long spines, and a single short one. Ventral surface scaly;



a, Ophiùra bracteàta, natural size; *b*, a small portion of the body and ray magnified, to show the pectinated scales; *c*, a small portion of the ventral surface magnified, to show the fiddle-shaped scales.

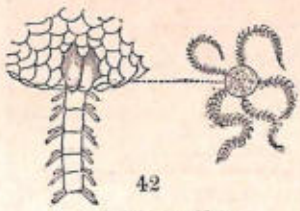
the space between the insertion of the rays covered with small white scales, and a large fiddle-shaped one placed inwards. Oral aperture in five triangular partitions, with pectinated margins: at the base of each section there are two small oval pectinated apertures through which the tentacular filaments are protruded, one from each hole. The specimen chosen for our figure is remarkable for its size, being twice as large as any other I have seen, and fully equal to that figured by Risso from the shores of the southern parts of Europe. It is eight tenths of an inch in breadth, and the length of the ray is $2\frac{1}{2}$ in., whereas the usual diameter of the body is about four tenths, and the length of the rays 1 in. It may be noticed that only one ray is perfect: the others have been broken short by some accident, and three of them are about repairing their loss by the reproduction of new apices. The colour is in general a reddish brown marbled with lighter shades; and the large scales are frequently white.

42. OPHIU'RA NEGLE'CTA. (*fig.* 42.)

SPEC. CHAR. — Body dorsally imbricated with smooth nearly equal scales; a large somewhat heart-shaped scale over the base of each ray.

Hab. — Between tide-marks in Berwick Bay; not rare.

Description. — Body circular, flat, margined, covered with imbricate smooth nearly equal scales; at the base of each ray a large scale divided down the middle by a plain suture. Rays 5, tapered, covered dorsally with a single row of quadrangular scales, and armed on the sides with blunt smooth spines about equal in length to the breadth of the ray, and three or four in a transverse line on each side of every articulation. Breadth of the body, 3 lines; length of a ray, 9 lines. The colour in general is greyish, the outer edge of the large scales white, as are also the lateral spines.



42

Ophiùra neglécta.

This appears to have been confounded with the preceding, from which it is very distinct, more particularly in the following characters. In O. bracteàta the rays are level and continuous with the back; in O. neglécta they are inserted below, so that the margin of the body is continued round uninterruptedly: in the former the scales at the base of the rays are distinctly separate, and placed at the sides; in the latter they are so close as to appear one, and placed precisely above the base: in O. bracteàta the scales of the rays are transverse, and the lateral spines very short; in O. neglécta they are quadrangular, and the spines are proportionably longer.

Berwick-upon-Tweed, April 1. 1835.

ART. V. *Short Communications.*

CRUSTACEOUS ANIMALS. — *The Spider Crab seen in a State of Ecdysis or Moulting.* — A few days since, a spider crab was sent, alive, to me, taken in the act of changing its coat. The operation was singular. The upper and lower shell being parted, the legs were withdrawn from their old cases, and served as a lever to detach the under shell from the upper. Some exertion of the legs was necessary to raise the upper shell: this had been accomplished, but it was not entirely detached from the body when brought to me. The body was quite soft, and the new skin of about the consistence of parch-

ment: in fact, the change was almost completed. — *Walter Henry Hill. Southminster Vicarage, Essex, Feb.* 12. 1835.

[Ecdysis and transformation are not identical subjects, but so kindred that the investigation of cases of ecdysis must contribute to solve the question of transformation. The notice of the preceding case had been written, its date shows, previously to Mr. Westwood's notification, in p. 275., of the doubt extant on the condition of transformation appertaining to crustaceous animals, as Mr. J. V. Thompson has asserted it to do. The following communication embraces both subjects.]

[*Ecdysis, or the Casting of the Skin or Shell, in Crustaceous Animals.*] — In Mr. Westwood's remarks on certain species of crustaceous animals, I perceive that some doubt is expressed (p. 275.) whether crabs and lobsters do, in fact, periodically cast their shells. "It is a point of some interest," says Mr. Westwood, "as to the manner in which the shells of crabs and lobsters are periodically cast, *if, indeed, such be the case*," &c. I cannot speak with any certainty as to marine Crustàcea, but that the common freshwater crayfish occasionally casts its shell, I can state from actual and repeated experience. In my youthful days I was acquainted with a delightful, little, clear, rapid brook, which meandered through a moist, boggy wood, and abounded with trout and crayfish. To this brook I was in the habit of paying a visit regularly once or twice every summer. In my own defence, and as some apology for my poaching unsportsmanlike propensities, I must observe that the dense impervious character of the wood utterly precluded all possibility of using the angle rod; so there was nothing left for it, but to walk up the stream, and grope for the game by hand in the holes, and under the hollow banks. The produce of the day's work was generally a good dish of crayfish, and of excellent, though not large, trout. On these occasions, I well recollect, we seldom failed to find, first, the exuviæ, or cast shells, of the crayfish; secondly, certain crayfish which had so lately undergone the operation, that their new shells had not yet acquired their usual firm consistency, but were soft and flabby, and as pliable to the touch as a piece of thin parchment. These soft-shelled individuals we used to consider as out of season, and we generally refrained from taking them. Thirdly, I may state, that when the crayfish came to be dressed and served up at table, it was no unusual occurrence to meet with some which had so nearly approached the period of their change, that on breaking the outward shell, a second and newly formed shell was perceptible beneath it. Fourthly, and to crown all, I have more than once seen crayfish in the act of casting their shells, i. e. with the old shell

not completely thrown off, but still adhering to the animal. Of the precise mode and manner in which they disengage themselves from their old shells I regret that I can give no particular account: I am speaking of things which I witnessed some thirty years ago, and perhaps, too, at the time of their occurrence I might have been too intent on the chase to pay much attention to minute points of natural history. I have no opportunity of renewing my experiments, as the brook (alas! that it should have been so!) has long since been ruined as a fishery, by having been converted into a straight uninteresting trench for the purpose of draining the wood through which it passes. I can state, however, that the shell is cast entire, not broken into pieces, nor split above; so that the crayfish (as we might expect) must crawl out from the fore part beneath. How often, in the course of their lives, these animals cast their shells, does not appear; but, if my memory serves me, exuviæ, as well as soft-shelled crayfish, were met with both of small and of full size. We must suppose, therefore, that the shells are renewed more than once. The operation too, of casting the shell, I should conclude, is not confined to any one fixed period of the year, but is regulated by other causes. My visits to the brook in question were made in the months of July and August; at which season, as already stated, some specimens were to be found which had recently undergone the change, others about to undergo it; but by far the greater number exhibited no signs either of recent or future casting of the shell.

Mr. Thompson, it should seem (p. 275.), maintains "the existence of transformations *throughout* the Crustàcea," similar, I suppose, to those of the larvæ of insects. Now here, again, I cannot speak to the fact as regards crabs and lobsters; and I know that there are anomalies in nature. But the young of the freshwater crayfish most unquestionably are hatched, and come into the world in the same shape as the adult ones. In the above-mentioned little brook, I have caught crayfish with the ova apparently just hatched, and the minute young not having yet, as it were, left the nest, but still adhering to the under part of the parent. Doubtless, the experience of other crayfish-catchers will be found, on enquiry, to confirm the above facts. — *W. T. Bree. Allesley Rectory, May* 12. 1835.

Birds. — *Some Feathers polarise Light.* I know not to how many species this property extends, but I may mention the feathers of the turkey, the "Argus bird," &c. On looking at a candle through the lateral fibrillæ of the feather of a young "Argus bird," the phenomenon was striking and

beautiful. The multiplication of the flame, with the haloes of iridescent light which accompanied these flames, or images, and the modification of the phenomena produced by causing the feather to revolve, were striking and beautiful.—*J. Murray. May* 19. 1835.

The Species of Caprimúlgus which inhabits the Neighbourhood of Lima, noticed by Mr. Matthews in VII. 633., *and technically described in* 635., *is, doubtless, the* C. *americànus of Wilson's "American Ornithology,"* vol. v. t. 40. fig. 1. — This identification is offered on a comparison of Mr. Matthews's specimen with Wilson's figure. The smallness of the bill, the absence of vibrissæ, the forked tail barred with white, and the markings of the wing feathers, accord entirely. — *D. Don.* [*Linnæan Society's House, 32. Soho Square, Dec.* 15. 1834.]

[Mr. D. Don has obligingly shown me Wilson's figure: the correspondence is as exact as need be. The figure exhibits a somewhat larger bird. The female bird, and an egg, are represented at the foot of the plate. The egg is just such a one as Mr. Matthews has noted in VII. 633.]

[*A Mode of removing from Eggs their White and Yolk in the Preparation of their Shell for Preservation, additional to the Modes made known in* IV. 145.; V. 516, 517.; VI. 171, 172.] — When I was at Bridlington last year, in order to acquire some certain knowledge of the water fowl and their incubation [VIII. 162—169.], I made a discovery in the blowing of eggs which I think will please you, and which can be applied with great facility to eggs not smaller than those of the thrush. I made one small hole in the side of the egg, and then sucked out a little of the contents to create a vacuum, or discharged that little by means of a small stick; then, taking the egg in my hand, I plunged my hand in water to the wrist; and, by shaking the egg while it was immersed in the water, I very soon emptied it of its yolk and white. I have shown this process to many people, and they approve of it highly. This, added to what I have already sent you, on preserving eggs for museums [V. 516, 517.], will, I think, render the subject sufficiently easy and efficacious. — *Charles Waterton,* [in a letter dated] *Walton Hall, May* 14. 1835.

Fishes. — *The Gravelling of the River Taw, a State of the Common Salmon, is not "full of Roe" when it appears in the Taw, as it is stated to be in* p. 54. — Please to correct an error which I have inexcusably and unaccountably fallen into in my remarks on the gravelling of the Taw (p. 54, 55.). I have stated there that, at the time of the appearance of the gravelling in the Taw, they are "full of roe:" this is unquestionably a mistake. — *O. Clapton, Feb.* 11. 1835.

The Roach (*Cyprinus rutilus* L.), *a Variety of which has Chestnut-coloured Lips.* — I have frequently caught this variety of the roach in the ponds in Wanstead Park, Essex; in the heronry pond, and in the large pond in front of the spot where the house formerly stood. — *O. Clapton, Feb.* 1835.

REVIEWS.

ART. I. *Titles of Works on Subjects of Natural History, published recently.*

KIRBY, Rev. *William*, M.A. F.R.S., &c., Rector of Barham: On the Power, Wisdom, and Goodness of God, as manifested in the Creation of Animals, and in their History, Habits, and Instincts. 1835. 2 vols. 8vo, 948 pages, 16 plates. 30*s.* The 7th of the Bridgewater Treatises.

We have not read this work. The type is large, and the page not so, and the quantity of words in the two volumes, we guess, about equal to the quantity in a few ninepenny parts of the *Penny Cyclopædia;* yet 30*s.* are asked for this quantity and the plates! Who can profit by the teaching of a Kirby, while the bookseller precludes access to his lessons?

Harewood, Harry: Dictionary of Sports; or, Companion to the Field, the Forest, and the River side; with Essays upon all National Amusements. 7*s.* 6*d.* 1835.

This work contains matter of interest and utility to all who claim any companionship with nature, and aspire to be ranked among her votaries. It is interspersed with excellent woodcuts of animals, biped, quadruped, and fish, together with sundry other delineations in illustration of the text. The sportsman will find much to rivet his attention; while Mudie, and other followers of Izaak Walton, will find the work by no means deficient in information on the "gentle craft." The author is evidently no great ornithologist, and in nomenclature the same errors as usually abound in works of this description are found in no sparing numbers. The same may be remarked on the nomenclature in mammalogy. But we heartily recommend the work to all who take any interest in hunting, shooting, racing, and sketches of natural history written in a pleasing style and interspersed with interesting anecdotes. — *S. D. W. July* 3. 1835.

Allies, Jabez, one of the Council of the Worcestershire Natural History Society: Observations on certain curious Indentations in the Old Red Sandstone of Worcestershire

and Herefordshire, considered as the Tracks of Antediluvian Animals; and the Objections made to such a Hypothesis refuted. With illustrative Engravings. Also, an Addenda of a few other Facts in Geology, Meteorology, Astronomy, Natural History, Topography, &c. 8vo, 132 pages. Edwards, London; Lees, Worcester; 1835.

Cattle bloated by eating noxious plants may be prevented dying by speedy bleeding. "Ignis fatuus, and its probable cause." Has the author seen the *Ent. Mag.*, i. 350—355.? "The old English black rat," "the brown rat has now nearly destroyed all" of. "Dry rot." Has the author seen Kyan's Treatise on a mode of preventing? "Turkish oaks and valonia." The *Quércus Æ'gilops* should be commonly planted to supersede the expense of importing the cups, called "valonia," of its acorns. We suspect that it would not thrive in Britain, although *Q. Cérris* does. It is most probable that the species which "thrives much faster than the British oak, but . . . . is not the species which bears the valonia," is the *Q. Cérris*.

Hooker, W. J., Regius Professor of Botany in the University of Glasgow: The British Flora; comprising the Phænogamous or Flowering Plants, and the Ferns. The 3d edition, with additions and corrections. 8vo; 500 pages. 1835. 12*s.*

Bupleùrum falcàtum E'chium violàceum, Fèdia aurícula, *Potamogèton prælóngus; Sàlix damascèna, laxiflòra, propínqua; Scirpus Sàvii*, Silène itálica, are the species, and there are others, that are treated of in this edition additionally to those in the second edition. The appendix on the natural orders to which the plants of Britain belong has been much enriched. In this part, and throughout the work, are amended botanical characters and increased popular remarks. The fault of this edition is that the generic characters, at least in the umbelliferous and cruciferous species of plants, are lessened in simplicity and conciseness, and new terms are introduced into them. — *G. Francis. 55. Great Prescott Street, London.*

Morris's *Guide to an Arrangement of British Birds*, noticed in p. 360., as announced as nearly ready, has since been published. Messrs. Longman and Co. are the London publishers.

Of Dr. Grant's work on *Comparative Anatomy*, Part ii., in which *Muscles and Nerves* are treated of, has been published. Every student of natural history should possess himself of the contents of the entire work.

THE MAGAZINE

OF

NATURAL HISTORY.

SEPTEMBER, 1835.

ORIGINAL COMMUNICATIONS.

Art. I. *Instances of the Effects of Forest Vegetation on Climate.* By the Rev. W. B. Clarke, A.M. F.G.S. &c.

Whatever may have been the changes wrought in the climate of Europe by the removal of those great forests which covered so considerable a portion of this quarter of the globe in the days of Cæsar and Tacitus; or however Canada, as asserted by Dr. Kelly (see the statement quoted in *M. N. H.*, vii. 617., from the *Quebec Transactions*), may have, notwithstanding the clearings of the settlers, still maintained to this day the climate which that part of America possessed two centuries ago, it cannot be denied that effects of a favourable nature have ensued upon various districts, by the diminution of woods and the cultivation of the soil formerly occupied by them. Two striking instances have recently been presented to my notice, which seem to deserve particular attention.

The first is taken from the very interesting work of the Baron de Brincken, on the forest of Bialowicza in Lithuania.* A few particulars respecting the situation of this forest may not be unacceptable to those who have not much knowledge respecting it.

After having passed the E.N.E. frontier of Poland Proper, and traversed the river Bug near the little town of Granne, and travelled a day's journey through the territory of Bialystok (formerly part of the palatinate of Podlachia, then ceded

* Mémoire Descriptif sur la Forêt Impériale de Bialowicza, en Lithuanie; redigé par le Baron de Brincken, conservateur en chef des forêts nationales de Pologne, membre du département des forêts à la commission des finances et du trésor, Chevalier de l'ordre de St. Stanislas, 2me classe. Orné de quatre gravures et d'une carte. Varsovie, chez Glucksberg. 1826. 4to, pp. 127.

to Prussia, and, at the treaty of Tilsit, to Russia, but never actually belonging to any government in the empire, and existing as a separate *arrondissement*), which every where presents fertile plains, well-built villages, and carefully cultivated fields, with but little wood, the traveller is struck by the aspect of an enormous forest, which he sees for the first time from the summit of the hills which overlook the town of Orla.

This is the forest of Bialowicza, which to the west offers an immense extent, and loses itself in the horizon to the north and south. Wheresoever the eye ranges, it sees nothing but wood and sky.* The hamlet of Haynowczyna is on the edge of the forest, and on the old frontier between Poland and Lithuania. From this place the forest extends seven geographical miles in length, and six in breadth, having a circuit of twenty-five miles. It is situated between 52° 29′ and 52° 51′ N. lat. and between 41° 10′ and 42° E. long. from Ferro (23° 18′ and 24° 8′ E. of London). It contains 22·67 square miles, besides portions which, belonging to private proprietors, are not included, amounting, it is supposed, to 7·51 miles in extent. The whole forest, therefore, covers a surface of more than thirty geographical miles.

The surface of the forest is nearly flat; there is scarcely a hill, though the natives talk of their *góra* (or montagne, as the French denominate an acclivity). The soil varies much. Sand, however, is the principal element, which, connected with the numerous lakes of the country, and the thick gravel which every where appears at a depth of 10 ft. or 12 ft., induces the idea that, if not formerly at the bottom of the sea, it has been subject to frequent inundations. In the midst of the sand there are spots where clay is mixed with it, which, being more moist, encourage a more vigorous vegetation, and, consequently, a deeper vegetable soil. It appears that the area of this soil (*humus*) is, in proportion to the sand, as 1 to 4; and in this latter four fifths the *Pinus sylvéstris*, and the *Abies Picea*, absolutely reign as lords of the soil, occupying 18·136 miles of the whole area.

The names of the trees occupying the other 4·534 miles are as follows: —

1. *Taxus baccàta* (in Polish, *Cis*; which word being found in the names of many Polish villages, together with remains of ancient roots, proves that this tree was formerly more common than at present). 2. *Quércus Ròbur* (pedunculàta). 3. *Cárpinus Bétulus*. 4. *Bétula álba*. 5. *Alnus glutinòsa*, *A. incàna*. 6. *Sálices*. 7. *Tilia parvifòlia* (in Polish, *Lipa*,

* At sea, to use the words of Ovid, it is "nil nisi pontus et aer."

whence *Lipiec*, July, the month in which this tree blossoms*), *T.* grandifòlia. 8. *P*ópulus nìgra, *P.* álba, *P.* trémula. 9. *P*yrus *M*àlus sylvéstris, *P.* Pyráster, *C*érasus *P*àdus. 10. *A*cer campéstre, *A.* Pseùdo-*P*látanus. 11. *U*lmus campéstris. 12. *F*ráxinus excélsior. †

It does not seem necessary to enumerate the shrubs and plants, which may be found enumerated in the work itself, and in Dr. Gilbert's *Flora Lithuanica*, Grodnæ, 1781.

These particulars are taken from the work here and there, without order, as necessary to the full understanding of the point in question; but, indeed, the whole book is worthy of translation, for it throws great light upon the administration of the "woods and forests" of Russia, and is deeply interesting on account of the branches of natural history on which it treats. But my object is to notice the following statement. The author says,— "The latitude under which the greatest part of Poland and Lithuania is situated is not the only cause

* This is not the only instance in which the seasons are indicated by the blossoming of trees and flowers: it is a common practice with the Indians of Demerara. (*Gard. Mag.*, xi. 487.)

† The following table, taken from a larger one, gives the age and dimensions of some of the trees:—

	Years.	Soil.	Height of tree in feet.	Thickness of trunk at bottom in inches.	Increase, in last 30 years, in cubic ft.
*P*inus sylvéstris (pine) -	170	Three quarters sand, and one quarter vegetable soil -	129	36·2	87
	180		118	38·2	81
	190		130	38·5	78
	200		111	39·5	63
*A*bies *P*icea (silver fir) -	120	Marshy vegetable soil, mingled with sand	110	30·2	139
	160		119	40·0	149
	170		115	44·2	137
	190		120	48·0	129
Quércus (oak)	180	Deep vegetable soil, moderately moist -	103	43·2	183
	200		110	46·1	193
	230		130	48·0	182
	300		100	55·0	136
C*a*rpinus (hornbeam) -	90	Deep vegetable soil, moderately moist -	90	22·0	52
	100		75	23·2	40
	120		80	26·7	41
*B*étula (birch)	90	Deep vegetable soil, moderately moist -	95	24·1	48
	120		100	26·1	37
*A*cer (maple) -	110	Deep vegetable soil, moderately moist -	92	24·1	80

The age of the oak varies from 500 to 600 years in this forest; but the author says he has seen, on the edge of the forest in the district of Niezanów, the fragments of a lime tree which had a diameter of 82 in., and had 815 layers: the pine seldom lives more than 300 years.

to Prussia, and, at the treaty of Tilsit, to Russia, but never actually belonging to any government in the empire, and existing as a separate *arrondissement*), which every where presents fertile plains, well-built villages, and carefully cultivated fields, with but little wood, the traveller is struck by the aspect of an enormous forest, which he sees for the first time from the summit of the hills which overlook the town of Orla.

This is the forest of Bialowicza, which to the west offers an immense extent, and loses itself in the horizon to the north and south. Wheresoever the eye ranges, it sees nothing but wood and sky.* The hamlet of Haynowczyna is on the edge of the forest, and on the old frontier between Poland and Lithuania. From this place the forest extends seven geographical miles in length, and six in breadth, having a circuit of twenty-five miles. It is situated between 52° 29′ and 52° 51′ N. lat. and between 41° 10′ and 42° E. long. from Ferro (23° 18′ and 24° 8′ E. of London). It contains 22·67 square miles, besides portions which, belonging to private proprietors, are not included, amounting, it is supposed, to 7·51 miles in extent. The whole forest, therefore, covers a surface of more than thirty geographical miles.

The surface of the forest is nearly flat; there is scarcely a hill, though the natives talk of their *góra* (or montagne, as the French denominate an acclivity). The soil varies much. Sand, however, is the principal element, which, connected with the numerous lakes of the country, and the thick gravel which every where appears at a depth of 10 ft. or 12 ft., induces the idea that, if not formerly at the bottom of the sea, it has been subject to frequent inundations. In the midst of the sand there are spots where clay is mixed with it, which, being more moist, encourage a more vigorous vegetation, and, consequently, a deeper vegetable soil. It appears that the area of this soil (*humus*) is, in proportion to the sand, as 1 to 4; and in this latter four fifths the *Pinus sylvéstris*, and the *Abies Picea*, absolutely reign as lords of the soil, occupying 18·136 miles of the whole area.

The names of the trees occupying the other 4·534 miles are as follows: —

1. *Taxus baccàta* (in Polish, *Cis*; which word being found in the names of many Polish villages, together with remains of ancient roots, proves that this tree was formerly more common than at present). 2. *Quércus Róbur* (pedunculàta). 3. *Cárpinus Bétulus*. 4. *Bétula álba*. 5. *Alnus glutinòsa*, *A.* incàna. 6. *Sálices*. 7. *Tilia parvifòlia* (in Polish, *Lipa*,

* At sea, to use the words of Ovid, it is "nil nisi pontus et aer."

whence *Lipiec*, July, the month in which this tree blossoms*), *T.* grandifòlia. 8. *Pópulus* nìgra, *P.* álba, *P.* trémula. 9. *Pỳrus Mâlus* sylvéstris, *P.* Pyráster, *Cérasus Pàdus*. 10. *Âcer* campéstre, *A.* Pseùdo-*Plátanus*. 11. *Ulmus* campéstris. 12. *Fráxinus* excélsior. †

It does not seem necessary to enumerate the shrubs and plants, which may be found enumerated in the work itself, and in Dr. Gilbert's *Flora Lithuanica*, Grodnæ, 1781.

These particulars are taken from the work here and there, without order, as necessary to the full understanding of the point in question; but, indeed, the whole book is worthy of translation, for it throws great light upon the administration of the "woods and forests" of Russia, and is deeply interesting on account of the branches of natural history on which it treats. But my object is to notice the following statement. The author says,— "The latitude under which the greatest part of Poland and Lithuania is situated is not the only cause

* This is not the only instance in which the seasons are indicated by the blossoming of trees and flowers: it is a common practice with the Indians of Demerara. (*Gard. Mag.*, xi. 487.)

† The following table, taken from a larger one, gives the age and dimensions of some of the trees: —

	Years.	Soil.	Height of tree in feet.	Thickness of trunk at bottom in inches.	Increase, in last 30 years, in cubic ft.
Pinus sylvéstris (pine) -	170	Three quarters sand, and one quarter vegetable soil -	129	36·2	87
	180		118	38·2	81
	190		130	38·5	78
	200		111	39·5	63
Âbies Picea (silver fir) -	120	Marshy vegetable soil, mingled with sand	110	30·2	139
	160		119	40·0	149
	170		115	44·2	137
	190		120	48·0	129
Quércus (oak)	180	Deep vegetable soil, moderately moist -	103	43·2	183
	200		110	46·1	193
	230		130	48·0	182
	300		100	55·0	136
Cárpinus (hornbeam) -	90	Deep vegetable soil, moderately moist -	90	22·0	52
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of the sharpness and severity which distinguish the climate of these regions from that of the other countries of Europe. It is well known that this same latitude presents in Germany and England very different and much milder conditions of climate. To the effects resulting from this latitude must be added two other causes, which have no existence elsewhere on the continent of Europe, the total want of mountains and the great masses of forest." He goes on to say that the great Sarmatian plain, extending from the Baltic to the Carpathian Mountains, is exposed to the cold north and north-east winds; the former blowing from regions covered with snow and eternal ice, and the latter passing from the deserts of Russia and Tartary, traversing swamps and forests, and consequently dry and cold to a degree greater than the north wind elsewhere. The northern slope of the Carpathians, therefore, feels the full effect of this; whilst on their southern side are grown the grape of Hungary, and the fruits of southern countries.* The Himalaya Mountains present the same phenomenon on a still greater scale; as, also, the Andes, and the Ghauts of India, as far as affects moisture.

"The great masses of wood, which often cover a vast extent of country, contribute no less to the severity of the climate; nevertheless, for several ages this severity has sensibly diminished. The rapid increase of the population has caused a part of the forest to be felled, has softened the temperature, and produces in the Slavonic countries, comprising therein central Russia (*la Russie Moyenne*), the same changes which are remarked in modern Germany (*Allemagne*), comparing it with ancient Germany (*Germanie*)."

The mean temperature of Lithuania may be fixed at 5° 4′ of Reaumur (44° of Fahr.); it lies, therefore, between that of Poland, which is 6° R. (46° F.), and that of Russia in Europe, which is 4° 8′ R. (43° F.), as has been carefully noted during the last eighty years. Although we have no observations on the forest itself, we shall not much differ from the exact truth in placing its mean temperature at 5° (43° R. 44° F.).

"The environs of Bialowicza have the following relations with the north of Germany. Its spring commences late and lasts not long; its summer is seldom fine, often cloudy, sometimes stormy, now cold, then insupportably hot; the autumn makes up in part for the summer, as it is serene, dry, and hot

* This remark reminds me of what is stated in *Malte-Brun*, tome iii. p. 625., who quotes Conrad, *Diss. de Effect Frig.*, Dantzic, 1670, and *Erndtel*, that the east wind is colder than the north, since it comes from the Ural Mountains; but he attributes the cold of Poland partly to the from the Carpathians, a contrary position to that of the text. Rzacz says, in 1654 a sudden frost destroyed the corn at Cracow on the Pentecost.

during the day, though cold at night; the winter is long and severe. Most of the kinds of grain and fruits of North Germany prosper in this climate, when properly cultivated; excepting, however, that in Germany they ripen quicker, and that here the more delicate kinds do not always attain a perfect maturity.

"*Near the forest the temperature is colder than at some distance from it, and the harvest is eight or ten days later. This difference is especially remarkable in the spring, for at this period the forest is still covered with snow: oftentimes we are there travelling in sledges, whilst in the neighbouring country, the villagers are already preparing to till the soil capable of cultivation.*

"The observation, so often made, that great forests, in exercising a marked influence upon climate, produce those *waters* which fertilise lands, is especially applicable to the forest of Bialowicza. Numberless rivulets are formed in the heart of it; whilst in the woods of smaller extent which surround it, we find only muddy waters, slowly trickling along the shallows which they conceal.

"Considered under these hydrographical aspects, the forest of Bialowicza belongs to the great basin of the *Vistula*, and more particularly to those of the *Narew* and the *Bug*.

"The Narew, which rises in the forest itself, and which gives its name to a small town of the arrondissement of Bialystok, receives the greatest part of the rivers of the forest, of which the most considerable is the Narewka."

"The *Lsna*, after being increased by the waters of the *Biala*, discharges itself into the *Bug*, near the little town of Pratulin, on the frontier of the kingdom of Poland. The *Narew* and the *Bug*, reunited near Sierock, throw themselves into the *Vistula*, under the name of the *Narew*, in sight of the ramparts of Modlin. These two rivers are navigable; the *Narew* almost up to its source. The *Narewka* and the *Biala* bear vessels even in the forest." * (*Mémoire, &c.*, chap. ii.)

* It does not fall within the purpose of the present notice, to extend these extracts to matters foreign to the subject; but, to such as may be curious, it may be satisfactory to know that the village of Bialowicza, which gives its name to the forest, contains a church, fifty-six cottages, a beer-shop (*cabaret*), and the gamekeeper's lodge (*maison de chasse*); and that these, as well as two hamlets within the forest itself (viz., *Teremiska* and *Pagorzelæ*, containing from twenty to thirty cottages), and the adjoining villages, are built of wood, the walls made of the trunks of trees, piled up according as they fit to each other, and the roofs covered with planks or shingle. The inhabitants, it appears from the *Chronicle of Hartknoch* (p. 202.), wear a dress corresponding exactly with that worn by the inhabitants of ancient Prussia in the days of the Romans. Of the hunting with Monuments, there is no opportunity of speaking in this place.

We see, by the above extracts, that several very important rivers take their rise, not on the summit of mountains fed by snows and ice, as the Rhine and the Rhone, but in the low sandy plains of Lithuania; and that the accumulation of waters which form them takes place from the action which vegetation exercises on the humidity of the atmosphere. Speculation might hence form several interesting conclusions respecting the changes which would ensue could the American continent, or even Lithuania, be completely cleared of its woods, and the deserts of the south be planted with forests.

But Mr. Lyell (*Principles of Geology*, ii. 102. et seq.) has argued out the point, and shown, what the memoir of De Brincken also states incidentally, that humidity and vegetation act reciprocally on each other. The leafy trees, which must have the greatest share in the action upon the atmosphere, grow in the marshy and damp spots of the forest of Bialowicza. It may be allowable to refer to Dr. Kelly's opinion, before quoted, to allege that forests alone are not the causes of cold or moisture. It has been stated by Malte-Brun that the winds in Poland blow, three fourths of the year, from the west, and that they are always humid; and that the north and south winds are both cold, the former moist; and that the east wind brings the greatest cold. (*Géog. Univ.*, tome iii. p. 625.) *

* The west winds in Poland are unhealthy. Agreeably to the known electric conditions of west winds, we find that Poland is a country where electrical phenomena are exceedingly common. Globes of fire, parhelia, falling stars, the aurora borealis, violent rains and winds, are noticed as characteristic of the climate. Amongst other occurrences noticed by Tylkowski is a ball of fire which seemed to detach itself from the moon. Reinzer, quoted by R. Zaczinsky and Malte-Brun, states that King Uladislas Jagellon was once enveloped, with his suite, in an electric cloud: this must have been in the beginning of the fourteenth century. More modern instances of the same phenomena are stated of Saussure, in the Alps; of M. Allemand, on May 3. 1821, whose hat, hand, and umbrella were, in a thunder storm, enveloped with a luminous phosphoric matter, in the canton of Neufchâtel. (*Bibliothèque Univ.*, xvii. 154.) But the most extraordinary instance I have met with is the following, for which I am indebted to the editor, who had received it from Dr. Johnston of Berwick upon Tweed. It will be concluded, perhaps, that this latter case is a proof of terrestrial disturbance sufficient to connect it with my essays on meteoric phenomena. To say the truth, this whole paper, and several other detached ones, which may appear, are purposely intended to have such connection; and my object in quoting this example is to unite it with the electrical phenomena of Poland, and the prevalence there of west winds.

Remarkable Recession of the Sea at Montrose.—" 1572. In this mene tyme wes ane greit feirlie in Montrois. Be the space of sex houris, the watter thairof wes dry in the sey; and during the quhilk space the peopil past within the said sey, and got sundrie fisches; and efter the quhilk space the peopill on the sands persewand the wattir as ane popill pitt, by some

We have, then, here a further testimony to the influence exercised upon climates by the westerly winds, from which it follows that neither forests, nor any other immediately terrestrial agents, modify so effectually the phases of the phenomena presented by the atmosphere, as those which bear upon the intensity and direction of the winds (see *M. N. H.*, viii. 4. et seq.); and that any cause which materially affects the winds in those respects must produce great physical changes upon the surface of the earth. The question thus opened for investigation, as affecting the conditions of the vegetable world, and the relative proportions of land and water at different periods, cannot be further noticed here; but it occurs immediately when contemplating such an expanse of forest in a flat sandy tract as is met with in Lithuania.*

Mr. Lyell (*Prin. Geol.*, ii. 200.) has quoted the *Phil. Trans.*, ii. 294., for instances of diminution of rain, in Barbadoes and Jamaica, by the felling of forests. The following

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quhilk thaj fled to land, and syne it wes sey agane suddenlie, and never nane pereist heirinto. Als thair wes ane hill callit [the name is not in the book, but a blank is left], quhilk brint be the said space; men rydand be the way, the menes and coillis [tailis ?] of thair horssis brunt, ze the wands of thair hands brint; pure men passand on the way, the stalfis in thair hands brint, and quhen thaj wald dicht of the fyre thairof, it wald entres agane." These phenomena appear to have happened about the end of October. (From "*A Diurnal of remarkable Occurrents that have passed within the Country of Scotland since the Death of King James the Fourth, till the Year MDLXXV.* Printed at Edinburgh, 1833." 4to, p. 321.)

* The prevalence of west winds in our part of Europe has been before noticed by me, as well as one of its consequences, viz. the direction of the branches of trees exposed to the west and south-west. (p. 143.) In two recent rambles, (over ground frequently traversed before by me, but never noticed in this way,) I have purposely looked out for examples; and remarkable instances I noted down as occurring at Ventnor, Undercliff, Isle of Wight, frequently on the road from Portsmouth to London, at Bromley in Kent, near Seven Oaks, about Rye, Winchelsea, and Hastings, and in the country intermediate between those places and London, wherever high trees have been exposed to the west winds.

Between Calais and St. Omer are many striking examples. The upper boughs of the tall poplars near Pont Sanspareil and Ardres are many of them broken as well as bent; and hundreds of smaller ones bear evidence yet of the destructive fury of the hurricane of August, 1833. From St. Omer to Cassel are many examples, and especially on the slopes of the latter remarkable hill. All the way from Cassel to Lille, and thence to Tournay, Halle, and Brussels, there is little difficulty in detecting examples. From Brussels to Ghent the examples are not quite so frequent; but in the flat country between Ghent and Bruges, where the road is lined for miles with tall trees, the instances are very striking. I made the observation to a friend in Brussels, who confirmed it by pointing out instances in his own walled-in and comparatively sheltered garden. There is a saying in Brussels, that it never rains a whole day in England; but they have the weather as in England: nor can the fact, I think, be disputed, when tained B[illegible]tions of the places are considered.

note from St. Vincent is from the pen of the late Rev. Lansdown Guilding *, and was made in reference to a short article signed J. R. in this work (I. 384.), in which America was quoted as affording instances of both diminution and increase of rain from clearing the woods. It is an excellent appendage to the quotations from the Baron de Brincken, and the paper on Raining Trees, by Mr. Murray, in *M. N. H.*, iv. 32.:—

"The climate of this island [St. Vincent] has been considerably affected by the continued industry of man, and his daily encroachments on the primeval forest. In the valley of Marriaqua, two fine cataracts, which used to adorn the landscape, and rush down the sides of the Grand Bon Homme, are now not visible except after heavy rains; and many portions of the cultivated lands, in dry seasons, suffer to a lamentable extent. So much has this change been felt, that laws have been passed to prevent the cutting down of timber, in certain directions, under heavy penalties. The planters in the suffering districts have long since seen with alarm the fatal mistake of their predecessors in denuding the mountainous ridges of their neighbourhood; and have, for many years, planted these parts again. But, in their short-sighted folly, trees were selected which attained but a very moderate height, merely because the wood was useful for cart-work! To have remedied the serious evil under which they and their descendants were to suffer, they should have entered the forest, and selected the seeds and saplings of those giant figs, and other fast-growing native trees, which, though useless as timber, would soon, by their height and magnitude, have attracted, detained, and broken the rolling clouds, which now pass over to the interminable and pathless woods." [*St. Vincent, May* 1. 1830.]

These facts are worthy of preservation; and entitled to notice, whether with reference or not to any geological system or hypothesis.

Stanley Green, May 14. 1835.

Mr. Guilding, in the note which Mr. Clarke has obliged us by appropriating, had spoken of mountainous ridges in the neighbourhood of man's residence as the localities which man had denuded. If most of the mountainous sites in St. Vincent are invested with forest, the following valuable note, which Mr. Guilding had penned, is also relevant t[o] about by some

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Mr. Clarke's argument, although Mr. Guilding had penned it in relation to a subject cited in II. 381., namely, "the power which running water exerts in removing heavy bodies," and there evidenced by some instances.

"II. 381. We have yearly before our eyes similar instances of the power of running water: during heavy rains in St. Vincent, while the coast, perhaps, is in a cloudless sunshine, the mountains are deluged with rain; and the myriads of tributary streams, looking like threads of silver in the mist, giving down their waters together, the ravines are on a sudden fully charged, and the swollen torrents, with an awful roar, a sudden and irresistible fury,

'With headlong rage and wild affright,'

descend towards the ocean, carrying every thing before them. In the Rabacca River, on these occasions, an incalculable mass of volcanic sand is brought from the choked ravines of the Soufrière, and masses of rock of many tons are lifted from their temporary resting-places, and brought on by stages to the sea.

"Our torrents often descend so suddenly as to surprise and carry off the careless washerwomen and their clothes, as well as the negro children sporting in the treacherous bed. On such days, the spectator, seated on some elevated bank, and listening to 'the torrent's awful voice beneath,' could not fail to be gratified.

'Noble the mountain stream
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The views which Mr. Guilding had entertained are, it seems to us, precisely in accordance with those which Mr. John Murray had expressed in the following sentence in his treatise "On Raining Trees," in IV. 32—34.

"It rains often in the woodlands when it rains nowhere else; and it is thus that trees and woods modify the hygrometric character of a country: and I doubt not but, by a judicious disposal of trees of particular kinds, many lands now parched up with drought, as, for example, in some of the Leeward Islands, might be reclaimed from that sterility and which they are unhappily doomed."

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following in relation to a notice given in I. 378., deduced from the *Bibliothèque Universelle*, of certain experiments on vegetation, which Professor Dobereiner of Jena had made, and which had led the professor to feel "disposed to believe that the diminution in the size of plants, as they rise into higher regions on mountains, depends more on the diminution of [atmospheric] pressure than of heat."

"The diminution in the size of plants, as they rise into higher regions in the mountains, I should rather attribute to the great power of the winds in the higher atmosphere, and to the thinness of the soil, which is so constantly washed away by the sheets of water which descend in elevated lands. As you advance upwards, the trees become gradually stunted, till, at last, nothing but brushwood and ferns occupy the

> ——— 'Loftiest and least shelter'd rocks,
> Rooted in barrenness, where naught below
> Of soil supports them 'gainst the alpine shocks
> Of eddying storms.'

"It is curious in these islands to see the trees on any windward station bent by the winds in their growth, and assuming and retaining this declining attitude. The spectator in the vale below, or on the sea, would suppose they were under the overbearing influence of some furious blast, which did not reach him. [See Mr. Clarke above, in p. 479., note *.]

"The water here [see I. 378.] said to be transpired by the trees is doubtless derived from the incredible dews of night, or the mist and clouds which roll round mountainous summits, and become entangled in the trees of the forest. I have often, when the lower lands have enjoyed the finest sunshine, been enveloped at noon-day, in mountainous damp woods, with so thick a darkness, that I could no longer select the mosses and other objects of which I was in search." — [*Lansdown Guilding. St. Vincent, May* 1, 1830.]

ART. II. *Description of the Young of the Common Lobster, with Observations relative to the Questions of the Occurrence and Non-Occurrence of Transformations in Crustaceous Animals.* By T. BRIGHTWELL, Esq. F.L.S.

"*Malacostraca* nascunt parentibus omnino fere similia; *Entomostraca* vero mutabilia, ætate, exuviis pluribus depositis, formam ultimam et durabilem induentia." — LATREILLE, *Gen. Crust. et Ins.*, i. 6.

IN the beginning of July last (1835), I procured about two ounces of the eggs of the common lobster; taken by some

fishermen, at Sherringham, near Cromer, from what they term a sick lobster, that is, one about to cast its spawn. The whole, having been put into spirits of wine, were of a red colour, except the eyes, which had the appearance of a large black spot in each egg. On opening an egg with a needle, the young lobster was immediately developed, and at the same time a strong colouring liquor exuded from the egg. Among the eggs were a few specimens of the young lobster. Their extreme delicacy and tenderness rendered it almost impossible to dissect them, but they displayed themselves very beautifully in water, and the extremities might thus be distinctly seen, under the microscope. Blotches of colour were visible in the claw, and upon various parts of the body. The eyes appeared, in this early state, sessile. The double antennæ were perceptible, the large claw was distinctly and perfectly formed, and the second leg, with the terminal claw, well made out. The other legs appeared imperfectly formed, and to be either very numerous, or mingled with transparent skin-like appendages, having the appearance of the skins of legs, cast off in moulting. The tail, was well developed, and was distinctly perceived, even in those young which were forced from the egg with a needle. Two specimens of the young, which appeared double, were found, being strongly united together at the head.

Mr. Travis, a surgeon of Scarborough, clearly alludes to this state of the lobster, in his letter to Pennant. (See *British Zoology*, vol. iv. p. 12.) He says, "Though the ova be cast at all times of the year, they seem only to come to life during the warm summer months of July and August. Great numbers of them may then be found, *under the appearance of tadpoles*, swimming about the little pools left by the tides among the rocks, and many also *under their proper form*, from half an inch to four inches in length.

Mr. J. V. Thompson, in a letter addressed to the editor of the *Zoological Journal*, xix. 383., after stating that he has ascertained "the newly hatched animal to be a Zoe," in all our most familiar native genera of the Decápoda, and including the genus *A'*stacus, has stated that, "with regard to the lobster, I can aver, that it does actually undergo a metamorphosis, but less in degree than any of the above enumerated genera, and consisting in a change from a cheliferous schizopode to a decapode; in its first stage, being what I would call a modified Zoe, with a frontal spine, spatulate tail, and wanting subabdominal fins; in short, such an animal as would never be considered what it really is, were it not obtained by hatching the spawn of the lobster." How far the

young lobster is zoeform, may be seen on a comparison of it with the figure of the Zòe, p. 275.

Mr. Thomson describes the young as "cheliferous," or claw-bearing; but this term applies as well to the adult lobster as to the young one.

"Schizopode" or split-legged. Two of the feet, at least, are perfectly formed: whether the others are correctly described as schizopodiform, I cannot determine.

"A frontal spine." I could not perceive any spinous process whatever about the head or thorax: the head has, I think, a more larva-like appearance than any other part. The adult lobster has a rostrum, or frontal spine, forming part of its specific character.

"Spatulate tail;" that is, a tail broad and round at the point, and narrow at the base. This description does not materially vary from the tail of the adult.

"Wanting subabdominal fins." Whether the young have these, I cannot determine, the imperfect developement of the minor legs rendering it almost impossible to do so.

The general appearance of the young animal is, I think, much more nearly that of the perfect lobster than Mr. Thompson has stated.

[*The Freshwater, or River, Crawfish, or Crayfish.* (p. 469.)] Mr. Thompson has intimated, in the letter above quoted, that some peculiarity in the crawfish must have escaped M. Rathke, and that he has erroneously stated that it leaves the egg in a perfect state; but subsequent observations all confirm M. Rathke's opinion. I have myself had several fine specimens of the river crawfish brought to me from the neighbourhood of Mattishall, Norfolk, where it is rather plentiful. Several of the females had eggs, and young ones just hatched under the tail. The appearance of these young ones perfectly agrees with the description given by M. Rathke; no difference whatever being perceptible between their form and that of the perfect animal. The eggs had tail-like appendages.

On the whole, whatever differences may exist between the young and adult state of some of the decapodous Crustàcea, it can hardly be doubted that Latreille's character, "nascunt parentibus omnino fere similia," will at least apply to some of them; namely, to the mountain crab, which the Rev. L. Guilding states (p. 276.) certainly leaves the egg perfect; to the Porcellàna, described in p. 269, 270.; to the river craw-fish (p. 469—484.); and to the common lobster (p. 482—484. with the qualification Latreille has given.

On the other hand, Mr. Guilding confirms (p. 27[illegible] than the Thompson's statement as to the fact that some s[illegible]

crabs undergo metamorphoses, when he states (p. 276.) that he has "seen a bay, a mile in length, covered with myriads of little dead crabs, bearing formidable spears, such as Mr. Thompson has figured, which had been washed on shore before their metamorphosis. From their incredible numbers, they were, probably," Mr. Guilding says, "immature *Pagùri*."

As to the sessile-eyed Malacóstraca, some of them, also, appear to leave the egg perfect. Olivier (probably following De Geer and Geoffroy), in his description of the genus *Gámmarus Lin.*, says, "These insects (as he calls the *crevettes*) *do not undergo any transformation; and they have, at their first appearance, the form which they preserve throughout life;* but they change their skin many times, according to their growth. The cast skin shuts to again so closely as to have the semblance of the insect itself." (*Encyclopédie Méthodique, Insectes*, vol. vi. p. 183.)

Mr. Montagu, also, in the *Lin. Soc. Trans.*, vii. p. 67., describing *Cáncer Phásma* (*Caprélla Leach*), says, "While examining a female in a watch-glass of sea-water, under a microscope, we were agreeably surprised to observe not less than ten young ones crawl from the abdominal pouch of the parent; *all perfectly formed*, and moving with considerable agility over the body of the mother; holding fast by their hind-claws, and erecting their heads and arms."

On the other hand, Dr. Coldstream has given us a figure of what he calls the *fœtus* of the Limnòria térebrans. In the *Edinburgh Philosophical Journal* (xvi. 325.), he says, "Within the sac there are generally found six or seven young Limnòriæ: in some individuals only five, in others nine. They have come under my observation always in an advanced stage of developement; but I have never seen them give any signs of life. The head, and the other five anterior segments, are larger, proportionally, than in the adult. The antennæ and eyes are almost completely formed, although the articulations of the former are not distinctly seen; the colour of the eye is nearly as deep as in the adult. The other appendages hang loosely from the inferior surface: all present the appearance of simple tubiform organs. Even the jaws and the branchiæ can scarcely be distinguished from the legs."

There is, evidently, a wide field open in this subject for investigation; and, since the intimation given in a note in Mr. Kirby's lately published treatise [*On the Power, Wisdom, and Goodness of God, as manifested in the Creation of Animals, and their History, Habits, and Instincts*], your readers will, I black g:e, in common with myself, look with eagerness for the yellowish Mr. Westwood's labours in it.

, *Aug.* 12. 1835.

[Mr. Brightwell has sent us with this communication drawings in illustration of it. They represent: — A young lobster protruded from the egg: natural size. — Young lobster just hatched; natural size. Magnified view of the last. The large claw magnified. — Young crawfish: natural size. Magnified view of the same. The egg: natural size. The tail. The legs.—We have omitted to have the drawings engraved, because they exhibit the objects upon too small a scale, and too indistinctly, to enable the engraver to produce figures from them that would be deemed much relevant to the questions on which they are cited. This is the opinion of a crustaceologist who is engaged in the study of these questions, and who has offered to dissect specimens of the youthful states of the lobster, and to delineate their structure, for exhibition in this Magazine, if Mr. Brightwell will be so kind as to supply specimens.]

Art. III. *A descriptive Catalogue of the Insécta Myriápoda found in Berwickshire.* By George Johnston, M.D., Fellow of the Royal College of Surgeons of Edinburgh.

MYRIA'PODA.

(*Léach*, in Zoological Miscellany, iii. 31. &c.; *Latreille*, in Cuv. Règ. Anim., iv. 326.)

Obs. The insects included in this small class are well known by the name of "Meggy-many-feet," in Berwickshire and in all the south of Scotland.

Order I. Chilo'gnatha. Antennæ 7-jointed: legs short: body generally crustaceous. (The motions of the species are slow; and they feed on decayed vegetable matter.)

* *Legs sixteen pairs.*

1. Glómeris. Body oval, arched, contractile into a globe: eyes distinct.

** *Legs numerous.*

† *Body serpentiform, spirally contractile: eyes distinct.*

2. Ìulus. Segments cylindrical; antennæ with the second joint longer than the third.

3. Craspedosòma. Segments subcylindrical, the sides protuberant: antennæ with the second joint shorter than the third.

†† *Body linear-depressed, spirally contractile: eyes obsolete.*

4. Polydésmus. Segments laterally compressed, margined.

Order II. Sy'ngnatha. Antennæ composed of 14 or more joints: legs elongated: body depressed, coriaceous or membranaceous. (The species creep with rapidity, and are carnivorous.)

5. Lithòbius. Legs 15 pairs, the hinder longer than the others; antennæ setaceous with numerous joints.

6. Geóphilus. Legs many pairs, the hinder not distinctly longer than the others: antennæ somewhat filiform, with 14 joints.

Ord. I. CHILO'GNATHA *Latreille*, in Cuv. Règ. Anim., iv. p. 329.

1. GLO'MERIS *Latreille.*

1. *G. marginàta.* Black, the margins of the segments yellow. — *Leach*, in Edin. Encycl., vii. 407.; Supp. Encycl. Brit., i. 430. pl. 22.; Zool. Misc., 3. 32. tab. 132.; Trans. Linn. Soc., xi. 377.; Sam. Ent. Comp., 113. G. limbàta, *Latr.*, Gen. Crust. et Insect., i. 74. G. limbàtus *Lam.* Anim. s. Vert. v. 37. *Iùlus* oniscòides *Stew.*, Elem., ii. 336. *Onìscus* zonàtus *Panz.*, Fn. Ins. Germ., 9. 25.

Hab. Under stones on dry banks, and near old walls; common.

Body elliptical, glossy and smooth, 4 lines in length, $2\frac{1}{4}$ in breadth: head black, pale grey or brown in front to a greater or less extent, and sparingly hispid: antennæ encircled at their insertions with a raised rim, black with paler blotches, the two outer joints clothed with short hairs: eyes small, black, granular, lateral and marginal, and between them and the antennæ there are three raised lines: post-occipital segment small, semicircular, marked with a slight depression in the centre, and three impressed lines across the front, the posterior margin yellow: first segment of the body large, transverse, the nine following much smaller, subequal, the caudal again enlarged and rounded behind; all of them pitch-black and margined with yellow; the anterior margin of the first with a transverse impressed stria, and two or three short oblique striæ on the sides of each of them, often concealed by the manner in which they overlap one another: ventral surface yellowish, blotched: legs black or sometimes dark-brown with paler blotches, alike and equal, hispid, terminated with a single sharp slightly curved claw. — In immature individuals the segments are usually marked with pale spots and blotches, sometimes disposed so as to form two series along the back, and the caudal segment with two round pale spots, which are sometimes more or less visible even in full-grown specimens. When alarmed, the insect contracts itself into a pill-like ball.

2. *IU'LUS Linnæus.*

* *Segments longitudinally striate.*

1. I. *sabulòsus.* Blackish glossed with grey, marked along the back with two reddish lines.—*Lin.*, Syst., 1065.; *Mull.* Zool. Dan., pr. 205. No. 2422.; *Latr.* Gen. Crust. et Insect., i. 75.; *Leach*, in Edin. Encycl., vii. 407.; Supp. Encycl. Brit., i. 430.; Zool. Misc., 3. 33.; Trans. Linn. Soc., xi. 377.; Sam. Ent. Comp., 114.; *Lam.*, Anim. s. Vert., v. 35.; *Latreille*, in Cuv. Règ. Anim., iv. 334.; *Risso*, l'Europ. Mérid., v. 149.; *Stew.*, Elem., i. 336.

Hab. Under stones and the bark of decayed trees; frequent.

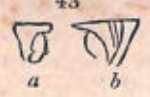
Body cylindrical, $1\frac{1}{2}$ inch long, thicker than a crow quill, bark-glossed with grey, marked along the back with two Body or reddish fasciæ, frequently tinted underneath with

pink and mottled with dots of the same colour as the dorsal lines: head smooth, clouded, the interior margin brown and ciliate: eyes black, sometimes encircled with a pale halo: antennæ dusky brown, hispid, the basal joint very short, the second longest, third rather longer than the fourth and fifth, which are equal, penultimate half as long as the fifth, and receiving the minute terminal one, which is truncate, all the joints thickened outwards: post-occipital segment smooth, black or piceous with a pale yellow margin: segments more than 50, longitudinally striate, the striæ impressed, very slightly waved, often forked, interrupted by the smooth interspaces: lateral pores small, dark: anal segment mucronate, hairy at the point, the valves black, roughish and hairy: legs clear yellowish-brown. — Some specimens are of a bright reddish-brown colour with straw-yellow legs, but in the dorsal fasciæ we have a constant character which readily distinguishes it under every variation. — From the thinness of the margin of the segments, they appear, in certain lights, to be bounded by a golden-yellow line. When bruised in a fresh state, the body exhales an acrid spirituous fluid, which, as Dr. Lister expresses it, "strikes the nostrils exceeding fiercely."

2. I. *niger*. Uniform glossy black when living, tinted with brown on the sides; anal segment mucronate, the mucro conical, acute. (*fig.* 43. *b*)—*Leach*, in Edin. Encycl., vii. 407.; Zool. Misc., 3. 34.; Trans. Linn. Soc., xi. 378. I. terréstris *Mull.*, Zool. Dan., pr. 201. No. 2421.; *Turt.* Gmel., iii. 778.

Hab. Under stones and the bark of decayed trees; common.

This equals the preceding in size, and can scarcely be distinguished from it otherwise than by the absence of the coloured dorsal fasciæ. Head smooth, clouded, pale brown anteriorly, and fringed with short stiff hairs: eyes black: antennæ inserted before the eyes, fuscous, hispid: post-occipital segment larger, smooth, fuscous, often clouded, the marginal line usually yellow: segments 50, glossy-black, piceous or tinged with brown underneath; longitudinally striate and marked with a small pore on each side, and frequently with a few hairs on the posterior margin: interspaces black, smooth: anal segment mucronate, the mucro conical acute, the valves black or brown, hairy: feet clear white or yellowish white, hairy on the inner aspect. There is a variety, or immature state, which is slenderer in proportion to its length than is usual; and the valves of the anal segment in this variety are more strongly hispid. The legs are sometimes very dusky. After death, as Dr. Leach correctly remarks, this species "generally changes to blue, having the margins


43
a *b*

of the segments brown or yellowish, with a row of black spots along the sides of the body." The feet are either pellucid white or yellowish white; and I have seen specimens with the white and yellow intermixed; the opposite legs of the same pair even not being always alike. On being rudely handled, a fluid transudes from the lateral pores, which has the same peculiar penetrating odour which *I.* sabulòsus exhales when bruised.

3. I. *punctàtus.* Reddish brown or very pale brown colour, the pores forming a series of dark spots along each side; anal segment with a short cylindric obtuse mucro (*fig.* 43. *a*) *Leach*, in Linn. Trans., xi. 379.
Hab. Under stones and the bark of trees; common.

Body from 8 to 10 lines in length: head pale with a dusky fascia across the front, smooth, the anterior margin fringed with hairs: eyes black: antennæ pale, dusky towards the apex, hispid: post-occipital segment smooth with dusky margins: segments about 60, striate in a longitudinal direction, generally a very pale brown, sometimes reddish brown, marked on each side with a dark spot, and there is a series of more obscure spots along the back, but these are sometimes wanting, especially on the posterior segments: anal segment yellowish brown, smooth, the mucro short, obtuse: legs clear white, somewhat hispid. — In pale-coloured individuals, the dark spots on the sides are very obvious and form a striking character; but in the darker specimens these spots are less obvious and require to be looked for. It differs from the *I.* nìger in being always less; in its colour; in the form of the anal mucro (*fig.* 43. *a*); and in having more numerous segments, for in a large specimen of the nìger I could not count more than 50; while in a specimen of the punctàtus, scarcely half the size, there were 57, or thereabouts. Of their distinctness as species there can, therefore, be little doubt. Our animal is certainly not *I.* terréstris of Leach; for he says its striæ are much stronger than in *I.* nìger, which is not the case in ours.

** *Segments smooth dorsally.*

4. I. *pulchéllus.* Narrow, cylindrical, sparingly hirsute; anal segment submucronate. Length 5—7 lines.
Var. 1. Body white, marked along each side with a series of orange-yellow or scarlet spots. — *I.* cándidus *Mull.*, Zool. Dan. Prod., 201. No. 2425. *I.* pulchéllus *Leach*, in Linn. Trans., xi. 379. *I.* fragariàrum *Lam.*, Anim. s. Vert. v. 36.
Var. 2. Body dusky or reddish brown, the lateral pores dark. — *I.* tuberculòsus? *Mull.*, Zool. Dan. Prod., 201. No. 2424.
Hab. At the roots of flowers and potherbs in gardens, and under the bark of decayed trees, abundantly.

Body linear, cylindrical, sparingly covered with short rigid

hairs; when mature, and after it has been exposed to the air, dusky brown or reddish, with a series of black spots along each side; but, when young and subterraneous, it is pure white, or only tinged with brown, and the lateral pores are scarlet or bright orange: head hispid in front: eyes pale: antennæ white, sometimes spotted with brown, hispid, more decidedly clavate than in any of the preceding species: basal joint minute, the second and third longest and equal, fourth and fifth also equal, the penultimate shorter, ovate, the terminal one small: segments about fifty in a large individual, not forty in a smaller one, smooth on the back, but the sides are marked with faint striæ: anal segment without a mucro, but brought to a very minute point: legs tinted with red or pellucid white, hispid.

This is narrower in proportion to its length than any of the other species. I have seen specimens of a bright red colour, and others are piebald. The pretty white variety is common at the roots of flowers in gardens the soil of which is clayey. In drying it changes to a dusky pink colour, and when preserved in spirits becomes blackish. I should have considered it the same as *I.* pusíllus of Dr. Leach, had I ever seen an individual marked with two rufescent lines; but no such character has been noticed in the numerous specimens examined; whereas, from being introduced in the specific character, it would seem to be constant in Dr. Leach's species.

3. Craspedoso'ma *Leach.*

1. *C. Raulínsii.* "Back fuscous brown, with four lines of white spots: belly and legs reddish." *Leach*, in Suppl. Encycl. Brit., i. 430. pl. 22.; Sam. Ent. Comp., 114. — *Iúlus* Raulínsii Leach, in Edin. Encycl., vii. 407.; Zool. Misc., 3. 36. pl. 134. f. 1—5.; Trans. Linn. Soc., 11. 380.
Hab. Under stones, the bark of trees, and in moss; rare.

Body ten lines in length, cylindraceous, slightly tapered near the tail, blackish, with a grey or hoary gloss, covered with a few scattered hairs, most abundant on the posterior segments: head small, flat, dusky brown, punctulated behind: eyes black, granular: antennæ dusky brown, the two basilar joints rufescent, hispid, basal joint very small, the second and fourth twice as long, the third and fifth longest, and the sixth and seventh short, nearly equal, forming together an ovate head: post-occipital segment paler than the head: segments transverse, roughish, marked with an impressed line down the centre, protuberant on each side, narrower underneath, where, consequently, the interstitial spaces are most obvious: caudal segment without a mucro: legs brown, duskier towards the claws, hirsute. The "four lines of white spots" are very obscure, and escaped our observation until they were

pointed out to us by Mr. J. E. Gray. In the *Edinburgh Encyclopædia* the markings are described as forming "two light red longitudinal lines" on the back.

4. Polyde'smus *Latreille.*

1. *P. complanàtus.* "Reddish cinereous; last segment of the body mucronated." — *Latr.*, Gen. Crust. et Insect., i. 76. *Leach*, in Edin. Encycl., vii. 408.; Suppl. Encycl. Brit., i. 430. pl. 22.; Zool. Misc., 3. 37. tab. 135.; Linn. Trans., 11. 381.; Sam. Ent. Comp., 115. *Iùlus* complanàtus, Lin. Syst., 1065.; *Mull.*, Zool. Dan. Prod., 201. No. 2423.; *Turt.*, Gmel., iii. 778.; *Lam.*, Anim. s. Vert., v. 36. *Scolopéndra párva terréstris tardipes, juncturis bipedibus, Petiv.*, Gaz. Nat., 24. pl. 15. fig. 10.
Hab. Under stones and the bark of decayed trees, and at the roots of plants in gardens; common.

Body 8 or 9 lines long, 1 line broad, linear, the back flattened, dusky yellowish-brown, the antennæ, interstitial spaces, and the feet paler: head small, smooth, with an impressed line down the middle, hispid in front: antennæ frontal, clavate, hirsute, the tips of the joints pale, first and second shorter than the third, which is longest, fourth and fifth equal, obconical, the penultimate thick, the apical small, ovate: eyes none: post-occipital segment transversely elliptical, the rest square, with raised sides, bossed with a large tubercle, divided behind by an impressed line, the disk tessellated with small tubercles arranged in three cross rows; interspaces smooth, depressed, rounded: ventral surface rounded, pale yellowish brown: tail narrow, mucronate, with a few hairs on the end: legs 31 pairs, hispid, with very short hairs, 6-jointed, tapered, and armed with a small sharp claw. The young are milk-white.

Ord. II. Sy'ngnatha *Latreille*, Gen. Crust. and Insect., i. 73.*

5. Litho'bius *Leach.*

1. *L. vulgàris.* "Under lip very smooth, with lightly impressed obscure dots on the anterior part; feet testaceous, yellow."—*Leach*, Zool. Misc., 3. p. 40. L. lævilàbrum *Leach*, in Edin. Encycl., vii. 409., and Trans. Linn. Soc., 11. 382.
Hab. Under stones and in moss; common.

From 10 to 14 lines in length, the breadth 1½: head subquadrangular, flat, broader than the following segments, chestnut-brown, sometimes clouded with dusky, smooth, marked with a curved impressed line extended between the bosses of the antennæ, the space anterior to it sparingly punctate: eyes marginal, placed behind the antennæ, black, granular: antennæ inserted on the front margin of the head,

* In the *Règ. Anim.*, iv. 335., this name is dropped, and that of Chilo'poda adopted.

multiarticulate, long, setaceous, covered with short patent hairs, the two basal joints stout and longer than the third, the following subequal, moniliform: mandibles very strong, 5-jointed, the basal one large, the three next short, the claw long, curved, acute, blackish brown: palpi filiform, yellowish brown, hispid, 4-jointed, the joints subequal, the terminal pointed with a minute claw: under lip a broad plate, divided longitudinally into two equal pieces, emarginate, the margin finely denticulated, either smooth or sparingly hispid, with scattered indistinct punctures anteriorly, yellowish brown, with a raised dark rim in front: larger segments of the body chestnut-brown, quadrangular, smooth, margined, the posterior margin slightly sinuated, the terminal one narrow and truncate: smaller segments transverse, a shade lighter in colour, produced at the posterior angles: legs 15 pairs, insensibly but gradually increasing in length as we count backwards, the posterior pair disproportionally elongate, tapered, of a uniform yellowish brown, sometimes very pale, hispid, more especially the outer articulations, and armed at the joints with a few spines, the claws acute, dark brown: joints 7, the two basal short, third and fourth longer, subequal, fifth and sixth elongate, the seventh not half the length of the penultimate: coxæ of the four hinder pairs of legs grooved on the inner aspect, and crossed with raised lines: ventral plates quadrangular, narrowest behind, the margin straight, smooth, yellowish brown, almost naked, the last rounded and more pilose than the others. The antennæ are about half the length of the body, but in the male sometimes only one third its length, and in the female they often considerably exceed the half. There are a pair of tooth-like claws, and two spines on each side beneath the caudal segment of the male, but neither the claws nor spines are observable on the female, the segment being merely margined with a few hairs. The animal is subject to great variety in size, and also in the intensity of its colour. The young are milk-white.

6. Geo'philus *Leach.*

* *Antennæ with short Joints.*

1. *G. subterràneus.* Body a uniform pale yellow, the head scarcely darker or subferruginous.—*Leach*, in Supp. Encycl. Brit., 431.; Zool. Misc., 3. 44.; Trans. Linn. Soc., 11. 385.; Sam. Ent. Comp., 116.

Hab. Under ground in gardens; rather rare.

Body of a uniform pale yellow colour, linear in front, tapered slightly towards the tail, smooth and glossy, but when viewed sidewise, a few very short hairs are seen scattered over the back: head a shade darker, swollen on each side of the vertex, marked with a few distant punctures, the

front rounded and minutely emarginate in the centre: antennæ approximate at the base, hairy, short, with 14 joints, which are nearly equal, and darker at their apices: under lip smooth, divided by a perpendicular line; the mandibles with dark brown claws, and a few short spines: post-occipital segment lunate anteriorly, the angles embracing the hinder part of the head: segments marked along the centre of the back with two impressed lines, and on the ventral aspect with a similar line on each side: legs of the same colour as the body, hispid, the last pair longer. Length, 1½ inch: breadth, scarcely 1 line.

2. *G. acuminàtus.* Body ferruginous, anteriorly gradually narrower; head castaneous, paler in front; legs yellowish brown.—*Leach*, in Supp. Encycl. Brit., i. 431.; Zool. Misc., 3. 45.; Trans. Linn. Soc., 11. 386.; Sam. Ent. Comp., 116.

Hab. Under stones; common in many parts of Berwickshire, especially on the sea-shore, and in great profusion at the base of the hills forming the Cheviot range.

Body linear-elongate, the anterior quarter narrowed forwards, ferruginous, sometimes marked with a series of dusky spots along the back: head quadrangular, narrowest in front, not broader than the following segment, smooth, castaneous, with a pale hispid margin, and a pale line across the forehead, the crown with a longitudinal dark line: eyes none: antennæ yellowish brown, short, filiform, hirsute, 14-jointed, the basal joints thicker but not longer than the others, which are obconic, with pale apices, the terminal one longer and ovate: lip yellowish brown, smooth, broadly triangular, the margin edentulous, emarginate in the centre, and sinuate on each side, where the strong mandibles have their origin; the latter armed with a sharp dark brown claw with a spine at its root: palpi filiform, yellowish brown: dorsal scales quadrangular, sprinkled with a few short hairs, smooth, the narrow intermediate ones mammilliform on each side, the penultimate and caudal somewhat enlarged, the former granulous underneath, the latter rounded, unarmed: ventral scales quadrangular, paler, somewhat hispid, an impressed line on each side: legs equal, or nearly so, of a uniform yellowish brown, hispid, 5-jointed, the basal joint short, three next longer, subequal, the fifth elongate, and terminated with a dark brown acute claw. Length, 1 in. 8 lines; breadth, not a line.

** *Antennæ with elongate Joints.*

3. *G. longicórnis.* Body pale yellow, tapered posteriorly; head chestnut, minutely punctured; feet the colour of the body; antennæ slightly tapered.—*Leach*, in Supp. Encycl. Brit., i. 431. pl. 22.; Zool. Misc., 3. 45. pl. 140. fig. 3—6.; Trans. Linn. Soc., 11. 386.; Sam. Ent. Comp., 117.

Hab. Under stones; frequent.

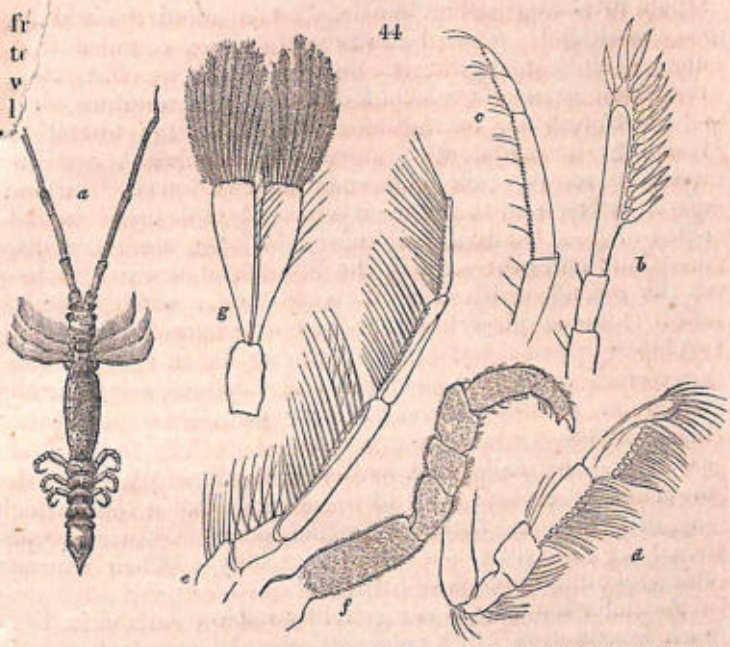
Body of a pale yellow colour, dusked about the middle linear, posteriorly tapered a little to the anus, rounded dorsally, smooth, glossy: head chestnut-brown, quadrangular, narrower than the post-occipital segment, punctured all over and sparingly hispid on the sides: the inferior lip punctured, divided by a medial line: maxillæ strong, with blackish-brown claws: antennæ originating in the anterior margin, tapered, hairy, with 14 obconical yellow joints, deeper-coloured at their apices, the basal one short and stout, second, third, fourth, and fifth twice as long, the following shortening insensibly to the terminal, which is again longer and elliptical: post-occipital segment brown, lunate, the lateral angles embracing the lower half of the head: segments shorter than their breadth, dusky along the posterior margin, marked with two impressed lines, interrupted by the narrow interstitial segments, which are mammillary on the sides: the ventral surface flat, of the same colour as the dorsal, with a roundish depression in the centre of each segment, and an impressed line along the sides: legs uniform, hispid, the posterior pair longer. Length, 1½ in.; breadth, 1 line. When viewed sidewise, a few very short hairs are seen scattered over the back; and a series of pores are visible along each side, one to every segment.

ART. IV. *Illustrations in British Zoology.* By GEORGE JOHNSTON, M.D., Fellow of the Royal College of Surgeons of Edinburgh.

43. ASTACI'LLA LONGICO'RNIS. (*fig.* 44.)

Synonyma. — Oníscus longicórnis *Sowerby*, Brit. Misc., tab. 15.; *Penn.*, Brit. Zool., iv. 42. Leàcia lacertòsa *Johnston*, in Edin. Phil. Journ., xiii. 220. Astacílla longicórnis *Fleming*, in Encyclop. Brit., vii. 502. edit. 7th.

Description. — Body linear, subcylindrical, 1¼ in. long, cinereous with dusky spots or blotches, granulous and tuberculate, formed of seven very unequal thoracic and two abdominal segments: head larger than the following segment, deeply lunate in front, the projecting angles obliquely truncate, the vertex flattish, tuberculate, and impressed, constricted behind the eyes, which are lateral, prominent, round, black, and reticulated: antennæ four, frontal, approximate at the base; the superior very short, four-jointed, the basal joint bulbous, the two next short, nearly equal, the terminal one elongate, linear-elliptical, ciliated along the under side with curious pedicled tubular hairs; inferior antennæ nearly



a, Astacilla longicórnis, of the natural size; *b*, the three outer joints of the superior antenna, greatly magnified; *c*, the same of the inferior antenna; *d*, a leg of the first pair; *e*, one of the swimming legs; *f*, one of the creeping legs; *g*, one of the branchial abdominal processes.

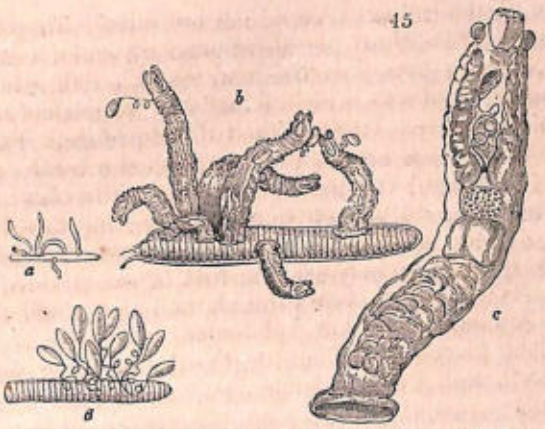
as long as the body, crustaceous, roughish, tapered, with seven joints, of which the first is very short, the second twice as long, the third and fourth still longer and nearly equal, the three terminal slender, short, sparingly hispid and serrulated underneath with a close series of spinous denticles: post-occipital segment united immovably to the head, transverse with dilated sides, its pair of legs short, directed forwards over the maxillæ, six-jointed, the thigh moderately elongate, the next joint forming a sort of knee, the third also short, the fourth and fifth longer and dilated, the terminal small and compressed, and all, except the thigh, densely ciliated along the inferior surface, the ciliæ in two marginal rows and plumose: two next segments of the body short, transverse, arched, tuberculate, with a dilated process on each side that overhangs the tubercles from which the swimming feet arise; the fourth segment is very large, equal in length to one half of the body, rounded and granulous on the back, and with a granular ridge on each side, separated by a smooth line, the ventral surface smooth and membranous, the front margin dilated laterally like the two preceding segments, and bearing

a pair of similar legs; these legs are equal, five-jointed, two basal joints short, the three outer elongate, tapered, ciliated along their internal margins with long white ha the three segments which follow the large one are sho equal, transverse, bearing each a pair of legs formed f creeping; these arise within a cup-shaped tubercle, are equal in length, rough, of six joints, and armed with a claw; the joints are emarginate on the superior aspect of their tarsal ends, to allow of freer motion, the femoral is long, the three tibial are short and nearly equal, the first tarsal is twice as long as the second, which bears the claw, under which there is a short spinous projection: abdomen composed of two inarticulate pieces, equal in length to the three preceding, angulated, with a few tubercles, and terminated by a strong triangular spinous process; on the ventral aspect are two linear-oblong movable plates pointed behind, joining accurately in the mesial line, and enclosing three pairs of white branchial processes: each of these consists of a stalk, which supports two equal flattened lamellæ, movable, beautifully ciliated on their sides, and more especially on their truncate apices, with long plumose bristles.

Astacílla longicórnis is apparently not uncommon in Berwick Bay; but, as it is a pelagic species, I have not been able to procure living specimens, and observe its mode of progression. The tubular ciliæ of the superior antennæ are very singular organs, the like of which I do not remember to have observed in any other isopodous crustacean insect. The joints of the inferior antennæ are deeply cut on the under sides, so as to allow of their being bent under the body; but they cannot be carried above its level, or laid on the back, as by the terrestrial species of the order when they are alarmed. The large middle segment serves the purpose of an ovarium, and, at certain seasons, is filled with numerous orange-coloured or reddish globular ova. When these are mature, the segment opens, by a natural rupture, along the medial ventral line, and permits their discharges, in the same manner that the belly of the pipe-fish opens for the escape of its spawn.

44. Udone'lla Caligo'rum. (*fig.* 45.)

I have given this little leech a new name; for I can find no established genus to which it can be referred. It is the parasite of the parasitical Calìgus, which infests the halibut (Hippoglóssus vulgàris), and which, appearing to be nondescript, will probably afford us the subject of a future illustration. The leech adheres by its sucker to any part of the body of the crustacean, and often fringes the sides, or



a, Udonélla Caligòrum, of the natural size, attached to a portion of the caudal filament of the Caligus; *b*, the same magnified; *c*, a single specimen compressed between plates of glass, and highly magnified; the proboscis is thrust out of the mouth and forwards; *d*, a cluster of ovaries magnified.

hangs in clusters from the caudal filaments, waving and contorting itself like a worm in pain. I have not seen it voluntarily leave its hold, but it may be removed without difficulty or injury, when it lies very helpless in the basin and apparently incapable of progressive motion. In its structure it seems allied to some intestinal worms, but from its habits there is reason to locate it among the *Hirùdines*, although it should be remarked that the Caligus did not appear to have become thin and exsanguinous, and swam about with its load of blood-suckers with great activity, indifferent to their wrigglings and annoyance.

Udonélla Caligòrum is about 4 lines in length, and scarcely one in breadth, of a milk-white colour, subpellucid, subcylindrical, contractile like a worm, soft, without limbs or processes; but when magnified the margins appear crenulate, from the skin being drawn into circular wrinkles. The anterior extremity is truncate, with a sort of thickened wart at each side: the mouth is inferior (not terminal), forming a longitudinal slit from which there is occasionally extruded a very short thick proboscis plaited round the rim, but edentulous: and the sucker at the posterior extremity is circular, cupped, and plain. If the body is now slightly compressed between plates of glass, we perceive near the middle a clear circular spot, or viscus, containing translucid granules, and immediately under this there is another bag, or viscus, about twice the size of the former. The largest appears to be the stomach; and the intestine is seen obscurely to form numerous convolutions in the space between it and the sucker; but their particular

course and termination could not be traced with any de[gree] of accuracy. Half way between the mouth and the first ci[rcle] spot, there is an opaque irregular mark, which gives ori[gin] the ovary, and which can be easily seen attached to a ve[ry] in this spot, by its thread-like twisted pedicle. I have ne[ver] seen more than one of these in the same body, and I have seen it extruded through an aperture at the side of, or near the mouth, as is shown in two of the individuals figured. The ovaries are oval or pear-shaped, and are filled with a granular matter: they are attached in clusters to the body of the Caligus by their pedicles, and may usually be found in great numbers.

Udonélla may be distinguished by the following character:— Body indistinctly annular; anterior extremity without a sucker; mouth inferior, longitudinal, edentulous; eyes none; posterior sucker plain. — The only known species appears to be plentiful in our seas; for, of numerous specimens of the Caligus which were brought to me in April, scarcely one was without a crowd of these parasites.

ART. V. *Observations on the Construction of Maps in Geographical Botany.* By RICHARD BRINSLEY HINDS, Esq. R.N.

As the subject of geographical botany has as yet met with but little attention, it is not to be expected that any maps with which we may be furnished would convey much information. The few that exist are, therefore, very bare of facts, containing merely the names of some plants, according to their common denominations; without any detail of physical agents, limits of the extension of genera or species, or any circumstances desired by the naturalist. They seem framed more to meet and please the general reader, than for any benefit for the advancement of science. Having lately paid some attention to the subject, a few circumstances have occurred to me, which I think worthy of notice in the construction of these interesting plans.

It will be necessary, at starting, to make such a division of the surface of the globe as we may deem most consonant with the distribution of vegetation. In the present state of our knowledge of the subject, I am inclined to think that the best that can be adopted is the six-fold one in use in geography; namely, into Europe, Asia, Africa, North America, South America, and Australasia. Let us now take any one of these, and, giving a little attention to its general vegetation,

subdivisions will immediately strike us; founded, not, as former, on physical causes, but on the character of vegetation. Here, then, our labours commence; this is the point where we register the leading features of its flora, and where our pursuits leave those of the geographer. For illustration, we will take Asia. Over its vast surface are spread several large masses of vegetation, each in its intensity presenting distinct well-marked features, but, when approaching its neighbours, imperceptibly shaded off into them; those more separated presenting appearances well defined, and impossible to be mistaken. Thus, the Siberian flora differs much from the Indian; for they are widely separated, and controlled by very different physical causes; whilst those which approach each other are often so similar as to make it questionable whether their individuality is correct. The Tartarian flora has many characters common to the Siberian; and it is questionable if the Malay should be separated from the Indian. Our object is to establish satisfactorily these divisions; and, having done so, they may be defined on the map by different colours: the taste of the naturalist leading him to adopt those, which seem to speak most to the mind of the nature of the vegetation.

If the soil should possess sufficiently distinct characters to be worthy of record, its varieties might be easily separated by dotted lines, running according to their distribution, and named in full at the point where they leave the traced outline of the map, or in any other convenient situation.

We now come to the more definite portion of our labours, and shall find ourselves much entangled by numerous names and observations, all to be crowded into a very confined space. Here every means must be adopted to convey as much information as possible by the fewest characters. The natural families have first to be settled; and to each of these should be attached a sign expressive of the other divisions of the world to which it may be common. Figures, at first, struck me as being the most likely to answer this end; but, on farther reflection, I thought it best to assume some form to which the eye was accustomed, some parts of which might be removed, without taking away the impression of its original shape. The circle seemed to answer admirably for this purpose, divided into six parts, in the manner represented in *fig.* 46.; one to four, or even five, parts of which might be removed; and the remaining would still show the station it occupied in the original figure. Com-

fig. 46.



mencing as I have numbered them, 1 will stand for Europe; 2, for Asia; and so on.

All the families occupying each section should be detailed, whether large or small; but in that division where a family prevails, and where it may be said essentially to belong, some distinctive mark should be attached to its name, as by having the commencing letter in a different type from the remainder the word. The more prominent genera in each division may be placed under the name of their natural family, unless better placed elsewhere; so that the type, under which a family appears in each division, may be immediately shown. The following examples will place this in a clearer view: —



[The author had placed the remainder of the diagrams in lateral continuation of the preceding ones; the limited width of our page renders it more convenient to us to present them thus.]



As to genera, their distribution is a subject of great importance, and should receive corresponding attention. To prevent the crowding of explanatory sentences, a line may be passed through the name of the genus, stretching north and south to the extent of its limits; or a portion of a circle may be made to sweep through the same extent. If its course in the direction of the latitude is interesting, this might be expressed by lines, parallel, converging, or diverging, according to its habitat, running to the perpendicular line as a base. A great number of these lines might be inserted in a map, and each may be perfectly distinct.

One of the chief objects of this study being the determination of the limits and circumstances under which man may

extend the more useful vegetables, it is desirable that all observations on this subject should be recorded; and, when plants in cultivation are spoken of, they should be placed in a different type. Italics naturally present themselves as claiming this distinction.

Respecting the interior of the large continents we know but little, as they have been but imperfectly, or not at all, examined. This enables us to place here some brief remarks on the peculiarities of their floras, physical agents affecting vegetation, &c.

The very interesting subject of the different zones of vegetation in mountain ranges is most conveniently detached from the body of the map, and placed at the side. These must be accurately drawn to an accompanying scale, and the mode adopted for obtaining the elevation mentioned, whether by the barometer, trigonometric survey, or any other means.

Perpendicular lines should be added, to which is to be attached the mean temperature, both as observed and calculated. But, as this conveys very imperfect information, it would be always advantageous to add the mean temperature of the hottest and coldest months in the year. The humidity of the atmosphere is also a very desirable object for enquiry.

Plymouth, July, 1835.

[In V. 587. are suggestions by Sir John Byerley, on devising and adopting "conventional signs to express objects in geology and physical geography."]

Art. VI. *Notices of Solar and Lunar Haloes, Parhelia, Paraselenæ, and Meteors, as Harbingers of falling Weather.* By W. H. White, Esq.

Having for several years paid considerable attention to these beautiful and interesting phenomena, I send you a brief notice of those that passed under my observation during the last month (July, 1835).

I have made choice of last month because the changes have been so few, and the indications so unerring; at the same time, I feel persuaded no general rules can be laid down for judging of the future state of the weather at all periods, especially in so variable a climate as ours; yet I am convinced if more attention were paid to the different undulations of clouds, winds, haloes, meteors, &c., a tolerably correct estimate might be formed of atmospheric changes, with as much cer-

tainty as by a daily appeal to the barometer; upon which instrument I purpose offering a few remarks in a future paper.

July 1., a lunar halo appeared, a little before 10 P.M., measuring nearly 44° in diameter, on a passing bed of attenuated cirrocumulus clouds, moving slowly from east to west: the halo exhibited four prismatic colours very distinctly. This beautiful phenomenon was followed by gentle rain at about 10 A.M. on the 2d. The barometrical change did not occur till past 11 P.M., or after the halo had been visible about 1½ hour.

July 4., another lunar halo became visible about 10 P.M., displaying lively prismatic colours. At half past 10, two faint paraselenæ appeared, of the same altitude as the moon, and about 22° from the centre of her disk. The barometer at this stage of halo exhibited no change. The paraselenæ were, on their first appearance, faint and irregularly shaped: in about four minutes, they became more distinct and appeared circular, faintly exhibiting the prismatic colours on that side only next the moon: they continued visible about 10 minutes. On the disappearing of the mock moons, the barometer gave the first indication of change. These phenomena were followed by gentle rain at 5 A.M. on the 5th. Several electrical meteors, or "shooting stars," appeared during the halo.

That these phenomena are worthy of notice, the following facts will illustrate. On the 2d, Bedfordshire (especially about Leighton Buzzard), and the neighbouring districts, were visited by a violent thunder storm and much rain. On the 7th, much heavy rain fell in the northern counties, especially in Cumberland; the river Eden overflowed its banks, and did much damage both to grass and corn.

July 27., a beautiful solar halo appeared about 7 A.M. rich in prismatic colours: it was formed on a slowly rising mass of vapour; it was about 45° in diameter, and continued visible about forty minutes; there was also a splendid corona round the sun during the time. At a quarter past 7, a faint parhelion appeared, of the same altitude as the sun, on the S.S.E. point of a small cirrus cloud that was passing behind the vapour. As soon as this began to disappear, another made its appearance on the opposite side of the halo, of the same altitude, and of the apparent size of the sun's disk: this was formed on a patch of plumose cirrus; but no prismatic colours were exhibited in either parhelion. On the total disappearance of the halo, the barometer indicated no change. About four hours after the phenomenon had disappeared, the barometer began to sink, notwithstanding the day was cloud-

less, and there was every appearance of continued heat and drought.

On the following day (28th), at 5 P.M., we were visited with a very smart shower, with thunder and lightning at a distance. [This shower had so limited a range westward of London, as not to extend to Bayswater; at Camden Town, northward of London, there was profuse rain.]

In the evening previous to the appearance of the solar halo, I observed a beautiful meteor pass just below Benetwasch in the tail of Ursa major: it took a south-easterly direction; its colour was first faint blue, which faded off into pale yellow. Several "shooting stars" were also visible.

In the evening of the 27th, there was (after sunset) a beautiful display of lightning, or ignited vapour, playing about in the S.: not a vestige of a cloud was visible. During this luminous display, the wind, which had been stationary for the last 7 days in the E., veered round to S.W. On the 28th, the wind became greatly disturbed during the shower, and not only completely surrounded the compass in a few hours, viz. from S.W. to S.W. again, but finally became settled in the E., the point of its station in which I first observed the halo. After this convulsion, the evening was clear and calm. Now, although I have not yet seen any meteorological reports of the latter part of July, yet I have no doubt the powerful indications which I witnessed will be verified as to the results, upon the simple principle of cause and effect. The maximum heat during the month of July was on the 20th; the thermometer being nearly 92°, one degree higher than June 10th. The minimum temperature during the night of the 20th was 67°; being 14° higher than the extreme heat of June 25.

From repeated observations, during a period of more than ten years, I conclude that both solar and lunar haloes are heralds of succeeding changes of weather from dry to moist; as rain generally follows in periods of from four to twenty-four hours after each manifestation, according to the brilliancy of its appearance, and the perfection of the halo, particularly if the wind be S. or S.W. And that these indications generally precede the indications of the barometer, may be accounted for thus: — As the lower stratum of the atmosphere becomes condensed (from contrary currents or other causes), it is better qualified to concentrate by reflection the rays of the sun or moon; and hence a halo is formed before the atmospheric pressure is sufficient to act upon the barometer.

Lunar haloes are more easily discovered than solar haloes, because the lunar rays are more feeble than the solar; but

solar haloes may be readily discovered, if observers would accustom themselves to look steadily within a few degrees of the sun, when he has risen from 10° to 30°; and also when he has about the same altitude in the evening (as solar haloes are of very rare occurrence at mid-day), when they perceive he shines faintly, and there is no appearance of cloud. Solar haloes are usually the most perfectly formed, and exhibit the prismatic colours the most distinctly on the *vesiculæ* of haze or thin vapour, on attenuated cirrostratus clouds, and sometimes on thin cirrocumulus.

The following prognostications of falling weather of Minna Troil, in the *Pirate*, are not only much to the purpose, but would greatly assist observers:—"The morning mist lies heavy upon yonder chain of isles, nor has it permitted us, since day-break, even a single glimpse of Fitful Head, the lofty cape that concludes yon splendid range of mountains. The fowls are winging their way to the shore, and the shell-drake seems, through the mist, so large as the scarf. See, the very shear-waters and bouxis are making to the cliff for shelter. See, the air is close and sultry, though the season is yet so early, and the day so calm, that not a windelstraw moves on the heath. See how heavy the clouds fall every moment; and see those weather-gaws that streak the lead-coloured map with partial gleams of faded red and purple. *The storm which these signs announce will be a dreadful one.*"—*Pirate*, vol. i. p. 58, 59.

Old Kent Road, August 7. 1835.

Art. VII. *Short Communications.*

Birds.—*The Effect of Feathers of some Kinds on Light, deemed, in* p. 469, 470., *that of Polarisation, is not so, but is the Result of the same Principles as the Fringes in the Shadows of small Objects, explained in some of the recent Works on Optics.* —Undulations of light come through the interstices between the fibres, and produce, by their interferences, dark and white spaces. Now, different colours are produced by undulations of different lengths; and these chequered lines of light and shadow, being varied in the distances at which they are intercepted, make the gay-coloured patterns. When the fibres of the feather are regular, the patterns are regular also.—*P. J. T. London, August* 7. 1835.

"*Are all Birds in the Habit of alluring Intruders from their Nests?*"—This question, treated of in VII. 483, 484.,

can only be satisfactorily answered, I consider, by different correspondents reporting their personal observations. With this view, I offer a few additional facts in connexion with those cited by Mr. Conway. Walking last spring amongst some rushes growing near a river, my attention was arrested by observing a black-headed bunting (Emberìza Schœnículus) performing manœuvres similar to those stated (VII. 483.) of the skylark, by shuffling through the rushes and trailing along the ground, as if one of her legs or wings was broken. I followed her to see the result; and she, having led me to some considerable distance, took wing, no doubt much rejoiced, on return, to find her stratagems had been successful in preserving her young brood; although not in preventing the discovery of her nest, containing five young ones, which I found was placed, as usual, on the side of a hassock *, about 2 ft. from the ground, and almost screened from view by overhanging dead grass. I have invariably found it in such a situation, and never suspended between reeds, as is sometimes stated; it was composed of dead grass, and lined sparingly with hair. This is the first and only instance of this bird resorting to such wiles, that has come under my observation. With the ring plover (*C*haràdrius Hiatícula) it is of more common occurrence. I have repeatedly witnessed this bird making use of the same stratagems as those I have mentioned, in V. 416., of the dunlin, and, in V. 420., of the arctic gull (Léstris Richardsònii, not "*Léstris parasíticus* Boié," as wrongly named in V. 420.). One instance has come under my view of the golden plover (*C*haràdrius pluviàlis) resorting to the same means on being disturbed from her eggs, which were near the time of being hatched. On disturbing some eider ducks from their nests at the Orkney Islands (V. 422.), they went flapping along on the ground, as if they were injured, for some considerable distance before they took wing. Last spring (1834), I had come suddenly upon a wild duck (*A*nas *Bó*schas) with a brood of young ones: she immediately exhibited great anxiety and distress by a variety of move-

* A species of grass [? of *C*àrex] that grows in detached clumps in the wet parts of our fenny districts, and often attains the height of 3 ft., the diameter of the clump being 2 ft. or more, forming a compact mass by the growth of years. Cut and dried, it may be often met with in many of our village churches, and used by the poor as hassocks to kneel upon.—*J. D. S.* [This nature-formed hassock was, as lately as two generations ago, and it may be that it is still, sometimes used as a supplementary seat in the chimney corners of some fen farm-houses. I have not seen one, but have been told this by individuals of the generation preceding my own who had. Will Mr. Salmon deem it too much trouble to supply a specimen of the plant's herbage, flower, and seed, either fresh or dried and pressed, to us?]

ments; pretending to be injured; flapping upon the surface of the water, &c., in a manner similar to that of the one described by Mr. Waterton in VI. 211., and this for some distance up the stream before she took wing; the brood had, in the meantime, scudded away under the projecting roots of an alder stump. Those persons who are in the habit of seeing the partridge during the breeding season, are well aware of the variety of attitudes this bird will put itself into when disturbed with a brood. I witnessed a very remarkable instance of this last summer (1834). I had disturbed a pair of old birds with twelve young ones, only a few days old: the latter immediately squatted close to the ground, almost all of them in different positions, some with a leg extended, others with their heads buried in the thick grass, &c. I could perceive that all of them had their eyes fixed on me; nor did they make the least movement during some considerable time that I was observing and admiring the wise provision of nature, that endowed these little beings with instinct so prompt and apt for self-preservation. The old birds used every artifice to draw away my attention, and kept constantly flying round in all directions, uttering notes of alarm; the female evidently appeared to be the more distressed of the two. On my stooping with the intention of taking up one of the young birds, they all immediately uttered a faint cry and started off.

I suspect that most birds that nidificate on the ground will, at times, endeavour to allure intruders from their nests, when the time of their hatching is near, or when they have young ones; but I should say this is by no means the case with birds generally; for, on the contrary, many of the larger birds will assume a menacing attitude, and boldly defend their nests when disturbed. Mr. Hewitson, in his *British Oology*, speaking of the lesser black-backed gull, says, — "After they have begun to sit, they become very bold in defence of their eggs. Whilst amongst them, I was amused with one near the nest of which I was sitting: it retired to a certain distance, to give it full force in its attack, and then made a stoop at my head, coming within two or three yards of me: this it continued to do incessantly till I left it." And of the skua gull,— "It is impossible not to admire its unflinching boldness of attack: soaring high above you, it will, on your approaching its nest, suddenly pounce at a short distance from you to the level of your head, and, flying directly at you, and with great force, will strike you with its powerful beak, immediately rising to repeat its attack, which is continued during your stay, and with increasing rapidity as you near its nest." See, besides, in connexion, Mr. Drosier's remarks in III. 324.

The black-headed gull, although not so formidable, will yet make a show of defending its eggs, by making sudden stoops, and, at the same time, violently screaming, at any intruder: this I experienced on visiting an extensive colony of these birds within six miles of this place, on the 16th of June last. — *J. D. Salmon. Thetford, Norfolk, Dec.* 18. 1834.

Efforts in the Sparrowhawk to secure its Nest from apprehended Invasion by Man. — Nothing, indeed, is more striking in the habits of animals, than the change in many of them from timidity to boldness, when their helpless young demand their protection. One day, in my rambling through the woods, I was much entertained with an instance of this in the common sparrowhawk. I was sauntering carelessly along, when I was a good deal startled by the sound of wings sweeping rapidly over my head, and so close as almost to touch me. On looking up, I saw a sparrowhawk perched on a tree, a few yards before me, uttering its shrill quavering note, peculiarly expressive of anxiety; and again it made a dash at me, and continued to repeat the menace, at intervals, with great impetuosity, until I had got to some distance. I was at no loss to conclude that there was a nest near the place; and, on returning the same way, found it without much difficulty. — *C. B. Edinburgh, October* 16. 1834.

[*The Fork-tailed Kite.* — It is stated, in VII. 511., of one, a female, that it pecked a hole through the hat of a boy, and scratched his hand "properly, before he could make her go off the nest."]

"*Are all Birds in the Habit of alluring Intruders from their Nests?*" (VII. 483, 484.) — Mr. Conway, the querist in this case, seems to lean to the affirmative side of the question. He gives the well-known instances of the lapwing and the grouse; after which he relates the case of a skylark, which, on being captured on her nest, feigned death; but, on his "remaining quiet for a very short period, the bird began moving; and, with one wing trailing along the ground, and shuffling along as if one of her legs had been broken, she proceeded for a considerable distance, and then took wing." I am induced to think that in this case it was fear, rather than parental solicitude, that caused the bird to act as she did. Would she have affected lameness, if she had simply been scared from her nest? I suspect not. Then follows a curious case of a nightingale luring him from her nest. To these instances he might have added many others, such as the common sheldrake, they grey squaterol or plover, the fallow chat, or wheatear, the dipper, the grey or common partridge, &c. &c. A little further observation would, however, convince us that, although

many birds possess this instinct, it is far from being extended to the *whole* of the feathered race. On frightening the throstle, the missel, or the yellowbill or blackbird (the only kinds of thrush which breed in Britain, except the ring thrush (*Túrdus torquàtus*), which is not yet open to popular observation), from their nests, they fly away, with their discordant clatter, to quite a different part of the wood (supposing they have not hatched), and make no attempt to transfer the intruder's attention from their nests to themselves. The hedge chanter, under the same circumstances, so far from manifesting signs of distress, hops about blithely unde the bushes, uttering its short note. The gold-crested kinglet (*Régulus auricapíllus*) flits from spray to spray, apparently quite unconcerned, while you examine her pretty pendent cradle. The ring pigeon flaps through the air on swift yet heavy wing, till she is out of sight, but makes no attempt to save her nest. The rock pigeon and the turtle dove, in like manner, I believe, allow fear for their own safety to outweigh maternal feelings. The wood pigeon we have here (near Derby) no means of observing, as that species does not frequent these parts. The redbreast flies off to a neighbouring bush, where she sits uttering her plaintive note till the prying naturalist is out of sight, when she returns and resumes her maternal office. These instances (and any one may multiply them) I think satisfactorily prove that, although some birds are in the habit of using stratagems to lure intruders from their nests, yet all do not. — *S. D. W. Near Derby, Nov.* 22. 1834.

The Snowy Owl (*Strix nýctea*), *an Individual of, has been taken alive in Orkney, and was alive on May* 9. 1835, *at Canonmills, near Edinburgh.* — " Last week I received from Mr. Scarth, Sanday, Orkney, a living specimen of the snowy owl (*Strix nýctea*). This was not a native specimen, but evidently a bird of last year, in immature plumage, but whose expanded wings extend 4 ft. in width. The bird arrived in Orkney during a strong north-west gale, with hail and sleet, along with flocks of wild swans, golden-eyes, snow flakes, &c.; indicating an Icelandic or Greenland origin. It was slightly pinioned, and captured by Mr. Scarth. It is now in [good] spirits, and, if possible, shall be tamed, as I am not aware of one having been taken alive before in the country, or kept in confinement." [Extracted from a letter from Patrick Neill, Esq., to the Conductor, dated Canonmills, May 9. 1835. We are happy to learn that the bird is in the care of one so kind-hearted and philosophic-minded. In V. 663—666. is an account of an individual of *Siren lacertina*, which had lived six years and four months in Mr. Neill's keeping.]

The Wigeon has been found breeding, wild, in the North of Scotland.—The "Notes on the Habits of the Wigeon," by Mr. Waterton [in p. 361—364.], induce me to send you a notice of its breeding in the north of Scotland. During the excursion which was made in Sutherlandshire in the summer of 1834 [by our correspondent and some friends of his, see p. 232.], the wigeon was found breeding. (See an account of the birds seen during this excursion, in the *Transactions of the Natural History Society of Northumberland, Durham, and Newcastle upon Tyne*, by Mr. Selby; in the latest number, I believe.) A few pairs of the wigeon frequented many of the lochs in that county. They were seen more particularly, however, upon Loch Shin, Loch Naver, Loch Loyal, and Loch Hope. They were by no means abundant; and it is probable that the birds in this district were at the most southern limit of their breeding stations, and bore no proportion whatever to the immense flocks which frequent our coasts in winter. We succeeded in finding a nest of the bird upon a small island in Loch Loyal: it was placed on the ground, at a distance of from forty to fifty yards from the edge of the water, among thick and long fern (*Ptèris aquilina*), which almost entirely covered the island. The nest was composed of a little grass, and debris of the stalks of the fern, mixed with the down of the birds. The eggs, six in number (and the whole number which would be laid by this individual, being advanced in hatching), were of the same colour as those of the teal or wild duck, and intermediate between them in size. One of the eggs is in the possession of Mr. Yarrell.—*W. Jardine. Holmes St. Boswells, Roxburghshire, July* 13. 1835.

[*Length of the Life of a Gander.*—In the *Morning Chronicle* of April 16. 1835, there is published a biography of, and an epitaph on, one "Tom the Gander," that had lived 37 years, 9 months, and 6 days.]

A wild Bird of the Family Anátidæ deemed a hybrid one.—A fine specimen of a mule bird was shot, near Newcastle on Tyne, in Feb. 1835: it is evidently a hybrid between the wild duck and pintail duck. In its plumage it resembles most the male of the former species, and female of the latter. It was purchased and stuffed by Thomas Ellison, a very skilful preserver of birds and animals; and is now in the possession of *W. C. Trevelyan, at Wallington, Northumberland* [who has communicated this notice of it].

The Night Heron (*A'rdea Nyctícorax* L.).—H. T. Clarke has noted, in VI. 94., his hearing one night at Clapton the note of a bird which he has queried may be of this species. [He has also noted, in VI. 93., and very pleasingly, his hearing

frequently in Suffolk, at night, the note of the same species of bird, be the species what it may.] After the severe thunder storm which fell at Clapton on the evening of June 14. 1834, I was walking in the garden, about 10 o'clock; and I distinctly heard the single and often-repeated note of this heron: it sounds like the word qua, qua, qua, as, I think, Selby remarks. As the bird flies slowly, the note may, on a still evening, be heard for a long time. Hail, of a remarkably large size, accompanied this storm, and much mischief was done in this neighbourhood, in the gardens, to the hand-lights and green-houses. —*O. Clapton, February*, 1835.

[*Charàdrius mìnor; the Accuracy of deeming it a Bird of Britain questioned, with Reasons.*] — Mr. Gould, in the 11th part of his beautiful work on the birds of Europe, has given us drawings of the Charàdrius mìnor, or little ringed dottrell, as a new acquisition to the list of British birds, on the authority of Mr. Doubleday of Epping. It is stated that a very young specimen of that species has been procured on the east of Sussex; but, upon careful attention, I think it may well be doubted if this idea is well founded. The characters given to distinguish it are, flesh-coloured legs, a black bill, and a white rump. The first of these characters at once proves it to be distinct from the Kentish plover, but not from the common ring dottrell; neither does the colour of the bill, as I have no hesitation in saying that birds of the latter species invariably have their bills black in early life. There remains, then, only the white rump as a character to mark it; but, on looking at Mr. Gould's drawing, which, I have no doubt, is an accurate portrait of the bird sent to him, I find that it *has not* the white rump which distinguishes the old bird, figured in the same plate. As this bird, therefore, has all the characters that belong to the young of the common ring dottrell, and has not the one which we should expect to find in the young of the *C.* mìnor, I have great reason to think that it is nothing but the young of the former species, and that the latter is, therefore, unknown in this country. Though I am not acquainted with the fact, yet I have no doubt that the young of the *C.* mìnor will be found to have the white rump, like the old one: if not, it exhibits a change of plumage which I do not remember to have before noticed.—*Arthur Strickland. Bridlington Quay, June* 10. 1835.

A Tippet Grebe was shot on Diss Mere, Norfolk, by Mr. B. Barrett, landlord of the Cross Keys public-house in Mere Street; the date "last week," in the *Bury and Suffolk Herald* for July 30. 1834.

The Peregrine Falcon, a fine individual of, was shot, early

in Dec. 1834, at Sudbury, Suffolk: it is preserved in the private collection of a gentleman in that town. — *Henry Turner. Bury St. Edmunds.* [Our friend and correspondent J. Grubb, Lexden, Essex, has informed us that the individual was "a very fine" one, and that the preserved specimen is in his "brother's possession," at Sudbury, Suffolk.]

The Hoopoe, an individual of, has been shot in Cornwall, and is in the possession of Mr. J. Brown, Bath. (*Bury and Suffolk Herald*, Jan. 28. 1835.)

An individual of the hoopoe has been lately shot near Charmouth, Dorsetshire, by Lord Bridport's gamekeeper: it has been preserved by my brother, Mr. F. P. Morris. — *F. O Morris, B. A. Lendal, York, Nov.* 10. 1834.

The Bohemian Waxwing, or Chatterer, was unusually plentiful in the neighbourhood of Bury St. Edmunds, Suffolk (IV. 165.), in the few days in January, 1835, in which snow lay upon the ground. On the 19th, 4 were seen in Rushbrook; on the 21st, a party of 9 or 10 was observed in the neighbourhood of Rougham; and, on the same day, 1 was shot at Livermere, feeding on the hips [fruit] of a rose; and either 2 or 3 were seen in Ickworth Park. About the same time, 1 was shot at Norton, and 4 were seen in Nowton, and one in the gardens of Hardwicke House. On the, I believe, 24th, 5 or 6 were seen feeding on the haws of hedges in the neighbourhood of Ixworth. The one shot at Norton had several haws in its stomach, as had another that was shot in the neighbourhood of Bungay. Two, at least, additional have been shot in or about Thetford. — *Henry Turner* [*Curator of the Botanic Garden*]. *Bury St Edmunds, Jan.* 30. 1835.

In Worcestershire, a male was shot at Radford, near Evesham, and a female at Claines, both during the past winter; and of the two, deemed "a fine pair," the preserved forms are in the museum of the Worcestershire Natural History Society. (*Berrow's Worcester Journal*, April 16. 1835.)

A very fine individual (a male it was presumed to be), which had its colours remarkably bright and vivid, and the four central of its tail-feathers terminated each with a horny appendage, the colour of red sealing-wax, and identical in kind with that with which each of certain feathers in the wings is terminated, was killed near Harnaby Bridge, in the neighbourhood of Carlisle, Cumberland, on Dec. 8. 1831. This was a second individual, with appendages to certain feathers of the tail, which had been taken in the neighbourhood of Carlisle, Cumberland. (*Philosophical Magazine*, Feb. 1832, p. 84.)

The Bohemian Waxwing, or Chatterer, living in a State of

Domestication in England. — An individual was taken alive early this winter, 1834–35, with birdlime, near Netherwitton, Northumberland; and I saw it lately (April, 1835.), very tame and healthy, in the possession of the captor, who feeds it chiefly with bread. Some other individuals, its companions, were shot, at about the same time, which he has preserved. — *W. C. Trevelyan. Wallington, Northumberland.*

Instances of the Occurrence of Summer Migrant Birds in the Winter Months: —

[*Corn Crake.*] A fresh specimen of the corn crake (*Créx praténsis*), shot in this neighbourhood, was sent to me about the middle of December, 1834; it was plump and in good condition.

[*Water Crake.*] A single spotted water crake (*Zapórnia Porzàna*), said to have been sent up from Kent, I saw exposed for sale in Newgate Market, in Jan. 1834. I am not aware that either of these species has ever previously been detected to winter in this country.

The Quail (*Cotúrnix vulgàris*) has, according to Montagu and others, occasionally been met with in winter in the southern counties. I could add two or three instances of its having been shot in this neighbourhood; and I possess a very fine female specimen, which was shot in Bedfordshire, in February, 1833.

Most probably all these birds had passed the summer far to the north. — *Edward Blyth. Tooting, March* 11. 1835.

The Brambling (*Fringílla Montifringílla*), a fine individual of, was shot on May 6. 1835, in a fir plantation about four miles east of York, by Mr. John Young, who has stuffed it, and it is in his possession. — Does this species breed in this country? — *Thomas Backhouse, Nurseryman, York.*

The Turtle Dove in Cumberland. — A young male was killed on Rockcliff Moss, on Sept. 14. 1833. A similar individual was obtained in the neighbourhood of Carlisle in Sept. 1832. "We are consequently inclined to think that the turtle dove occasionally breeds in Cumberland. It is, however, very rarely met with in this [the Carlisle] district." (*A Contributor*, in the *London and Edinburgh Philosophical Magazine*, third series, vol. ii. p. 97., and vol. iv. p. 336, 337.)

The Turtle Dove shot in Perthshire, and so late, in 1834, *as Oct.* 20. — "When last I had the pleasure of an interview, I mentioned that I had stuffed a turtle dove shot on Oct. 20. [1834], by Mr. John Rennie, in a field near Pitfour: at which you expressed some doubt and surprise. I am quite satisfied as to its being a real turtle dove, from enquiries I have made in consequence of the doubts you expressed. The bird was

solitary when shot, and had not the least appearance of having been in confinement. On dissecting it, I found its stomach full of wheat. As far as I have learned, I believe the bird has never been found [before] so far north. The turtle dove is said by naturalists to be migratory, arriving in the southern parts of England about the end of April, and departing in September, and to have been found as far north as Newcastle. The specimen to which I allude is, perhaps, the first that has been seen to the north of the Tay."

[*A Swift seen alive, wild, in Perthshire, on Nov.* 8. 1834.]— "As I am writing on natural history, I may mention that on Saturday, Nov. 8., I saw, in this neighbourhood, a swift (*Hirúndo Apus*), a swallow latest in making its appearance, and first away, appearing hereabouts about April 27. and departing about August 27. How could this bird have supported itself during the frosty weather in the end of October? Will it undertake a solitary emigration? Or will it stay, and be starved to death with cold and hunger? Or will it sleep through the winter like a bat? Perhaps some of Mr. Loudon's correspondents will reply to these queries; and you will oblige me much by transmitting to him, at your convenience, the contents of this letter." — *Mr. William Adam, Manufacturer, Errol, Perthshire, in a letter to Mr. Gorrie, Annat Gardens, dated Errol, Nov.* 18. 1834.

A Swallow accidentally fettered into the Nest in which it had been reared, and hence detained from accompanying other Swallows in their Departure in Autumn from Britain: one of its Parents had stayed to attend it. — After the departure of the general flight of swallows, I observed that one remained, and continued to go in and out of its nest several times a day. At first I took no notice of it, thinking it to be a straggler which had from some cause been left behind, and I expected it to soon follow; but my attention was at length attracted by its still continuing to frequent the nest, and I determined to examine the cause. Upon examining the nest, just after the bird had left it, I found in it another, apparently full-grown bird, which in vain endeavoured to make its escape. Upon further examination, I found that the poor bird's leg was fixed in a piece of cord, its claws being firmly secured in it, in such a manner that the exertions of the poor bird itself, and of its mother, were insufficient to release it. The two swallows remained for a few days after the young one was released, and then disappeared. — *R. Dyneley Chamberlain. Skipton in Craven, Nov.* 19. 1834.

The Storm Petrel (*Procellària pelágica L.*). — An individual was shot, a few weeks ago, on the banks of the Thames at

Richmond. It had been observed by many persons to frequent that neighbourhood for several days, till a man of the name of Arris, passing by the river side with his gun, accidentally perceived it fluttering slowly along at a little distance from the ground. He shot it, when it proved to be the above species of bird, but was in a very exhausted state. It had most likely been blown up from the channel, or had been carried down the river by a very powerful tide, to the spot where it was taken. It was first noticed by two ladies swimming on the water. — *A. Tulk. Richmond, Feb.* 23. 1835.

Some Information respecting the Habits of the Kingfisher [p. 251—255.] *in making its Nest.* — Bewick's work is the only one I can get at that says any thing about it; and his account is rather an unsatisfactory one. I took a nest, the only one I have ever seen, about two weeks ago; and its build and situation were so different from what I expected, that I felt a wish to know what the bird's general habit is. It was in a hole in the river bank, about 8 ft. above the water, out of flood's way, at least such floods as usually occur at this season. The nest was a very simple one, composed of fish bones, (merely) laid on the mould, which appeared to have been scooped out a little to receive them. The hole was about 18 in. long, two thirds of its length straight, then turning off to the right. The eggs, which had evidently been hard sat on, were seven in number. The bird was on the nest when I took it: I gave her her liberty. On being let go, she fluttered a little at first, and then, "swift as the hurled-on-high jerreed," she glanced away, and was out of sight in a moment. I was rather at a loss to conceive what could have made the hole: the bank in which it was was bare and unsheltered, and rose almost abruptly from the water; obviously an unlikely place for a water-rat to burrow in; and it was hardly likely to have been hollowed out by a bank swallow, as none of those birds had been seen there, and there were no other holes anywhere near. I noticed some of the soil, that had been thrown out of it, still lying underneath on a projecting part of the bank. Now, this looked as if the hole had been rather recently excavated: the sides of the passage were slightly grooved in appearance. I thought it did not look altogether unlike the work of such an instrument as a bird's bill. — *H. N. Leominster, April* 23. 1835.

In I. 23, 24., are "Some Remarks on the Habits of the Kingfisher;" by S. T. P. In II. 206. is a notice by F. of a kingfisher's nest, which F. had examined.

The Dipper (p. 374—376.).—"Mr. Waterton will not, I believe, allow that birds ever oil their feathers; but I would wish

to ask of him, how he accounts for the fact that, while the feathers of a robin or thrush, if they have only fallen into the water for a few minutes, become totally spoiled as far as the purposes of stuffing are concerned, those of the dipper may remain half an hour or more in the water without receiving any damage?" (*Rev. F. O. Morris*, p. 375. note *.)

I cannot account for the fact stated by the Rev. Mr. Morris. If he infers that birds oil their plumage from the fact that the feathers of the dipper "may remain half an hour or more in the water without receiving damage," he nullifies his inference, by adducing a subsequent fact, that the feathers of a robin or a thrush, "if they have only fallen into the water for a few minutes, become totally spoiled, as far as the purposes of stuffing are concerned;" for the robin and the thrush have the oil-gland as completely developed, and as perfect in every point of view, as that of the dipper. If, then, the feathers of the dipper are preserved from injury in the water by the contents of the oil-gland, surely, by a parity of reasoning, those of the robin and the thrush ought to be equally preserved. But the Rev. Mr. Morris informs us that the feathers of the robin and the thrush become totally spoiled, as far as the purposes of stuffing are concerned, if they have only fallen into the water for a few minutes. This I consider tantamount to an avowal, on the part of the reverend ornithologist, that the robin and the thrush do not lubricate their feathers. So much for the oil-gland, and its supposed uses.

I will now take the liberty of assuring the Rev. Mr. Morris, that the feathers of the robin and the thrush do not become totally spoiled, as far as the purposes of stuffing are concerned, by immersion in the water; on the contrary, their plumage is improved by it. *Merses profundo, pulchrior evenit.* I will engage to steep a robin and a thrush for a whole day in a basin of water, and make better specimens of them than if I had stuffed them before they had undergone the immersion.

A concluding word on the remark, that "the habit of the dipper walking underneath the water, is too well known and authenticated to need any additional information from me" [that is, from Mr. Morris]. I am not a convert to the doctrine of a subaquatic promenade: first, because I know that the bodies of all birds float on the surface of the water; secondly, because I am convinced that birds are obliged to make great exertions with their wings and feet in order to be able to reach the bottom; thirdly, because I am satisfied that, as soon as they have arrived at the bottom of the water, the

force which enabled them to descend to it ceases to act. Hence I infer that the body of a bird, impelled to the bottom by the aid of the feet and wings, *must* rise again when deprived of that aid. I can easily conceive, however, that the dipper, by the use of its legs and wings, may manage to keep sufficiently near the bottom to be enabled to turn over the pebbles with its bill in quest of food; because, in this position, the legs and wings would have power to act, and they would tend to counteract the rising motion of the body. I maintain positively, that a bird cannot, by any chance, walk on the ground under water. The moment it attempted to do so, the legs and wings, by the altered position of the body, would be deprived of all depressing power; and the body itself would be raised up towards the surface by the fluid in which it is immersed. This would put an effectual stop to all proposed perambulations at the bottom of the stream. This is only theory, and theory may err. I often used to watch the dipper, when in Northumberland; but I own that I never had courage to follow it to the realms below, in order to have a clear and distinct view of its proceedings. I wish that old Nicolas Pescé were alive in these days. I would engage him to put this very important ornithological question at rest for ever. Old Nicholas was quite at home under water. His toes and fingers (*credat Judæus*) were said to be webbed; and he could take in at one gulp as much breath as would serve him for a whole day. They tell us, he would often spend five days together in the midst of the waves, and live on the fish which he caught. The roaring gulfs among the Lipari Islands were a kind of Hyde Park promenade to him. Nick would resort to them whenever he felt inclined to take an airing, either for his amusement, or for the benefit of his health.—*Charles Waterton. Walton Hall, July* 8. 1835.

[Since Mr. Morris made the incidental reference, in p. 375. note *, to the question of birds' oiling their feathers, he has sent us a discussion on it of eleven foolscap pages of manuscript. The discussion includes arguments on the views of Mr. Waterton and others, published in this Magazine; which views of others were not fully present to Mr. Morris's mind when he made the passing reference to the subject which Mr. Waterton has quoted and combated above. Mr. Morris's communication was delivered on August 5. We are, for our own part, tired of discussion on the subject; but if Mr. Morris will give us a comprehensive page on the subject, we will give space to this quantity.]

The Robin is not Non-Frugivorous, as represented by J. D. (p. 241, 242.); *and if not eminently Frugivorous, as taught by*

Mr. Swainson in the extract (p. 241.) *from his "Discourse," is Frugivorous in a degree.* — With regard to the difference of opinion as to the thievish propensities of the robin redbreast in gardens, which has been discussed, in p. 241., I think that J. D. is wrong in saying that this species does not eat currants. In summer the gardens swarm with this species, which comes in for a pretty plentiful share of the fruit. The redbreasts hop two or three times under a bush, dart at the fruit, and swallow it in an instant. Their depredations, however, sink into insignificance when compared with several species of fauvet (*Ficédula*), particularly the black-capped species (*F.* atricapílla). Swainson is, however, wrong when he says that no writer on our native birds has been aware of these facts; for Gilbert White expressly says, in his *Natural History of Selborne*, — "Notwithstanding the prejudices in favour of redbreasts, they do much mischief in gardens to the summer fruits." (p. 123.) And to this passage Herbert subjoins the following note: — "I have seen a robin feed its young, which were reared in a conservatory, entirely upon red currants. It used to alight on the ledge of the window, and always brought one red currant in its bill. I do not think they eat any other fruit; but they are troublesome in the hot-house. They devoured, last year, every seed of the Hæmanthus multiflorus and Griffinia hyacinthina just as they were ripening; and it is very difficult to save the berries of any Daphne from them." And Rennie adds, — "A redbreast, which I had in a cage, greedily devoured the berries of Solanum Dulcamara, but would not touch those of privet." The evidence given above (if there was no other) would, I think, not only prove that redbreasts will eat currants, but that they are even partial to them. But, notwithstanding this, I think it would not only be unjust, but also impolitic, to destroy them. Mudie's observation is quite correct, that "the redbreast is not only a very interesting bird, but it is also an exceedingly useful one about gardens, orchards, and shrubberies, and plantations near houses generally." (*Feathered Tribes*, i. 301.) Coalhoods (*Pyrrhùla Temminck*) commit as much damage as any small birds with which I am acquainted; but the gardener who should attempt to exterminate these little birds would soon find himself in the same plight as the farmers who destroy the rooks. It would indeed be selfish to grudge the feathered race a little grain and fruits, after they have cleared our fields and gardens of insects, and cheered us with their lively habits and melodious songs. — *S. D. W. Near Derby, May.* 5. 1835.

Smith has remarked of the two species of *Dáphne*, *D. Mezèreum* and *D.* Laurèola, that "every part is very acrid, producing a burning heat in the mouth and throat." (*Eng.*

Flora, ii. 229.) Yet, he has noted, in the same page, of *D. Mezèreum*, that the fruit ("berries") is "the favourite food of some species of finch, *Loxia*." S. D. W. has shown above, from Herbert, that they are an object of food with the robin too. "The berries of D. Laureola are poisonous to all animals except birds." (*De Candolle*, quoted by *Lindley* in his *Introd. to the Nat. Syst. of Botany*, p. 76.)

All the green parts of the Clématis Flámmula *L.*, the species which bears a profusion of small, white, very fragrant flowers, and to be seen about many residences, is so acrid as, when chewed by man, to inflame the interior of the mouth; yet Hèlix aspérsa, the common large garden snail, will feed upon the foliage without scruple. Hence, the faculty of tasting must differ in animals. — *J. D.*

The Robin is a Species of Bird sociable even when not under the Pressure of Necessity, as in Summer; and not only when under the Pressure of Necessity in Winter. — It is stated by several authors, and among them Fleming, that, on the approach of the vernal season, the redbreast, forsaking the abodes of man, wings his way to the woods. Knapp says (*Journal of a Naturalist*), "It [the redbreast] slights and forgets our kindnesses the moment it can provide for itself, and is away to its woods and its shades." On the contrary, redbreasts about here [near Derby] continue as familiar through the summer as during the winter (perhaps owing to our not persecuting them; for, although they commit, like the greater tit and blue tit, a good deal of harm in a garden, yet we think that their insectivorous services and interesting habits far outweigh the damage caused by the innocent little depredators), and make no scruple of entering the house at any window which may be open, and at any time that suits their convenience; and never find their confidence abused. A short time since, one perched upon an inkstand, and overthrew the ink. The sly little rogue, as if aware of the harm he had done, immediately flew away: in about ten minutes, however, he returned, and poured forth his sweetest notes, as if to disarm ill-will. A friend informs me, that, while sitting in a room with another person, a redbreast entered, and, after hopping about for some time, actually perched on his knee. — *S. D. W. Near Derby, Nov.* 22. 1834.

Fishes. — *Sea Fishes are often best killed by Immersion in Fresh Water:* they then die in convulsions, with their fins extended; just as they should be represented in drawings. [*Lansdown Guilding. St. Vincent, May* 1. 1830. He had made the note in relation to p. 123. of Vol. II.; in this page, and others before and after it, Dr. Drummond on the poisonous effects of fresh water on some sea animals and plants.]

REVIEWS.

ART. I. *Titles of Works on Subjects of Natural History, published recently.*

THE British Association for the Advancement of Science: Report for 1834. 1 vol. 8vo. London, 1835. 15*s.*; to members, 10*s.*

The subjects reported on are: — Geology of North America; by H. D. Rogers. Laws of contagion; by Dr. C. Henry. Animal physiology; by Professor Clark. Zoology; by Rev. L. Jenyns. Capillary attraction; by Rev. J. Challis. Physical optics; by Professor Lloyd. Hydraulics, part 2.; by G. Rennie. Transactions of the Sections, and recommendations of the Association and its Committee. The Report on Zoology is, more detailedly, entitled,—

"Report of the Recent Progress and Present State of Zoology; by the Rev. Leonard Jenyns, M.A. F.L.S. F.Z.S. F.C.P.S." Of this we have been favoured with a copy; separate from the rest of the volume, which we have not seen. This report occupies 109 pages, and is replete with information of rich interest to those engaged in the study, or in noting the progress of the study, of animals, in the relation of what systematisers of animals have deemed their natural affinities. It is, in this scope, as it were, a map of the extent of human discovery, so far as the author has been able to investigate it, which is to a great extent, and been able to appreciate it; and, incidental to this its scope, it has the second one of indicating the tracts in the animal world, viewed relatively to systematism, which are yet undiscovered. The systematism cited is that of classifying animals in the order of the agreements in the modes of their structure. The author's course is in the order of the several classes of animals, beginning with those deemed most highly organised, and passing successively to those less so. The report is ended with a chapter entitled "Conclusion," in which are presented remarks incentive to the promotion of the study of zoology in Britain. Of these remarks, the more essential are here quoted: —

"Its general progress, viewing the natural system as the true object of the science, and considering the very imperfect knowledge we have of this system at present, must clearly depend upon the discovery of new forms, and a more thorough investigation of those already known to us. If the former be necessary, in order to supply some of the numerous links that are yet wanting to complete the chain of affinities, the latter is not less so, to determine the parts of the system to which these links belong. But, of these two,

there can be no doubt the latter is that we stand most in need of. I question whether we shall not be rendering more service to zoology by paying closer attention to the species we are already acquainted with, than by further augmenting the immense collection of uninvestigated forms which now exist in our cabinets. We have, perhaps, sufficient materials on our hands, though not for discovering the whole natural system, at least for solving many important problems in zoology, were we only better instructed in the nature of these materials. It has been shown, in the course of this Report, that there are large groups, even whole classes, of which the true situation and affinities are either not determined at all, or involved in much uncertainty, from the imperfect knowledge we have of their structure and economy; and, in the details of the system, there is not one class which does not present many genera, and a vast many more species, in this predicament. Here, then, is where the researches of naturalists should be directed. Until we shall have more closely analysed the characters of these groups, and learnt both the method of variation and relative importance of all the organs; until we shall come to understand their whole structure, as compared with those structures we are already acquainted with; we can neither determine the affinities of these groups, nor of any others allied to them which we may hereafter discover.

"Researches of the above nature are, perhaps, best embodied in monographs. The value of such works has been every day more and more appreciated since the science has become so extensive, and since its legitimate object has been better understood, especially when they refer to every point in the history of the group treated of, and when due care is taken, first, to ascertain what others have written on the same subject. Many excellent monographs fulfilling these conditions already exist. . . . . Nevertheless, it would be extremely desirable to have them multiplied. By the help of such works, we may arrive step by step towards a more complete generalisation of the large number of facts embraced by zoology, at the same time we greatly facilitate the researches of other naturalists. But all enquiries into the structure and economy of animals presupposes an exact discrimination of species. Without this, the most detailed observations are rendered of little use, and it is the want of it which detracts from the value of much that has been recorded by those who have not sufficiently attended to this matter. Hence it should be one object of a monograph to investigate species with a view to their exact differences, and to elaborate the synonymes of those which have been noticed by other authors. This is especially necessary in some

groups, in which great confusion exists on this head. Cuvier was particularly sensible of the importance of this step, ... and he has more than once observed in some . . . . of his works that there is greater service done to natural history in thus extricating from error and confusion the history of old species, than in publishing and describing new ones. But not all have it in their power, from the want of requisite materials, to furnish a complete monograph of any entire group. Such persons may, notwithstanding, still contribute greatly to the advance of zoology by restricting their monograph to the species in their own neighbourhood: only let such works be conducted with the same care, the same original observation and research, which are thought necessary in the productions just alluded to. Faulty catalogues, or even works of a more elaborate kind, if merely compiled from other authors, are utterly worthless; whereas good local faunas, or portions of a fauna, however limited the district, *may* be rendered of the greatest possible value. By studying with scrupulous exactness the structure and habits, although only of a few species, we may be able to throw much light upon their natural affinities, we may accumulate enough facts to make some approaches to generalisation ourselves; at any rate, we are amassing the best materials for enabling others to do so.

"With reference to the further advancement of zoology, in this country in particular, I cannot forbear observing, that, while there are some branches of the science that are most sedulously cultivated by us, there are others, and those, too, such as, from our insular position, it might be thought would be among the first to attract our notice, which have for a long time lain comparatively neglected. I allude to ichthyology and the study of the marine Invertebrata. . . . . With regard to marine Invertebrata, I refer more particularly to the Radiata of Cuvier, although there is reason to believe that our knowledge of the Mollusca is far below what it might become by a more diligent enquiry into these tribes. . . . . In the several classes of Echinodermata, Acalepha, and Polypi, it is impossible to say what and how many species are to be found on our shores, or what important additions might not be made to our knowledge of these groups, as parts of the natural system, by those whose situation and opportunities afford the means of studying them. . . . .

"While it is thus in our power to do much for this science as individuals, I conceive it is also in our power to

do something as a nation; and in no respect more than by encouraging and promoting expeditions to foreign countries, deputing naturalists to those parts of the globe which have been least explored, and affording the means of making known to the public the fruits of their researches. France has long since set us an example in undertakings of this nature. . . . . I apprehend we have effected very little as a nation, which will bear to stand in competition with what has been done in this way by France, and some other nations on the Continent which might be mentioned.

"Such are the hints which, with much diffidence, I would venture to throw out for the further promotion of zoology. I have only to add, that, with reference to the progress it is actually making in our own country, and the promise which is held out of uninterrupted advancement, comparing this country, not with others, but with itself at former periods, there is ground for much exultation."

[The author has next proceeded to mention that important works and memoirs have appeared among us; that channels have been opened for the more successful cultivation of this science; and that the Zoological Society, founded in 1826, has contributed more than any thing to this impulse, by its correspondence, gardens, museum, and *Transactions*.] "But it is not merely in the institution of the Zoological Society that we trace a rising spirit of enquiry into this branch of science: we see it in the establishment of natural history societies in almost all the principal towns of England . . . . This circumstance alone speaks to a more generally diffused taste for zoology, which is the first step towards the advancement of zoology itself. It is only necessary to give a proper direction to the researches of these societies, to point out those departments which need most cultivation; and we may reasonably hope that the time is not far distant, when England will no longer be considered behind her Continental neighbours in this, any more than in other sciences."

The Council of the Worcestershire Natural History Society: Proceedings at the Second Anniversary Festival of the Worcestershire Natural History Society, with the Address of the Council, delivered by C. Hastings, M.D. F.G.S.; the Speech of the Right Hon. Lord Lyttleton, Lord-Lieutenant of the County, on laying the First Stone of the Worcestershire Museum; Report of the various Speeches at the Dinner, Names of the Officers and Council, List of Donations, &c. 8vo, 64 pages; with an engraving of a view of the "Elevation of the Worcestershire Museum,

Foregate Street, Worcester, erected 1835." Published 1835, Worcester.

A means by which those who desire to know the particulars of the condition of this Society can acquire information of them.

Selby, P. J., F.R.S.E., &c. The Natural History of the Pigeon Family (Columbidæ), with Illustrations from the Drawings of Mr. Lear. With a Memoir and Portrait of Pliny. Small 8vo. It is the Fifth volume on Birds of Sir W. Jardine's "Naturalist's Library." Edinburgh and London, 1834. 6*s.*

This volume, containing the principal species of this interesting family, certainly reflects no discredit on the well-known author of the highly appreciated *British Ornithology*. The descriptions of the three species found in Britain are especially interesting. The plates are by no means inferior to those in the preceding volumes. The vignette (a pair of ring pigeons) is very — we may say exquisitely — beautiful, and, in our opinion, worth all the plates put together; although these are by no means destitute of merit.—*S. D. W. August*, 13. 1835.

Perrott, Mrs. *C. L. E.*, Honorary Corresponding Member of the Worcestershire Natural History Society: A Selection of British Birds frequenting Worcestershire and the adjoining Counties. Illustrated by Drawings from Nature; with Observations on their Habits; the Drawings by the Authoress of the "Observations," and engraved by Robert Havell. The work is dedicated, by permission, to Her Royal Highness the Landgravine of Hesse Hombourg. Elephant folio. In two-monthly Parts; each to contain 5 plates and 5 pages of letterpress. Price, with the plates uncoloured, 14*s.*; with them coloured, 1*l.* 1*s.*: to be completed in two volumes, the extent of which is not specified.

In Part I. the male of the fowl of the Hamburgh breed, the wood-pigeon, the raven, the whinchat, and the blue tit, are depicted, and descriptive matter to all but the last of these is supplied. Six pages of letterpress are included in this part; one of them contains the "preface," whence we quote that, "under the influence of the [Worcestershire Natural History] Society, a general interest in the different branches of natural history pervaded the whole county: all were equally desirous of offering their quota to the general store, and, with improved health, I resumed my pen, anxious

that what little information I had gleaned in the course of fifteen years' attention and observation, from the studies which had formed the charm of my life, might be rendered available to pursuits so generally advantageous to mankind." We think that an agreeable sentimentality is transfused through the preface and through the description of the cock, wood-pigeon, and raven: that of the whinchat is technical. We think that severe criticism would perceive some faults in the portraits of some of the birds. The cock, raven, and whinchat are displayed in landscapes; the wood-pigeon and blue tit upon branches not in landscapes.

Westwood, J. O., F.L.S., Secretary of the Entomological Society of London, &c.: Addresses on the Recent Progress and Present State of Entomology. Read at the Anniversary Meeting of the Entomological Society, on Jan. 21. 1835. 8vo, 22 pages. London, 1*s*.

Mr. Jenyns in his report on Zoology, which we have noticed in p. 519., has commenced his notice of the class Insécta with these remarks:—"It is impossible to do more than to treat of this class in the most general manner. Indeed, from its great extent, the immense additions which have been made to it of late years, and the large number of individuals who have contributed to its progress, it may well deserve to be made the subject of a separate report." Mr. Westwood's address comprehends a report on it; and one which will, we cannot doubt, satisfy, gratify, and avail the pursuers of entomology.

Deakin, R., F.R.C.S.E.; and *Marnock R.*, Curator of the Sheffield Botanical and Horticultural Gardens: Florigraphia Britannica; or Engravings and Descriptions of the Flowering Plants and Ferns of Britain. In Monthly Numbers, demy 8vo; each to contain figures and descriptions of twelve species of plants, the 12 figures upon two plates, 6 on each. Price per Number, with the figures not coloured, 6*d*.; with the figures coloured, 1*s*. Sheffield, London, Edinburgh, Dublin, 1835.

No. I. was published early in August. The species are treated of in the order of the Linnæan system, and with very creditable skill. The figures are not of exquisite quality. The work is very cheap.

Stewart, R. B.: Outlines of Botany; a Sketch of the Linnæan Arrangement of Plants, with Tables to illustrate the distinctions of Genera and Species; to which are added,

Hints for the Management of a small Garden. 8vo, 72 pages. London, 1835. 2*s.* 6*d.*

The botany occupies 22 pages, in which the more commonly occurrent Linnæan terms and the Linnæan classification are explained, and the species of plants are named, in most cases, in which illustrations of the explanations may be found. Instructions on forming a Hortus Siccus, occupy two pages. Pages 25 to 68 include "Hints for the Management of a small Garden, especially in a Town." These hints are from practice, and are valuable. They are concluded by a chapter "On Birds, &c., as Objects of Interest in a Garden." The last four pages are occupied by a "Description of a Garden," in verse, and by "A Defence of Botany," in verse.

Bohler, J.: Lichenes Britannici; or, Specimens of the Lichens of Britain, with Descriptions and Occasional Remarks. In monthly fasciculi. No. I. June; No. II. July; No. III. August. 8vo. 3*s.* 6*d.* each. Sheffield and London, 1835.

In our p. 416. are the names of the species that are illustrated in No. I. We have not seen No. I. nor No. II. In No. III., before us, the following species are illustrated: — Lecídea geográphica, by a coloured figure; these by dried specimens, Parmèlia omphalòdes, Gyróphora eròsa, Bórrera tenélla, Ramalìna *f*raxínea and fastigiàta, Cladònia furcàta, and Scyphóphorus fimbriàtus. The figure and specimens supplied are characteristic ones; but we are disposed to wish for, for ourselves, a larger quantity of specimens of Ramalìna *f*raxínea and Scyphóphorus fimbriàtus, species not rare. The specimens are affixed to stiff paper, and this of a size so much extra to octavo, as to allow the part extra to cover the specimen, or the figure, when folded over it. In the text are stated the characteristics of the genera and species illustrated, references to works in which the illustrated species are elucidated, habitats, and short "Occasional Remarks."

Lindley, J., Ph. Dr., F.R.S., Professor of Botany in the London University; and *Hutton, W.*, F.G.S., Member of the Geological Society of France: The Fossil Flora of Great Britain; or, Figures and Descriptions of the Vegetable Remains found in a Fossil State in this Country. No. XVII.; July, 1835. 8vo, 9 plates. 5*s.* 6*d.* Continued quarterly.

In this number is included, besides engravings of forms of fossilised plants and descriptions of these, a treatise entitled "Note upon the Value of Numerical Proportions in the ancient Flora of the World, with reference to a Determination of Climate. By Professor Lindley." Of this treatise

we present the following abstract: — First, an extract from Brongniart's *Prod.*, p. 181., is given, in which Brongniart has expressed opinions to the amount that the plants which, in their fossilised condition, constitute the coal measures, had grown in a hot, insular, and humid atmosphere, and this on the facts that the fossil species which had been determined were mainly of the families ferns and Lycopodiàceæ; and that in the living plants of the world, in the present era, the numerical proportion of the species of plants of these families, as compared with the number of phanerogamous species, in any site considered, had been found to rise correspondently to the condition of that site in insularity and the extent of the temperature and moistness of its atmosphere. Professor Lindley has opposed to these opinions the following facts and considerations: — "It . . . always appeared to me very doubtful whether such data as we possessed concerning the flora of the coal measures could be considered of a nature sufficiently precise to justify geologists in entering into such calculations, in which, for them to be of any value whatever, a full knowledge of all facts is obviously indispensable. It was, moreover, perfectly clear that the numerical proportion borne by ferns to other plants was rapidly diminishing as the examination of the vegetable remains of the coal measures became more carefully conducted. The very remarkable fact, that ferns are scarcely ever met with in fructification in a fossil state, was also a circumstance upon which no light was thrown by the theory of a high temperature and damp insular atmosphere. Taking all these into consideration, along with the constant state of disintegration of vegetable remains — a disintegration unquestionably not the result of drifting,—I was led to suspect that, possibly, the total absence of certain kinds of plants, the as constant presence of others, and several other points of a like nature, might be accounted for by a difference in the capability of one plant beyond another of resisting the action of water. Accordingly, on the 21st of March, 1833, I filled a large iron tank with water, and immersed in it 177 specimens of various plants, belonging to all the more remarkable natural orders, taking care, in particular, to include representatives of all those which are either constantly present in the coal measures, or as universally absent. The vessel was placed in the open air, left uncovered, and left untouched, with the exception of filling up the water as it evaporated, till the 22d of April, 1835; that is, for rather more than two years. At the end of that time, what remained was examined, with the results stated in the following list."

[For this list we refer to the *Fossil Flora*, No. xvii. We

quote the conclusions which Professor Lindley has drawn from the results.]

"This experiment appears to me to lead to most important conclusions. These things seem clear:—Firstly, that dicotyledonous plants, in general, are unable to remain for two years in water without being totally decomposed; and that the principal part of those which do possess the power are Coniferæ and Cycadeæ, which are exactly what we find in a fossil state. Secondly, that monocotyledones are more capable of resisting the action of water, in particular, palms and scitamineous plants, which are what we principally find as fossils; but that grasses and sedges perish: so that we have no right to say that the earth was not originally clothed with grasses, because we no longer find their remains. Thirdly, that fungi, mosses, and all the lowest forms of vegetation disappear, and that even Equisetum leaves no trace behind; which seems to settle the question of Calamites being an extinct form of that genus: and, finally, that ferns have a great power of resisting water, if gathered in a green state, not one of them having disappeared during the experiment; but that the effect of immersion in water is to cause their fructification to rot away.

"Hence the numerical proportion of different families of plants found in a fossil state throws no light whatever upon the ancient climate of the earth, but depends entirely upon the power which particular families may possess, by virtue of the organisation of their cuticle, of resisting the action of the water wherein they floated previously to their being finally fixed in the rocks in which they now are found."

ART. II. *Literary Notices.*

A TREATISE on the Geography of Animals, the Natural System, and the Principles of Classification; by W. Swainson, Esq.; being vol. ii. of the *System of Zoology*, and forming vol. lxvi. of Dr. Lardner's *Cabinet Cyclopædia*. Published.

Jardine's *Naturalist's Library*. Two volumes on *British Birds* are in preparation.

The Natural History of Beetles; illustrated by 32 plates and numerous woodcuts. By J. Duncan, M.W.S. This has been published. A Memoir and Portrait of Ray are prefixed to the work.

Figures and Descriptions of upwards of 250 undescribed Species of singular and beautiful Insects of India, and the Islands of the Indian Seas, are, it has been announced, in prepara-

tion by E. Donovan, F.L.S. and W.S. They are to be published in 12 monthly parts; each, quarto, 4*s.* 6*d.*; large paper, 7*s.*; the whole number of the plates, 58. The arrangement is to be Linnæan, with references to the writings of modern authors. No species of opposite genera are admitted on the same plate.

Figures and Descriptions of Species of singular and beautiful Insects of China. A work to consist of these, by the author of the preceding work, of the same character as that, and nearly of the same extent, has been announced.

Dr. Hooker's *Companion to Curtis's Botanical Magazine.* Dr. Hooker has discontinued his *Botanical Journal*, under this name, and has begun to communicate the kind of information which has been supplied in the *Botanical Journal*, in the *Companion to Curtis's Botanical Magazine*, which magazine Dr. Hooker edits. The first number of the *Companion* was published on August 1.: it is to be continued monthly, in numbers, each of 2 sheets and 2 partially coloured plates, 1*s.* 6*d.*; if taken stitched with the *Magazine*, 1*s.*

Of Macgillivray's *Withering's Systematic Arrangement of British Plants*, a third edition has been recently announced as "just published." With the announcement was this statement: — "In this edition the introduction has been considerably enlarged; and nearly a hundred species of plants have been added, chiefly of such as are peculiar to Ireland, to render the work applicable to that country as well as to Great Britain. Publishers; Scott, Webster, and Geary. 36 Charter House Square.

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THE MAGAZINE

OF

NATURAL HISTORY.

OCTOBER, 1835.

ORIGINAL COMMUNICATIONS.

ART. I. *On the Geology and Natural History of the North-Eastern Extremity of the Alleghany Mountain Range, in Pennsylvania, United States.* By RICHARD C. TAYLOR, Esq. F.G.S., Member of the Geological Society of Pennsylvania; of the Academy of Natural Sciences, Philadelphia; and of the Albany Institute, New York.

IN the beginning of April, 1834, I commenced a professional exploration, resumed during the present spring, of an extensive district within the limits of the Alleghany range of mountains, in the northern part of Pennsylvania. The objects of my researches were chiefly to determine the existence and extent of the bituminous coal deposits, and their accompanying mineral strata of argillaceous carbonate of iron. During the progress of this investigation, upwards of 350,000 acres of mountain and unbroken forest land have been traversed and become familiar to me, until the snows of winter, and a temperature of thirteen degrees below zero, put a stop to geology for the season.

The scene of my labours — for truly laborious is the task of the geologist in the Alleghany wilderness — is that part of Pennsylvania, to the north, which is drained by the head waters of the Tioga river, Lycoming and Towanda Creeks, and by the eastern branches of Pine Creek, all which may be seen on almost any map of the United States, approaching to the confines of York state. The surface of the table-land of the Alleghany range, or rather of that which once was uniform continuous table-land, is now from 1000 ft. to 1500 ft. above the main intersecting valleys containing those streams, and from about 2000 ft. to 2200 ft. above the level of tide water. I propose to give a condensed notice of the geological

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features of this region, which has hitherto been undescribed and unvisited for scientific objects.

The highest beds alone in this elevated country consist of secondary sandstones, and shales, containing beds of coal and iron; the whole series, being comprised within a thickness of from 100 ft. to 450 ft., approaching to horizontality. Beneath them are beds of grits, like the millstone grit, coarse conglomerates, and carboniferous sandstones, upwards of 300 ft. thick. These repose upon the old red sandstone group, whose beds are inclined, and are no less than 6000 ft. thick, comprising an immense series of laminated greenish-brown sandstones, red sandstones, and shales, with innumerable Prodúcta and Encrinìtes; blue and greenish shales and argillaceous sandstones, containing some interstratified beds of conglomerate limestone; a few thin subordinate seams of sub-crystalline shelly limestone or marble; some occasional deposits of vegetable remains, partially carbonised; and traces of carbonate of copper, and numerous remains of obscure Fucöìdes. These form the mass of the Alleghany group here. Below them are innumerable coloured shales; red, blue, green and dark grauwacke slates, and argillaceous beds; altogether occupying a thickness of 2300 ft. To these succeeds the first series of transition limestones, with few fossils, 6000 ft. thick. A second parallel of grauwacke rocks and slates succeeds, characterised by encrinital casts, Prodúcta, and occasionally by trilobites and Fucöìdes, comprising a thickness of 3000 ft. more, and followed by the second limestone parallel, and an enormous series of other grauwacke and transition rocks, which it is not my purpose further to advert to here. These are the mean results obtained from two sections, which traverse a hundred and twenty miles of this country.

A third section, eighty miles to the southward of the foregoing, exhibits the series as follows: —

	Feet.
The carboniferous secondary series	1000
The old red sandstone group	1800
Red and dark shales beneath, to the base of the Alleghany Mountains	1700
Grauwacke shales, with some small calcareous beds	3800
Grauwacke siliceous grits, conglomerates, and beds containing Fucöìdes	3500
Transition limestone, sometimes highly siliceous, with few fossils	6000
Second series of ferruginous sandstones and conglomerates	3500
Followed by other limestones, and again by sandstones, many thousand feet thick.	

A fourth section, thirty miles to the south, shows the series with some variations.

	Feet.
The carboniferous series as before - - -	1000
Old red sandstone, and shales, passing into grauwacke shales, slates, and argillaceous sandstones, with Prodúcta, &c. - - - -	5000 to 7000
Highly inclined grauwacke slates, and other argillaceous beds, some of them slightly calcareous, with encrinital casts	3000
Grauwacke sandstones and grits - - - -	2500
Transition limestone, often siliceous, one bed being oolitic -	5000
Ferruginous sandstones and conglomerates - - -	2000
Limestones and grauwacke rocks, in vast thickness, beneath.	

From these statements will be seen how enormous is the developement of the beds immediately succeeding to the secondary rocks of this region.

By a series of instrumental observations, made in the coal region we are proceeding to describe, it appears that the coal measures vary in elevation above the sea (at the distance of 180 miles from it) from 1560 ft. to 2100 ft., in the counties of Lycoming, Bradford, and Tioga. Here the coal is disposed in two principal basins, those of Lycoming and Tioga. They are based upon a series of hard conglomerates and grits, which originally formed one vast continuous platform, now cut through and furrowed down by innumerable watercourses, which form narrow ravines and gorges many hundred feet in depth. The coal area, which once was a coextensive deposit, stretching widely across the country, is thus cut into a series of insulated patches, which, from the undulations of their planes, now present the appearance of, and in fact are, really separate mineral basins, capping the summits of some of the highest table-lands.

Having extensively studied the structure of this part of the bituminous coal district, I am satisfied that it is to the undulating character of the coal strata, in the aggregate, that the circumstance of the presence or absence of the mineral portions must be mainly ascribed, the intervals between these small coal fields being several miles. Hence the concave portion of the undulations, being less exposed to the destroying agency of alluvial causes, in slow but constant and gigantic operation, remains undisturbed in its basin, while the convex parts of the rolling strata have, in every instance within my knowledge, been partially or entirely swept away; it being obvious that the soft argillaceous beds of the coal measures would be the first and the most effectually acted upon by atmospheric and superficial causes. It is this physical character or structure which has preserved the coal basin of Blossburg on the Tioga, and which has left bare an extensive area to

the south and east. It is to the same circumstance we trace the preservation of the Lycoming coal basin, and of one or two small detached coal fields in Bradford county to the east, which have been similarly protected, while a great intermediate space to the west remains barren of mineral strata. These undulations, though not very apparent to the eye of the casual observer, amidst so much vegetation and broken ground, are easily proved by the requisite observation, and are quite adequate to produce all the modifications which we have indicated.

These remarks are made with a view to explain, on geological grounds, why so large a portion of the lands in this section of the great Alleghany coal range, even where the mountains attain their greatest altitude, are still without that useful mineral. In such situations the lowest members only of the coal formation are found *in situ*. We perceive the platform upon which the coal measures usually repose; but the soft strata containing the coal itself are absent, or can only be traced by their detritus; and sometimes the old red sandstone rises to the summit without any covering of secondary rocks.

With respect to the scale of these curvatures, it will convey an adequate view of the configuration, derived from correct data, to state that the Lycoming coal field in its shortest transverse diameter, from south to north, represents an arc whose chord is three miles, and whose versed sine is only 110 ft. The Tioga coal field, which lies seven miles north of this, is a vast arc, having a chord of seven miles in length, the versed sine of which is only 200 ft.

In this portion of the Alleghany range the coal veins are commonly five in number, comprised within a thickness of from 100 ft. to 150 ft. About three of these are of sufficient size to be worked, averaging about 3 ft. thick.

From the analysis which Mr. Clemson was good enough to make, the Tioga coal yielded the following proportions, in different veins:—

	Coal of Bear Creek.	Of coal run.
Carbon	73·74	75·4
Volatile matter	15·	16·4
Cinders	11·26	8·2
	100	100

	Splint coal.	Pitch coal.
Carbon	69·3	54·26
Volatile matter	14·6	18·50
Ashes or cinder	16·1	27·24
	100	100

Interstratified with these veins of coal, are several beds of argillaceous carbonate of iron. That of the Lycoming coal, on analysis by a professor at the West Point establishment, presents results of the following nature:—

Carbonic acid	27·47
Protoxide of iron	47·64
Silica	14·50
Alumine	6·80
Carbon, water, and loss	3·59
	100

This mineral contains 37·05 of metallic iron, and ought to yield 30 per cent of cast iron.

Analysis of the Tioga or Blossbury kidney ore, by T. G. Clemson, Esq. Siderose or lithoid spathic iron, containing lamellar crystals of sulphuret of zinc:—

Carbonic acid	30·94
Protoxide of iron	49·42
Sand and argil	12·60
Lime	1·
Carbonate of manganese, Carbonate of magnesia, Bitumen and water	6·04
	100

One hundred parts of this ore then yields 38·2 of metallic iron.

I should pass beyond the reasonable limits of a communication like the present, were I to enter more in detail into the geological character of this interesting district. I will only add here, that, at the present moment, these valuable mineral deposits are untouched, and that not a single pound of iron has yet been converted from this excellent ore. There is field enough for the employment of English enterprise and capital in a district which possesses so many natural advantages.

The remainder of this article I propose to devote to the natural history of this region, or, rather, to the notice of such facts as occurred within my knowledge in this department of science during my ten months' sojourn in the woods; and I take pleasure in acknowledging the assistance I have received in drawing up this part of my communication from several scientific friends.

Explorations of this kind are not performed without many privations, much fatigue, exposure, and the customary inconveniences attending our peregrinations amongst woods and rocks, far from human dwellings, where our bed is the hemlock boughs [*Abies canadénsis*], our covering the bark of the forest timber, our awning the "greenwood tree." Yet have this rude forest life, these wild scenes, and even these temporary privations, their share of interest, and of not unpleasing novelty. After the heat and burden of the day have

been borne and its toils have ceased;—after all hands have been busy about "the camp," each to his individual task, some in erecting the temporary sleeping place, or shanty, by some pleasant stream; one cutting logs and bringing in a substantial stock of fuel for the night, another barking trees for our roof; one making up a fire large enough to roast an ox, and preparing the evening meal, while another catches trout, which abound in all these mountain streams, and the hunter brings in, perchance, the newly killed venison; — after all these preliminary duties have been despatched, as well as the meal, the refreshed geologist, or naturalist, as he reclines on his fragrant couch of hemlock, and basks before a cheerful fire some ten feet long in his front, and has, like myself, the good taste to luxuriate in a cigar, and the good fortune to possess one, feels well inclined to thank his stars for the comparative comforts and enjoyments of that evening. And then the peculiar charms that pervade those calm and beautiful nights, in the depths of the forest, when the fire flies glance around him;— when the whip-poor-will enlivens the solitude with his vociferations, for song it is not, yet always seeming the voice of a friend; when the blazing night fire illuminates the outspread canopy above, and brings into relief each drooping branch of birch or maple, of tulip [Liriodéndron Tulipífera] or cucumber [Magnòl*ia* acuminàta], or some of a hundred other native forest trees; and the bat flits around, and the woods resound with the chirp of the cricket and *C*icàda; and, perchance, he listens with excited interest to the distant bark of some wolf or fox, who has scented from afar the evening's repast. Long before daybreak he hears the shrill peculiar notes of one little early songster. I never could obtain a sight of this punctual warbler, who failed not to announce the approach of day. His song is seldom of so long duration as an hour, and he ceases at the rising of the sun. The *C*icàda and the cricket, and the *C*aprimúlgus are silent; but other voices are uplifted around, and new sounds fill the woods. The squirrels, grey, and red, and black, chirp, and chase each other among the branches; the pheasant seeks his accustomed log, on which he commences to drum; and flocks of the passenger pigeon, in search of their morning meal, come sweeping by with a rushing sound. Numerous species of the thrush tribe have commenced their song from the topmost branches, and chaunt their early matins; and it is time for us ramblers of the forest to be up and stirring likewise. The trout now bites greedily in the neighbouring stream: in half an hour a supply for half a dozen hungry fellows is brought into the mess. We toast them at the fire, or, if we have the luxury of a

frying pan, they are soon in delicious condition: the coffee boils, and, with the help of maple sugar, a glorious breakfast ensues. I do not exactly say that we fared so sumptuously every day, as I am unwilling to spoil the romance of the thing. In truth, I must admit that, in the spring and fall, we were something like frost-bitten, and an extra blanket would have been agreeable now and then; and that at times provisions were rather scarce, compelling the observance of a general fast for some twenty-four hours. A bitter infusion of hemlock [*Abies canadénsis*] is an indifferent, but sometimes necessary, substitute for tea in the woods, and one must learn to bear with philosophy an occasional inundation of a few inches of water over our "lowly bed." The "lights and shadows" will be found inseparable, even in a back-woods life. During fifty-three nights passed in this kind of bivouacking, and altogether eight months almost wholly living in the woods, we became familiarised to these circumstances. Abundant leisure and opportunities were afforded for studying nature and her varied productions.

Our first camping ground was, for twenty-three nights, at different points of the Tioga valley, a few miles from the sources of that river. Here we had the pleasure of the society of my friend Dr. Saynisch, an able German naturalist, seeking specimens of the numerous birds which traverse the Alleghanies on their way from the south. We had sufficient guns and rifles among our party to insure a supply both of birds and animals, and to afford work during the evening to skin and prepare them. At this position we found ourselves in the midst of a scene which was new to us, and, in fact, of rare occurrence. It was the nesting place, a season or two previously, of the passenger pigeon (*Colúmba migratòria*); and here the gathering together of these birds, for the purpose of incubation, was exhibited on a scale perfectly astonishing. For the length of nine miles they had occupied every tree and sapling in the whole breadth of the valley, which is from a quarter to a third of a mile wide. Thousands and millions of nests were seen on the beech, birch, and maple trees, every tree of which contained several nests; and I counted on some of them from twenty to fifty nests. Unlike most birds, they are said never to return to their "nesting places" in a succeeding year; we therefore saw only their deserted nests: yet even these were interesting, as evidences of the countless multitudes which had congregated here. During the season, when the young pigeons, or "squabs," were ready to fly, their retirement was invaded by numerous persons, who filled sacks and carts with them; there requiring no other trouble

than the shaking of the young trees, or occasionally cutting down those of greater size. This year the pigeons established themselves in a new spot, in the beech woods ten miles to the west. By daybreak in the morning, they would fly past us, almost with the rapidity of lightning, in flocks of hundreds, in constant succession, in search of food, and would be seen returning during the day. The hunters say, with what accuracy I know not, that these flocks would travel sometimes a hundred miles for a breakfast.

I proceed with a list of the birds, animals, &c., which were taken by our party, or by hunters, during this expedition, adding from time to time a few characteristic notes as they became known to me. It is to be observed, that several of the birds which were killed early in the season were probably birds of passage. Their names are corrected from the splendid work of Mr. Audubon; and many details have been furnished by Dr. Saynisch. The classification of the animals is that of Dr. Harlan in the *Fauna Americana;* and of the Reptilia, from the *North American Reptilia*, of the same naturalist, in the *Journal of the Academy of Natural Sciences.*

MAMMA'LIA.

Order *Insectivora.*

Vespertilio noveboracensis ? New York bat? — A constant visiter in and about our cabins, and entering the houses, in the autumn, in search of flies. It made its first appearance on the Alleghanies on May 15.

Sorex brevicaudus, Short-tailed shrew, sometimes called polecat shrew. —Very abundant. In the spring, we repeatedly saw them lying dead in the paths, having been destroyed and partly eaten by owls or other enemies, which had been compelled to abandon their prey, on account of its strong smell of musk. They continue in full activity during the winter, not hibernating. In the deep snow, on the summits of the mountains, at near 2000 ft. elevation, I continually observed their long galleries, through which they traversed with great rapidity. They appear to be singularly fierce, restless, and impatient under confinement.

Scalops canadensis, American mole. — Taken at 1500 ft. elevation.

Condylura ? *cristata*, Radiated mole. — In the bottom meadow lands, around the settlements.

Talpa ? *americana*, American or black mole.

Order *Carnivora.*

Ursus americanus, Black bear. — Numerous. Many shot or trapped during my stay in the mountains. They resort to muddy springs, to wallow like hogs; these places being called "bear wallows." They turn up the flat stones on the ridges, in search of worms and roots. One frequently sees the topmost boughs of lofty beech trees broken down by them, to get at the mast. They are very fond of huckle berries [the fruit of different species of *Vaccinium*], and come down to the settlements, in the fall, to feed on elder berries. When such food is scarce, as was the case last year, they prowl round the farm-house [VI. 98, 103.], and take off the pigs, even out of their sties.

In the heat of summer they retire into the cool laurel swamps (Kálmia and Rhododéndron) of the mountains. They resort much to hemlock trees to gnaw the wood, apparently using it for medicinal purposes; and are accustomed to scratch the bark and whet their claws in the manner of cats.

Lùtra canadénsis, American otter. — They abound in most of the trout streams of these mountains. I have often observed their favourite resorts, and the "otter slides" have been shown me by the hunters. To these spots the otters resort for their favourite recreation, of sliding and tumbling down a bank into the water. A hunter told me that he has watched them for many minutes, intently occupied with this amusement, while within reach of his rifle.

U'rsus lòtor, American raccoon. — These swarm about the newly cleared lands of Lycoming valley, eating and destroying much corn in the fall. Not less than a hundred of these animals were taken, in October and November last, by traps and dogs during the autumn evenings, in a few fields near me.

Mustèla ermínea, Ermine. — One of these animals caught during the last winter.

Mustèla vulgàris, Common weasel.

Mustèla Bison, Mink. — There are probably more than one species of *Mustèla* here.

Mustèla Mártes, Pine martin. — Two specimens taken during the present spring by Dr. Saynisch.

Mephitis americàna, Skunk or American polecat.

Cànis Lùpus, Common wolf. — This animal is becoming scarce as settlements increase, and hunters are stimulated by the bounty given by the state for each scalp. Some of the deep ravines bordering the Tioga afford undisturbed lurking places for wolves. They do not attack men; but I have been followed by one, after dark, for two hours, when benighted in the woods; and they were commonly heard round our camp, but at a respectful distance. Two were shot here in the summer in one day.

Cànis Vúlpes, Common red fox. — Several shot, and a litter of young cubs were taken.

Cànis virginiànus, Grey fox.

Fèlis cóncolor, Cougar de Pennsylvanie, pouma, panther. — Now rare on the Alleghany Mountains; but some are still annually destroyed, and a bounty of twelve dollars obtained for each scalp. By the county treasurer's annual report for Lycoming county, I perceive he paid, last year, for panther and wolf scalps, three hundred dollars; and for fox and wild cat scalps one hundred and ninety dollars.

Fèlis montàna, Lynx du Mississippi, catamount, mountain cat. — Three or four shot here in the fall: length, 3 ft. or 4 ft.

Fèlis?——, Wild cat. — Somewhat smaller than the above; spotted, black and grey, 3 ft.

Order *Glires, Gnawers.*

Cástor Fiber, Common beaver. — Traces of these animals occurred only at one or two spots, in the freshly-cut and barked limbs of young trees, floating on the water. They are nearly extinct in the Alleghany Mountains [VI. 511.].

Fiber zibéthicus, Musk rat, ondatra. — They swarm in many situations; and are destructive to the embankments of canals and mill-dams. At Blossburg, we used to take one or two nightly in the nets set to catch trout: we always found them drowned. In the form of the skull they have a remarkable resemblance to the beaver [VI. 511.].

Arvícola xanthógnathus, and, probably, A. pennsylvánica, Meadow mouse.

Mús Ráttus, Common rat.

Mús ? sylváticus, Small field rat (or mouse) of the woods. — I used to remark a cat which brought in one daily, apparently referrible to this species.

Gerbíllus canadénsis, Canadian jerboa, long-tailed jumping mouse. — A constant visiter in our camps, at every place where I staid in the woods of the Alleghany Mountains. This elegant animal is extremely familiar; a little too free, occasionally, in jumping over one's person during the night. It is attracted by the provisions, to which it quickly returns after being chased away. One female selected my trunk, to which she contrived to obtain access, and deposited her four young ones in some cotton brought for stuffing birds.

A'rctomys mònax, Maryland marmot, wood chuck, ground hog. — We saw several, and caught one or two, and shot another, near a mountain stream, at the height of 1600 ft. It is a coarse-haired unsightly animal.

A'rctomys tredecemlineàta ? *Sciùrus*, Striped and spotted ground squirrel? — These active little creatures multiply greatly about new settlements, and are more frequently seen in the wooden fences of fields than in the uncleared woods.

Sciùrus cinèreus Grey squirrel; *Sciùrus* nìger, Black squirrel; *Sciùrus* striàtus, Ground squirrel; *Sciùrus* hudsònius, Red squirrel or Chickaree. — The four species are extremely numerous in the woods. They are eaten as great delicacies, particularly the grey and black squirrels. On account of the great damage they do to the grain and corn, they are destroyed without mercy. Shooting matches are frequently formed for this object. On the 8th of June, a match was decided between twenty men on each side, in Lycoming valley, who, during three days, were to shoot the greatest number of squirrels and other animals that are pronounced destructive to the farmer's corn, grain, domestic animals, fowls, &c. At this meeting were produced 2657 head of all denominations coming under this class. Nearly at the same time, in the adjoining county of Tioga, another party was matched to shoot squirrels, when the winning side brought in no less than 1732 squirrels, and the losing party produced 1035; the whole being 2767 squirrels.

Ptéromys volucélla, American flying squirrel. — They are rarely visible in the daytime, hiding and sleeping in hollow trees, and at night come out stealthily to feed. It is very common to keep them in cages, but they are not so amusing and lively, in such confinement, as the other species of squirrel. In the warm state of Virginia they swarm in the woods.

Hýstrix dorsàta, Common porcupine. — Saw four of these in May last; one of which nearly destroyed two dogs, who have a mortal antipathy to these animals, and attack them furiously. They generally are fully revenged on their antagonists, and, in the case I refer to, it was horrible to witness the condition of the dogs, whose mouth, gums, tongue, and throat, were stuck full of spines, which were not extracted without great difficulty. The porcupine attains its largest size on the Alleghany Mountains: I measured one which exceeded 4 ft. in length. In June, my men took the trouble to cut down a lofty hemlock, on whose topmost bough a large porcupine had taken refuge. I wished to obtain his head for Dr. Harlan, and carried it in my hands, for two hot days, through the woods. It is now in his collection of comparative anatomy. [VI. 510, 511.]

Lèpus americànus, American rabbit (a true hare). — Generally white, or nearly so, on these mountains. We always saw them about the laurel swamps, on the highest part of the Alleghanies.

Order *Pécora, Ruminating Animals.*

*C*érvus virginiànus, Common deer, fallow deer. — Their numbers are much reduced as clearings and population increase, and the hunters find their occupation much less profitable than formerly. An active hunter now seldom kills more than one in a day, and sometimes is unsuccessful during two or three successive days. I have, however, known four deer to be shot by an experienced "Leatherstocking" in one morning.

*C*érvus canadénsis, Wapiti, elan Americain; the American elk. — Now almost extinct in most parts of Pennsylvania. Like the poor Indians, they have gradually retreated to the "far west." I found their horns repeatedly in the woods, mossy, and gnawed by mice or wolves. A pair of elks were shot on Pine Creek, in the spring, and a herd of thirteen was killed by a couple of hunters, in February of last year, near the head waters of Pine Creek.

BIRDS.

Order I. *Accipitres, Rapacious Birds.*

*S*trix virginiàna, Great horned owl, Virginian owl.
A'sio, Little screech owl.
*F*álco leucocéphalus, Bald-headed eagle.
Hen hawk.
Privateer hawk.

Order II. *Pies.*

*P*ìcus auràtus, Golden-winged woodpecker.
erythrocéphalus, Red-headed woodpecker.
vàrius, Yellow-bellied woodpecker.
plumòsus, Grey woodpecker.
pileàtus, Pileated woodpecker.
Sìda carolinénsis, Little blue woodpecker.
*A*lcèdo *A*'lcyon, Belted kingfisher.
*C*órvus cristàtus, Blue jay.
*C*òrax, Raven.
Coccýnnus americànus, Yellow-billed cuckow.
*T*róchilus *C*ólubris, Green hummingbird.

Order III. *Passerines.*

*T*úrdus polyglóttus, Mocking bird [I. 416.]
*f*élivox, Cat bird.
migratòrius, American robin. [I. 415.]
rùfus, Red or ferruginous thrush. [I. 415.]
*m*ustelìnus, Wood thrush.
mìnor, Hermit, or little thrush.
mélodus, thrush. [I. 415.]
Wilsòn*ii*, Tawny thrush.
*I*cterus phœníceus, Red-winged starling, or marsh blackbird.
*S*túrnus ludovicìànus, American meadow lark.
predatòrius.
picatòrius, Cow blackbird.
Quíscalus versícolor, Crow blackbird.
Lóxia curviróstra, American crossbill.
*F*ringílla hyemàlis, Grey snow bird.
trístis, Yellow finch, American goldfinch. [I. 419.]
cardinàlis, Cardinal grosbeak, red bird. [I. 418.]
nivàlis, Snow bird.
*p*asserìna, Yellow-winged sparrow.
ludovicìàna, Rose-breasted grosbeak.
pusílla, Field sparrow.
Muscícapa, Flycatcher.
Sýlvia sìàlis, Blue bird. [I. 420.]
Emberìza nivàlis, Snow bunting.
Pàrus atricapíllus, Black-capped titmouse.
hudsónicus, Canadian titmouse.
*H*irúndo, Swallow.
*C*ýpselus pelásgius, American swift.
Colúmba migratòria, Passenger pigeon.
carolinénsis, Turtle dove.
*C*aprimúlgus vocíferus, Whip-poor-will.
Troglódytes americàna, Wood wren.
*S*ítta, Nuthatch.

Order IV. *Gallinaceous Birds.*

*M*elèagris Gallipàvo, Wild turkey.
*T*étrao umbéllus [*L*agòpus], American pheasant, or ruffled grouse.
*P*érdix [*C*otúrnix] virginiàna, Quail.

Order V. *Grállæ, Waders.*

*C*haràdrius, Plover.
Scólopax Wilsòn*ii*, Snipe.
? rustícola, Woodcock.
Trínga, Sandpiper?
Rállus virginiànus, Rail.

Order VI. *Anseres, Swimmers.*

*A*nas, Duck.
Blue-winged duck.
Colýmbus glaciàlis, Loon, or great northern diver.
Wild swan and White gull.

AMPHI'BIA.

Reptília. Order I. *Chelònia.*

Cistùda claúsa, Common land tortoise.
Chelonùra serpentìna, Snapping turtle.
E'mys concéntrica, Terrapin, or fresh-water tortoise.
pícta, Painted turtle.
Lizards, many species.
Salamander and Common frog.

Order II. *Ophídia, Serpents.*

Crótalus duríssus, Banded rattlesnake.
Cóluber constrictor, Black snake.
sipèdon, Water snake.
Vipera, Copper head.
Cóluber sirtàlis, Garter snake.
vernàlis, Green snake.
ordinàtus, Striped snake.

FISHES.

E'sox *Lùcius*, Pickerel, or pike.
Sálmo Fàrio, Common trout.
Cýprinus oblóngus, Chub.
Cýprinus tères, Sucker.
Anguílla vulgàris, Common eel.
Sun fish.

CRUSTA'CEA.

A'stacus Bartòn*i*, Crawfish.

Rattlesnakes are in great numbers in some parts of this district, having their dens on the dry points of rocky ridges, facing the south: but it is remarkable that they are seldom or never found in those woods, in the same country, which consist of beech and maples. We killed forty-one huge rattlesnakes on one ridge, bordering Lycoming valley, during one month's stay in August. Some of these were from 5 ft. to 6 ft. 2 in. long, very thick, and truly formidable. Although I was in the daily habit of finding these horrid reptiles coiled in my path, I was only once struck at by one, and, fortunately, it did not reach me. I have, however, had twice opportunities of observing the rapid effects produced by the bites of this terrible animal, upon men who were attached to the service on which I was engaged. The first case was on the hand, which swelled almost instantaneously, extending frightfully up to the shoulder. We were then encamped near the summit of the Alleghany ridge, late in the evening, and many miles from medical assistance. In this emergency, amidst the alarm consequent on such an event, and under such circumstances, the poor man's life was, in all probability, saved by the coolness, courage, and promptness of my amiable friend, Mr. H. Hopkins, now himself numbered with the dead, who sucked the venom from the wounds. The hand was then scarified with a razor, and a temporary kind of cupping apparatus, made out of a common earthen jug, was applied, and fortunately

with perfect success. Much blood was extracted, and the man came back to his employment in three or four days. The second case was that of an assistant, last year, who was bitten in the ankle into an artery, which happily leading to much hæmorrhage, prevented the absorption of the venomous fluid, and enabled the man to resume work in less than a week. Rattlesnakes are sluggish, and easily killed. I have repeatedly endeavoured to verify Mr. Audubon's account of the rattlesnake ascending trees, which has been confirmed.

Black snakes are called "racers," from their occasionally chasing men with great ferocity. They move with astonishing swiftness; the eye can scarcely follow their rapid passage: They are constrictors of great power.

The water snake leaves the water to bask in the sun, on the roads and paths. He is very fierce, and springs boldly and frequently to the attack; but is not poisonous. I have taken a large trout from the stomach of one I killed on a road.

Copper head snakes of the Alleghany Mountains are more deadly in their bite than the rattlesnake. They are more dreaded than the latter, because, unlike it, they give no warning of their vicinity. They are also sluggish, and easily destroyed. Our party killed eighteen under one large stone on the banks of the Little Juniata River, near the base of the Alleghany Mountains.

313. *Chestnut Street, Philadelphia, June* 15. 1835.

ART. II. *Notes on the Habits of the Mallard.*
By CHARLES WATERTON, Esq.

THIS bird yields to none of our wild water-fowl in loveliness of plumage, while it far surpasses most of them in the excellent flavour of its flesh. Having been completely subjugated by man, it can now be obtained either in its enlarged dimensions, acquired by superabundance of food picked up at the barn-door of its owner, or in its original small and compact form, on which a precarious subsistence in the field of freedom has hitherto worked no visible change.

There cannot be a doubt that the wild duck and the domestic duck have had one and the same origin. They are still intimate; for they breed together, and flock together, and are both subject to the double annual moulting; of which more anon. The domesticated duck only loses its inclination for flying, when it is bred and reared far from any large sheet of water; but where an extent of water is at hand, this bird will be observed to assume more brisk and active habits. It

will indulge in long and lofty flights, and frequently take off with the congregated wild-fowl in their nocturnal excursions. [p. 45. and note *.]

I have the finest possible opportunity of looking into the habits of the mallard at any hour of the day, from the rising to the setting sun; for here this bird, and large flocks of its congeners, are perpetual visitors during the winter months. They fear no danger; and they seem to know that in this populous neighbourhood there is one retreat left to which they can retire, and in which they can find a shelter from the persecutions which are poured down so thick upon them in other places, by man, their ever watchful and insatiate pursuer.

Some six years ago, I put a number of wild ducks' eggs to be hatched by a domestic duck. The produce of these eggs having intermixed with the common barn-door breed of ducks, there has been produced by this union such an endless variety of colouring, that it is now impossible to trace the identical origin of the birds with any degree of certainty. Half wild, half tame, they will come to the windows to be fed; but still they have a wariness about them quite remarkable; and they will often startle and take wing at very trivial causes of alarm. In this group the naturalist may see the milk-white duck, and the duck in the real wild plumage; and others of every other intermediate colour; now sporting and diving before him, now retiring to the stranger flocks at a distance, and now rising with them in the air at the close of day, to pursue in congregated numbers their journey through the heavens, to those favourite places which afford them a regular supply of food.

In 1827, two males and three females made their appearance here, and took up their permanent quarters with the domestic ducks. They resembled the original wild breed in every thing except in size. You could barely perceive that they were a trifle larger, and that was all. Hence I conclude that there must have been a shade of the reclaimed duck in their parentage. Though shy at first, in time they became surprisingly tame. One of the ducks singled out the cook as an object worthy of its attention, and would steal into the kitchen whenever an opportunity offered. The number is now reduced to one, the other four having disappeared at intervals. Fearing that this last remaining bird might give me "the slip for ever," I have taken the precaution to pinion him. The curtailing of his flight will probably be the means of prolonging his existence; for I always conjectured that his companions had been surprised and killed in their aberrations down the neighbouring brooks, where protection was not extended to them.

The wild ducks which frequent this place may be observed to catch insects on the water in the daytime: but they do not, in general, rove on land in quest of food, though once or twice, in moist and heavy weather, I have seen them waddle through the pasture; but I marked the fact down, as one of rare occurrence. When undisturbed, they are seen to pass much of their time asleep on the ground. At intervals they will take to the water; and while some float on it, with the head reclined on the shoulder, others will sport and dive into the deep, and then return to land, and there arrange and preen their feathers, though not with oil from the gland on the rump, as is generally supposed. At the close of day they become exceedingly vociferous, the voice of the female being much louder and more frequent than that of the male; a circumstance too notorious in the human species. After this uproar of tongues has continued for a certain time, they rise on rapid wing in detached flocks, and, to a bird, they go away for the night. At early dawn they return in companies, consisting of fifteen or twenty birds, and stay here, to pass the day in peace and quiet. When the water is frozen over, they sometimes huddle together on the ice, and at other times collect in one large flock in the adjacent pasture. Every now and then a peregrine falcon makes his appearance, and perches on a neighbouring sycamore tree. We know of his approach by the singular agitation which takes place amongst the ducks: they shake their wings with a tremulous noise, and get into a compact group. After this they all rise in the air; and then you may see the falcon dash at an outside duck with an almost inconceivable velocity.

"Ocior cervis, et agente nimbos
Ocior Euro." *

One morning he was observed to pursue a teal, which only just escaped destruction by alighting on a pond, within a few yards of the place where some labourers were at work.

I should think that the old birds remain in pairs through the entire year; and that the young ones, which have been hatched in the preceding spring, choose their mates long before they depart for the arctic regions in the following year. I have a favourite hollow oak tree on a steep hill, into which I can retire to watch the movements of the pretty visitors. From this I can often see a male and female on the water beneath me, nodding and bowing to each other with as much ceremony as though they were swimming a minuet, if I may

* [Far fleeter than the timorous hind,
Far fleeter than the driving wind.
Hor. *Carm.* 2, 16, 23. *Francis.*]

use the expression. Hence I conclude that there is mutual love in the exhibition, and that a union is formed.

When these large flocks of wild-fowl take their departure in spring for the distant regions of the north, about a dozen pairs of mallards remain here to breed. Sometimes you may find a solitary nest of these birds near the water's edge, or a few yards from it, on a sloping bank thickly clothed with underwood: but, in general, they seem to prefer the recesses of a distant wood for the purposes of their incubation; though we have had an instance of one building its nest in a tree, and of another which hatched its young on an old ruin. [IV., 519.] Last year a domesticated wild duck had a brood of ten young ones in the month of May; and on the 27th day of October the same bird brought out a second brood of eleven. In an evil hour they strayed too far from the water. A tame raven met them on their travels, and killed every bird.

At the close of the breeding season, the drake undergoes a very remarkable change of plumage: on viewing it, all speculation on the part of the ornithologist is utterly confounded; for there is not the smallest clue afforded him, by which he may be enabled to trace out the cause of the strange phenomenon. To Him alone, who has ordered the ostrich to remain on the earth, and allowed the bat to range through the ethereal vault of heaven, is known why the drake, for a very short period of the year, should be so completely clothed in the raiment of the female, that it requires a keen and penetrating eye to distinguish the one from the other. About the 24th of May, the breast and back of the drake exhibit the first appearance of a change of colour. In a few days after this, the curled feathers above the tail drop out, and gray feathers begin to appear amongst the lovely green plumage which surrounds the eyes. Every succeeding day now brings marks of rapid change. By the 23d of June scarcely one single green feather is to be seen on the head and neck of the bird. By the 6th of July every feather of the former brilliant plumage has made its disappearance, and the male has received a garb like that of the female, though of a somewhat darker tint. In the early part of August this new plumage begins to drop off gradually, and by the 10th of October the drake will appear again in all his rich magnificence of dress; than which scarcely any thing throughout the whole wild field of nature can be seen more lovely, or better arranged to charm the eye of man. This description of the change of plumage in the mallard has been penned down with great care. I enclosed two male birds in a coop, from the middle of May to the middle of October, and saw them every day during the whole of their captivity. Perhaps the moulting

in other individuals may vary a trifle with regard to time. Thus we may say that once every year, for a very short period, the drake goes, as it were, into an eclipse, so that, from the early part of the month of July, to about the first week in August, neither in the poultry-yards of civilised man, nor through the vast expanse of Nature's wildest range, can there be found a drake in that plumage which, at all other seasons of the year, is so remarkably splendid and diversified.

Though I dislike the cold and dreary months of winter as much as any man can well dislike them, still I always feel sorry when the returning sun prepares the way for the wild-fowl to commence their annual migratory journey into the unknown regions of the north. Their flights through the heavens, and their sportings on the pool, never fail to impart both pleasure and instruction to me. When the time of their departure comes, I bid my charming harmless company farewell, and from my heart I wish them a safe return.

Walton Hall, August 21. 1835.

ART. III. *Sketches of the Natural History of my Neighbourhood.* No. 3. *Fragments of Ornithology.* By C. CONWAY, Esq., of Pontnewydd Works, Monmouthshire.

I HAVE long contemplated the finishing of my remarks on the birds of my neighbourhood, begun in VII. 333.; but, some trifle or other has always diverted me from my purpose. I will not promise to make an end of it now: I will "begin to finish;" and, if the observations I have now to offer are acceptable to your Magazine, you may use them in whatever way you please.

The Wren.—The science of political economy, at least as far as regards a division of labour (and that is a most important part of the science), is not exclusively confined to the lords of the creation. In watching a pair of wrens building their nests in an old road, I noticed that one confined itself entirely to the construction of the nest, which it never left for a moment; whilst the other was as incessantly passing and repassing with materials for the structure. These materials, however, this helper never once attempted to put into their places: they were regularly and always delivered to the grand architect that was employed in constructing the building.

[*The Robin.*]— During some inclement days, in the end of December, 1830, a redbreast was observed resting upon a twig which overhung a stream, and intently watching some

small floating body that was carried down with the water. When the object got opposite him, he darted upon it, clasped it with his claws, and flew away. It proved, however, too heavy for him: he was obliged to relax his grasp, and let it drop again into the water. Not to be thwarted, however, he again took his station upon another twig, lower down the stream: there he awaited the arrival of the object; again repeated his former operation; and finally bore away the prize. Is there not forethought, contrivance, consideration, and something very nearly approaching to the process of reasoning, evidenced in this case?

The pugnacity of the redbreast is too well known to render it necessary for me to give many instances of it: the following anecdote, however, may not be altogether uninteresting:—A neighbour of mine has a small arbour erected in his garden, to which he frequently resorts, and here he has been in the habit, during the summer, of casting some crumbs of biscuit, bread, or other food, to a redbreast that frequented the place. This had been so often repeated, that the bird at last grew so familiar, that, whenever it saw any person approach the arbour, it immediately followed; and there it hopped about, waiting every stray crumb, and almost careless of all efforts to scare him away. A short time back, another redbreast was captured in an out-building, and, having been placed in a cage, was hung up in the arbour. Here, however, he found no repose; for the redbreast that had been in the habit of visiting the place no sooner discovered the intruder, than he attacked the cage with the utmost possible fury, beating it with his wings, and pecking at it with his beak in all the furious ways that he, in his petty rage, could devise; and, when he discovered that he could not reach the intruder, he kept a constant and vigilant watch over the captive, scarcely ever leaving the place, and taking every opportunity of giving him every annoyance in his power, until his enemy died, which he did in the course of a few days.

I must not, however, load the shoulders of my redbreasted friend with vices, without, at the same time, recording his virtues. The familiarity of the robin is almost as notorious as his pugnacity; it is, however, reckoned a bad omen, by the vulgar, when a robin affects attachment to any particular person: it is accounted a forerunner of death. Many are the stories which I have heard in corroboration of this *fact*; I am happy, however, in having it in my power to record *one instance* in which death has not been found to be the inseparable result of visitation, in this case daily, from this little bird. A friend of mine, in a neighbouring town, has a small garden

attached to his dwelling; here, if he enters and whistles a call-note, a robin invariably comes hopping along, will perch upon his finger, pick up his allowance of crumbs from the palm of his hand, and then return: this he has been in the habit of doing for the past two or three years; and my friend is not dead. How is it that vulgar prejudice should attach such an ugly idea to so beautiful, sprightly, and familiar a bird?

The Wren is occasionally almost as pugnacious as the robin: indeed, little folks appear to be more subject to violent paroxysms of anger than those of larger growth, or we take more notice of it in them than in others, probably from the ridiculous exhibition which they occassionally make of it; for in proportion to its intensity is its imbecility. I was once attracted by the chattering of a wren, in the midst of a hedge, at a considerable distance; but, as her scoldings (if I may so term it) continued and increased as she wound her way through the thick of the hedge, I directed my attention to the spot. Here I discovered that the wren was in pursuit of a weasel: she hopped from twig to twig, just over the weasel's head as it passed along, making all the noise her little throat was capable of, and pecking at her enemy with all her might. The weasel bore the annoyance with philosophical indifference: he did not deign to cast a look at his little tormentor, but passed on heedlessly, and thus the relative parties continued until I had lost them in the distance.

The minute *Gold-crested Wrens* are very abundant with us, hanging their compact nest to the pendulous branches of the fir tree and the larch tree, and making the groves echo, occasionally, with their shrill and powerful pipings.

The Wheatear, or white rump, is almost exclusively confined to the sides of our mountains; it is amongst the very first of our spring visitants, and enlivens the dreary and heathy sides of the hills by its rapid and continued motions.

The Wagtails. — The yellow wagtail almost incessantly follows the cows, continually flitting before their noses whilst they are grazing, deriving its livelihood, I presume, from the insects which they disturb. [V. 288.] The pied wagtail is a constant attendant upon the plough, picking up worms and insects from the furrows, and frequently exercises itself as a pedestrian flycatcher, performing the operation with much dexterity. The grey wagtail is not so common as the others; but it shows itself, even in the depth of winter, when we have a bright sunshiny day; and it is again lost to our view, until another genial day arrives. Where does it hide, and how does it support itself in the intervals?

The Skylark (*Alaúda arvénsis*) and the *Woodlark* (*A. arbòrea*) are both plentiful; and I hardly know of the song of each which to admire most. The skylark has been the theme of poesy time out of mind; and a delightful theme it is; and cheering is the song as he mounts aloft in early spring, when *all things* are cheering: but the woodlark cheers us when all else is desolate. He delights us in a December morning, when "the sun shines cold," wheeling his circling flight in the air, round, and round, and round, without any upward progress whatever; and thus he pours forth his voluminous song for hours and hours together; and, whilst three or four are thus vying with each other on the wing, there is scarcely a tree in the wood that is not occupied by one or more of the little musicians, who make the whole neighbourhood resound with their warblings. I always fancy the song of the woodlark, at this dreary and cheerless season, as one of the most delightful of rural sounds: it exhilarates the spirits, which are prone to be depressed by the muggy December weather; it gives a cheerfulness to the otherwise dreary appearance of nature; it induces a flow of charitable and good-natured feeling in the heart, and excites a glowing sense of enthusiasm in that of the naturalist: in fact, it is altogether delightful, and must be heard, as I have frequently heard it, on a still Sabbath morning on the uplands, when all the busy hum of men is hushed in the vale below, before it can be duly appreciated.

Mr. Jesse informs us (in his *Gleanings*, i. 5. and 6.), that he has observed the skylark remove its eggs from one field to another in its claws; and he imagines that this is the use for which the long hinder claw was intended. When a man states a fact, I have no right to doubt its truth. Mr. Jesse, I have no doubt, feels confident of the correctness of his observation; and I am sure he is too honest, to wish to impose upon his readers: I think, however, that the man who saw so much similarity between the egg of the magpie and lapwing (VII. 338. note*) may possibly have made some mistake with regard to the extraordinary fact which he records. But, leaving the fact, let us look to the inference. If the lark were the *only* bird that deposits its egg on the ground, then there might be some plausibility in the opinion that its long hinder claw was furnished for its convenience in removing its eggs when disturbed: but the rail and the partridge deposit their eggs in similar situations, and are equally liable to be disturbed by the husbandman; and yet they are not furnished with long claws. There are many other observations which suggest themselves upon this subject; but I will not pursue it. Mr.

Jesse's book is popular, and deservedly so; I will not, therefore, attempt to prejudice it: nevertheless, it is the bounden duty of every observer to endeavour to overturn every false position, and to controvert every hasty and unsupported conclusion.

[Mr. Conway has communicated, besides, that of the species of birds of his neighbourhood, there are of the species kindred to those he has noted on above, the whinchat, stonechat, hedge-sparrow, and meadow pipit.]

March 28. 1835.

ART. IV. *An illustrated Description of a Species of Eurýnome, supposed to be hitherto undescribed; and Notices of some Instances of some Change of Form which occurs in certain cited Species of Crustaceous Animals.* By S. HAILSTONE, Jun. Esq.

EURY'NOME [Leach] ? SPINO'SA [*Hailstone*]; ? áspera in a young state. Female. (*fig.* 47., much magnified.)

47



FEMALE. External antennæ (*b*) distant, a little shorter than the rostrum, inserted at the internal corner of the eye; the first joint rather shorter than the second, the third shorter than the first; the remaining portion of many joints. External double feet palpes (*c*), with the second joint of their internal footstalk emarginate, and notched at its internal corner for the reception of the palpus. Anterior pair of legs thicker than the others, didactyle with deflexed fingers, a little longer than the body, tuberculated, spinous; 2d, 3d, 4th, and 5th pairs moderately long, with sharp claws and tuberculated thighs. Shell somewhat triangular, anteriorly terminated by a bifid rostrum, with its segments divaricating, which, exteriorly, are spinous; covered with spines and tubercles, of which ten are more prominent than the others: sides with two lamellæ behind each eye; the rest of the margin set with spines. Orbit spinous. Eyes thicker than their peduncles. Abdomen oval (apparently 7-jointed, with a longitudinal carina, tuberculated, and the tubercles occurring in transverse lines: of their character I cannot speak positively, as this part was in a different a state).

Two female specimens I found in a mass of Filípora filogràna; the same which yielded the Pontóphilus trispinòsus [p. 261.], the Hippólyte macrochèles [*Hailstone*, p. 394, 395.; Dienècia *Westwood*, sp., p. 552.], the Ancèus forficulàrius

[p. 273.], and a host of the Porcellàna Linneàna [p. 394, 395, 552.].

This crab differs from the Eurýnome áspera in the spinous rostrum; the position of the eyes, which are situated something similarly to those of the male of the E. áspera; in the sides of the shell having only two lamellæ, and those of a different shape, the other appendages being spines; in the antennæ not being so long as the rostrum; in the elongated shape of the shell; and, if I am correct in my observation, in the abdomen being tuberculated. That it is not the young of the áspera, may be argued from its shape being farther removed from the common type of the Brachyùra than is the shape of the known species, that being, in the female, rounded; in this, triangular: but it must not be concealed, that, in a specimen of a short-armed individual, in Dr. Leach's collection, in the British Museum, of about twice the length of the one in question, the three hindmost marginal lamellæ are represented by blunt teeth; and, though I could not discover any spines on the rostrum, the largest female in the collection has its external margin with a *wavy* outline, which may denote the former existence of them.

Notices of some Instances of some Change of Form in certain cited Species of Crustaceous Animals. — In *fig.* 48. is represented the carapace of what I take to be Pilúmnus hirtéllus in a very young state; and I send it you because it illustrates very clearly the kind of change, in shape, which some of the Brachyùra undergo before they acquire their final form. The full-grown specimens of this crab are transversely elongated, having five spines behind each eye; and this young one is nearly square, and has the rudiments of the same number of spines. Now, the largest individual I have seen is nearly 1 in. across, and, consequently, the one in question must be very young; and from this it appears that, at a very early period of their existence, they possess the characters that distinguish the older ones; while the aberration from the common types of this order is the result of age. In a specimen of the Cárcinus Mæ`nas, of the same size as the crab figured above (*fig.* 47.), I have found this to be the case, the spines being all present, but the form more square than the full-grown specimen.

48



But the above observation does not hold good with regard to all the Brachyùra, for, in a specimen of the Cáncer Pagurus, one third of an inch in breadth, which is smaller in comparison with the full-grown animal than any of the preceding,

I have found all the characters, as well as the individual form, perfect; and in specimens of the Portúmnus variegàtus and Pirímela dentàta, each a line in length, I have made the same remark.

While upon the changes in form of the Crustàcea, I may as well mention a few other observations which may be interesting. Of the Macroúra I have seen a specimen of the Galatèa squamífera, of two lines in length, with all the spines and features observable in the full-grown ones; the difference being in their unfinished form, the marginal spines being more like expansions of the lamellæ forming the carapace.

A specimen of the Pisa Gíbbsii, not quite two lines in length, differed from the old ones in nothing but the obtuseness of its dorsal spines. A specimen of the Macropòdia Phalángium of the same size has a rostrum of a length proportional to its size, which is a fact bearing upon the question of the doubtful Macropòdia I have communicated to you [p. 263, 264. 267, 268.]. The following observation is of a case analogous to that of the spinous arms of the young Porcellàna Linneàna [p. 265. 268, 269. 394, 395. 552.]. Some specimens of the males of the Corýstes Cassivelaúnus have their fore legs about 2 in. long, which in others are at least 3 in. Now, upon those of the former, on the inner side of the arm and wrist, are two sharp hooked spines, which in the latter degenerate into blunt tubercles; the alteration being the result of age.

Of the forms of crabs, in the earliest stages of developement from the ova, I have had no means of judging; but, as far as my observation extends, they seem, in comparison with the size which they afterwards attain, to assume their final shape when very small, and, consequently, at an early period of their existence.

Cheltenham, August 22. 1825.

The Species of Crustaceous Animals discovered and described by Mr. Hailstone, and illustrated and annotated on by Mr. Westwood. (261—276. 394, 395.) — After your own observations [p. 395.] in reply to Mr. Hailstone [p. 394, 395.], in which I fully concur, I know not whether it be necessary for me to offer any further remark; but, lest my silence should be deemed evidence of the justice of Mr. Hailstone's animadversions, I may be allowed to observe,

1the first place, that I can see no great impropriety in suggesting (as I merely did) the name of minùta [p. 267.] for a small animal, or that of rùbra [p. 274, 275.] for a red one.

Next, I do not admit, so far as *principle* is concerned (although Mr. Hailstone is perfectly welcome to the imposition of the names of the animals in question), that he is at liberty to claim the insertion of fresh trivial names which may appear more adapted to them; because, although he caught and described the animals, yet the trouble of ascertaining whether they had been previously described by crustaceologists or not was mine: and every naturalist is aware that this a greater task than the mere describing of an animal. Unquestionably, therefore, as the manuscripts were placed in my hands in an imperfect state [so far as the absence of identification and denomination, which are the points in question], without the slightest intimation that Mr. Hailstone wished the subject to be again laid before him in case the species were undescribed, I had the right, in order to render the paper complete, to apply a specific name; which must stand, because, having been once published, "nomina trivialia nunquam absque summa necessitate mutanda sunt."—*Fabr.*

I gave [p. 274, 275.] my reasons for suggesting the name of rùbra to the Cryptopthálmus?, which I need not repeat. Mr. Hailstone has given (p. 395.) it as Hippólyte macrochèles, without any doubt as to its genus. But, taking into consideration Mr. Hailstone's several observations thereupon [272, 273. 394.], and my own [274.], I do not now hesitate to raise it to the rank of a distinct genus, under the name of

Dienècia (*Diēnekēs*, continuous; the abdomen not gibbose in the middle). *Antennæ superiores* bisetosæ. *Abdomen* supra, in medio, haud gibboso-elevatum. *Rostrum* perbreve, haud serratum. *Cephalothoraæ* oculos obtegens. *Pedes antici* maximi, chelis maximis. *Pedes secundi* anticis vix longiores, graciles, carpo articulato, apice chelis minutis armati. *Typus* Hippólyte ? rùbra, *Mag. Nat. Hist.*, vol. viii. p. 272. fig. 31.

If Mr. Hailstone be correct in giving [p. 395.] his Porcellàna [p. 265. 268—270.] as identical with Leach's Linneàna in the British Museum, although Mr. Hailstone's specimens, which I had before me at the time I wrote my remarks, neither agreed with Desmarest's nor Gray's descriptions of that species (as, in fact, I noticed [p. 267.]), this latter name, as well as that of Leàchii of Gray, must also be expunged, and that of héxapus, given to it by Linnæus and Latreille, applied in its stead. Observe, moreover, that the héxapus of Linnæus formed the type of Leach's genus Pisídia; a genus founded upon characters notably less strong than those of Dienècia proposed above.—*J. O. Westwood. The Grove, Hammersmith, August*, 1835.

[*A Correction* (p. 394. 552.) *of the Error in the Engraving*


49

(p. 272.) *of ? Hippólyte ? rùbra* Westwood (p. 272. 274.); *H. macrochèles* Hailstone (p. 394, 395.); *Dienècia* Westwood, *sp.* (p. 552.).—In the annexed figure (*fig.* 49.), the scale at the base of the antennæ, which is omitted in fig. 31. in p. 272., as noted by Mr. Hailstone in p. 394., is inserted as present in the drawing by Mr. Hailstone from which fig. 31. in p. 272. was prepared.

In p. 273. line 9., for "filogranà," read "filogràna."]

ART. V. *A List of Species of Crepuscular Lepidopterous Insects, and of some of the Species of nocturnal ones, known to occur in Switzerland; with Notices of the Localities in which they have been observed.* By P. J. BROWN, Esq.

[*CORRECTION to the Information on certain of the Diurnal Lepidopterous Insects treated on by Mr. Brown in* p. 205—220. — We place these corrections first, because they belong to a precursory communication; and to make them the more obvious.] Your brackets in the first line of p. 215. having caught my eye, I find that I had omitted the words "by the white streak:" this induced me to skim over the rest; and I find the following corrections necessary: — In p. 212. No. 69., after "highest Alps," insert "as"; in p. 214. No. 98., "Alcæ*is*" should be "Aléxis"; in p. 216. line 1., "Vivsch" should be "Viesch;" in p. 216. No. 119. for "tail. (Polyómmatus Elèus Fab. I have often found in Lower Valais)", read "tail (Polyómmatus Elèus Fab.), I have often found in Lower Valais." Upon your own shoulders be the responbility of diphthonging M. Godart, by which you risk confusing the Burgundian entomologist Godart, who died in July, 1825, with the Flemish Gödart, whose works were published about the middle of the 17th century: the work I have always referred to is the "*Histoire Naturelle des Lépidoptères ou Papillons de France*," which is only now drawing slowly towards its close, being continued, since Godart's death, by Duponchel. [We had supposed "Goedartius" (in Kirby and Spence's list of "authors quoted") intended.]

I have delayed obeying your call for the continuation of the list of Swiss Lepidóptera (p. 220.), from a wish to ascertain whether I could hope to fill up, in any satisfactory manner, the blank left by the abrupt termination of Meisner's useful Catalogue [at the genus Eyprepìa in the Noctúrna, as

noted by Mr. Brown in p. 220.] I am too little pleased with my success to make the attempt at present; so, in the hope of being able to send you, at some future time, a muster-roll that we need not be ashamed of, I proceed, without further preface, to the Swiss Crepusculària.

[" This list being essentially that of Meisner the whole must be considered as his, except such species or notices as are included in parentheses." — *Mr. Brown*, in p. 206.]

CREPUSCULA'RIA.

ATY'CHIA.

1. státices. Common in June and July, in meadows.
2. globulàriæ. Usually confounded with státices; but is distinguished by having its antennæ longer, more slender, ending in a sharp point, and not so broadly pectinated (in the males); the wings more rounded; the fore ones verdigrise green, with a play of blue colour, and dark grey fringe. It flies later than státices.
3. prùni. Rather smaller than státices. Antennæ blackish green, shining, finely pectinated, pointed; head and back dull green, shining; abdomen blackish; fore wings blackish brown or blackish green, rarely with a blue shade, under side deep grey, fringe dark; hind wings blackish. Female smaller, with sub-feathery antennæ.
   (This species not being in Stephens's or Curtis's *Catalogue*, and No. 2. appearing to be rare in England, I have inserted the description, which may probably lead to detection of them; as, although far less common than No. 1., they both visit the same spots.)
   (Chimæ'ra lùgubris. Low Alps of the Valais; rare.)

ZYGÆ'NA.

4. Mìnos. Common in June and July on dry slopes.
5. brìzæ. In Valais, about Sierre. I have a variety from that place, in which the parts usually red are yellow.
6. scabiòsæ. Valais, near Louesch, Sierre, &c.
   (Sarpèdon. Valais.)
7. achillèæ. Not rare about Berne, at end of May, in meadows.
8. éxulans. On all high Alps, in July and August.
9. cýnaræ. Valais.
10. melilòti. About Blumenstein, at foot of Stockhorn.
    (trifòlii. Valais and Italian Switzerland.)
11. loníceræ. Frequent about Berne, &c. (Meisner then describes a variety he has taken in Italian Switzerland and the Valais, much larger; the fore wings dark blackish blue; hind wings with broad black borders; and abdomen very much lengthened. Ochsenheimer says he has received both sexes of this variety from Wallner, and named *Z.* transalpìna; but it is not the transalpìna of himself and Mazzola.)
12. filipéndulæ. Abundant everywhere, and in several varieties; ex. with smaller spots in the Valais, and frequently with confluent ones near Bellinzona.
13. transalpìna. (Meisner cannot find any character to distinguish this from the last, and doubts its being a good species. Ochsenheimer says it is notoriously distinct from both that and the following. Meisner, perhaps, had not the true fly, which is, however, found in the Tessin.)

14. medicáginis. Valais.
15. peucédani. Rare. I have it from the vicinity of Neuville on the Lake of Bienne.
16. Ephiáltes. Valais; particularly in several places between Louesch and Sierre, very abundant.
17. onobrỳchis. In several meadows about Berne; not rare. Abundant and of great size and brilliancy in Valais.
18. Faústa. Valais, about Sierre; Jura, near Locle; and, according to Füessly, near Pfeffers.
19. jucúnda *Meis.* This new and undescribed species is smaller than Faústa: the antennæ have a thick blunt club; collar reddish white; back black; abdomen black, with red or white anus, rarely with slight trace of a red band not reaching quite round on the under side; fore wings dark blackish blue, with carmine spots edged with white, one at the base, two always confluent middle ones, an outer crescent-shaped one, either confluent with a fifth, or scarcely separated from it; hind wings with the outer edge rather hollowed, carmine red with a rather strong blackish-blue border; fringe reddish; under side similar to the upper, but all the colours faint: feet, above, black; below, white. First found by Professor Studer, near Kandersteg. In August, 1818, I took it on the Anziendaz, at the foot of the Diablerets, where it was abundant low down in the grass. (Ochsenheimer says he has an indifferent specimen without antennæ; and that it is apparently a new species, to be placed between Faústa and his Faustína.)

Sy'ntomis.

20. Phègea. Plentiful in Valais, near Lax; and near Breig, in descending towards Louesch; more abundant in the Tessin.

Thy'ris.

21. fenestrìna. In May, near Berne, Zurich, &c., in meadows; rare. Seems to be double-brooded, as it is found in the Valais in August also.

Se'sia.

22. *a*pifórmis. In May and June, early in the morning, on the stems of trees, especially Lombardy poplars [*P*ópulus dilatáta], on which the caterpillar feeds. (The fly almost invariably mounts towards the tops of the trees soon after sunrise.)
23. *a*silifórmis. About Geneva. (Thun).
24. *s*phecifórmis. Near Berne. I have found it sitting on the leaf of *B*étula álba, in the stem of which the larva lives and undergoes its changes.
25. chrysidifórmis. About Thun.
26. prosopifórmis. Jura near Locle, and about Geneva.
27. *i*chneumonifórmis. Near Berne, and in Valais.
(cynipifórmis. Between Thun and Berne.)
28. andrenæfórmis. Near Berne.
29. culicifórmis. Near Berne.
30. mutillæfórmis. Near Berne.
31. *f*ormicæfórmis. Near Berne.
32. nomadæfórmis. Near Geneva.
33. *t*ipulifórmis. About Berne.
34. *t*enthredinifórmis. About Berne and Geneva.
35. philantifórmis. Near Geneva.
36. masarifórmis. Near Büren.
(Meisner observes that, besides the above, it is probable that most or

all of the species of Sèsia enumerated by Laspeyre and Ochsenheimer are to be found in Switzerland.)

Sphi'nx.

37. *f*uciformis. In May and June, on flowery slopes; rather common.
38. *b*ombyliiformis. Similar places to the last.
39. stellatàrum. Very common everywhere in July and September. Late ones often winter in houses.
40. œnothèræ. Near Berne, very rarely. By Winterthur, &c., the larva is found in July at its full growth, and changes above ground. The fly is produced the following year; often in April, but frequently not till June; and requires several hours for the full developement of its wings.
41. nèrii. I insert this species with doubt, not knowing that any individual has been taken wild. It is probably native to the southern parts of the Tessin, as it is unquestionably found in the Borromean Islands. (The breeders in the Valais, &c., rear many of them; but I have my doubts as to whence they obtain the larvæ.)
42. Celèrio. Italian Switzerland; extremely rare in Northern Switzerland. In 1804, a perfectly fresh specimen was taken at the Orphan House, in the town of Berne; and it has since been found at Yverdon. (In 1834, one was also taken under the arcades at Berne.)
43. Elpènor. Rather common everywhere. At Berne the larva is usually found on Impàtiens Nolitángere. (Elsewhere on various species of Epilòbium; and at Thun, very frequently in vineyards, which Duponchel says it rarely inhabits.)
44. *P*orcéllus. (Similar places to the preceding, but much more rare.)
45. lineàta. Everywhere rare; but has sometimes been taken near Berne. In the summer of 1818, it was more than usually plentiful; and I was much surprised at finding it at noon-day on *C*irsium eriophorum, on the Alp of Sollalex, at the foot of the Diablerets.
46. gàlii. Rare. Near Burgdorf. I once found the larva at the foot of the Gemmi, near the baths of Louesch; and the sphinx also near the Bourg of Louesch, in a meadow. (In 1834, many were taken; not a few near Berne.)
47. hippóphaës. This rare sphinx is found in the Lower Valais, and in the neighbourhood of Geneva. (Chiefly in the valley of the Arve, on the road from Geneva to Chamouni, where the *H*ippóphaë *r*hamnöides is scarcely more abundant than in the Lower Valais. This plant is also extremely common about Thun; but I cannot learn that the insect has ever been taken here. Godart observes, in 1822, that the price of this sphinx at Geneva was still ten napoleons. It remained for some time at three napoleons; but, from the numbers bred at present, good specimens are sold for three francs.) [Mr. Spence has noted (in IV. 148.) thus on this species: — "*S*phínx (Deiléphila) hippóphaës, formerly sold at fifty francs each, and of which one of the first discovered specimens was sold for 200 francs, is now [Mr. Spence's communication is dated August 27. 1830.] so plentiful, in consequence of the numbers collected and bred by the peasants all along the course of the Arve, where *H*ippóphaë *r*hamnöides grows in profusion, that a specimen costs but three francs.]
48. euphórbiæ. In the warmer parts of Switzerland, Canton de Vaud, near Bex, and in Valais, &c., very common; near Berne, rarely; near the signal on the Belpberg (between Berne and Thun), abundant.
49. *V*espertílio. First taken near Baden, at the foot of the Lägerberg (Argovie), sitting on a rock: since in several other places, as at

Wimmis, at the foot of the Neisen; near Berne at the Engi. In 1818, the Pasteur Rohrdorf of Seen, near Winterthur, found thirteen larvæ on Epilòbium rosmarinifòlium? (More probably E. spicàtum.)

50. A'tropos. In some years very plentiful, in others rare, or almost none. The larva is frequently found among potato plants. (Meisner then gives a long quotation from Engramelle on the little known history of the juvenile days of this caterpillar; all of which Ochsenheimer, from his own experience, pronounces to be a barefaced fable.)
51. convólvuli. Everywhere one of the most common species.
52. ligustri. Near Berne, and in other parts, abundantly.
53. pinástri. Everywhere in the plains where there are fir forests. In the evening, this and the last frequent gardens where honeysuckles abound.
54. tíliæ. In all parts where there are lime or elm trees, in June. The insect, fresh from its chrysalis, is often found sitting on the stems. This varies more than other species in its colours and markings.
55. ocellàta. Also nowhere rare. The larva is found, from July to the end of September, on willows, poplars, apple trees, &c.; and the fly usually appears the following spring.
56. pópuli. Everywhere common.

In 1803, a newly excluded female, which had had no connexion with the male, produced fertile eggs; the larvæ from which I reared up to their metamorphosis. I made a similar experiment in 1806 with a female of *B.* Càja; and Mr. Wagner of Arau with *Sphínx* ocellàta also: it would therefore appear that in the Lepidóptera, a single pairing can render fertile more than one generation, as is the case with the A'phides.*

[* We have put the preceding statement, which is so very interesting in the information which it communicates, in a larger type, to render it the more noticeable.

In the *Gardener's Magazine* (vii. p. 196—199.) is an abstract of a memoir "On the Gooseberry Caterpillars, and the Application of Heat for their Destruction; by Robert Thom, Esq., Rothesay," which had been published in the *Memoirs of the Caledonian Horticultural Society.* It was read before the Society on "Dec. 7. 1820." Mr. Thom has stated in his memoir a fact kindred to those stated above by Mr. Brown.

Nématus ribèsii Stephens (VII. 265.) seems to be the species of insect treated of..." The insect is male and female; but the ova of the female produce caterpillars, even when the male and female flies are kept separate. How long this offspring would continue to breed has not been ascertained; but by following up the experiments it might be very easily done." The author has continued: "There is some reason to suspect that there is a connexion between the male and female *caterpillars;* for I have frequently observed them twisted together for some time after they had ceased eating, and a little before they cast their skins to go into the pupa state. By a little more attention this may be ascertained." This is a notion of Mr. Thom's which may not be agreed to. We digress to quote from him, not a notion, but a conclusion, which seems to be derived from close observation, to the amount that the caterpillar of Nématus ribèsii, which is to be changed into a female imago, eats more than a caterpillar which is to be changed into a male imago. Has it been observed that this case is general

NOCTU'RNA.

SATU'RNIA.

1. pỳri. About Neufchâtel, in Canton de Vaud, about Geneva, in Lower Valais, and in Tessin: has been once only found near Berne. Its district appears to commence beyond the Saane and the Aar, and to spread thence over Western Switzerland.
2. cárpini. Everywhere; but not in every year equally abundant.

AGLI'A.

3. táu. Very common in beech woods, as soon as the leaves are expanded.

E'NDROMIS.

4. versicolòra. In Argovie and the vicinity of Winterthur: found once near Berne.

HARPY'IA.

5. vínula. Common everywhere in May and June. Later, the young larvæ are very easily found on willows and poplars. The pupa often remains two full years before it assumes the perfect state.
6. ermínea. Very rare. (Then follows a detailed account of raising some from the egg, with the appearance of the larva after each change of skin.)
7. bicúspis. I am not quite certain whether this is really a native of Switzerland; if it is so, it is extremely rare. (It certainly has been found in Switzerland. Boisduval makes this and the next merely varieties of fúrcula; and, so far as my own observations go, I think him perfectly right.)
8. bífida. Near Berne; rather rare.
9. fúrcula. Near Zurich and Winterthur, &c.; but everywhere rare. (I have found the larva near Thun.)
10. úlmi. Has been found near Winterthur.
11. fâgi. Rare. The queer-looking caterpillar is found on oaks, hazels, beech, lime trees, &c.; and is rather difficult to rear until its final change.
12. Milhaúseri. Very rare; has been found at Winterthur.

NOTODO'NTA.

13. trítophus. Has also been found near Winterthur.
14. zíczac. On poplars and willows; rather common.
15. Dromedàrius. Near Winterthur.
16. camelina. Near Berne and other places; not rare.
17. carmelìta. Is probably found in Switzerland; but a doubt exists as to the identity of Füessly's insect, in consequence of his having a wrong reference to Linnæus.
18. Dictæ'a. About Berne and other places, but seldom. (I have found the larva occasionally near Thun.)

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in insects which undergo metamorphosis, and is it so? "They [the caterpillars of Nématus ribèsii] are generally said to be extremely voracious; but this is owing to their great numbers; for, upon an average, each caterpillar barely eats one leaf during its whole life; the female eating more than double of what the male eats. For the first five or six days they eat very little; each, at that time, having made only a small hole in the leaf of about one tenth of an inch in diameter. It is in the last four or five days that they make the havoc on the bushes; and the damage is therefore nearly all done before it is discovered."]

19. dictæöïdes. Valais, on the Simplon route, above Breig.
20. palpìna. On willows and poplars; not rare.
21. plumígera. Has been taken near Winterthur; and about Bipp, at the foot of the Jura.
22. velitàris. In several places near Berne, and by Zurich and Winterthur.
23. Dodonæ'*a*. Very rare. I found it once on the Bucheggberg, beyond Soleure, in a thick wood.
24. trépida. Near Winterthur, and also about Berne.
(Chaòni*a*. Rarely; in forests.)

Co'ssus.

25. Lignipérda. Everywhere sufficiently common. The larva is found in willow, oak, beech, lime, ash, apple, and plum trees: not only in decayed, but in healthy ones also.
26. pantherìnus. Has been found in the Canton de Vaud.
27. æ'sculi. Has been taken near Berne, Geneva, Arau, and in other places; but is rare. (I have found the larva in the Simmenthal.)

Hepi'alus.

28. hùmuli. Chiefly abundant on the higher parts of the Jura; also on the higher Alps, as the Wengen Alp; and on the plains, near Fraubrunnen. (Not rare at Thun.)
29. Vellèd*a* I have found in the Valley of Urseren, and on the Cherbenon in the Valais.
30. Gánna. Near Berne, but rarely.
(lupùlinus. Rarely; in oak forests.)
31. Héctus. Frequent in woods; to be taken about sunset.

Litho'sia.

32. quàdra. Not rare in woods.
33. grisèola. Said to be found in Switzerland; but doubtful.
34. complàna. Not rare.
(helvèola. Chiefly in Northern Switzerland.)
35. unìta. Rare (and chiefly in Italian Switzerland).
36. lutèola. (In Northern Switzerland.)
37. aurèola. (Found occasionally in many parts.)
38. rubricóllis. Very common about Berne.
39. ròsea. In vicinity of Büren, not rarely.
(róscida. In Eastern Switzerland.)
40. irròrea. Lower Valais, Geneva, Grisons; also, rarely, about Büren.
41. aurìta. In Alpine woods, Upper Valais, not rare; and in many places abundant. (I have taken it on the St. Bernard, high above the Hospice.)
42. ramòsa. In similar places; but not so low down towards the valleys as the last.
43. eborìna. In neighbourhood of Berne and other places; not rare.
44. jacobæ'æ. Everywhere; extremely common at Bex.
45. ancílla. In Valais; especially about Louesch; not rare.
46. punctàta. In similar places with the last: both conceal themselves in berberry bushes, and may be driven out by shaking or striking them.
47. mundàna. Very common about Berne and other places. It flies at night towards the candles, and enters rooms. The larva is often found crawling on garden walls, where it lives on the lichens.

Li'paris.

48. mónacha. The larva is found at its full growth in July, on stems of pines and firs, to which it does great damage.

49. díspar. In many years extremely abundant, and injurious to fruit trees.
50. sálicis. Not rare; in many years abundant.
51. v. nìgrum has been found near Winterthur (and I have taken it at Thun, sitting on my own garden wall).
52. chrysorrhœ'a. Everywhere very common. In some years the larva does great damage to fruit trees.
53. auríflua. Also common everywhere. The larva lives on all fruit trees; but not existing in such large societies as the last: it does less mischief.

O'RGYA.

54. pudibúnda. Not rare.
55. fascelìna. Common.
56. gonostígma. Not common. The larva is found in autumn on various trees and shrubs; but very small: it passes the winter, and arrives at its full growth the following June.
57. antiqua. More common than the last.

PYGÆ'RA.

58. anastomòsis. Rather rare near Berne.
59. reclùsa. Very rare. (Thun.)
60. anachorèta. Not rare in May and August.
61. cibítula. Rare.
62. bucéphala. Not rare anywhere.

GASTRO'PACHA.

63. ilicifòlia. Very rare about Zurich and Winterthur: has also been found in Bremgartenwald, near Berne.
64. betulifòlia. Also very rare near Berne; but more frequently found than the last. (Also at Thun.)
65. populifòlia. Has been found a single time near Berne (and since frequently at Thun).
66. quercifòlia. Common about Berne, and everywhere as far as stone-fruit trees grow.
67. pìni. This moth, whose larva is so notorious for the amazing ravages it occasions in the pine forests of Germany, is a rarity in all parts of Switzerland, and its destructive effects are unknown here. The larva is occasionally found near Berne, in February and March, under the turf at the foot of fir trees, where it winters: later, it is not difficult to find, and must be sought for about the tops of the fir trees.
68. prùni. Very rare.
69. potatòria. Very common: the larva is found in damp grass in May.
70. lobulìna. Very rare. (Then follows an account of rearing some from the eggs.)
71. trifòlii. Common everywhere where clover is cultivated.
72. quércus. Very common everywhere.
73. rùbi. Very common everywhere.
74. dumèti. Very rare: found once near Berne. (Then follows a long notice of the larva.)
75. pópuli. The larva is found early in spring on stems of ash, lime, &c.: the moth is first disclosed late in autumn. I have found a fresh male in the middle of November.
76. cratæ'gi. Rare in all parts of Switzerland.
77. processiònea. Rare near Berne; often found near Nydau, and in Seeland; and, according to Füessly, is, in some years, abundant about Zurich.
78. *P*ityocámpa. Very rare about Berne: common in Canton de Vaud,

particularly about Denens (? Devens). In Switzerland we never experience the devastations occasioned by the appearance of the larvæ in prodigious numbers. Great care must be taken in handling the caterpillar, as its brittle hairs remain in the skin, and occasion great irritation.

79. càtax. Not rare in vicinity of Zurich.
80. Evèria. Not rare in Canton de Vaud and about Berne.
81. lanéstris. Very common everywhere. (How remarkable is the difference in the final change of individuals of the same brood, of which some appear the first, others the second, third, even to the sixth year.)
82. francónica I have found in the Valais on the Cherbenon Alp, where the male was flying about in mid-day, while the female remained settled on the stems of grass. It has been found on other high Alps, and very rarely descends to the plains. A female has been taken in the Bremgartenwald, near Berne.
83. castrénsis. Valais, in the Viescherwalde; about Breig, &c.; and has been found in the neighbourhood of Berne, though very rarely.
84. neústria. Very common everywhere.

EYPREPI'A.

(cándida. Alps of Tessin.)

85. crìbrum. Very rare. A specimen in the possession of M. Müller was taken near Berne.
86. púlchra. About Geneva, and sometimes near Berne.
87. grámmica. In the Valais, about Louesch, Mörel, &c. I find it chiefly in woods.
88. rússula. In spring; not rare in moist meadows; also on low Alps.
89. plantáginis. This, which I have always taken in the North of Germany, in low damp meadows, is found in Switzerland on the low, and also on the high Alps, as the Jura, chain of the Stockhorn, Cherbenon, &c.; in many places very common, and in numerous varieties. (On the Thurnen, one of the mountains of the Simmenthal, I took, in July, 1833, and in the space of half an hour, and on the same spot, the following varieties: — 1. The type with hind wings yellow, marked, as usual, with black. 2. The black predominating and confluent, so as to leave but a few yellow blotches, towards the edge. 3. Ground of hind wings white instead of yellow, black markings as usual. 4. Same as No. 3., except that the black markings were very small and faint. 5. A transposition of No. 3.; that is, the ground black, and the markings white, making the hind wings uniform with the fore ones. There were also several intermediate shades.)
90. domínula. In the plains, ex., near Berne, rarely. In the valleys of the Bernese Oberland, ex., near Unterseen, Lauterbrunnen, &c. Common.
91. hèra. In many parts of the Valais; Unterseen, Brienz; here and there in the Jura; in some places very common; in others, as about Berne, very rare (Abundant on the Beatenberg, above the Lake of Thun, and not rare at the entrance of the Simmenthal.)
92. purpùrea. A rarity in most parts of Switzerland. The larva is found near Berne, on *Gàlium* vèrum and *G. Mollùgo*. In some years it is rather abundant in spring; but is not easily reared. (I have frequently found the larva near Thun, and never experienced any difficulty with it.)
93. aúlica. On the Jura, in the neighbourhood of Bienne? As this information was not communicated by an unquestionable authority, I insert it with doubt.

(curiàlis. I have not seen; but am assured it is sometimes taken.)
94. matrónula. Near Berne, Zurich, and other places; but a rarity everywhere. (I have already mentioned (p. 220.) having found, near Thun, a female in which the fore wings were absolutely wanting: she was sitting on the leaf of a hazel bush.)
95. víllica. Near Yverdon and Martigny; rarely.
96. Càja. Very common everywhere.
97. Flàvia. Is said to have been found by Dr. Amstein, at Marschlins, in the Grisons; but I have never heard of its having been further noticed in Switzerland. (Duponchel cites it as being found on the mountains of Switzerland; but does not mention what mountains, or give his authority.)
98. fuliginòsa. Very common. The larva which have passed the winter are found in plenty, in the spring, under stones.
99. luctífera. About Bipp, at foot of the Jura; not rare.
100. mendìca. About Geneva; rare at Berne (and at Thun).
101. menthástri. Very common everywhere.
102. lubricípeda. Much rarer than the last.
(parasita. Alps of Valais; rare; first taken in 1830.)

And here, I am sorry to say, we break off for the present.

Thun, Canton of Berne, Switzerland, June 22. 1835.

[In IV. 148, 149. Mr. Spence has made notice of the facilities and extensive assistance which M. Auguste Prévost Duval of Geneva is capable of rendering those who may be anxious to possess themselves of lepidopterous and coleopterous insects "of the Swiss Alps, the South of France, and Germany." A short list of the rarer of the species of which he can supply specimens is given in IV. 149.]

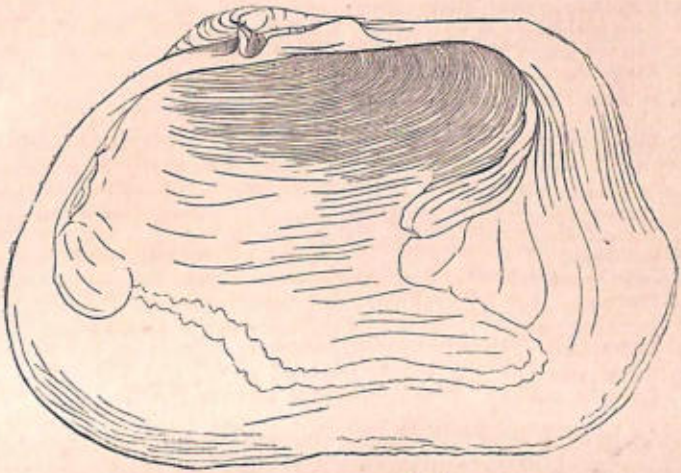
ART. VI. *Descriptions and Figures of Panopæ'a Glycýmeris, a rare, and Anòmia coronàta, a newly ascertained, Species of British Shell.* By Mr. WILLIAM BEAN.

PANOPÆ'A GLYCY'MERIS. (*figs.* 50, 51.)

Synonymes. — *My*a Glycýmeris *Don.*, Brit. Shells, t. 142. Panopæ'a Glycýmeris *Turt.*, Biv. Brit., p. 42.

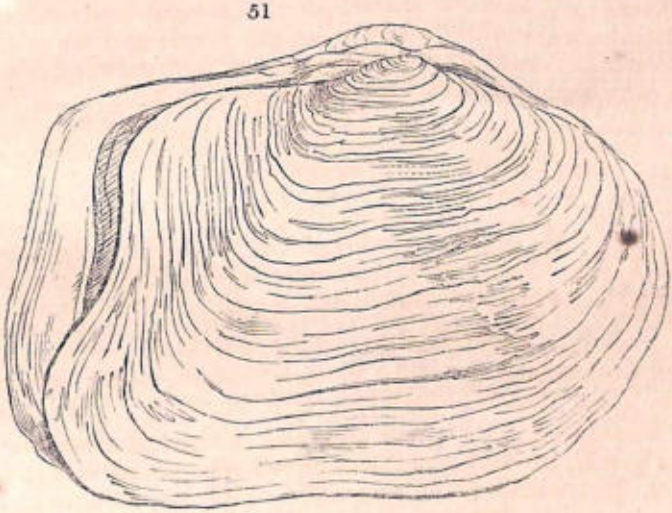
SHELL very thick, oval, equivalve, inequilateral, gaping at both ends, coarsely wrinkled transversely. Beaks almost central, from which two longitudinal ridges cross the shell like the letter V. The anterior end a little rounded, the posterior obliquely truncated. A single conic tooth and two distant muscular impressions in each valve. As in the rest of the shells of this genus, the ligament is external, large, and the fulcrum prominent. Colour white, covered with a yellowish wrinkled epidermis. Length, $2\frac{1}{4}$ in.; breadth, $3\frac{1}{2}$ in.

50



We have obtained, at Scarborough, three specimens of this, in every sense of the word gigantic, prize. It was first placed among our native shells by Donovan; but its claim to British

51



parentage has been subsequently disputed. To some of the fishermen of our coast it appears to be well known by the name of the "bacca-box," from a fancied resemblance to one of their most useful household gods. They were all caught

by the hook, and rescued from destruction in a singular manner. The first from which our figure is taken was destined for a tobacco-box; the second had the honour of holding the grease belonging to the boat establishment; and the third, "Tell it not in Gath, publish it not in the streets of Askalon," was inspected alive for several days by the officers and members of a modern philosophical society (all of them unconscious of its value), and, after amusing them by squirting water to the ceiling, was at last seen by a learned friend, purchased for a trifle, and generously placed in our cabinet. The animal we have not seen, but the colour is black.

ANO'MIA CORONA'TA *Mihi.* (*fig.* 52.)

SHELL above six lines long and four broad, oval, glossy, and of a pale amber colour; upper valve concave, smooth, with a rather undulating surface. Beak pointed, but not terminal; above which are three or four rows of spines, the outer ones extending beyond the shell, giving it a coronated appearance. The under, or perforated, valve convex, with an irregular surface, and a few indistinct traces of longitudinal striæ.

52



We have only found one specimen. The spines on the upper valve will readily distinguish this species from all its congeners. Unfortunately, they are so fragile and perishable, that only few and faint traces of their former beauty and integrity now remain.

Dr. Turton, in his *British Bivalves*, describes eleven species of Anòmia; and Mr. Sowerby, in his *Genera of recent and fossil Shells*, reduces them to two or three at most; but we are convinced that more than twice the number Mr. Sowerby mentions are to be found attached to the rocks, shells, and corallines of the Scarborough coast.

Scarborough, Feb. 13. 1835.

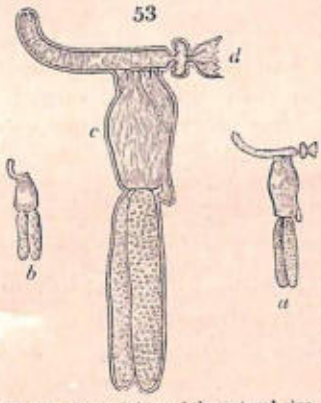
THE Pagùri, *from their habits, are often useful to the Conchologist.* — I have known those species which inhabit shells that are found only in the deepest seas, enter our fish-pots, and thus present the conchologist an opportunity of obtaining specimens of shells not otherwise to be procured. — [*Lansdown Guilding. St. Vincent, May* 1. 1830. He had made the note in connexion with a notice in II. 154. of the *P*agùri and certain other animals impropriating empty univalve shells.]

ART. VII. *Illustrations in British Zoology.* By GEORGE JOHNSTON, M.D., Fellow of the Royal College of Surgeons of Edinburgh.

45. LERNÆ'A UNCINA'TA. (*fig.* 53.)

——— "Is this a creature,
Or a monstrè transformed agayne nature?" CHAUCER.

OF all the curious creatures which the naturalist meets with in his researches, there are none more paradoxical than the Lernæ'æ; none which are more at variance with our notions of animal conformation, and which exhibit less of that decent proportion between a body and its members which constitutes what we choose to call symmetry or beauty. Of its paradoxicalness no better proof can be given, than the difficulty which the most experienced systematists have found in determining the proper place and rank of the family among organised beings. Linnæus located it amongst the Mollúsca, because of the softness of the body, and its want of a shell; Cuvier placed it at the end of his first order (Cavitaires) of intestinal worms; to Lamarck it appeared to have some resemblance to worms, and some to insects; but, belonging to neither, he conjectured that it indicated the probable existence of a new class, which should fill up the void that yet exists between those classes. Latreille has collected the various genera into a group, which forms the first order of his worms, Elminthógama; while Audouin and M. Edwards maintain that they are suctorial Crustàcea "become monstrous after they have fixed themselves:" and this allocation seems, on the whole, the best of any, though neither Chaucer nor M. Edwards will convince me that they are monsters "transformed agayne nature."



a, Lernæ'a uncinàta, of the natural size, a side view; *b*, a posterior view; *c*, a side view, magnified.

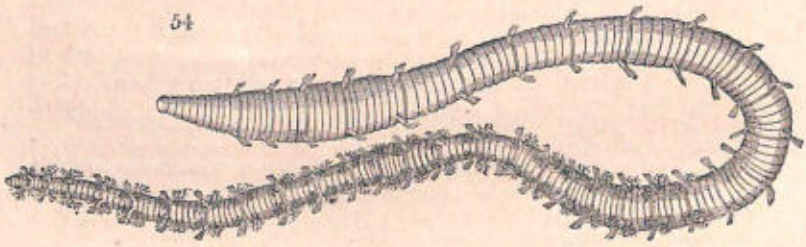
I am not aware that Lernæ'a uncinàta has been yet admitted into the catalogue of British species, although it is probably the most common of any in our seas. It affixes itself to the fins and gill-covers of the cod and haddock by the dilated part marked *d* in the figure, and cannot be removed without pain and difficulty. It is from six to eight lines long, of a milk-white colour, smooth, opaque, and enveloped in a thin transparent pellicle, or skin: the head or mouth (*d*) is reddish,

somewhat corneous, and roughened, apparently, with some short spinules; but, as it is deeply immersed in the flesh of the fish, I have not succeeded in removing it in a state so entire as to form a correct idea of its natural form. Immediately behind it there is a collar, and then a short narrow neck, uniting it to a long cylindrical process, which is curved and bifid, or deeply sinuate at the apex. From the anterior and inferior side of this process the body depends; this is thick, oblong, with an obscure furrow down the middle, and terminated below by a papillary process. The two ovarian cords are articulated to the base of the body, and are nearly twice its length; they are cylindrical, straight and smooth, and dotted with brownish specks, which are presumed to proceed from the embedded ova.

Lernæ'a uncinàta belongs to the restricted genus Clavélla of *Oken*, Cuv. Règ. Anim., iii. 258.; and the following are the only additional references which my library enables me to make: — Lernæ'a uncinàta *Mull.*, Zool. Dan. Prod., 226. No. 2746.; *Fabr.*, Faun. Grœnl., 388. No. 328.; *Turt.*, Gmel., iv. 114.; *Lam.*, Anim. s. Vert., iii. 231.: *Bosc*, Vers, i. 59. pl. 1. fig. 4. (bad). [On Lernæ'æ, see some information in VI. 95.]

46. Areni'cola ecauda'ta. (*fig.* 54.)

54



The worms which constitute the little family named Arenicólidæ, are of the number of those which connect the Annélides errántes with the A. tubícoles, their organisation being of that undecided and commixed character, that some naturalists have placed them in the former, and others, of equal authority, in the latter order. Thus Savigny arranges them among the Serpùlidæ; a family of Tubícoles, but Cuvier among his Dorsibránches, which is almost synonymous with the Errántes of Audouin and M. Edwards.

The body of the Arenicólidæ is vermiform, cylindrical, and formed of comparatively few segments; but the segments themselves are annulated, or divided into a certain number of circular plaits or rings: it is acephalous and obtusely pointed in

front, truncated behind, and, for the sake of description, may be divided into three portions; an anterior, which is generally inflated, and always abranchial; a middle, distinguished by carrying the branchiæ; and a posterior, which is both apodal and abranchial, but which the species figured for the present illustration proves not to be essential. At the end of the anterior extremity we find the mouth, which is provided with a short edentulous retractile proboscis, roughened with conical fleshy papillæ: there are neither eyes, nor antennæ, nor cirri. The feet are all similar in structure, and consist of a dorsal branch garnished with proper bristles, and of a ventral ridge (scarcely perceptible on the anterior segments), surmounted with a series of embedded crotchets. Upon a certain number of the middle and posterior segments we find highly developed branchiæ, fixed, like miniature arbuscules, behind the dorsal branch of the foot.

There is only one genus in this family, the Arenícola of Lamarck; the name derived from *arena*, sand, and *colo*, to dwell in, and very expressive of the habits of the species. These may be characterised as follows: —

1. *A. piscatòrum.* Branchial tufts 13 pairs; the first six pairs of feet and the tail abranchial.
   Lumbrìcus púnctis promínulis Lin., Faun. Suec., 364. No. 1270. — *Lumbrìcus marìnus Lin.*, Syst., 1077.; *Mull.*, Zool. Dan. Prod., 215. No. 2609.; *Fabr.*, Faun. Grœnl., 279.; *Penn.*, Brit. Zool., iv. 64. pl. 20. fig. med.; *Turt.*, Gmel., iv. 58.; *Stew.*, Elem., ii. 354.; *Turt.*, Brit. Faun., 128.; *Home*, Comp. Anat., iv. pl. 40. fig. 1, 2, 3.; *Roget*, Bridgew. Treat., i. 277. fig. 135. — Arenícola piscatòrum *Lam.*, Anim. s. Vert., v. 336.; *Audouin* and *Edw.*, in Ann. des Sc. Nat., xxviii. 420. pl. 22. fig. 8—12. — Arenicole des pêcheurs, *Bosc*, vers, i. 190. pl. 6. fig. 3.; *Cuv.*, Règ. Anim., iii. 198.—Arenícola tinctòria et A. carbonària *Leach*, in Supp. Encycl. Brit., i. 452. pl. 26.—Lug-worm, or Lob-worm, *Provincial.*
2. *A. branchiàlis.* Branchial tufts 19 or 20 pairs; the first twelve or thirteen pairs of feet and the tail abranchial.
   Arenícola branchiàlis *Audouin* and *Edwards*, in Ann. des Sc. Nat., xxviii. 422. pl. 22. fig. 13.
3. *A. ecaudàta.* Branchial tufts more than 20 pairs; the first fourteen or fifteen pairs of feet abranchial, tail none. (*Nova species.*)

Arenícola piscatòrum is about 10 in. long, contractile, cylindrical, the anterior and branchial portions thick and mutable in form; the posterior suddenly narrower, varying in colour from a yellowish to an umber brown, sometimes glossed with purple, sometimes dusky or black, the whole surface rough with small granules: mouth reddish, puckered, with a short proboscis closely covered with papillæ; above the upper margin of the mouth, which projects a little, there is a small, smooth, somewhat triangular, spot, with a furrow in the middle: segments 19 between the mouth and the last pair of branchiæ, as long as their own diameter, each consisting of five granulous

rings separated by an impressed line, their own divisions marked by an elevated band very obvious when the worm contracts; first segment conoid, each of them furnished with a pair of setigerous feet protruding near the band of separation, the first pairs small, gradually enlarged on the other segments; the seventh pair with a small branchial tuft at its base, and every foot behind this has a similar but larger tuft: branchiæ red or purple, arborescent, consisting of several principal branches, which are much divided, the divisions spreading, papillary: bristles yellow, not very numerous, unequal, slightly curved towards the sharp point, smooth: underneath this setigerous foot there is a transverse fold, armed with a series of crotchets shaped like the italic letter *f*; they are few under the first pairs, but become more numerous under the branchial pairs, forming a ridge which meets its opposite on the mesial line: the tail is equal to the rest of the body in length, the segments indistinct, but often constricted at intervals, and sometimes so regularly, that it might almost be described as moniliform.

Arenícola branchiàlis has not been noticed as yet on the British coast: it is smaller than the preceding, and, in this respect, as well as in the number of the branchiæ, approximates the A. ecaudàta, from which I might not have considered it distinct, had any specimen of the latter exhibited any trace of posterior abranchial segments; and the fishermen assure me that the want of a tail is an invariable character.

Arenícola ecaudàta (*fig.* 54.) is from 6 in. to 8 in. long, very contractile, minutely granular, of a yellowish-brown, tinted in many places with green and yellow, or sometimes very black, glossed with green: the primary rings seem to be composed of only four intermediate ones: the first fourteen or fifteen pairs of setigerous feet are destitute of branchiæ, but to every foot behind these there is appended a dark red arborescent branchial tuft; in one specimen there were twenty-two pairs, in another twenty-five; the first few pairs are smaller than those about the middle, whence they again decrease towards the tail. In other respects, the structure is similar to that of Arenícola piscatòrum.

The lug-worms burrow in the sand, prefering a station near low-water mark. The hole is about 2 ft. in depth, and the presence of the worm is detected by the spiral rolls of sandy excrement coiled above its aperture; for these worms twist their "ropes of sand" with an ease which spirits might envy *,

* "The formation of ropes of sand, according to popular tradition, was a work of such difficulty, that it was assigned by Michael Scot to a number

and renew them after every reflux of every tide. They live in the hole with the head downwards, and ascend and descend with amazing rapidity. The worm "bores its way through the sand by means of the peculiar construction of the rings of its head, which, when elongated, has the shape of a regular cone. As each ring is so much smaller than the one behind it as to admit of being received within it, the whole head, when completely retracted, presents a flat surface. When this disk is applied to the sand, the animal, by gradually projecting the cone, and successively dilating the rings of which it is composed, opens for itself a passage through the sand, and then secures the sides of the passage from falling in by applying to them a glutinous cement, which exudes from its skin, and which unites the particles of sand into a kind of wall, or coating. This covering does not adhere to the body, but forms a detached coherent tube, within which the animal moves with perfect freedom, and which it leaves behind it as it progressively advances; so that the passage is kept pervious throughout its whole length by means of this lining, which may be compared to the brickwork of the shaft of a mine or tunnel." (*Osler*, quoted in Roget's *Bridgewater Treatise*, i. 278.)

The intestine of the lug-worm is always full of sand, from which it doubtless extracts the intermixed nutritive matter; and the colour of the body appears to depend on the nature of the ground the worm burrows in, and on which it feeds, being yellowish brown when in pure sand, and very dark, or even coal-black, when the soil is miry and equally dark-coloured. In Berwick Bay, specimens of both species, of all shades, occur. Vast numbers are daily dug up on all parts of the coast by the fishermen, who esteem them one of their best baits. They discharge, on handling, a liquor that imparts a yellow stain to the fingers, which it is difficult to remove.

Berwick upon Tweed, June 1. 1835.

ART. VIII. *Short Communications.*

[*A SUPERSTITION which is extant in Switzerland, similar to that of the Rupture-Ash in Britain*]. — The rupture-ash having

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of spirits, for which it was necessary for him to find some interminable employment." (*Minstrelsy of the Scot. Border*, iii. 253.)

> "They sifted the sand from the nine-stane burn,
> And shaped the ropes so curiouslie;
> But the ropes would neither twist nor twine,
> For Thomas true and his gramarye." (*Ibid.* p. 266.)

been noticed (VII. 557. and 564.), I can add a more recent instance differing only in the kind of tree. A neighbour having a child slightly ruptured, the poor little fellow was taken from his warm bed on the morning of the 1st of May last, sufficiently early to be carried to a wood, at a considerable distance, where a young oak was prepared, through which he was passed *naked*, three times, as the clock struck four: it was essential that each time the ruptured place should touch the split part of the tree; and on no other day or hour could the mummery be performed with any beneficial effect. If we lament that such a folly should be perpetrated, how should we blush to acknowledge that the mother of the child was — a Swiss peasant [VI. 510.]? No! An Englishwoman of family and education!!! — *P. J. Brown. Thun, Canton of Berne, Switzerland, June* 22. 1835.

Mammiferous Animals. — *The large Bat* (*Vespertílio altivolans* White, V. *Nóctula of Turton's British Fauna*). — Mr. White had the merit of being the first discoverer of this bat. He alludes to it twice in his *History of Selborne*, and speaks of its being rare in his neighbourhood. In a foot note in Letter 28., to Pennant, he observes,—"I have never seen the large bat till the end of April, nor after July." From its arriving and departing about the same periods of the year with the swift (*Hirúndo Apus*), he thought, particularly as they both hawked high in the air for food, that their habits and food were the same. On the evening of Aug. 22. 1834, as I was returning from a fishing excursion in Essex, we observed this bat, in the meadows between Parndon and Harlow Mills, hawking for its prey over the river (the Stort). We, at first, took it, from its large size, for the brown owl; but, on its nearer approach, we distinctly detected, from the flit of its wings, that it was a bat. It was flying at the height of about 40 ft. or 50 ft. from the ground; and, as it passed and repassed, we had ample opportunity of observing it. The period of the year was later by some weeks than that stated by Mr. White for its departure, and some days after the usual time of the retreat of the swift. Mr. White, to the last, clung to his favourite opinion of hybernation (hiding); and he liked the idea of associating the habits of the swift and bat, from the known fact of the hiding and winter torpidity of the latter. — *O. Clapton, Feb.* 1835. [See in p. 513. of the last Number.]

The Hedgehog's Habits. (p. 107. 110.) — Our hedgehogs (p. 109.) continue to live without food; and they hiss, or rather blow, at us, when we open the lid of the basket which contains them. — *J. D., sen. Waterbeach, near Cambridge, Jan.* 22. 1835.

A Fact on the last Individual of the Wolf killed in Scotland.—In a catalogue of Mr. Donovan's sale of the London Museum by Mr. King, April 1818, one article is (in p. 53. lot 832.), a "Wolf, a noble animal, in a large glazed case. The last wolf killed in Scotland, by Sir E. Cameron."—*J. C. Dale. Glanville's Wootton, Dorsetshire, April* 20. 1835.

BIRDS.—*On the geographical Range of the Flamingo* (*Phœnicópterus rùber* L.) [VI. 285, 384.].—I beg to inform your correspondent H. B., who has mentioned, in VI. 285, 286., as something extraordinary, seeing a string of flamingoes carried to market at Cadiz, and has requested to know whether these birds were ever seen alive in Spain, that they are met with in various parts of that interesting country. They are tolerably abundant, during the winter season, on the Alfaques, a strip of sands running down to the sea-shore, between Catalonia and Valencia. They arrive from Africa towards the end of October, and depart again in March. They have been shot on the banks of the Ebro, two leagues above Amposta; and Mr. Bridgeman showed me, in his collection at Tarragona, an individual which was killed on the sea-shore, only a mile from that town. They are also found during the brumal months, on that magnificent retreat for the aquatic feathered tribes, the Albufuera, about a league from Valencia; as well as on the extensive piece of water, called by the same name, near Alcudia, in the richly cultivated and truly lovely island of Majorca.* I also beg to state, that the flamingo breeds in the marshes in Andalusia, on the authority of Don José Naudo of Reus, in Catalonia, who assured me he had frequently taken the nest, which he stated to be irregularly built of rough materials, to be raised considerably above the surface of the ground, forming a prominent object in the distance, and to contain two or three white-coloured eggs of an oblong shape. In the museum at Meudon, a small hamlet, between Bagnères de Bigorre and the beautiful pastoral valley of Campau, in the Hautes Pyrénées, I saw also a pair, shot, as I was informed, in the vicinity. These must, of course, have been individuals on passage. The curator of the museum at Nismes, moreover, informed me that the specimens in his collection were procured near that town: he also asserted that the fla-

* The water in the Majorcese Albufuera is very brackish, though separated from the sea by a shingle bank, through the pebbles of which the salt water must percolate. An enormous species of eel, as thick as a man's arm, forming, when cooked, a most delicious dish, is caught in great numbers in this lake, as I presume I may term it. Notwithstanding the extreme brackishness of the water in the Albufuera, a variety of *fresh-water* fish are found in it.

mingo bred in the marshes in the neighbourhood; but this, I feel very much inclined to think, must be a mistake, as they certainly take their departure for their native land early in the spring, from the Alfaques of Catalonia, and the Albufueras of Valencia and Majorca, places further south, and in every way much better adapted to their habits. Nismes, however, is so frequently visited by tourists nowadays, that I make no doubt some of your readers will be able, from their own experience, to corroborate or disprove this assertion of the curator. The flamingo, I learnt from an old sportsman in Catalonia, whom I requested to shoot for me a pair, is a very shy and wary bird, flies high, and carries off a vast deal of shot; it is, therefore, no very easy matter to get specimens. To complete this sketch of the geographical range of this remarkable bird, I beg to add, from Temminck (*Manuel d'Ornithologie*, tom. ii. p. 589.), that it is tolerably abundant in Sicily and Catalonia; is met with in large troops on the marshes and small lakes of Sardinia, especially near Cagliari; is but seldom and only accidentally found on the rivers in the interior of these countries; and has been occasionally, though very rarely, shot on the banks of the Rhine. — *W. Perceval Hunter. Sandgate, July* 10. 1835.

Birds of the Swallow Kind: Means conducive to the keeping of them alive in Britain through the Winter. (VI. 270.)—J. C., in speaking (VI. 270.) of his not being able to keep the swallow he has told of through the winter, says, "Surely, it must be climate which killed him." But I have heard of several swallows being kept through the winter by covering the perches with soft baize, as it is the hardness of the perch, and its want of warmth, which prevents the birds from using their feet in the natural way. I have no doubt that, with J. C.'s preparation of vermicelli, and baize-covered perches, birds of the swallow kind might be easily preserved alive, even in the severest winters.—*Beverly R. Morris.*

Earliest and latest Dates of seeing the Swallow in Britain. — In 1834, April 1., Nov. 3. In 1835, April 1. — *Id.*

A wild Blackbird, which sings like a Blackbird, and crows like the Male of the Bantam Fowl besides. (IV. 433.)—At Lindsil-town, amongst the trees close to Mr. Boxwell's house, there is a blackbird that is in the habit of flapping his wings and crowing exactly like a cock. He crows three or four times, and then sings like a blackbird, and then crows again. The crowing resembles that of a bantam cock, and is full as loud. The bird does not differ in appearance, in the least, from the cock blackbird. Great numbers have been going for some days to see the phenomenon. (A correspondent of the *Wexford*

Independent newspaper, the editor of which has remarked, that he "can vouch" for the "accuracy" of the account.) Our notice is from a transcript contributed by our correspondent Mr. Fennell, from the *John Bull* newspaper of May 24. 1835. The similarity of the facts of the case to those of another case which a correspondent, (we believe, Rev.) Barton Bouchier, has related from his own observation, in IV. 433., renders it, we deem, proper to present a notice of this second case in this Magazine. — *J. D.*

Species of Birds seen in the immediate Neighbourhood of Southminster Vicarage, Essex; additional to those seen there noted in VI. 452. — A longer residence here has introduced me to a few more. — Two specimens of the Strix *O*tus, the horned owl. One of them is now in my possession, a male bird, in full plumage; the markings of buff and brown are very beautiful: the wings are much crossed on the rump, extending beyond the tail. — The tree sparrow is occasionally abundant here; it may be distinguished from the house sparrow by the brownness of the head, and the black patch that extends low on the breast.—I observed, lately, near this place, a sparrow with the wings nearly white.

Of the water birds: I have seen the Rállus aquáticus, water-rail: very rare here. — The green sandpiper (Tringa óchropus. — Moorhen. — Little Grebe. I have seen another species of grebe on the river Crouch (an arm of the sea), about the size of a wigeon: I suppose it to be the *Col*ýmbus cristàtus (the crested grebe), but have never been near enough to decide which of the species it is. — Two specimens of the *Col*ýmbus Rínguia (lesser guillemot, or ratch), shot on the Crouch, have come under my observation. It is a clear lively looking bird: its brilliantly white breast is set off by the sombre hue of the head and back. The position of the legs obliges it, whilst on them, to rest on the tarsus, so that it appears to be sitting down. It dives with great quickness. — The redshank (*Scól*opax Cálidris). On turning to Bewick's account of this, we find that he is incorrect in describing it as of a solitary character. On this (the Essex) coast, on the immense flat oozy banks which lie at the mouth of the Thames, this bird is to be found in flocks of from ten to thirty or forty individuals, which are there called by the name of teuks: their plaintive whistle is easily distinguished amongst the various notes of the birds frequenting the mud-banks. There is likewise another bird, which the gunners call a merle, about the same size as the redshank; the legs dark, and without any note: I have not yet obtained a specimen to decide which of the waders it is. —

The *Anas Tadórna* (sheldrake) is common, either in pairs, or in flocks of about a dozen, in the creeks and inlets of the river Crouch.—The *Anas clypeata* (shoveller) is rarely killed: I have seen one pair this winter. Likewise the pochard; and the golden-eye, here called the bastard diver.—The herons .... [the remarks on are printed in p. 458.].—One individual of the kittiwake has been killed on the Crouch. Here ends my list.

A Hooded Crow has attacked a Kestrel possessed of a Snipe that it had wrested from a Sparrowhawk. — Allow me to relate a contest I was witness to, a few weeks since, on the Southminster marshes. I was beating a ditch for snipes, when a sparrowhawk, about fifty yards from me, made his stoop; and I lost sight of him in the ditch, which was nearly dry. On my making towards the spot, he rose many yards from where I saw him descend, but near enough for me to see that he had captured a snipe. He not having secured it well, alighted about eighty yards from me, and was on the point of taking wing, when a male kestrel, which I had not seen before, rushed upon him, and succeeded in taking the snipe. I was on the point of shooting at the group, when they took wing too far from me to make a shot. Immediately, the kestrel was attacked most violently by a royston, or hooded, crow; and he, being burthened with the snipe, and followed by the sparrowhawk, suffered himself to be knocked down rather than give up his plunder. He, however, recovered himself, and, laying wing to the air, made the best escape he could, till I lost them in the distance; but he was epicure enough to keep his snipe: so I judged from going to the spot where he was felled, and not finding it there. — *Walter Henry Hill. Southminster Vicarage, Essex, Feb.* 12. 1835.

The Method of preserving Fowls' Eggs in Lime-water for eating is well known, but does not seem to be practised as it deserves to be. We are still using eggs at breakfast which were preserved in April last year; and *they are as good as the day they were laid*, retaining the milkiness and delicate taste peculiar to a new-laid egg. I had one, two days ago, marked "1st April" (then, of course, ten months and nineteen days old), with all the characteristics of a newly laid one. It is lime-water, in fact, that we use, and the eggs are mostly warm when put into it. None of them are allowed to be twenty-four hours old: this is essential, I believe. The shells are liable to crack in the boiling; but the eggs do not burst; and [only] a very few of them have a slight curdy flavour, not unpleasant, however, to those who like *new* eggs. — *A Subscriber. Vale of Alford, Aberdeenshire, Feb.* 22. 1834.

SPIDERS.—*Epeìra diadèma.* (*fig.* 55.)—In this neighbourhood [Dundee] the diadem spider is abundant, inhabiting almost every kind of locality; the rich warm garden, the shady wood, the grassy meadow, and the wild mountain heath are alike its home, where it spreads its net of beautiful symmetry, and constructs that little silken tent in which, snugly concealed, it watches for its prey; and all is prey that comes into the monarch spider's net. The largest moths and butterflies are retained; and I have frequently seen a strong-bodied bottle-fly, suspended by a thread together with its destroyer, struggling in vain for liberty and life. But one of its deeds of boldest daring I lately witnessed while rambling among the Sidlaw Hills, when it certainly had a formidable antagonist to deal with. This was no other than a good-sized wild bee, I believe of the species *Apis lapidària* [Bómbus lapidàrius], whose feet had unfortunately been entangled in the net while it was searching for the honey of the heath-blossoms. In an instant, the spider darted from his concealment, and seized upon the bee; but, seemingly aware of the power of his victim, and knowing where its strength lay, he clung to its back in such a manner as to prevent the poor honey-gatherer, with all its wrenching and writhing, from injuring him with that sharp weapon which it wielded. Its efforts became weaker and weaker; and, in all likelihood, every spark of vitality would soon have been extinct, had I not rescued it from its perilous situation, and sent it home rejoicing to relate to its comrades the tale of its hairbreadth escape. — *William Gardiner, jun. Dundee, Forfarshire, Oct.* 4. 1834.

55



[*Notices of the Forms of the Egg-Cases of some exotic Species of Spider: by the late Rev. L. Guilding*, who had made them as an annotation on the figure and description of "*A Nidus on a Rush*," given in II. 104.]—These curious bottle-shaped cages are, without doubt, the egg-chambers of spiders. They are, of course, perfectly distinct in use and structure from the house (habitaculum *Guild.*) of the solitary larvæ; the camp (castra *Guild.*), or loose web, of gregarious caterpillars; or the foliculus, or cocoon, of pupæ. I have, therefore, applied the term *theca* (case, or bag) to these artificial bodies.

In the case recorded [in II. 104.], the unoccupied space was very likely to be used as a nursery till the young were strong enough to rupture the sides, and provide for themselves.

It is not uncommon for the young of spiders to remain together for a season, protected by the mother, before they are dispersed. The rushes were easily reached by the webs of the female, and would afford a very safe support for these egg-cases, even supposing they did not belong to those spiders which are said to traverse the water.



56

The following Shapes [*of Egg-Cases* (*Thecæ* Guild.) *of Spiders*] are known to me: —

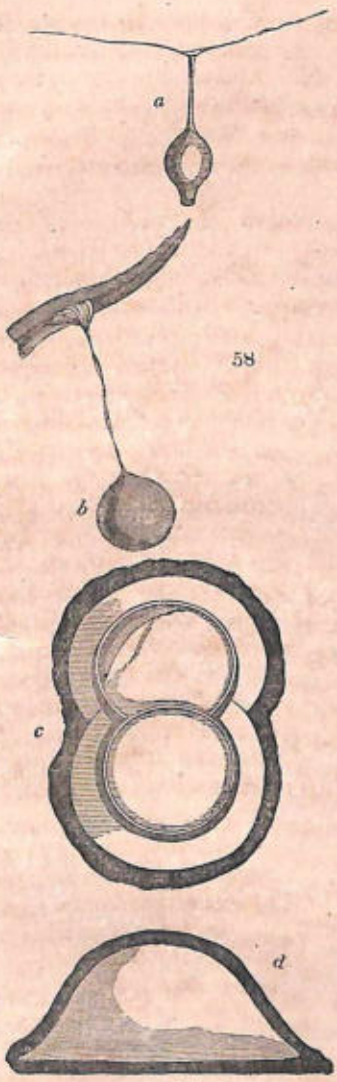
1. Bottle-shaped; the upper and fixed extremity very much attenuated, and the bottom flat and closed. (*Mag. Nat. Hist.*, ii. 104. fig. 23. A. A.)

[We exhibit here the figure presented in II. 104. (*fig.* 56.), which Mr. Guilding had cited. Particulars on the subject which the figure illustrates are registered in II. 104., and mentions of the discovery of similar egg-cases, or nests, are registered in II. 303. 405—406; III. 458. In III. 458. are remarks in elucidation of the previously registered cases, a mention of "analogous nests," and, "figures of our beautiful nidus in its unplastered and plastered state." These figures we give here (*fig.* 57.), and quote, in explanation of the plastered condition, thus much: — ". . . . This snow-white silken fabric is concealed by a covering of mud soon after it is spun. . . . . I met with one partly covered with mud, which led me to the discovery of others thoroughly plastered over. In this state they resembled bits of dirt splashed from the road on the stalks of grass. The plaster was evidently collected by the parent spider from the moist bed of the drain from which the grass grew [whose stems were bearing the egg-cases]. I could have collected dozens of the nests in the different states: the plastered ones were the most numerous." The collection of notes from Mr. Guilding is on subjects in Vols. I. and II. of this Magazine; and hence, there is not a note on the case cited.]

57



The rest are in my own cabinet: I have sketched them for the journal.



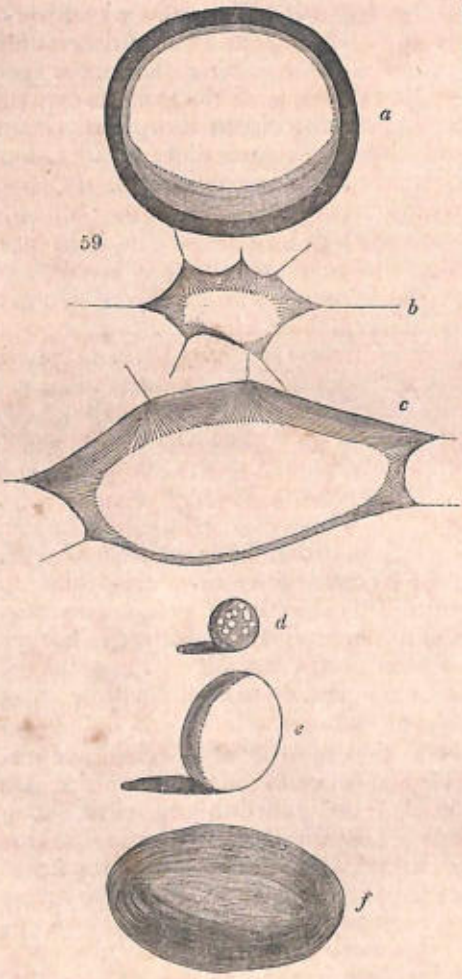
2. (*Fig.* 58. *a.*) Flagon-shaped, its greatest natural diameter $\frac{3}{16}$ in.; the upper part attenuated into a strong stiff line; mouth downward, small, closed by a slight web. Colour of the case, brownish. It hangs suspended from the common web by a transverse short cord. It is formed by a lovely little spider, whose body resembles a globule of quicksilver.

3. (*Fig.* 58. *b.*) Nearly spherical, greatest natural diameter $\frac{5}{16}$ in., brown, hanging loosely from a line of slight silken threads, attached to mosses and ferns in the high damp woods. There is no mouth, but the side is ruptured by the young, which are numerous. It appears to belong to a genus separated from *Phalángium* by Mr. Kirby.

4. (*Fig.* 58. *c.*) Plate-shaped, greatest natural diameter $\frac{7}{10}$ of an inch, whitish; base thin, expanded; centre raised and circular. Specimens of this case are spun firmly upon doors or wooden partitions, united together, sometimes, to the number of 3——8——. The young spiders escape by removing the side of the superior lid.

5. (*Fig.* 58. *d, a lateral view*). Circular, raised high in the centre; greatest natural diameter 1 in., of a snow-white web, usually secreted in leaves drawn together by the female as a temporary lurking-place. The young escape by bursting the margin.

6. (*Fig.* 59. *a.*) Circular, thick, and compressed, shaped like a round white cake; greatest natural diameter $\frac{11}{12}$ of an inch. This is always borne by the female, pressed to her chest, and firmly held there by the palpi. She will only surrender it with life. The young escape by rupturing the margin. It



belongs to a large species inhabiting houses, and useful in destroying cock-roaches. The negroes superstitiously suppose that, if they kill one, they will be unfortunate in breaking glass and china. [Additional information on the habits of this species of spider is already given from Mr. Guilding in VII. 362.; where the name of it is stated to be *Aranea* venatoria *Fabr.*, Thomisus venatorius *Latr.*]

7. (*Fig. 59. b.*) Subcompressed, angular, tough, supported by threads attached to the points; its greatest natural length $\frac{10}{16}$ of an inch, lilac-coloured. It belongs to a small spotted spider inhabiting cellars.

8. (*Fig. 59. c.*) Subcompressed, angular, tough, supported by threads attached to the points; its greatest natural length $1\frac{7}{16}$ in., sulphur-coloured. This is the property of a large species of spider common here, having a thorax and spots of frosted silver, and the abdomen marbled with a brilliant yellow or brown ground. It is found every where on hedges.

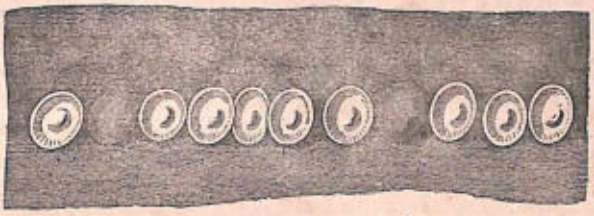
9. (*Fig. 59. d.*) Spherical, its greatest natural diameter $\frac{5}{12}$ of an inch; slightly connected, the eggs being visible through the sides. It is borne about by a small species of spider inhabiting trees.

10. (*Fig. 59. e.*) Ovate, its greatest natural diameter $\frac{7}{12}$ in., white, deposited under stones.

11. (*Fig. 59. f.*) Web loose, like that of the silk worm, bright yellow; deposited in crumpled leaves. Its longest natural diameter is $1\frac{4}{16}$ in. This is the simplest form I know, and resembles nearly some loose spun folliculi of pupæ: but, however slight may be the workmanship of similar thecæ, they always in the same species assume the same given form, and are constructed in the same places. — [*Lansdown Guilding. St. Vincent, May* 1. 1830.]

[In II. 296., is a view, which we give here (*fig.* 60.), thirty times larger than that of a piece of flint one tenth of an inch

60



a *b*

in length, bearing certain objects, on which we quote the following information from II. 296.:—Mr. S. Woodward, Norwich, walking, about Midsummer, 1828, on the Precinct Meadows, was "struck with the appearance of the flints and other hard substances being partially covered with a white powder." He "found this powder fixed, and, on further examination with a lens, that they must be either minute plants of the order Cryptogàmia, or the nidi of insects." He "also found them on the high ground on the opposite side of the river." He has stated, under date of April 3. 1829, that "the objects appear to be in the same state as when I first brought them home. . . . . The disks of the objects are finely radiated, and two of them (*a*, *b*) are globular. An explanation will oblige." Sequent to Mr. Woodward's communication, in II. 296., is there given this remark from Mr. J. D. C. Sowerby: — "I have ever considered these to be the eggs of a red *Acarus*, which always accompanies them, as far as I have observed." On these same objects we have now another opinion to register.]

"I have no doubt that these are the egg-cases of spiders, not *Acari*, and resembling the variety noticed by me, *fig.* 58. *c*, The two marked *a*, *b* [*fig.* 60.] have not been ruptured by the young; the others, if I judge rightly, have lost the superior protecting lid." —[*Lansdown Guilding. St. Vincent, May* 1. 1830.]

A List of Species of Shells found in the Neighbourhood of Sudbury, Suffolk. *c* signifies that the species is common in this locality; *f*, frequent; *r*, rare.

Cỳclas córnea, *c*; ámnica, *f*. A'nodon cýgneus, *c*. Hèlix nemoràlis, *c*; horténsis, *f*; arbustòrum, *f*; carthusiàna, *c*; ruféscens, *c*; serícea, *r*; caperàta, *r*; aspérsa, *c*; nìtens, *f*; lùcida, *f*; híspida, *r*; crystállina, *r*; radiàta, *f*; pulchélla, *f*. Carocólla lapícida, *f*; var. without keel, one specimen. Clausília rugòsa, *c*. Bùlimus obscùrus, *f*; lùbricus, *c*. Bàlea frágilis, *r*. Succínea amphíbia, *c*; oblónga, *r*. Carýchium mínimum, *r*. Pùpa marginàta, *r*. Planórbis carinàtus, *c*; marginàtus, *f*; vórtex, *c*; córneus, *c*; contórtus, *r*; álbus, *f*. Limnèus auriculàrius, *f*; péreger, *c*; stagnàlis, *f*; palústris, *f*. Phỳsa fontinàlis, *c*. Valvàta obtùsa, *r*; spirórbis, *f*. Paludìna vivípara, *f*; impùra, *c*; símilis, *r*. Neritìna fluviátilis, *r*. A'ncylus lacustris, *f*. — *T. L.* [*Received on March* 23. 1835.]

REVIEWS.

ART. I. *Titles of Works on Subjects of Natural History, published recently.*

JESSE, Edward, Surveyor of His Majesty's Parks, Palaces, &c.: Gleanings in Natural History. Third and Last Series. To which are added, Notices of some of the Royal Parks and Residences. 8vo, 318 pages, 2 engravings. London, 1835. 10*s.* 6*d.*

A work which must, one thinks, induce pleasure to every naturalist who reads it. The chief grounds of its merit to do this are, one deems, these:—The tendency of the views of the author to promote a habit of amiableness of feeling; the new facts which it may be found that he has related; his agreeable and cultivated manner of communicating the facts and his views. On the other hand, the arduous technical naturalist will find some subjects of disapprobation in this Series, as in one or both of the previous two: see in VII. 338. note *, and VIII. 548. The following is a notable one:—"Earwigs turn to flies. This may easily be ascertained by developing one, after killing it, with a pointed penknife. The swallow-like tail will be discovered to be two terminations of wings." (p. 149.) The statement on the case of any female calf born as one of twins, echoed in p. 59., had been negatived in this Magazine, V. 765.

The Editor and various Contributors : The Analyst ; a monthly Journal of Science, Literature, and the Fine Arts. No. 12. July, 1835. 1*s.* 6*d.*

This number, which contains sixteen additional pages, completes the second volume, and completes it in a very satisfactory manner. We shall briefly point out those articles which belong to natural history. Twenty-four pages are devoted to a very interesting article by Dr. Hastings, " On the Salt Springs of Worcester." The general reader, as well as the ornithologist, will be gratified with the perusal of an article by Mr. Neville Wood, " On the Habits of the Brake Nightingale (*Philomèla Luscínia Sw.*)" This interesting communication details several new facts in the history of the nightingale. The next article is by Mr. Edwin Lees, headed, " Sketches of Insects, Pictorial and Poetical ;" and a more charming article it has not been our lot often to meet with. It is written in the true poetic vein. Next follows " Remarks on Phrenology as applied to Education." We mention this, because the science of phrenology, strictly, belongs to natural history, and because the facts and inferences are such as involve the happiness or misery of the human race, without excepting any rank, pursuit, or calling whatever. Then follows an article by Mr. Neville Wood, " On the Nomenclature of Birds," in answer to Mr. Strickland. We have not the slightest doubt but that the doctrine herein developed will ultimately prevail. Among the critical notices, which are very ably conducted, many works on natural history are reviewed : we would direct especial attention to that of Swainson's *Zoology* in Lardner's *Cyclopædia.* The Analyst will in future be conducted in Birmingham instead of Worcester, the latter town having seemingly not yet risen sufficiently in the intellectual rank to support such an undertaking. It is deserving of all encouragement, and will, no doubt, receive it. — *S. D. W.*

Morris, Rev. *F. O.*, B.A. : A Guide to an Arrangement of British Birds ; being a Catalogue of all the Species hitherto discovered in Great Britain and Ireland : and intended to be used for labelling Cabinets or Collections of the same. 8vo, 18 pages. 1835. 1*s.* 6*d.*

For every species there is produced a systematic name, an English name, and a number, all printed in kinds of type easily legible, and all disposed between a pair of double parallel lines that bound them. The names, numbers, and lines are printed upon only one page of each of the several leaves occupied by the catalogue. The author's mode of arrangement is shown by the series of the numbers. The

number to each species is affixed at a little distance from the names of that species, so that it can "be conveniently cut off," if the author's "arrangement is disapproved of." The author has stated other objects of his, as follows: — "As so much difference exists as to the proper location of various genera, I have thought it better not to give any other divisions than those of genera and species, so that each collector, by merely changing the relative situation of the cases, may place a bird in any family or sub-family, or other division, as to [on] its adaptation to which he may have changed his opinion. The grand object of having a *fixed* nomenclature will, I hope, be answered, and a world of trouble saved, in not having to print and reprint names over and over again, and 'sæpe stylum vertere.'"

Jacob, Rev. *J.*, LL.D.: West Devon and Cornwall Flora. In monthly Numbers, 1*s.* each. The publication of these was begun some time in 1835.

Each number "will contain a description of at least twelve plants. A plate of the rarer plants will occasionally be given. ... In the first instance, the phanerogamous plants only will be treated of; but the riches of the cryptogamic class, more particularly of the Algæ, will shortly be brought forward." — Numbers 1st, 2d, 3d, and 4th have been looked into; and in these are proofs of the author's ability to produce a flora in which botanical accuracy, a clear exposition of the matters to be communicated, and some useful fruits of his own investigation shall be present together. In the four numbers seen, the genera treated on are taken isolatedly, and the pages are not numbered. Directions for arranging are to be supplied with the 12th number. It is clear that the arrangement is to be according to the sexual system of Linnæus. In the 2d number is supplied a coloured figure of *Scílla vérna*, and of parts of it; in the 4th number, a coloured figure of *Lòtus angustíssimus*, and of parts of it.

Francis, G.: A Catalogue of the Species of British Flowering Plants and Ferns that are described in the third edition of Dr. Hooker's *British Flora*; published to facilitate Botanical correspondence, as an Index to Herbariums, &c. In one sheet, price 6*d.*; 5*s.* a dozen.

A means of very great convenience to those to whom the writing of lists of some length may be an inconvenience. Mr. Francis's catalogue is disposed upon one page of a single sheet; the names are arranged in columns; and there is a

small quantity of blank space between the columns, there is a portion of blank space about the edge of the sheet, and the reverse page is wholly blank; so that any one can, with minute writing, notate to considerable extent upon this sheet. The species are arranged in the order of the Linnæan system: it is probable just in Dr. Hooker's series.

Shepard, C. U., A. B., Lecturer on Natural History in Yale College, Member of the American Geological Society of France, &c.: Treatise on Mineralogy: Second Part, consisting of Descriptions of the Species, and Tables illustrative of their Natural and Chemical Affinities. With 500 woodcuts. In two volumes, 8vo, 631 pages. New Haven, United States, 1835.

This registering of the title of this work will serve to make known the fact of its being extant: a critical notice may be inserted in a future Number.

Sowerby, James, F.L.S. G.S. W.S., &c. deceased: The Mineral Conchology of Great Britain, or Coloured Figures and Descriptions of those Remains of Testaceous Animals or Shells which have been preserved at various Times and Depths in the Earth. Continued by *James D. C. Sowerby*, F.L.S. &c. No. 105., August, 1835; containing a Portrait of the late Mr. Sowerby, the Preface to the General Indexes, and the Systematical Index to the six Volumes. Sold by the Sowerbies and Longman and Co., and Sherwood and Co. No. 106. is to include the rest of the indexes: it is to be published in November.

Extracts from the preface: — "The work was originally planned to be arranged zoologically, so that, in the absence of an index pointing out such an arrangement, it must be incomplete: this index would have been given, with another geologically arranged, soon after the conclusion of the sixth volume; but the author of that and the one preceding was unwilling to adopt hastily any system which was then proposed, and even now feels that his duty is very imperfectly performed. He has adopted the system of Lamarck, as given by M. Deshayes, and made only a few alterations, which seem to him to be absolutely needful. . . . . One advantage, and that a considerable one, in the system he has adopted, is its being nearly the one followed by most modern geologists. . . . . The geological index will, in some cases, be found at variance with the former text; where that is the case, the difference has arisen from some discovered error in the locality given, or has been made upon authority which cannot be questioned: still, the author fears many errors remain. . . . ."

After the indexes have been published, the work is to be continued in a number every other month: No. 107. is to be published in January, 1836.

ART. II. *Literary Notices.*

A HISTORY of British Quadrupeds: by Thomas Bell, Esq. F.R.S. F.L.S., Lecturer on Comparative Anatomy in Guy's Hospital. The work is to be comprised in one volume, 8vo, uniform with the *History of British Fishes*, by Mr. Yarrell; and is to be published by the publisher of that work, John van Voorst, Paternoster Row, London.

Of Yarrell's *History of British Fishes*, seven parts have been published: there are to be sixteen.

In Royle's *Illustrations of the Natural History of the Himalayan Mountains, and of the Flora of Cashmere*, part vii., are figures, coloured, of Gárrulus bispéculans, Carduèlis cániceps, and Túrdus albicóllis, "Himalayan birds of European forms," and of 12 species of insects of Himalaya and the north of India; 11 of them beetles, 1 an earwig.

Now in the press, the *Rise and Progress of Ornithology;* being reviews of every ornithological work of note, and a synopsis of the systems, published from the time of Willughby to the present day; and intended to form a complete guide to the ornithologist in the choice of his books. By Neville Wood, Esq.

Also in preparation, by the same author, *Sketches in British Ornithology;* being a work on the smaller British birds, and intended as a plan for a complete work on British Ornithology. The author will be much obliged to any one who will communicate to him any facts or anecdotes on any of the species. Communications on the larger birds will also be acceptable, and would, of course, be duly acknowledged. These would appear in an appendix, which will contain miscellaneous notes on the habits of British birds. All communications to be addressed to the author, at Foston Hall, near Derby. — *September* 20. 1835.

Of the *Parent's Cabinet of Amusement and Instruction* the 36th number has been recently published. In it is a notice that the work will be discontinued for the present. Enough of subjects in natural history are treated of in the work, and are treated of sufficiently well, to render it worth the attention of those who would promote in their children a tendency towards an affection for natural history.

THE MAGAZINE

OF

NATURAL HISTORY.

NOVEMBER, 1835.

ORIGINAL COMMUNICATIONS.

ART. I. *Biography of the Gold-crested Kinglet* (*Régulus auricapillus*). By S. D. W.

> "Aloft in mazy course the golden wren (goldencrest)
> Sports on the boughs; she who, her slender form
> Vaunting, and radiant crest, half dares to vie
> With those gay wanderers, whose effulgent wings
> With insect hum still flutter o'er the pride
> Of Indian gardens."
>
> GISBORN'S *Walks in a Forest.*

THE goldcrest is plentiful throughout our island, its range extending from the southern counties even to the Shetland Isles, which, however, it is said to desert before the arrival of winter. Nothing seems to delight the goldcrests more than whisking among the dark foliage of the cedar, the yew, or the pine: where these trees are present, the bird of the golden crown is seldom absent. They are as active and unceasingly diligent as if they were fully impressed with the truth of the maxim, "Idleness is the root of all evil." They have no slight resemblance to the tits (Pàrus) when performing their evolutions, and engaged in "entomological research." I have remarked that these little fairies of the creation, as well as the tits, are partial to the favourite haunts of the brake nightingale (*P*hilomèla *L*uscínia *Swains.*), damp situations, abounding in beeches, pines, and plenty of underwood, consisting chiefly of the genus *R*ùbus. I have not, however, been able to verify the assertion of several ornithologists as to their partiality for oaks. Willughby remarks, "they (goldcrests) abide and haunt, for the most part, on the tops of trees, especially oaks." (*Ornithology*, 227.) And Latham is of the same opinion; for he observes, the goldencrest

" seems to prefer the oak trees in preference to all others." Pennant also remarks, " the golden-crowned warbler frequents woods, and is found principally in oak trees." (*Brit. Zool.*, i. 515.) That they may be seen among oaks I have no doubt; but, as far as my observation has gone, they do not show such a decided liking for those glories of the English forests, as for the pride of the Scottish mountain tops, the gloomy pine. The chief reason for their preference for spruce, fir, cedar, and yew trees, is, the abundant nourishment which they afford in the shape of innumerable minute winged insects, which swarm on the bark and among the foliage. These form the chief food of the little kinglets, who are unceasingly hunting for their insect prey. Thus the *cui bono* of those little birds in the economy of nature becomes at once evident, and they are as certainly, though perhaps less obviously, employed in the service of man, as the rook when delving in the newly sown field.

Goldcrests are far from being so scarce as is generally believed. This general impression of their small numbers most probably arose from the haunts of the birds, which are peculiarly fitted for concealment. Even that close observer, Gilbert White, says, " they (goldcrests) are almost as rare as any bird we know." (*Nat. Hist. Selb.*, 131.) Indeed, I believe that this bird is rarer in the southern parts of Britain than in the northern; but if any one will direct his steps to such places as I have indicated above, and seat himself on some mossy piece of rising ground (which abound in those localities), I am confident he will soon hear the silver chirp of the winged sprites, and, ere long, catch glimpses of them as they flit about and dart, meteor-like, from spray to spray, as intent on their perpetual insect hunt, and as unconcerned of aught else, as if that were the only employment of any moment in the world. What Mudie says of the red ptarmigan will in some measure apply to the goldcrested kinglets: — " So difficult is it to raise red grous, especially when the season has been rather unfavourable, and they are not in good feather, that one who has little knowledge of the moors may wander for days, in the places where they are most abundant, and not see a single bird." (*Feathered Tribes*, i. 33.) But, though goldcrests are generally abundant in their favourite haunts, it is certain that they are scarcer during some seasons than others, which I am inclined to attribute to the migration of part of their numbers. The peninsula of Scandinavia is the probable place of retreat, as well as for the crossbills, the field thrushes (*Turdus pilaris Will.*), and some others. Their migration is rendered the more probable from their having

been, like swallows and nightjars, found among the luggage of ships. The following is the account of an eyewitness of the circumstance: — "When off Whitby, about fourteen miles from land, on the 7th of October, 1833, a flock of goldcrests settled on the ship's tackle: the little creatures, being much exhausted, suffered themselves to be taken with the hand, as did also a solitary chiffchaff (Sylvia lòquax), which, together with nine goldcrests, it was attempted to bring alive to London; but they all died on the passage." Selby records an instance in which he actually witnessed the arrival of an immense flock of kinglets on the coast of Northumberland; and another equally strong proof of their migration is the fact, stated by the same author, of "the total disappearance of the whole tribe, natives as well as strangers, throughout the whole of Scotland and the north of England. This happened towards the conclusion of the month of January, 1823." (*Brit. Orn.*, 2d edit. i. 230.) The fact of these little birds buffeting the adverse winds, when winging their flight over the stormy sea, ought to have removed all sceptical feelings regarding the migration of swallows, which seem to have been so prevalent among the older ornithologists. If the kinglet, which, when with us, scarce takes a longer flight than from one tree to another, in a thickly wooded plantation, can dare the stormy blasts, and brave the foaming surge, surely the elastic-pinioned swallow, who spends the greater part of his life on the wing, may be supposed capable, even if there were no evidence to prove the fact, of transporting himself to more genial climes. Though the goldcrest is seldom seen on the wing for any length of time, yet, according to Pennant, it sometimes hovers in the air like the colibree: — "We have observed the gold-crested warbler suspended in the air for a considerable time over a bush in flower, whilst it sang very melodiously."

The nest of the gold-crested kinglet is not the least interesting part of its economy. This pretty verdant cradle is suspended underneath the thickly matted foliage of a yew, a spruce, a cedar, or a larch; sometimes it is placed amid the clustering foliage of ivy. Thus the female bird when sitting, and the young when hatched, are as securely guarded from the rain as if covered with an oil-cloth. Though destitute of the lichen spangles so lavishly besprinkled over the nest of the chaffinch, the pendent cradle of the goldcrest is a very elegant structure. The staple article is green moss, which is fashioned by the fairy architects into a cup-like shape, covered at top, except a little hole in the centre, for the ingress and egress of the proprietors. The inside, which is much

snugger and more *cozy* than that of the brown wren, seems quite choked up with feathers, and the young ones have as soft a feather-bed as the greatest duke in the land. Altogether, it is a right snug little country seat. The female deposits ten eggs, of a dusky brown, on which she sits about a fortnight. I have found more nests of the goldcrest deserted than of any other species of the warbler family (Sylvìadæ); but whether this arises from some accident befalling one or both of the architects, or from their being easily scared from their nests, I cannot tell. But that the observation has not been only made by me, may be seen on referring to the *Feathered Tribes*, where the author records the same circumstance. This is, perhaps, one of the reasons why goldcrests do not increase in proportion to the number of eggs laid by each female. Some birds, such as the green grosbeak and the hedge coalhood, make but little difference in the height at which they build their nest from the ground; but the goldcrest swings his hammock high or low, having, seemingly, no other guide in this affair than caprice. In any case it is not very easy for any but a practised eye to detect the Lilliputian mansion, especially if it be concealed in larch or fir. It is sometimes found in the holly, but not so frequently as the nest of that prince of British nest-builders, the long-tailed tit. When it is wished to preserve a specimen, the branch must, of course, be preserved too, else half the beauty and character of the nest is gone. The nest of the long-tailed tit, torn from the twig to which it was woven, is a miserable object; and, moreover, the excuse which I have heard alleged, that the branch would take up too much room, is untenable; for, if there is room for the nest, there is also room for its support. And the plan of putting nests into artificial attitudes is another practice that should be avoided. Thus, it is very common to see the nest of the hedge warbler (Sýlvia Hippolàis), which has the entrance at the side, placed so as to have the entrance-side uppermost; and, it being altogether a very loose fabric, the hole soon enlarges so much as to give it the appearance of any common open-topped nest. In Weaver's museum of natural history, in Birmingham*, in the case

* I should wish to direct the attention of every ornithologist to this museum. It is mentioned in a communication in this Magazine (iii. 162.), dated Nov. 17. 1829, as containing "a few British birds;" but it now includes almost every bird ever found in a natural state within the four seas of Britain, from the eagle to the kinglet. It may be interesting to the ornithologist to specify a few of the jewels of this collection: — a noble specimen of the white-tailed ossifrage (*Ossífraga albicílla W.*), a white-headed forktail (E'lanus furcàtus *Sav.*), a hooting snowflake (Nýctea cinèrea *Steph.*), a rose-coloured pastor (Pástorròseus *Tem.*), male and

which contains the tits, is an unpardonable offence of this kind: the nest of the longtail is crammed in a corner amidst artificial plants, as if built on the ground, giving an unornithological person quite an erroneous impression. Truth should not be sacrificed to effect. Also in the collection of nests, very little attention appears to be paid to exactitude. One labelled "sparrow" is as unlike a sparrow's nest as any nest I have ever seen; but the eggs evidently belong to that bird. The same may be said of the pied wagtail's nest and eggs.

Authors have recorded several varieties of the goldcrest. Montagu says, "a pair of these birds, in the collection of Mr. Luscome of Kingsbridge, were of a cream colour, with the usual yellow crown." (*Orn. Dict.*, 2d edit. p. 205.) Temminck mentions a still more remarkable variety:—"Des variétés accidentelles ont le sommet de la tête d'un bleu azuré; d'autres, moins rares, ont la tête et une partie du plumage de couleur blanchâtre: souvent les plumes de la huppe sont d'un jauneli vide." (*Man. d'Orn.*, 2d edit. i.p. 230.) ["Some accidental varieties have the top of the head of an azure-blue; others, less rare, have the head and a part of the plumage of a whitish colour: oftentimes the feathers of the crest are of a livid yellow."] According to Stephens, there is a specimen of a white variety of the goldcrest in the British Museum.

Three species of kinglet are known to inhabit North America; the ruby-crested kinglet (*Régulus calendulus Vieil.*), the tricoloured kinglet (*R.* tricolor *Nuttall*), and the carbuncle kinglet (*R.* carbúnculus *Bonaparte*). All three are described in the *Ornithological Biography;* a work which as much eclipses all other ornithological works in floridness of

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female golden oriole (*Oriolus Gálbula Lin.*), wood shrike (Lànius rùtilus *Lath.*), marsh hoopoe (*Upupa Epops Lin.*), black woodpecker (*Picus mártius*; this extremely rare bird is set in exactly the same attitude as that shown in the figure in Gould's beautiful work, the *Birds of Europe*), crested tit (Pàrus cristàtus *Ald.*), bearded pinnoc (Calamóphilus biármicus *Leach*), pippin crossbill (Cruciróstra màlus *W.*), pine thickbill (Densiróstra enucleàtor *W.*), turtle dove (*Perístera Túrtur Boje*), wood grous (*Tétrao arbòrea W.*), collared pratincole (Glarèola torquàta *Meyer*), bearded bustard (*Otis tárda Lin.*), field busternell (Tèrax campéstris *Leach*), cream-coloured swiftfoot (Cursòrius Isabell*inus* Meyer), white pelican (*Pelecànus onocrótalus*), cinereous crane (*Grús cinèrea Bech.*), red lobefoot (Lóbipes fúsca *Cuv.*). For several of these, the swiftfoot, in particular, a large sum was given. Those who delight in gorgeous colours and elegant forms will find ample gratification in a choice and beautiful display of foreign birds. There are also insects, stones, shells, skeletons, &c.

[Additional means of information on the scope and character of Weaver's museum are given in V. 546—548. 668, 669. 749—753.; VI. 136.]

style, exactitude, interest, eloquence, and vividness of description as the great luminary of day, in the effulgence of his meridian glory, eclipses the pallid moon and twinkling stars. Two species inhabit Europe, the gold-crested kinglet (*R.* auricapíllus) and the fire-crested kinglet (*R.* ignicapíllus). In the first edition of Temminck's *Manuel d'Ornithologie* (1815), the firecrest and the goldcrest were described as one species; but in the second (1820) this error was corrected. For an interesting account of the discovery of the firecrest as a British bird, I refer my readers to Mudie's *Feathered Tribes.*

Edwards, in his *Natural History of Rare Birds* (v. pl. 254.), figures a bird which he intends for the goldcrest; but, as he says it came from America, I am inclined to think it the tricoloured kinglet, which Wilson and others confound with the goldcrest. Bewick's figure of the goldcrest is a decided failure: an excellent representation may be found in Selby's *Illustrations of British Ornithology*, i. pl. 47. fig. 4.

The name kinglet is, of course, given in allusion to the "kingly crown" which distinguishes all the genus. The Latin name regulus has the same meaning; rex, a king; regulus, a little king: the Greek, *turannos;* the French, roitelet; the Italian, reattino; the Spanish, reyezuelo; the German, königchen; the Swedish, kongsvogel; and the Portuguese, averei; have all the same meaning; that is to say, all have reference to the same ornament.

I shall now give the synonymes, references, and characteristics of the species: —

Régulus cristàtus *Will.*, Orn., p. 227.; Montagu's Orn. Dict., ed. Rennie, p. 202. Pàrus sylváticus *Aldr.*, Ornithologia, ii. 724. *Motacílla Régulus Lin.*, Syst., i. 338. *Régulus* vulgàris *Steph.*, Shaw's Gen. Zool., x. 758. *Régulus* auricapíllus *Selby*, Brit. Orn., i. 229.; Mudie's Feath. Tribes, i. 302. Sýlvia *Régulus Lath.*, Ind. Orn., ii. 548.; Temminck's Man. d'Orn., i. 229. Roitelet, Buff., v. 363. Roitelet couronné-d'or, Edwards's Rare Birds, v. pl. 254. Roitelet ordinaire, Temminck's Man. d'Orn. Gegrönter sanger, Meyer's Tassch. Deut., i. 250. Goldhähnchen, Bechstein's Cage Birds. Regolo, Storia degli Uccelli, iv. pl. 390. Gold-crested wren, Will. Orn.; Lewis's Brit. Birds, ii. pl. 116.; Montagu's Orn. Dict.; Low's Fau. Orcad.; Arctic Zool., iii. 109.; Mudie's Feathered Tribes; Syme's Song Birds, p. 152. Wood titmouse, Gesner's Hist. An. Gold-crested warbler, Pennant's Brit. Zool., i. 514. Common goldcrest, Stephens's Shaw's Zool.; Rennie's Field Nat. Mag. Gold-crested regulus, Selby's Brit. Orn., i. 229. pl. 47.

Length 3½ in.; weight from 75 gr. to 80 gr. Bill three tenths of an inch in length, depressed at the base, narrowed towards the tip. Tarsus six tenths of an inch long, slightly scutellated. Bill black; tarsi yellowish brown; base of the bill beset with bristly feathers. Crown of the head covered with silky feathers of a rich orange in the centre, shaded off into a light yellow towards the sides. A stripe of black runs along each side of this crest, and sets it off to great advantage. General colour of the back olive green. Cheeks, breast, and belly dusky white, tinged with green. Quill feathers sepia-coloured, with light yellow margins. Tail sepia-coloured, with olive-green margins; inner feathers shortest.

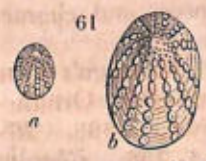
Near Derby, June 1. 1835.

[Mentions of a few facts in the habits of the gold-crested wren, or kinglet, are made in I. 179., IV. 119., VIII. 547.]

Art. II. *Records of the Results of Dredging.* No. 2., *Including Notices of Species of Patélla, of Búccinum, and of Lìma.* By Edward Forbes, Esq.

Adhering to shells in deep water, on the Manx coast, a small species of Patélla occurs in considerable abundance, which appears to be undescribed. (*fig.* 61.) It is allied to the virginea, but differs from that species in its never attaining so large a size, and, more characteristically, in its markings, being of a bluish white colour, with 10 or 12 moniliform red rays. The bluish hue of the shell, when young, is often so intense in the centre of the links as to cause an appearance of blue spots, resembling those of cærùlea. Old shells become of a semi-opaque reddish white. These characters I have never found to vary; and there is little difficulty in distinguishing the shell at sight. (*a*, natural size; *b*, magnified.) The animal is yellowish white, with moderately long tentacula, and the eyes are at their external base; the cloak has pink spots on its edge at regular intervals (margin entire?). The species may be characterised as follows: —

61



Patélla pulchélla *Forbes.* Patélla testâ ovatâ, subpellucidâ, radiis rubris subtessellatis; apice acuto, submarginali. Longit. $\frac{2}{10}$, latit. $\frac{1}{8}$ unciæ.

The P. Clealándi of Sowerby has occurred, though rarely, on the Manx coast. One specimen I found alive, on a stone, at very low water; and I have several others which were cast

ashore. Allied to it is a shell well known, in Scottish collections, under the name of Patélla clýpeus (figured in Brown's *Illustrations*). It is found plentifully at the Gair Lock, opposite Greenock, and in Arran. It differs from P. Clealándi in its larger size, its more acute apex, deeper longitudinal striæ, and in the markings being reticulated on the upper part of the shell, whilst they are radiated on the lower. I have found a similar shell in Siäellard. Is the "Patélla testudinària," indicated by Mr. Lowe, in one of his papers in the *Zoological Journal*, identical with this species?

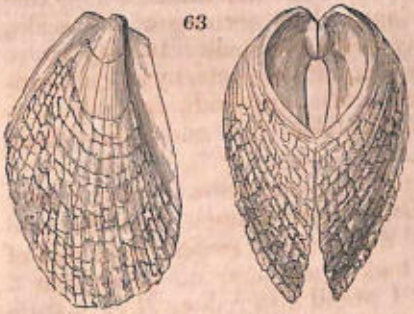
The animal of Fissurélla græ`ca (a species which is pretty frequent on the Manx coast) is often of a beautiful rose colour, sometimes vermilion: this appears to be occasioned by its food, which consists of a red spongy zoophyte, incrusting the *P*écten operculàris, and staining the shells of the pecten of a brick-red colour. I have seen the Cássulus hungáricus affected in the same way; but, though Emargínula fissùra occurs in great plenty in the same locality, I have never found a specimen so tinged. By the way, there is a shell allied to Emargínula, the "Sìpho" of Captain Brown, on the nature of which some remarks appeared in the *Athenæum* some time ago [see the date of this communication]; wherein the reviewer stated his opinion that the shell was, if I remember right, a young Fissurélla. At the time I was inclined to think the same; but, having since seen a specimen in Captain Brown's possession, I am now fully persuaded not only that the shell is not a young Fissurélla, but that it possesses considerable claims to generic distinction. The specimen I saw was evidently an old shell, and appeared, at first sight, to be a full-grown example of Emargínula fissùra, from which it differed, externally, in the slit not being prolonged to the margin; internally, it presented its most obvious distinction in the form of an appendage arching over the slit, and opening about half way down the shell. It may prove to be a subgenus of Emargínula. It connects, by its conformations, Emargínula with Scissurélla, and both, in some measure, with Calyptræ`a and Crepídula. It is said to have been dredged up at Greenock.

The *B*úccinum striàtum of Pennant occurs in great plenty in the Irish Sea, being almost more common than the true *B.* undàtum; but the animal differs in no respect from that of the latter, and therefore I look upon it as no more than a variety. To the same rank I would also reduce *B.* carinàtum of Turton, of which, by the by, I once saw a specimen, probably from Greenland, in that part of the collection of Othó Fabricius which is at present in the possession of Professor

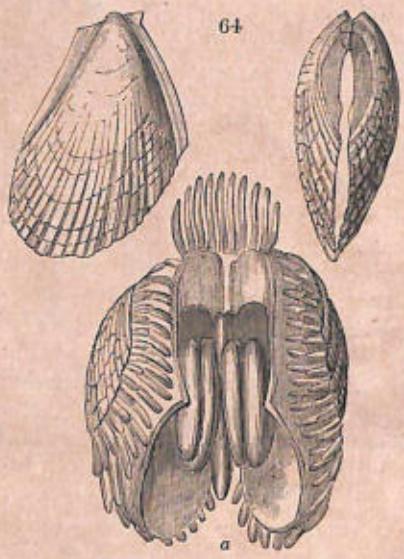

62

Eschniht of Copenhagen. The *B.* Humphreys*iànum* of Bennet has, perhaps, better claims to a specific rank. Fleming has referred the latter to Lamarck's *B.* anglicànum. Is not Lamarck's anglicànum the striàtum of Pennant? I have a *Búccinum* (*fig.* 62.), brought from Zetland (where it is frequent in very deep water), by my friend Mr. E. Charlton, which has as good claims to specific distinction as most of the so-called species. It is nearest in its relations to the *B.* fusifórme of Broderip, which it resembles in shape; but is still more produced, having 9 rounded whorls tapering to a fine point, and spirally striated, but not crossed by any transverse ribs, or striæ; the outer lip is slightly patulous, and the interior of the shell is tinged with purple: the largest specimen I have seen was about 3 in. long. According to the views on species generally entertained by conchologists, it is decidedly distinct, and might be named *B.* zetlándicum; but I am inclined to look upon the *B.* undàtum, striàtum, carinàtum, fusifórme, and my Zetland shell, as one species, presenting so many permanent varieties; viewing the animal as the only ground for specific character, where the shells are so nearly allied as the above. *B.* acuminàtum of Broderip appears distinct, and links the *B.* undàtum with the *B.* glaciàle. Is there any description of the animal of the latter published?

Of the genus Lìma I have dredged up three kinds, apparently distinct; two of them certainly so; but, from the indefinite nature of the descriptions of the British species, it is almost impossible to name them with any degree of certainty. The first of my shells (*fig.* 63.) is rather a large species, being 1¼ in. long, having the shell strong, with rough longitudinal ribs, crossed by lines and furrows of growth; the hinge is oblique, and the shell gapes widely on both sides, the margins touching only for a small space in front; the animal has very long filaments of a bright red colour, and is much too large for the shell, as is also the case with the two other

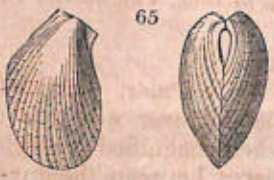

63

64



kinds. The second (*fig.* 64.), of the animal of which I have sent a drawing, as it appeared when alive and healthy, in sea water (*a*), differs, so far as regards its shell, only in this being more compressed, and the gape narrower; but the filaments of the animal are of a pale yellow tipped with red, and much shorter than in either of the others. The comparative length of the filaments is, however, I suspect, a very unsatisfactory character, depending much on the will of the animal. The third (Lìma frágilis ?) is a much smaller shell (*fig.* 65.), translucent, very fragile, finely striated, and closed, or nearly closed, on all sides. The filaments are long, and of a diluted crimson tint. This species is the most frequent of the three, occurring in the cavities of old shells, in twenty fathoms of water. Of the first of these shells I have seen, besides my Manx specimens, several from the coast of the Isle of Arran. When taken out of the water, they snap their shells violently, at intervals, in the manner of the pectens; but when in the water, they remain quiet, with heir shells wide open, in the manner represented in the drawing (*fig.* 64. *a*), presenting a very beautiful appearance.

65



Edinburgh, December 5. 1834.

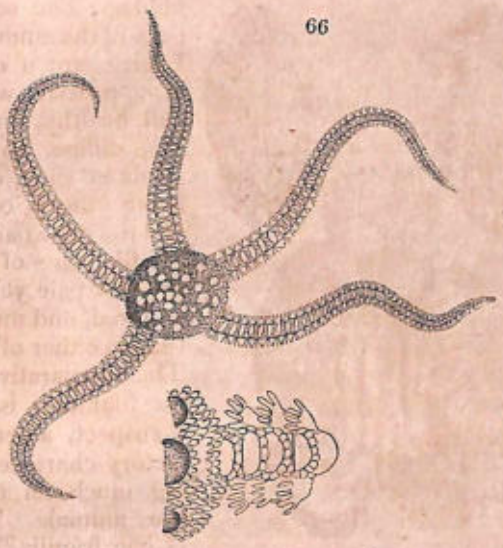
(*To be continued.*)

ART. III. *Illustrations in British Zoology.* By GEORGE JOHNSTON, M.D., Fellow of the Royal College of Surgeons of Edinburgh.

47. OPHIU'RA BE'LLIS. (*fig.* 66.)

SPECIFIC Character. — Body covered dorsally with separate round scales, the interstices roughened with small blunt tubercles; no scales over the base of the rays.

66



Synonymes.— Ophiùra béllis, Flem. Brit. Anim., 488. *Asterias* sphærulàta *Pen.*, Brit. *Zool.*, iv. 131. pl. 34. fig. 2.; Turt. Brit. Faun., 141. *Astèrias* aculeàta *Stew.*, Elem., i. 401.; Fleming, in Edin. Phil. Journ., viii. 298.

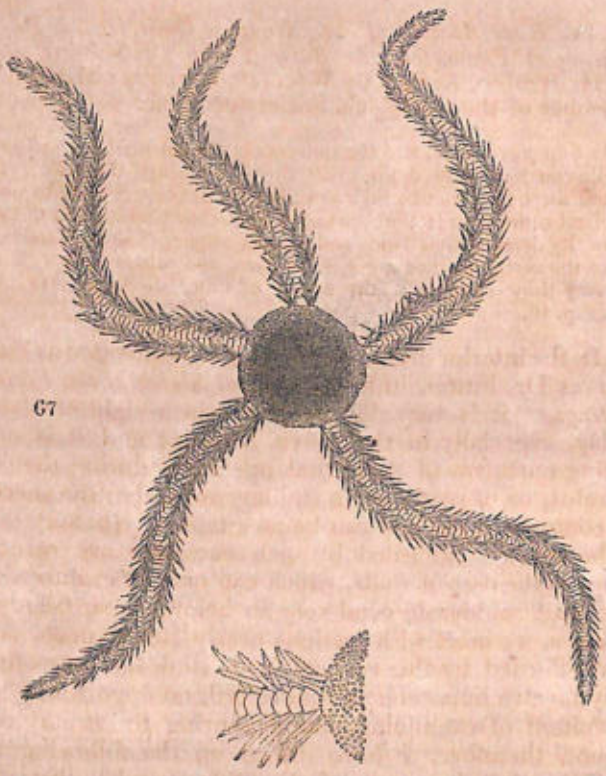
Hab. Not uncommon in deep water.

Description.— Body pentagonal or circular, flattened, rough with small tubercles, and spotted all over with round flat separate scales, minutely rough when magnified; margin rounded, and, as well as the oval spaces between the rays, rough with tubercles like those of the back. Rays 5, tapered, convex dorsally, and covered with oval scales divided from one another by a ring of small obtuse warts; scales of the under surface square, rather distant, with a pore in each interspace; lateral spines shorter than the breadth of the ray, smooth, obtuse, five in a series, and at the ventral base of each series there is a white lateral scale. Diameter of the body half an inch or a little more; length of the rays 1½ in. or 2 in. Colour various, generally brown, the rays annulated with orange-coloured bands. All the figures I have seen of this pretty species are very bad, and do not exhibit its essential characters.

48. Ophiu'ra granula'ta. (*fig.* 67.)

Spec. Char.— Body scaleless, covered with close-set minute granules.

Synonyme.— Ophiùra granulàta *Fleming*, in Edin. Phil. Journ., viii. 301.; Flem. Brit. Anim., 488.



67

Hab. — Kirkwall Bay, Orkney, Rev. Dr. Fleming. Coast of Berwickshire, plentiful in one or two places, but very local.

Description. — Body circular, flat, of a uniform dirty brown colour, the back covered with granules, which may be rubbed off, exposing a paler surface; margin rounded; ventral interspaces triangular, tumid, grey, covered with minute overlapping scales: mouth pentagonal, its triangular processes edged with smooth scales, and there is a large somewhat cordate scale between the origins of the rays: rays 5, quadrangular, of the same colour as the body, the spines paler and rather longer than the breadth of the ray; the dorsal scales smooth, the middle one somewhat triangular, rounded on the outer edge, overlapped by a smaller one on each side; ventral scales square, rounded on the outer angles and sinuated in the centre; spines 6 in each series, roughened with spinous teeth pointing upwards. Diameter of the body seven tenths; length of the rays from two to three inches.

Berwick upon Tweed.

ART. IV. *Some Account of the Limestone Quarries and Petrifying Spring at Pounceford, in Sussex; with Preliminary Remarks on the Wealden Rocks.* By WILLIAM PERCEVAL HUNTER, Esq., Member of the Geological Society of France.

"As time never fails, and the universe is eternal, neither the Tanais nor the Nile can have flowed for ever: the places where they rise were once dry, and there is a limit to their operations, but there is none to time. So also of all other rivers; they spring up and they perish; and the sea also continually deserts some lands and invades others. The same tracts, therefore, of the earth, are not some always sea, and others always continents, but every thing changes in the course of time." — ARISTOTLE, *Meteor.*, lib. ii. cap. 16.

"IN the interior of a country so highly cultivated as Sussex," observes Dr. Fitton, in his *Geological Sketch of the Vicinity of Hastings*, "it is very difficult to obtain a sight of a stratum of clay, especially in the lower districts; and it is only by availing ourselves of accidental openings, during the cutting of drains, or of roads, or in sinking wells, that the succession and contents of the bed can be ascertained." (p. 30.)

The sections afforded by such occasions are rare; and, except in the case of wells, which can only be examined while being dug, seldom descend very far below the surface: when, therefore, we meet with sections nearly 100 ft. deep, such as those afforded by the vertical shafts sunk for extracting the shelly bivalve limestone at Pounceford, no opportunity should be omitted of examining and measuring the strata: on this account, therefore, I have drawn up the following notes; premising that, however defective they may be, they will, at all events, have accuracy to recommend them, as I made my measurements with great care, several times over, at different places, and collected specimens of all the strata. These notes I was the more induced to put together from perceiving that Mantell, though he mentions the spring (*Geology of South-East of England*, p. 22.), says very little about these beds, which appear to have been unknown to Dr. Fitton, who, speaking of the general structure of the country surrounding Brightling, says, "As there are here no coal beds to reward the labour and expense of accurate levelling and surveying, *it is impossible, at present, to give a correct section of the country.*" (*Geol. Sketch of Hastings*, p. 55.)

Before entering on the description of these beds, a short outline of the geological phenomena presented by the country may, perhaps, be interesting and useful to those who have hitherto paid but little attention to the subject.

The Wealden beds, calculated to be, in some parts, no less than 2000 ft. thick, comprising, 1. Weald clay; 2. Hastings

sands; 3. Purbeck beds; which last the strata hereafter to be described are considered by Conybeare (*Outlines of Geology of England and Wales*, p. 148.) to be introductory to, if not identical with; form one of the most remarkable geological groups in England, containing some most extraordinary fossil remains, and furnishing us with the most striking proofs of the great extent of former revolutions in the position of sea and land. One of the facts respecting this formation most deserving of notice is its limited extent: Lullworth Cove in Dorsetshire, to the Lower Boulonnois in France, or about 200 English miles, being its extremest limits from west to east; while it extends from north-west to south-east, Whitchurch in Buckinghamshire, to Beauvais in the interior of France, a distance of about 220 miles. (Fitton, *Geol. of Hastings.*) This limited space, considered to have been formerly occupied by the Wealden; the marked difference in the character of its fossils, most of which are freshwater, from those of the marine strata both above and below it; the peculiarity of these fossils themselves, few of which resemble those found in any other formation; as well as the change of climate, and alteration of the earth's surface they are supposed to indicate; have induced our most distinguished geologists to conclude that the whole of this group had its origin in freshwater communicating with the sea.

The clay of the Weald of Sussex is well defined by Martin as "a stiff clay, brown on the surface, and blue and slaty beneath, containing concretional ironstone." (Martin, *Geolog. Mem. Western Sussex.*) This ironstone was formerly in high request: in the sixteenth century, before coke was used for smelting iron ore, two thirds of the whole iron of England were procured from the Sussex beds; many of the roads on the Ashburnham estate are still paved, as in Derbyshire, with the slags, the refuse of the founderies; though what is now excavated is, I believe, but trifling in quantity, and very indifferent in quality. Beneath this is an alternation of sands and clays, including thin beds of the limestone, containing such numbers of the Paludìna vivípara, a freshwater shell, well-known as the Petworth or Sussex marble.

The following is the order, according to Dr. Fitton, of the beds of Hastings sands, in Sussex:—1. Ferruginous and fawn-coloured sands and sandstone, including small portions of lignite, with stiff grey loam; 2. Sandstone; 3. Sandstone, containing concretional courses of calciferous grit; 4. Dark-coloured shale; 5. White sandstone of Hastings cliffs, 100 ft.; 6. Clay, shale, and thin beds of sandstone, containing lignite and silicified wood (Endogenìtes eròsa, of which large pieces

may be occasionally procured, at low water, on the beach near Eaglesbourne); 7. Sandstone, without concretions; dividing into rhomboidal masses; numerous veins of argillaceous iron ore, and of clay, approaching to pipe-clay at the lower part; 8. Dark-coloured shale, with roundish masses of sandstone, and several layers of lignite, and a vast quantity of fragments of carbonised vegetables.* The same author observes that the equivalent beds, in the Isle of Wight, are composed of sands and sandstones, "frequently ferruginous, with numerous alternations of reddish and variegated sandy clays, and concretions of calcareous grit." (Fitton, *Ann. of Phil.* 1824.)

The remains found in these beds are such as we may imagine to have been deposited in the estuary or delta of some mighty river, which brought down, with its sands and clays, from the neighbouring land, the plants and animals that inhabited it. Turtles and trionyxes crawled along its banks; plesiosauri and crocodiles sported in its waves, or lay basking in the sun in its fens and shallows: while the gigantic megalosaurus, an amphibious animal clothed in mail, far exceeding the largest crocodiles in size, being, according to Cuvier, 40 ft. in length, though, from some bones in Mantell's museum, Dr. Buckland conjectures it to have been nearly double that extent, and in height equal to a full-grown elephant (*Geol. Transac.* ii. 2d series); that yet more gigantic herbivorous reptile the iguanodon, whose well-worn teeth, resembling the molares (grinder teeth) of living herbivorous Mammalia (differing therein from the whole family of lizards, from one member of which, from its apparent resemblance in other respects, the iguana of the West Indies, it derives its name), bear witness to the great voracity of its appetite, one of whose thigh-bones measured no less than 23 in.†, and a condyle, or joint, of another bone, 34 in. in circumference (Bakewell, *Introd. Geol.*, p. 280.), and which Mantell calculates could not, at the lowest calculation, have been less than 70 ft., or equal to a large-sized whale in length ‡

* Fitton, *Geol. Sketch Hastings*, p. 36, 37. Fitton considers the Tilgate beds, so celebrated from the remarkable fossil animals discovered by Mantell, to belong to the upper part of the Hastings sands.

† Mantell, *Fossils of Tilgate Forest*, who justly observes, "Were this thigh-bone clothed with muscles and integuments of suitable proportions, where is the living animal that could rival this extremity of a lizard of the primitive ages of the world?

‡ It is now very well known that the largest species of whales in the Northern seas seldom exceed 70 ft. in length. The old accounts of their having been discovered, occasionally, upwards of 100 ft. in. length, appear to have been very much exaggerated. The largest, probably, ever known, was the one caught near Ostend, the skeleton of which was exhibited in London in 1830, and measured 96 ft. in length.

and that strange species more recently discovered, the hylæosaurus, from 20 ft. to 25 ft. in length, whose skeleton, observes Fitton, "blends the osteology of the crocodile and lizard," and the scaly fringes on whose back *, some 17 in. in length, must, when erected, have startled the astonished beholder; roamed through the forests of palms, ferns, and gigantic reeds which then flourished in luxuriant profusion in Sussex. The plants found fossilised in the Wealden, comprising five species of distinct genera; viz. 1. Sphenópteris Mantélli Brong., 2. Lonchópteris Mantélli, 3. Lycopodites (species not determined), 4. Clathària Lyélli, 5. Carpólithus Mantélli, now no longer exist, but appear, as already stated, to have been allied to the palms and tree-ferns found only at present in the warmest parts of tropical climates. The species are peculiar to the Wealden rocks, being found neither in the lower green-sand, the gault, the upper green-sand, nor the chalk, the strata immediately above; nor in the Portland and oolites, nor even in the Purbeck beds (which appear, as I have already observed, to differ from the Pounceford group only in being less shaly and more stony) immediately below them: nor do they at all resemble any hitherto discovered in the coal formation. All these fossil remains, with the exception of the beds of shells which appear to have been deposited tranquilly in deep water, bear evidence of having been transported from a distance, the bones of the reptiles being detached from the skeleton, and more or less broken and rolled, and the stems of most of the plants much torn, and intermingled with pebbles of quartz and flinty slate and jasper, "all concurring," says Mantell, "to prove that these heterogeneous materials have been subject to the action of water; yet it is manifest that the action was fluviatile, not littoral. The pebbles, though smooth, from their angles having been worn away, are not rounded into beach or shingle; they have been subject to the operation of currents and torrents, but not to attrition from the waves of the ocean." (*Geology of South-East of England*, p. 330.) Among the numerous fossils of the ancient delta of the Wealden no remains of a single mammiferous animal have hitherto been discovered. This is a very remarkable fact, which has excited a great deal of discussion, and given rise to a variety of hypotheses; as we should naturally expect, on examining the deposits now forming in similar rivers, the Ganges and Indus in Asia, the Mississippi in

* Large cartilaginous processes, with horny coverings, which form a sort of dermal fringe along the back. See Mantell, *Geol. S. E. England*, p. 326.

America, &c., for example, to find the remains of large species of Mammàlia which frequent the banks of rivers, such as the hippopotamus and rhinoceros in the former, the tapir in the latter country, which we know are now annually carried down and entombed in the deltas.

"It is certainly a very startling proposition," observes Lyell, in his invaluable *Principles of Geology* (iv. p. 235.), "to suppose that a continent covered with vegetation, which had its forests of palms and tree-ferns, and its plants allied to the dracæna and cycas, which was inhabited by large saurians, and by birds, was nevertheless entirely devoid of land quadrupeds. If the proofs were confined to the Wealden, we might hesitate to lay much stress on mere negative evidence, since extensive deposits of the Eocene period, such as the London clay, have as yet yielded no mammiferous fossils, and the coal strata of Great Britain, after having been studied for so many years, are only now beginning to produce the bones of saurians. But when we find the same general absence of mammalia in strata of the oolitic and liassic eras, we can hardly refuse to admit that the highest order of quadrupeds was very feebly represented in those ages when the small didelphis of Stonesfield was entombed. Some of the bones, indeed, collected by Dr. Buckland from the oolitic series have been pronounced by Cuvier to be cetaceous; but that naturalist has himself remarked how closely the vertebræ of the larger reptiles resemble those of certain dolphins; so that it is highly desirable that the fossils alluded to should be examined with great care."

We may therefore conclude that, during the periods of the Wealden, the oolite, and the lias, there was, as Lyell observes, "a large developement of the reptilia, at the expense, as it were, of the cetaceous and terrestial mammalia." (Lyell, *Principles of Geology*, iv. p. 236.)

While the species and genera of Testàcea found in the cretaceous beds are very abundant, in the green-sand group alone (including the upper and Shanklin, or lower, green-sands, and the gault) 49 genera, 86 species, and almost exclusively marine; those found in the Wealden, on the other hand, are much fewer, 10 genera and 30 species only having been hitherto determined, although the individuals are abundant to profusion, and belong, by far the greater part, to fresh water. Notwithstanding these remarkable facts, there are no indications of disturbance, with the exception of part of the country adjoining the strata hereafter described, which is very much dislocated, affording many faults, or "horses" as the

quarrymen term them*; the lower green-sand, the first marine bed above the Wealden, rests conformably on the clay, and the change from the deposition of the freshwater remains to that of marine shells appears to have been "effected," observes Dr. Fitton, "simply by a tranquil submersion of the land to a greater depth beneath the surface of the waters." The remains in the Purbeck strata, below the Hastings sands, are, for the most part, freshwater; but a singular exception occurs in the middle of the bed, in a layer of oysters 12 ft. thick: oysters, however, as is well observed by Dr. Fitton, are well known to inhabit estuaries within the range of fresh water. The Portland strata, immediately below the Purbeck, may be said, for the depth of 10 ft., to be composed of thin layers of compact slaty limestone, down to the famous "Dirt-bed," in which are found the remains of large groves of trees, some of which are prostrate, some inclined at various angles, and many again with their roots firmly fixed in the black soil in which they originally grew, their trunks and branches, stretching upwards through the freshwater strata above, resembling, in this respect, the various subterranean forests found round about the sea-coast of Great Britain, as well as on the shores of the north of France; save that the trees, in the latter instance, belong, for the most part, to existing species, while those which occur in the "Dirt-bed" are no longer met with in any part of the globe. From the stumps of these trees remaining erect, Dr. Buckland and Mr. De La Beche have inferred that "*the surface of the subjacent Portland stone was, for some time, dry land, and covered with a forest; and probably in a climate such as to admit the growth of the modern Zamia and Cycas.*" † The "Dirt-bed" is succeeded by a stratum called "*Top-cap*" by the quarrymen, 10 ft. thick, and having very much the aspect, according to Webster, of freshwater limestone: it contains, however, no fossils. The remains of the next and subjacent beds are exclusively marine. Whether this very curious alternation of marine and freshwater remains was produced by the elevation

* Dr. Fitton mentions a fault in the limestone, sixty fathoms deep; he however does not give the locality, and I enquired for it in vain of the workmen, in my rides to the different quarries within 20 miles from Hastings. The workmen wholly disbelieved its existence, and evidently considered I was hoaxing them when I mentioned it.

† See abstract of the paper from which this passage is taken, *Geol. Soc. Proceedings*, April, 1830, p. 218, 219.; and *Phil. Mag.* and *Annals*, vol. vii. p. 454. The details will appear in Dr. Buckland's Memoir, in the fourth volume of the *Geol. Transactions*, now in the press; in which also will be published Dr. Fitton's long expected paper, "On the Beds beneath the Chalk," &c.

of the land itself, or by subsidence in the level of the ocean, has long been matter of the most fiery dispute amongst geologists, many of whom suppose that the chalk, though not the slightest vestige of it is found in the alluvium of the hills and valleys of the central and forest ridge of the Wealden, formerly "covered the whole space in which the inferior strata are now exposed." This assumption Conybeare pronounces "to be highly rash," "though," adds he, "the truncated form of its escarpment evidently shows it to have once extended much further than at present." (*Outlines of Geology of England and Wales*, p. 144.) Lyell, however, in his beautiful *Principles of Geology*,—a work pronounced by men of all parties (for among geologists, to their shame be it spoken, party spirit runs as high as amongst politicians) to be the most eloquent, comprehensive, and truly philosophical outline of the science ever published in the English or any language,—adopts this theory to its full extent; observing, that, though he never traversed "the wide space which separates the North and South Downs, without desiring to escape from the conclusions expressed as to the original continuity of the upper secondary formations over the anticlinal axis of the Weald, yet he was invariably brought back again to the opinion that the chalk was originally continuous, on a more deliberate review of the whole phenomena." (p. 190.) The hypothesis, however, proposed by the reviewer of Lyell's work in the *Quarterly*, appears to me so far more probable and intelligible, that I insert it below, as a conclusion to this imperfect sketch. It, at all events, does away with a great deal of theoretical reasoning, never very interesting to beginners, and has simplicity, if nothing else, to recommend it. I think it right, however, to premise, that both Mr. Bakewell (*Introduction to Geology*, p. 291.) and De La Beche (*Manual of Geology*, p. 307.), high authorities on such a subject, appear to coincide with Mr. Lyell's views.

"Why is it necessary to suppose the chalk to have at any time extended over this part of Europe? Why are we not at liberty to suppose that the Weald clay and Hastings sands had been elevated above the sea before the deposition of the chalk, and formed a ridgy island in that sea? These latter beds must have been formed above the sea level, since they contain only organic remains of land and freshwater animals and plants. If it must be admitted that they subsequently sunk in some degree, so as to allow the marine formation of the green-sand to overlap their edges, at least it is not necessary to suppose such an amount of subsidence as would have clothed their whole surface with the entire thickness of the

green-sand, gault, and chalk formation; the latter, especially, having the character of a deposit formed only in deep water. There does not appear any reason for introducing the sea into the Weald valley, as Lyell does, for the purpose of effecting its denudation, and the removal of the materials of its ancient strata. The agency of rivers and rains, acting through an indefinite time, may have alone accomplished this; and, since no traces of marine deposits of the Eocene, or any later age, are met with, throughout the whole basin, we must hesitate to believe that the sea covered it, during any part of the tertiary period." (*Quarterly Review*, April, 1835.)

To return to the section of the quarries to which this paper more particularly refers. The tract of country occupied by these beds extends from Totten Field to Vine Hall, about 9 miles in length, and half a mile, on an average, in width.* The general aspect of the country surrounding Pounceford, situated 18 miles from Hastings, 3 from Burwash, and 26 from Brighton Downs, is highly undulating, affording numerous picturesque glens and deeply cut valleys, and mostly richly wooded; with a very poor sandy clay soil, which, however, being very well cultivated, produces good wheat and very fair hops. The limestone, in many parts, a complete aggregate of shells, which is excavated for burning, is found in layers at about 60 ft. from the surface. The following is an exact measurement of the beds at the most southern shaft sunk for extracting the stone (the sections at the other two vertical shafts differ but little from it), from the surface to the first layer of the blue bivalve limestone, which is worked under ground, and consequently interferes but little with the meadow land above, on which cows and sheep are turned out to feed. The names marked with inverted commas are those given by the workmen, which being, as is generally the case, very vague and indefinite, I have added a brief description of each stratum.

Section at vertical Shaft to the South of Pounceford Farm.

		ft.	in.
1. Soil and alluvium	Consisting of mull, sand, clay, and calciferous grit, in various proportions - -	9	0
2. 'Raggedbole'	a hard shelly grit, with argillaceous ironstone and sand rock - - -	9	0
3. 'True bole'	a compact shelly limestone, occasionally in veins; furnishing excellent lime, though not worked for that purpose; at places, however, earthy and yielding - -	10	0

* On the authority of the head quarryman, an amateur, and a very intelligent man in his way.

		ft.	in.
4. 'Sand rock'	varies in hardness. Lignite and carbonised vegetables are found in this bed, in sufficient quantities to be collected and used for firing, by the workmen. It burns remarkably well, they informed me, as coal* - -	7	6
5. 'Top Crat'	a mixture of clay, grit, and ironsand, varying in hardness - - -	1	10
6. 'Irony Crat'	grit, with shells, remarkably hard - -	1	0
7. 'Pavour' -	well described by quarrymen as 'like a pincushion, all full of holes, as if eaten by worms.' - - - -	1	0
8. 'Stony bed-stone'	sandy shales, of different degrees of hardness. A thin layer of marl between this and the one which follows - - -	4	0
9. 'Top vein' -	calciferous grit - - - -	1	0
10. 'Meallies' -	(as its name implies), very easily rubbed to pieces — affording, like 'True bole,' very good lime, but not worked - -	1	0
11. 'Middle vein'	very hard grit, containing thin seams of coal	0	10
12. 'Fox' -	a clayey sand, with shells in abundance; affording good lime. Top and bottom coated with shelly shale - - -	0	11
13. 'Bottom vein'	gritty limestone; affording, however, very indifferent lime. Between it and following bed, a vein of marl - - -	2	9
14. 'Rottenstone'	near bottom vein, marly. Adjoining 'grey vein,' compact sand - - -	1	11
15. 'Grey vein'	varies: in places, crumbling sand; in others, hard grit - - - -	0	4

* Herschel has cited, as an example of the value of physical knowledge in teaching us to avoid attempting impossibilities, an instance in which ignorance of the first principles of geology led to a most expensive and fruitless undertaking, in part of the country occupied by the ancient delta of the Wealden; an undertaking set on foot from the great quantities of lignite and carbonised vegetables found in the different varieties of sand rock in the Hastings sands, which induced several persons to form most sanguine expectations of discovering coal beds. This attempt is thus noticed by Herschel: — "It is not many years since an attempt was made to establish a colliery at Bexhill, in Sussex; the appearance of thin seams and sheets of fossil wood and wood coal, with some other indications similar to what occur in the neighbourhood of the great coal beds in the North of England, having led to the sinking of a shaft, and the erection of machinery on a scale of vast expense. Not less than eight hundred thousand pounds are said to have been laid out in this project, which, it is almost needless to add, proved completely abortive, as every geologist would at once have declared it must: the whole *assemblage of geological facts being adverse to the existence of a regular coal bed in the Hastings strata*; while this, on which Bexhill is situated, is separated from the *coal measures* by a series of interposed beds, of such enormous thickness as to render all idea of penetrating through them absurd. The history of mining operations is full of similar cases, where a very moderate acquaintance with the *usual order of nature*, to say nothing of theoretical views, would have saved many a sanguine adventurer from utter ruin." (Sir John Herschel's *Discourse on the Study of Natural Philosophy.*)

		ft.	in.
16. 'Blue bed' -	indurated clay, containing very few shells -	1	11
17. 'Top hard bed'	very like 'Blue bed;' only, in places, considerably harder - - -	1	0
18. 'Red bed' -	of a lighter colour than the preceding stratum, inclining to grey, and a great deal harder -	1	6
19. 'Irony or hard shelly bed'	grit, with shells. Unless softened by water, the hardest stratum in the whole group -	0	9
20. 'Bottom bed'	very like 'Blue bed' - - -	1	6
21. 'Shab' -	a species of argillaceous ironstone, with an infinity of small shells, immediately above the first layer of limestone - -	0	11
		59	8

The limestone occurs in three layers, shales of various degrees of hardness and consistence intervening as follows, with but very little variation, over the whole quarry: —

1. First layer of limestone	a complete aggregate of very fine small bivalve shells; the animals of which, judging from their perfect unbroken state, must have lived and died on the spot where they are now collected; many of them not much bigger than a pin's head. Contains very little iron; and affords most excellent lime	0 11
2. 'Slate bed' 'Slate'	shales, more or less earthy; containing occasionally, though very seldom, a long muscle-like shell; generally speaking, however, destitute of shells - -	0 5
3. The second layer of limestone	contains a good deal of iron, but few shells, and furnishes very poor lime -	0 5
4. 'Dirt beds' -	earthy shale - - -	0 11
5. The third layer of limestone	abounding in shells; and furnishing, like the first layer of limestone, most excellent lime - - - -	0 5

59 ft. 8 in. + 3 ft. 6 in. = 63 2

Below this, at the deserted shaft, now filled in some places two feet deep with water, whence I procured the calcareous water mentioned below, occurs a bed, several feet thick, of hard calciferous grit, excavated, in other parts of the county, for repairing the road, which is identical with the Tilgate stone, so celebrated as the deposit from which the bones of those extraordinary creatures before mentioned, megalosaurus, iguanodon, &c., were procured by Mr. Mantell. In a glen, called the Gill, a little below Pounceford Farm, through which flows a small rivulet, on the banks of which irregularly shaped nodules of argillaceous ironstone occasionally occur, are some interesting sections of curiously twisted strata.

The shells found in such abundance in these strata belong, for the most part, for the genus Cyclas (Cyclas membranàcea and mèdia forming entire beds). In some specimens of 'ragged bole' I collected from some heaps of rubbish on the roadside, near Burwash Wheel, I found several individuals of a beautiful little species of the spiral genus Melanópsis or Melània. Mantell mentions (*Geol. South-East of England*, p. 227.) having collected with Mr. Lyell on the quarries at Swife's Farm, just about a mile to the right of Pounceford, specimens of the genus *Mytilus* from the shale: undescribed species of Córbula and *Tellina* also occasionally occur.—These two last, as well as the *Mytilus*, are, I believe, considered marine; the existing species of these genera inhabiting the sea-coast. The presence of a few marine shells, however, will not, as De La Beche most justly observes *, invalidate the general testimony in favour of a lake, river, or estuary; "for not only may these shells have been introduced accidentally, but the animals inhabiting them may also have been gradually accustomed to live in fresh or estuary waters, as is the case, in the present day, with the species of some genera usually considered marine." (*Manual of Geology*, p. 305.)

Among other instances of this interesting fact, I may cite, from my own observation, that noble sheet of water, the Albufuera, near Alcudia, in the beautiful island of Majorca, separated from the sea by a shingle bank, through the pebbles of which the salt water percolates, the water of which I tasted, and found extremely brackish and unpleasant,—where a great variety of freshwater fish are, I was told, found. In a stream communicating with the Albufuera, about four miles up the country, several eels, natives of that lake, were caught in my presence, which I and my guide afterwards cooked and had for supper: we found them most delicious eating.

There are three workmen employed on this quarry, who are paid by the day: they work ten hours, and extract daily four square yards of limestone, containing about a hundred bushels of lime. A kiln, containing eight hundred bushels of lime, takes thirty-four hours in burning; and two hundred fagots are consumed in each kiln; a bushel of lime costs six-

* The experiments of M. Beudant have shown that, if freshwater Mollúsca be suddenly introduced into sea water, they die in a very short time; but, if the fresh water be gradually impregnated with salt, they will live in it when of the strength of sea water, withoutany injury: the same experiments repeated on fresh water Mollúsca gave similar results. See *Annals de Chim. et de Physique*, t. 2. p. 32.

pence, and it is in high repute amongst the agriculturists of this part of Sussex. A few bones of the *Crocodilus priscus* were found in the calciferous grit excavated for the roads, near Brightling, some years ago; and the publican at Burwash Wheel, at whose house I put up, gave me a solitary oyster from the same deposit. The beds, with the exception of the violently contorted strata in "the Gill" afore-mentioned, are almost horizontal, dipping at a slight angle to the north-by-east.

In Mantell's highly valuable work on the *Geology of the South-East of England*, is a drawing and description of the incrustating spring at Pounceford. He states that it forms an inconsiderable cascade over a rock of sandstone, and, pursuing a tortuous course, "deposits carbonate of lime on every extraneous body that lies in its channel, converting the mosses and other vegetables, within the reach of its waters, into masses of calcareous tufa." The specimens in Mantell's possession are incrustations of leaves, mosses, *Equisèta*, &c. "When recently collected, the moss on the surface was green and flourishing, and had evidently continued to vegetate, although the roots, &c., were completely embedded in the stone." (*Geol. South-East of England*, p. 22.) This water was never analysed; and the spring, after gradually diminishing every year in its lapidescent powers, has, at length, entirely been lost. In a deserted shaft, however, of the limestone, a deposit of calcareous earth from water is gradually taking place. I procured a pint bottle full, from the 'largest drip' (as the quarryman termed it), at about 70 ft. from the surface; for which purpose I waded knee-deep for nearly a quarter of a mile. The roof was covered with small stalactites, none of them exceeding 3 in. or 4 in. in length: some fagots, placed here some years ago to prop up the roof, as well as several pieces of wood which had fallen into the water, which will in time, if not checked, completely fill up the shaft, had become gradually petrified or converted into stone. Some years ago, in a block of rock formed by this deposition, which was soft when excavated, though it hardened on exposure to the air, was discovered a perfect skeleton of a hare: which had evidently fallen in from a fissure above, and gradually become entombed in calcareous matter. The bones, my informant (the head quarryman) told me, were beautifully white.

Sandgate, July 28. 1835.

ART. V. *Short Communications.*

MAMMIFEROUS ANIMALS. — *A Contest between a Stoat* (*Mustèla ermínea*) *and a Water-Rat* (*Arvícola amphíbia* Flem.). — I was passing along the banks of a small rivulet, in search of insects, in September, 1834, when I was greatly amused by the feats of a water-rat. He darted into the water, which was very clear, and about 2 ft. deep, and ran to and fro along the bottom, as if in chase of prey. He then took his station again, and looked intently into the water, and again plunged in as before; and this he repeated five or six times. The only living objects I could perceive in the water were a few sticklebacks (Gasterósteus aculeàtus) darting backwards and forwards: but whether he seized any of them, I could not ascertain. As I felt desirous of satisfying my curiosity as to the cause of his diving in the stream, I kept my eye intently fixed upon him and the water alternately; when he suddenly gave a loud scream, which certainly startled me for a moment. It was a shriek of fear, for he was in great trepidation, and moved his fore feet with great rapidity, as if to run away; still he kept his eyes intently fixed upon one place. His trepidation increased; my anxiety increased too, as I was ignorant of the cause of so much trepidation, and rapid action; but my mind was soon relieved, for he uttered another shriek of horror, and at that instant a large stoat sprang from the opposite bank (by which it had been concealed from my view). A furious contest took place, which lasted four or five minutes. The rat defended himself with great courage and ferocity, but was at length overpowered by his antagonist, which then seized him just under the ear, and bore him off in triumph to his retreat. This was the first rat I had ever seen killed by a stoat. — *W. H. White. Old Kent Road, Jan.* 10. 1835.

[*The Weasel's Agency in Destroying Mice in Stacks of Corn.* (V. 296, 297.)] — This little animal often makes the farmer its enemy, by its frequent depredations in the poultry-yard among the eggs, chickens, ducklings, &c. It is not so great an enemy, in all instances, as it is generally supposed to be. My venerable father, who was a considerable farmer in Derbyshire, left the following account of the weasel among his papers, which was found after his decease. He was a man who encouraged almost all living creatures on his farms; upon this principle, in his own words, — "As every cause has its effect, so has every evil its corresponding good."

"The weasel," he writes, "has been of great value to me during the last three years (1802, 1803, and 1804). I was

very much troubled about the vermin (mice) in my wheat ricks: I had tried ferrets, but I could not lessen their numbers apparently. As I was one day looking round my rick-yard I saw, on the roof of a wheat-rick, a *weasel*, seemingly intent upon watching for its prey: he suddenly entered a hole in the thatch, and brought out a mouse (nearly full-grown), and was immediately followed by another [weasel] carrying a similar burden. They entered another hole in the rick, and I thought I had finally lost all traces of them; but they soon found their way through the rick, and came out at the bottom, each bearing its burden. They crossed the rick-yard, and entered a hole in a bank which led under an ash tree. In about five minutes, they returned from their retreat in the bank, without their loads; crossed the yard, and entered the same rick again; when one of them stationed itself by the hole, as before, while the other, as I suppose, ferreted out the mice. On the approach of the latter to the hole, in the hope of making its escape, the weasel again darted into the hole, and very shortly, both the weasels returned, each bearing a mouse, as before, which they conveyed to their retreat under the ash tree; and this they repeated four times in about one hour and a half: thus destroying eight mice.

"I suspected that their nest was under the ash tree, and in this I was not deceived; for I soon found that they brought out four young ones, and introduced them into the wheat-ricks; and so greatly had they thinned the destructive mice, that, when the ricks were carried to the threshing floor, scarcely a mouse was to be found. After some months, the young weasels disappeared, and the old pair were left undisputed masters of the domain. This favourite pair continued for three years; each year producing a young brood, which disappeared the following spring. At length, one of my favourite *mousers* was caught in a rat-trap, and the other soon afterwards disappeared." May we not infer from the circumstances related, that the weasel might be tamed, and made as useful in driving away and destroying mice, as the ferret is in driving away rats? — *W. H. White. Old Kent Road, Jan.* 10. 1835.

[It is noticeable, in the two preceding anecdotes, that two kindred species of carnivorous animals were preying on two kindred species of rodent ones.]

A Cat with Eyes of different Colours. — At the house of Mr. Handforth, broker, No. 10. Borough Road, Southwark, is a white cat, whose left eye is of a light green, while her right is of a beautiful bright blue. — *James Fennell. Southwark.*

White Cats, I have observed, without exception, to sleep

very little in the day to what other cats do. Is this owing to the peculiar colour of their eyes permitting them to endure for a longer time than cats of ordinary colour the light of day? If not, to what is it ascribable? — *James Fennell.*

Birds. — Every season brings with it peculiar pleasures. Grieve not that the wild rose has departed like a sweet thought; droop not that the woodbine sounds not its bugle with perfumed breath; sorrow not that the song of the nightingale has ceased, that its beautiful "jug—jug," its thrilling swell, its matchless strain, flow not now from its melodious throat; sorrow not that the thrush has ceased its song, that the wild shout of the blackbird is more rarely heard, and that the pæan of the lark is not now poured to the rising and the setting sun. The gates to other enjoyments are opened hour by hour, and day by day. Here sweeps across the wheat lands, then poising in mid air, the tyrant hawk, yet gladdening the sight with its graceful motions; but, disappointed in its expected prey, hurrying like a coward to a weaker or less cautious victim, and presenting a striking contrast to the heavy flight of the fisher heron. Wandering in the woods, the eye is greeted with the sight of a host of wild pigeons; yet, cautious of the approach of man, they hurry on the wing, making the wood resound with the noise of their boisterous uprising. On the hedge-row trees the starlings are screaming and preening themselves in the sun; while the fieldfares, and their congener the redwing, are exulting and commingling in the most harmonious manner, yet timid and wary of the approach of the stranger. These, with several others, as well as the numerous water-birds of winter, afford a delightful source of amusement and instruction to the ornithologist. (*Doncaster, Nottingham, and Lincoln Gazette*, Feb. 6. 1835; in an able pleasing communication, entitled "Notes on the Season, No. VIII.," and given as appropriate to January: the part quoted above is not inapt to November also.)

[*Date of the Appearance of the Woodcock in Inland Localities.*] — Yesterday (Oct. 6. 1833) I accidentally put up a woodcock while walking in a little plantation near the house; this is early for their appearance in this part of the country. Woodcocks are always *first* found in little plantations and odd places, before they take to the great woods. I have between 40 and 50 acres of wood on the further side of the parish, a very favourite resort of these birds; but, were you to beat the whole wood at this time, I dare answer for it, you would not find a single cock. I have often seen a cock in the small plantations about home, considerably earlier than they are to be met with in the large woods; and the like is

the case in other parts of the country, and is known to sportsmen. — *W. T. Bree, in a Letter dated Allesley Rectory, near Coventry, Oct.* 7. 1833.

The Woodcock occasionally Breeds in Britain. (I. 83., VIII. 612.) — A woodcock's nest was found in Worcestershire in 1811. I forget the number of eggs, but two young ones, well stuffed, I saw in the possession of a shoemaker, who preserved specimens of [objects of] natural history for sale. — *Lansdown Guilding. May* 1. 1830. [Montagu has remarked, see his *Orn. Dict.*, Rennie's edit., that many instances of the woodcock's breeding in Britain are recorded. Two others are now added here.]

[*Early? Time of the Year for the Occurrence of a Nest of Young Woodcocks in Britain.*]—I find that it was on April 1. this year [1834], that Mr. Palliser found, at our place, Seacocks Heath, Hawkhurst [Kent], a woodcock's nest with four young ones. The nest was in an open part of our wood, upon the ground, and was composed of dry leaves and grass. We tried to rear one of the young ones, but it died after two days. In the same month,

A Snipe was constantly lying in the rushes of one of our ponds, but we could not find its nest. — *F. Palliser* [*Staying at*] *Wimbledon House, Surrey, May* 30. 1834. [On the woodcock, see also II. 146.; V. 502, 503. 570. 725, 726.]

On May 28. a woodcock's nest was found, with eight fully fledged young woodcocks in it, on the shore of Loch Lomond, near Belloch Castle. (*The Oxford Herald*, June 13. 1829.) The woodcock's eggs are generally four. (*Montagu*, as adduced in Rennie's *Mont. Orn. Dict.*, p. 560.)

A Notice of an Unusual Individual of the Common Woodcock (*Scólopax rusticola* L.), *or of an Individual of a Distinct Species.* — On about Dec. 10. 1832, I went into Cornwall, and, whilst staying at Trebartha Hall, the seat of F. H. Rodd, Esq., went out woodcock shooting. It happens that this place is one of the best places for woodcocks in the county; consequently the keeper, who is a very intelligent man, must be supposed to know something on the subject, from having seen so many killed. We flushed one and killed it; but, when we came to pick it up, we found that, although it was perfectly formed and feathered, it was but of half the size of the common woodcock. The colour was the same. The usual weight of a woodcock is, I believe, from 12 oz. to 14 oz.: this weighed 5½ oz. The keeper said that he had not hitherto recognised more than one species, differing in plumage according to the sex, and that some have the outermost feather of the wing white; others have it of a mottled brown, the

same as the other feathers of the wing: these differences he supposes to be the distinguishing ones between the male and female. Now, what I wish to know is, whether a less sort of woodcock is known to occur ever in this country? or whether this is to be considered a dwarf one of the common species? Or, can it be the American woodcock? which is, I believe, a small bird. The individual was considered so curious there, that they had it stuffed. Bewick does not help us. — *A Constant Reader.* 13. *Old Cavendish Street, March* 12. 1833.

[Montagu states (see Rennie's *Mont. Orn. Dict.*, p. 560.) that the woodcock "is subject to great variety: some are very dark-coloured and small; others are large, and the plumage much more rufous. These have been thought two different sexes, but without foundation. By dissecting many, we found that the female is generally larger, and commonly partakes more of the ferruginous than the male."]

A Pair of a Species of Bird, presumed to be Sabine's Snipe, (*Scólopax Sabini Vigors*), *shot in Lancashire.* (III. 29.) — Some years ago I killed what I am now persuaded was a Sabine's snipe; but, unfortunately, it was not preserved; for, hanging it up in the larder with the other birds I had killed, I found, to my great mortification, that the cook had stripped it of every feather before I was aware of it, and before I had noted down the markings of the plumage. The dry weather of August, 1820, had driven a flock of the golden plover from the moors to the banks of the river Wharfe; and, on the 14th of that month, I had been out with my gun endeavouring to shoot some of them. On my return I sprang this snipe from a pond near home, and killed it. When I picked it up, I was astonished to find a snipe with the plumage of a woodcock, and showed it to a friend of mine who is a good practical ornithologist; but he was as much puzzled as myself to give it a name: so, not being able to find a description of it in any books to which we had access, we jumped to the conclusion, that it was a hybrid between the snipe and the woodcock, and called it a bastard woodcock. According to the recollection I have of it, it was as large as the solitary snipe, and the bill was a little longer; the general appearance of the plumage on the wings and back resembled a dark-coloured woodcock; but under the wings the fine *bloe* inner coverts exactly resembled those of the snipe. In those days I had no idea of the value attached to rare birds, nor did I know any thing of the art of preserving birds, or of bird-preservers; and, no doubt, some of these gentlemen will pronounce me a *great Goth*, when I tell them, that what I regretted most, when I

found that the bird was plucked, was the loss of the wings, the feathers of which I wanted to dress [artificial] flies with. Three days after I had killed this, I saw another of the same species in a ditch adjoining Sir Henry Ibbetson's park at Denton; but, being in his preserve, I had no opportunity of procuring it. I have never seen one since; and, until I had seen the sixth edition of Bewick's *Birds*, I was unable to make out the name; about which I may still be mistaken. — *T. G. Clitheroe, Lancashire, May* 29. 1834.

The Scólopax Sabìni (II. 207.) [in reply to the query there]. The Scólopax Sabìni is described and figured in the *Linnæan Transactions;* but, unhappily, the custom of giving uncoloured plates has been followed in this, as in too many other instances. — *Lansdown Guilding. St. Vincent, May* 1. 1830.

The Nightingale singing in the Winter-time in Britain. — Mr. Newman has related, in V. 654., that, on December 12., either 1823 or 1824, he "heard the nightingale singing clearly and distinctly, although not very loudly," at Godalming, in Surrey. The poet Cowper has also some stanzas addressed "To the nightingale, which the author heard sing on new year's day, 1792." Mr. Newman has also remarked that he has "frequently seen the nightingale," in the neighbourhood of Godalming, "in October, and once in November."

Some Skylarks were Singing on the Wing on Sept. 27. 1834, *in Scotland.* — While I was enjoying a rural walk on the morning of Sept. 27. 1834, with two friends, both keen and accurate observers of the feathered race, our ears were agreeably, though unexpectedly, saluted by the well-known voice of the skylark, several of which were pouring in mid air their clear and spirit-stirring minstrelsy. So full of sweet enthusiasm were their effusions, that, had it not been for the dull damp atmosphere, the flutter of falling leaves, and the sad and sterile aspect of the fields, we might have fancied that they were welcoming in that "season of soft delight" when bud and blossom gem the laughing earth. So unusual a circumstance is it, indeed, to hear larks in full song during the moulting season, that my friends averred that a similar instance had never come within their observation; and they attributed it to the individual birds in question, which were young ones, being of such uncommonly strong and healthy constitution, as had enabled them to get through the moulting easier and earlier than their contemporaries, and that they had been tempted by the mildness of the weather to try the power of their wings, and give vent to their pleasure in the animated accents of their own delightful melody. — *William Gardiner, jun. Dundee, Oct.* 4. 1834.

The Honey Buzzard (*Fálco apívorus* L.), a fine individual of, was shot, a few days ago, by Mr. W. Thompson, of the Bleach Green, near Brandon, three miles from Sutherland. Mr. Thompson shot it on the wing; and, when he went to take it up, he found that the craw, or stomach, had burst with the fall, and that hundreds of wasps, with their larvæ, were lying on the ground. He has sent the specimen to Mr. W. Proctor, keeper of the museum of the Durham university, for preservation. (*The Hull Advertiser*, October 9. 1835.) [In the account, it is stated, besides, that "The length of this bird, from the bill to the end of the tail, is 22 in.; and, when the wings are expanded, they measure 49 in. from tip to tip." It is not absolutely clear whether this is stated of the species, or of the individual noted on.]

The Bohemian Waxwing, or Chatterer (p. 511.); *the Appendages to its Wings vary in Number in different Individuals: an instance of this.* — A beautiful individual of the Bohemian chatterer was shot in January, 1835, by Mr. John Crosthwaite, of Hall Garth, in Thornthwaite, close to his own house. ". . . . the secondaries are tipped with yellow, each pointed with a flat horny substance of a bright vermilion colour. These appendages vary in different subjects: this bird has five on one wing, and seven on the other . . . This is the only" individual "which has been shot in this part since 1803." (*The Carlisle Journal*, in the latter part of January, 1835.)

[*Charàdrius mìnor has been taken in Britain; Grounds of Proof of the Correctness of Identifying the Birds so deemed as it.*] — I have just seen the 53d number; and, in p. 510., was much surprised to find an article by Mr. Strickland, questioning the accuracy of Mr. Gould in considering the bird which I sent to him for inspection as the young of the little plover (*Charàdrius mìnor*). Mr. Strickland has, apparently, formed his opinion solely from Mr. Gould's plate, without either examining a specimen of the bird (*C. mìnor*), or the description of it in the works of any of the Continental naturalists. Had he done this, he would have found that Mr. Gould was incorrect in figuring it with a white rump, as that character is not possessed by the little plover, either in the young or adult state: how the mistake occurred in Mr. Gould's plate, I cannot say.

I am perfectly acquainted with the common ring-plover in every state of plumage, having killed and examined a great number of specimens at various times; and I have no hesitation in saying that the specimen in question is quite distinct from that bird, and that it is really the young of *Cha-*

ràdrius mìnor. My friend, Mr. Yarrell, at once pronounced it to be so; and no person at all conversant with ornithology could possibly confound it with either *C.* Hiatícula or *C.* cantiànus. I have now the bird before me, together with a common ring-plover of *the same age*, and the difference is very obvious. *The much smaller size of the bird* *, *the far slenderer bill and tarsi*, and *the very small foot*, at once distinguish it from the latter species, independently of what I believe to be an invariable distinctive character, in the *young* at least; viz., the exterior feather of the tail: in the *young and adult* Charàdrius mìnor, it is *white, with a large blackish spot on the interior web:* in the young *C.* Hiatícula, *invariably pure white;* and in all the adults I have seen this character holds good. I have this day examined several specimens, and not one has the least trace of a spot on this feather; and, on turning to the appendix to Parry's *Voyage*, I find it stated that this feather was pure white in all the specimens obtained.

I have compared two Continental specimens of *C.* mìnor, with my bird, and they perfectly agree in the tail, bill, tarsi, &c., the only difference arising from age, these being adult specimens.

I will now subjoin Wagler's and Temminck's description, as far as necessary.

"Charàdrius mìnor. Rostro toto nigro, pedibus flavis, remigibus fuliginosis, scapo primæ albo, cæterarum fusco: — vertice, occipite, *dorso toto*, scapularibus alarumque tectricibus omnibus *fusco-cinereis*, rectricibus utrinque duobus extremis albis nisi intus medio fasciola nigricante." "Juv. horn. Remigum rectricumque pictura eadem ac adulto." *C. Hiaticula.* Juv. *rectrice utrinque extima tota alba.*" (Wagler, *Systema Avium.*) "Charadrius minor. — Bec entièrement noir, pieds jaunes," &c. "Occiput, et *toutes les parties supérieures, d'un brun cendré:* les deux pennes extérieures de la queue blanches, mais portant une bande noire sur la barbe intérieure." (Temminck, *Manuel d'Ornithologie.*) From the above extracts, Mr. Strickland will see that *C.* mìnor has not a white rump; and I may add, in confirmation, that the rumps of the two adults I have precisely agree with the same part of *C.* Hiatícula, and that no specific distinction can be drawn from it.

I also hope that what I have now said will convince Mr. Strickland, that my bird is a specimen of *C*haràdrius mìnor; that it, occasionally at least, visits this country; and that I am

* The length of the young *C*haràdrius Hiatícula is 7¾ in., the middle toe ⅞ of an inch long. The young *C.* mìnor only measures 6½ in., and the middle toe ⅝ of an inch; yet the bird is full-grown, as the tail, &c., are quite perfect.

as well acquainted with the distinction of the two species as he appears to be. I may just add, here, that on the 3d of October, 1834, I shot a fine adult male of

The Grey-headed Wagtail (*Motacilla flàva* Tem., M. *neglécta* Gould), I believe the only individual ever killed in this country. It was on the top of the cliff at Walton on the Naze. — *Henry Doubleday. Epping, Oct.* 8. 1835.

The Guillemot's Habits. (p. 162—165.) — I lately happened to have an opportunity of observing a guillemot diving in very clear water, and was much struck with the very great similarity of its wings, both in their shape and in its manner of using them under water, to the fins of a fish, "remigium alarum;" and in the water, instead of the air, the analogy loses none of its force. — *F. O. Morris.* [Received on September 22. 1835.]

A Nest of the Wren (*Anorthùra*) *built within that of the Chimney Swallow.* — On the 22d of April, I was informed, by an observant person in the neighbourhood (though one but little acquainted with books, unless it be the *Penny Magazine*), that "a tit had reared her brood in the nest of a swallow." Every one knows that house sparrows frequently build in the nests of swallows, especially of the window swallow (*Hirúndo úrbica Pliny*); but I had never heard of a tit (Pàrus) behaving in so shabby a manner. In V. 602. is an account of the large black-headed tit breeding in the nest of a magpie; but then, in this instance, the little "saw-sharpener" had full right to the prickly castle; he had not, like the saucy sparrows, suited himself at another's expense. However, I set off in quest of this tit's nest within a swallow's, and, after some search, saw the nest of a chimney swallow (*Hirúndo rústica*) with a rim of moss peeping out. I climbed up, and found it empty: the young had flown; so, without compunction, I took it down, and found, from its materials, the architect of the inner apartment to be, not a tit, but a wren (Anorthùra *Rennie*). My informant was a Yorkshireman, which accounts for the name he gave to the swallow's tenant: for I have found what Mr. Herbert says in Rennie's beautiful octavo edition (1833) of White's *Natural History of Selborne* to be correct; namely, that, in Yorkshire, the wren is called a "tit;" the yellow bunting, "goldfinch;" the hedge dunnoc, "cuddy;" the goldwing, "redcap;" and that the fauvettes (*Ficédula*) are confounded under the name "whitethroat," except the black-capped fauvette (*F.* atricapílla *Blyth*), which is not known at all. Neither was the individual to whom I have alluded acquainted with the reedlings (Salicària *Selby*). One of them at least, however, the sedge reedling (S. phragmìtis *Selby*),

can hardly fail to be known to any one who has listened to the nightingale (*Philomèla Swainson*). The nightingale, the reedling, the cuckoo, the gallinule, the crake, and the nightjar are the nocturnal performers in our neighbourhood. — *S. D. W. Near Derby, May 5.* 1835.

[*The Canary Finch, a Notice of Societies once extant for promoting the Culture of it, and of their Scope.*] — There were in London, fifty years ago, several societies, consisting of gentlemen and respectable tradesmen, who took great pleasure in breeding canary birds, for the beauty of their plumage, not caring about their song. I think that this practice is still continued. They held their show-day some time in November, when prizes were awarded. They had a standard of the properties wherein the beauty was deemed to consist, and the bird that came nearest to it obtained the best prize: others had smaller prizes. In a society called The Royals, the highest prize was thirty guineas! Each society had a secretary, and the members were ruled and governed by established laws, some of which were as follows: — When any one enters the society, he must purchase his birds of a member; then he must inform the secretary how many pairs of birds he puts together, and pay accordingly; when his young ones are hatched, he must declare them to the secretary, while they are in the nest. The secretary will visit every breeder from time to time, just like an exciseman, to see that he does nothing unfair. This fancy was attended with some expense, for there was a subscription to raise a fund to pay the prizes; then there was a dinner, with other incidental expenses. I will now state, as well as I can, the five primary beauties: — First, the cap, for magnitude and regularity; secondly, for colour; thirdly, fair breast; fourthly, size and shape; fifthly, wings and tail black. There are five secondary beauties: — The bottom of the down-feathers must be black; the quill-feathers in each wing must be just eighteen in number, and black; and the tail-feathers twelve, and black also; the back should be finely spangled, gold-colour, and black. N. B. If there was one white feather in either the wings or tail, the bird was deemed a foul one. — *M. Ashley. Chelsea, June 25.* 1835.

[An addition contributed subsequently by the same.] — The fancy canary birds were bred in France and Germany for a long time before they were bred in England, and, on that account, they were called French and German birds, as if supposing them to be aborigines of those places: but they came originally from the Canary Islands; and, although there is such variety of colour in them in their cultivated state, they

are uniformly of one colour in their wild state, which is a greenish yellow, and not very beautiful. The connoisseurs call those of the strongest colour, junks; and the others, mealies. It is the general practice to breed junk and mealy: the mealies are reckoned the strongest birds. If any one wishes to breed beautiful hybrids, they should have a junk female canary, and as large a male goldfinch as they can get. As soon as the young ones are hatched, take away the goldfinch, for he will not feed them, but be continually pecking them.

The Carrier-Pigeon. A Society of Pigeon Fanciers, at Ghent, give an Annual Prize for the Best Carrier Pigeon. — In 1833, this prize was decided on June 24th, when 24 birds were sent off from Rouen, whither they had been conveyed from Ghent. The distance in a direct line is about 150 miles. They were started at Rouen at 55 minutes after 9 o'clock in the morning. The first which arrived at Ghent had made the transit in an hour and a half; 16 arrived in 2½ hours, three in the course of the day, and four were lost. (*Berrow's Worcester Journal*, July, 18. 1833.)

Molluscous Animals. — *Nummulites.* It will be as interesting to the geologists as to the collectors of animals, to learn that I have lately dredged up in these seas numerous specimens of recent Nummulites, entangled in sea-weeds. They are thin, the whorls very numerous, and the shell not exceeding three lines in diameter. I, at first, supposed they might be allied to some genera of corallines; but, from their structure, it is more probable that the shell, as in Spírula [V. 612.], is subinternal. This fact [? assumption], however, I have yet to prove. They form an interesting object for the microscope, and shall soon be figured for some British work. — [*The late Rev L. Guilding. St. Vincent, May* 1. 1830.]

A Fact in Proof that the Eatable Muscle (*Mýtilus edùlis*) *may be poisonous at the Time at which it produces its Spawn.* — It is well known that fish generally are more or less unwholesome at the spawning season; the salmon, for instance. Some, indeed, are extremely deleterious: a beautiful and wise provision, intended by Providence to secure the perpetuity of the species. Some eight summers ago, while walking *en solitaire* along the sands of Exmouth, on the coast of Devonshire, I picked up a substance resembling crumb of bread sponge; and, on minutely examining it with a lens, discovered it to be the matrix of innumerable minute muscles, evidently the spawn of the *Mýtilus* edùlis. I rubbed a portion of the embedding substance on the back of my hand; when it was followed by a virulent inflammatory

action, accompanied by eruptive spots; which, finally becoming ulcerated, healed with great difficulty. The marks still partially remain, and, it is likely, will continue for life. I was informed that a gentleman, in bathing, accidentally set his naked foot on this substance, which was attended by violent sickness. These facts show that it is not an imaginary or fanciful poison, but one possessed of no gentle malignity; and as children, especially, are too apt to handle the rejectamenta of the sea, this cursory notice may not be altogether useless. — *J. Murray. May* 19. 1835.

Worms. — *Lumbrìcus tùbifex* β is Müller's name for the species, or variety of a species, of worm on whose habits interesting facts have been registered in V. 387, 388., under the title "*Zoophytes at Bury St. Edmund's;*" in V. 388., under the title "*Freshwater Polypus;*" in V. 754, 755., under the title "*Blood-red Zoophytes.*" Mr. Bree has suggested, in V. 754., that "it might be worth while to give a figure of it, together with its name, and a more full description." We have expressed, in the same page, a concurrence in the purpose of this suggestion, and a disposition to perform it, if some correspondent would supply us with the means. Shortly afterwards, a correspondent favoured us with the following communication: — "These creatures are improperly termed zoophytes. [This had been noted in V. 754.] As you expressed a wish, in your last Number [V. 754.], to be furnished with a figure and some further account of this supposed zoophyte, I send you a sketch of one from a drawing which I made several years ago, accompanying a few remarks. Although these creatures are common, at some seasons, in shallow water on muddy bottoms, I cannot readily procure specimens now, or I would send you a more highly magnified figure. The animal is of a pellucid pale yellow, with a red spiral or undulated line, which I consider the alimentary canal, visible through its whole length. The fore part, for about one third of the animal's whole length, is armed with fine setæ (bristles) pointing backwards. I cannot refer it to any described species; but I think it will rank with Lamarck's Naïades. I once found patches of these worms in a shallow pool containing

Branchiópoda stagnàlis, and thousands of Cỳpris conchàcea, and Cỳclops Geoffroỳii of Leach. — I collected some of all these interesting creatures in a glass vessel, with the mud and water of the pool, and kept them, to my great amusement, many weeks. The worms acquired their natural habit as soon as the mud had settled at the bottom of the glass; for they kept their anterior part out of the sediment in continual

motion, except when they were disturbed. A slight movement given to the vessel caused them to instantly withdraw out of sight for a few seconds. They, very probably, fed, when in confinement, on the smaller animalcula; but this I never noticed. I expect that some of your scientific correspondents will furnish you with better information, and more illustrative figures, of this worm; but, if they do not, I will examine it more attentively when I meet with it again, with a view to the *Magazine of Natural History*. — *W. B. B. W., Nov.* 14. 1832.

Not any correspondent has fulfilled W. B.'s expectation; and, as W. B. had not, up to the closing part of April, 1835, farther noticed the subject, we then asked of Dr. Johnston of Berwick upon Tweed an identification of the animal treated of in V. 387—389. 754, 755., and in W. B.'s sketch and communication, which we referred to him. Dr. Johnston has, in a note dated May 11. 1835, obligingly answered as follows: — "The blood-red zoophyte, referred to in the communication now returned, is *Lumbrìcus tùbifex β Müll.*, Verm. ii. 27.; and is very common over all Britain, as I believe. I know of no figure of it; but the one appended to the communication of W. B. is not sufficiently accurate for engraving: it is very like our *Lumbrìcus lineàtus*." [VIII. 259.]

[*A Notice in Confirmation of the Correctness of the Idea conjectured by Dr. Turton, that the Shell of Patélla tricórnis is the Operculum of Sérpula vermiculàris* L.] — Many of your readers have, doubtless, observed a postscript to Turton's *Conchological Dictionary*, in which the learned author mentions the fact of his having observed several of his Patélla tricórnis so situate as "closing up the orifices of the tubes of Sérpula tubulària" [Sérpula vermiculàris *L.*; see in VII. 421.]; and he hence conjectures, that "they may eventually turn out to be the opercula, or lids, of the Sérpulæ:" yet, as the animal inhabitants of such specimens as he examined were "dead and shrunk deep into the tubes," he could not perceive any kind of attachment, and, therefore, left the decision of this interesting point to the result of future observation. Now, I have recently been fortunate enough to take a living specimen of Sérpula tubulària, with a Patélla tricórnis attached to it in such a manner as to leave no doubt whatever of its being the operculum of the Sérpula. I have kept the specimen for some days in a living state, and have therefore had ample opportunity of convincing myself of the fact above mentioned. I am not aware that any one has preceded me in the confirmation of Turton's conjecture; and, if not, I trust that this

communication may not be altogether uninteresting to your conchological readers. — *F. H. N. Glossop. East Teignmouth, Devonshire, September* 7. 1835.

LEECHES. — *The Flying Leech.* (II. 368., V. 754.)—I have lately read with much interest, in a book entitled *The History of Ceylon by Philalethes, and Robert Knox's Historical Relation of the Island*, some account of leeches which I have no doubt are the same kind as those mentioned in this Magazine (II. 368; V. 754.). Why they are called flying leeches I cannot understand; but I think an extract or two from Philalethes and Knox will be acceptable to some of your readers: —

"Leeches swarm in particular situations, where they are found very vexatious to the traveller on his way, or to the troops on their march. They are of a reddish brown colour, about the thickness of a knitting needle, and an inch in length. They fasten on the feet," &c. (*Philalethes*, p. 264.) "There is a sort of leech of the nature of ours, only differing in colour and bigness; for they are of a dark reddish brown colour, and as big as a goose-quill; in length some are 2 or 3 inches. At first, when they are young, they are no bigger than a horse-hair, so that they can scarce be seen. In dry weather none of them appear, but immediately upon the fall of rains the grass and woods are full of them. These leeches seize upon the legs of travellers, who, going barefooted, according to the custom of that land, have them hanging upon their legs in multitudes, which suck their blood till their bellies are full, and then drop off.

"They come in such quantities, that the people cannot pull them off as fast as they crawl on: the blood runs pouring down their legs all the way they go, and it is no little smart neither, so that they would willingly be without them if they could, especially those that have sores on their legs; for they all gather to the sore. But besides these, there are water leeches, the same with ours." (*Knox*, p. 48.) — *W. B. B. W.*, *Nov.* 15. 1832.

[In the extract (Vol. II. p. 368.) quoted from Heber's *Narrative*, it is stated, that "they possess the power of springing, by means of a filament, to a considerable distance." "A Subscriber" observes, (vol. v. p. 754.), on his own experience, "I never saw them attempt to spring; but they certainly contrive to fix themselves most dexterously on the legs of men and horses, even when moving on at a smart pace." The late Rev. Lansdown Guilding has observed, in a note lying by us (date, May 1. 1830), that "this flying or springing leech? [II. 368.] is worthy of farther investigation. I have

elsewhere read of leech-like animals, which, in Asia, attack the skin, and produce dangerous and poisoned wounds."]

INSECTS. — *The Glowworm* (VII. 250—252.); *The Results of Experiments in Elucidation of a Knowledge of its Habits.* — I collected six glowworms in June, 1829, on a bank in Ampthill Park, Bedfordshire, and placed them in a glass jar, into which I put sand to the depth of about 2 in., taken from the bank on which I had found them, and covered the sand with moss from the same place, that their artificial situation might resemble their natural one as nearly as my confined limits would allow. I introduced my little family into their new and confined dwelling on June 25th, and watched them daily with considerable anxiety. I was obliged frequently to sprinkle them with water, for I found that, if the moss got dry, they would bury themselves in the sand, I suppose in search of moisture; for, as soon as they found the moss wet, they would come from their hiding-places, trim their beautiful lamps, which became dull when the moss and sand were too dry, and shine with almost unremitting splendour.

I wanted two things to complete my experiment; namely, a male, and proper food for their subsistence. I had considerable difficulty in capturing the male; but I have since understood that the males are very fond of the juniper tree, and may be taken about it without any difficulty.

Food. The females had been in confinement a week when I introduced the male; and, during that period, I had tried a great variety of things, such as worms, caterpillars, beetles, various insects, decayed animal and vegetable substances; in short, any thing I thought the vicinity of their haunts likely to produce: but the objects I supplied seemed not to please their appetites at all, and I began to fear they would die for the want of proper nourishment; I therefore resolved to visit their favourite resorts, and endeavour, if possible, to detect them in the habit of feeding; and I was amply rewarded for my trouble; for on my third visit I detected a female, half buried in the shell of a snail (Hèlix nemoràlis), in the act of feeding. My mind being thus relieved, I soon procured a plentiful supply of food for my little prisoners. I divested two or three snails of their shells, and soon had the gratification to find that I had provided them with a most agreeable repast; so much so, that three of the females appeared to eat nearly the whole of the following day, without intermission; after this abundant feasting, they abstained from food for eight days, at least during the day-time. I also found that the middle-sized snail seemed to give the most agreeable relish; hence I considered I had found the proper food for the glowworm.

My next care was to carefully watch them from day to day. I found that a change of moss, once in ten or twelve days, was very agreeable to them, as they always appeared more lively and active, and emitted also a more brilliant light. On July 12th, the male flew out of the jar; and, the window being open, he made his escape. On the 16th, I observed one of the females depositing her eggs among the moss; and on the 23d she died. The other four died about the beginning of August; but how many of them laid eggs I could not ascertain.

Eggs. The eggs were of a pale yellow colour when deposited, and instantly emitted light; and I found, when I had occasion to sprinkle the moss with water, that the eggs emitted a stronger light: they became a little darker in four or five days.

Larvæ and Pupæ. I found, on August 27th, that the larvæ began to appear. They were rather lighter in colour than the eggs, but became gradually darker as they advanced towards maturity. They had, when young, the power of emitting light, or otherwise, at pleasure. After about 30 of the larvæ had escaped from the eggs, I carefully transferred them to the fresh moss, and placed the old moss, with the remainder of the eggs, upon a bank, to follow nature's course. In sixteen days, three of the larvæ ceased to eat, and retired to one side of the jar, for the purpose of moulting, or casting their skins, in which operation they appeared to suffer much: they became very weak and languid, and ceased to emit light. The operation being at length overcome, two whole days passed before they appeared to have strength to partake of food; but, after they had once or twice taken nourishment, they became more lively and vigorous, emitted a much stronger light, and seemed to make amends for their long fasting, by eating, if I may so speak, with double voracity. My little family continued to feed, grow, moult, and hasten to their maturity. On the 10th of May following (making a period of nearly nine months in coming to perfection), three of the larvæ ceased to take food, and, as I thought, to prepare for another moulting; which, indeed, was the case; but, instead of a lively worm, I soon found (on the 13th) that one of them had become a chrysalis, and the other two changed into the same state on the 15th. The chrysalis, at first, appeared of a yellowish colour, but soon deepened into a reddish brown. In the course of ten days, several other larvæ entered into the chrysalis state; while others, to my great astonishment, still continued in their larvæ state till the May following, making a period of one year and nine months: whether this was owing

to any improper treatment, or whether they required longer time to arrive at maturity, a second experiment may be the means of convincing me. But to return to my chrysalides: the first, a female, arrived at perfection on the 30th of May; the second, a male, on the 3d of June; and the third, a female, on the 5th. The skin of the chrysalis is so transparent, that the perfect insect, whether male or female, is easily distinguished through it.

I propose making a second experiment, if I can meet with a few glowworms this approaching summer. — *W. H. White. Old Kent Road, Feb.* 6. 1835.

Localities near London in which the Glowworm has occurred. —I have seen glowworms in a friend's possession, at different periods, brought from Hendon and other places near London; and I have known them to be found on the banks of the ditches at Kennington Common. — *James Fennell. Temple, May*, 1834.

Notice of certain Characteristic Differences between the Larva and Imago of the Glowworm. — The larva of the glowworm has the thirteen segments of the body, each laterally marked with a reddish spot; the female imago is generally without any trace of this: the larva is velvety black; the imago brown and somewhat glabrous; the larva is longer and narrower; the imago broader and shorter: the larva gives an uncertain and intermitting light from the telum (*Newman*) and paratelum (*Newman*) only; the imago gives a bright and continuous light from the decator (*Newman*), protelum (*Newman*), paratelum, and telum: the antennæ and legs of the imago have their parts fully developed; the same parts, in the larva, are rudimental. — *E. N. D. Nov.* 22. 1834.

E. N. D. obligingly supplied these definitions in reply to the same point of question of our correspondent E. Wilson, junior, as is expressed in VII. 251., who sent, after the publication of that question, specimens to illustrate it, which we submitted to E. N. D. His reply above answers the point of question, Is the larva luminous? affirmatively.

The Larva of the Glowworm differs from the Perfect Insect most materially in point of size, its body being much larger; besides, it is more elongated, more segmented, and possessed of greater power of motion. Mr. Rennie, who has given a figure of it in his *Habits of Birds*, p. 25, 26., found it at Dartford in Kent, so early in 1830 as March 14.; but has not stated whether it possessed a luminous appearance at that period. — *James Fennell. Temple, May*, 1834.

The Glowworm's Eggs are Luminous. (VII. 252.) — Captain Brown, in his edition of White's *Natural History of Selborne*,

p. 318., mentions the same property in the egg. — *Id.* [Mr. White has too, above, in p. 624.]

The Female Glowworm "has the Power of dimming her Lamps, if disturbed by an unwelcome Visitor." (VII. 251.) — This is a very common notion, but does not appear to be always correct; for I have seen glowworms shining while held between the fingers, and even when shaken in a box; and Mr. Rennie, by way of disproving Mr. Knapp's theory respecting their dimming their light to escape from birds, positively states (*Insect Miscellanies*, p. 228.) that they never extinguish it when alarmed or seized. — *Id.*

Glowworm's "hide themselves by Day." (VII. 251.) — I have once seen a male, in the day-time, on a paling at Paddington. — *Id.*

The Earliest Dates in the Year at which the Glowworm has been seen in a Luminous State. (VII. 252.) — June 14. is the earliest given in VII. 252., and the instance was seen by the Rev. W. T. Bree. I saw three glowworms in a luminous state, in fact, quite as brilliant as at midsummer, on May 5. 1834, in the course of a professional ride late in the evening. They were lying at intervals along the road, on the upper beds of the Wealden, about four miles below the chalk-hills.— *P. M. Reigate, May* 19. 1834.

A date more than six weeks earlier than that of June 14., cited from Mr. Bree, is recorded by White in his Calendar; namely, May 1., Mr. Knapp says that the light is not so clear and steady after the middle of July. — *James Fennell. Temple, May*, 1834.

Véspa británnica. (VI. 535—538.) — I found last month, on my premises, a fine specimen of the nest of *V*éspa británnica, as big as a large cricket-ball: it was in the hole of an old tree. I take it to be the same [in kind] as Mr. Whitfield's published in VI. 536. We have

An Abundance of Common Wasps this Year [1834], in July and August, though there were very few to be seen in April: just the reverse of last year, when there were very few in the summer, and an unusual number in spring. How strange! and how is it to be accounted for? — *W. T. Bree, in a letter dated Allesley Rectory, August* 7. 1834.

["Abundance of wasps is said to denote a good fruit year. We have remarked, also, the converse of this; for in the present season (1824), perhaps the worst for apples and stone fruit that we remember, there is scarcely a wasp to be seen. In general, towards the close of summer, they are very numerous, particularly in the month of September. In 1821, they were prodigiously plentiful; and in 1822, there were a

great many of them; while 1824 scarcely presented a solitary wasp, even where they usually abound. (*Forster's Encyclopædia of Natural Phenomena*, ed. 1827, p. 71, 72.)

The measure of the means of sustentation must influence the rate of reproduction in every species of organised being: fruits are a staple means of sustentation to wasps.]

[*Facts on the Habits of Wasps of the Species* Véspa holsática Fabr. (*Synonyme*, Véspa ánglica Leach): *it may be some on the Habits of the Common Wasp* (Véspa vulgàris).]—Wasps have again (VII. 265.) appeared here, but are not numerous. I have seen five nests, all closely resembling fig. 69. in VI. 537. each apparently occupied by a single individual. Accident prevented my capturing more than one of the five wasps, which I enclose. It is clearly a *V*éspa británnica, differing slightly from fig. 71. in VI. 538., in the form of the yellow bands on the joints of the abdomen. Many of the wasps that infested us last summer (VII. 265.) were, no doubt, of this species, as many nests were the same. Others, whose nests were in holes in banks, were probably different; perhaps, *V*éspa vulgàris.

I had an opportunity, last May, of noticing in how short a time a wasp's paper nest may be constructed, having seen, about 10 o'clock one forenoon, one of the size and shape of fig. 69., VI. 537., suspended from the very spot under the overhanging bank of a pit, from which I had seen gravel scooped at 12 o'clock the day before: the inner wall was complete, and about a quarter of an inch of the second formed; in the course of the day this was brought down about half way; the next day it was completed, and a third case begun; after this I left home, and found the nest destroyed when I returned. During the whole time that I observed its progress, the wasp seemed to be as much occupied with some work in the interior (perhaps its comb) as it was with its outer cases. — *A Subscriber. Vale of Alford, Aberdeenshire, July* 25. 1834.

[The specimen sent we have submitted to an able entomologist, who has replied that it is of the species *V.* holsática *Fab.*, *V.* ánglica *Leach*; and has added, that this species is not of solitary habits generally: "I have seen large colonies of them. — *E. N. D.*"

In VII. 373. is a description, by the late Rev. L. Guilding, of the structure of the nest (if nest, such as the above, and it, should be called; Mr. Guilding had termed them "natural hives," in an observation printed in VI. 540.) of the species of wasp which he has noted "is the marabunce of Demerara."]

An Instance of the Natural Hive (*Nest*) *of the Hornet being*

formed in a Bank. — In the volume on *Insect Architecture*, published in *The Library of Entertaining Knowledge*, at p. 79., is the following passage: — "The hornet, also, does not build underground, but in the cavities of trees, or in the thatch, or under the eaves of barns." An exception to this occurred, under my own observation, in July [1834], when I assisted in destroying a hornet's nest formed in a bank, composed of soft light grey sand and heath: it was in a recent state, there being only four or five hornets, and but few cells: the greater number of the latter were occupied by grubs. — *John Reynolds Rowe. Wimborne, Dorsetshire, Nov. 4. 1834.*

Trichiosòma lucòrum (V. 85. 748., VI. 157., VII. 265.), *the Larvæ of, in the earlier Stages of its Existence, does, when disturbed, eject from Pores* [?] *in its Body a Liquid in thin fountain-like Columns. Facts on other Habits of the Species.* — The larvæ of this insect having been peculiarly abundant this season, on all the hawthorns around Dundee, I have had an opportunity of observing their habits, and can corroborate the curious fact of their ejecting from the pores of their bodies "a liquid in thin fountain-like columns;" stated by Mr. Fennell in VI. 157., but there ascribed, through mistake, to the larvæ of *Tenthrèdo amerinæ*. The doubt expressed, in VII. 266., of this habit being usual to the species, has probably arisen from the circumstance of its being manifested only during the earlier stages of the insect's existence; for, when the larva appears in its last coat, no trace of this habit remains. The fluid, which is of a green colour, and strong disagreeable odour, is spirted with such violence as often to force it to the distance of more than a foot from the insect; and its use is, perhaps, to defend the larva, in its more tender state, from the annoyance of the ichneumon flies. In the last stage of its growth, the head, which, in the previous stages, was black, is of a bright red colour, gradually softening into yellow towards the sides; and the body appears less mealy-like, but is thickly covered with white transverse ridges. They feed only during the night, and repose themselves, half coiled up, on the under sides of the leaves throughout the day. They first made their appearance here, this season, about the 22d of June, and in the beginning of August were transformed into pupæ. I might just add, that I have found the beautiful figure and description, with which Mr. Woodward has furnished us in V. 85., perfectly accurate, with the exception of his supposing it possible that the fibrous appearance of the pupa case was owing, in part, to "the agglutinated hairs of the larva." The larva, unfortunately, cannot apply its hairs

to such a purpose, for the best of all reasons, because it does not possess any; so that it is likely Mr. Woodward, when he hazarded this conjecture, had not seen the insect in its larva state; or else his insect and mine are different, which I scarcely think is the case. — *William Gardiner, junior. Dundee, Sept.* 27. 1834.

I send you a specimen of Trichiosòma lucòrum, the only one that has yet left its cocoon, in order that you may identify it with that of your other correspondent, before the publication of my remarks on the insect. — *William Gardiner, junior. Dundee, May* 19. 1835.

[The specimen from Mr. Gardiner was, on the authority of Mr. Westwood, of the species Trichiosòma lucòrum. Mr. Woodward has not mentioned his seeing the insect in a state antecedent to the cocoons of it brought home by his son, from which imagoes were eventually produced; and, as the imagoes are partly shaggy with hair, one not familiar in entomology (and Mr. Woodward would not pretend to be) might suppose that hairiness would appertain to an insect in its earlier stages as well as in its final one.]

A List of Species of Moth of the Group of Hawk-Moths (*Sphingìnæ*) *which have been found in Forfarshire, and Observations on them* — But few species have yet been observed in this county, and of these few no one is very common; they are the following: —

Zygæ`na filipéndulæ.—This is very rarely met with, except on the Sands of Barrie, where it, in some seasons at least, swarms in prodigious numbers, giving life and gaiety to the desert scene. It, while robbing the florets of *Serrátula arvénsis* [*Cnìcus arvénsis, Cirsium arvénse*]) of their sweets, hovers on the wing in a manner similar to that of the humming-bird hawk-moth (Macroglóssa stellatàrum), but does not emit any sound. The pupa case, formed by its larva, is a singular and durable structure; and, as I am not aware that it has ever been figured, I add a sketch from one in my possession, found on June 2., 1833, from which an imago was developed on July 7. It is fixed to the stem of a gramineous plant, and formed of a thin but tough and elastic membrane, of a pale yellow colour. [It has been judged that the subject cannot require illustrating to entomological readers: the cocoons, or pupa cases of Zygæ`na lòti, noticed in VII. 534., were, in structure, similar to that Mr. Gardiner has described of Z. filipéndulæ.]

Smerínthus pópuli. — The most common species we have; and, although the moth is but seldom seen, as it flies by night,

the larva commits great devastation among our poplars and willows, often stripping them entirely of their foliage.

Acherόntia A'tropos. — Rare, but has been captured occasionally.

Sphinx convólvuli, *S.* ligústri. — These two species are enumerated by that indefatigable naturalist, the late Mr. Geo. Don of Forfar; but neither of them has yet come under my notice.

Deiléphila Porcéllus. — Captured on Will's Braes, by Mr. William Jackson, and now in his collection.

Macroglóssa stellatàrum. — Never observed in this vicinity till July, 1833, when it was first noticed on Will's Braes, by Mr. James Christie. These braes are planted with trees, and adorned with a rich store of flowering plants; among which, the elegant *E*chium vulgàre rears here and there, in beautiful clusters, its stately spikes of cærulean blossoms; and the nèctareous juices of these were preferred by the humming-bird hawk-moth to all other sweets of the flowery banquet; and, as it flitted from cup to cup, extracting their luscious contents, its gay and airy motions, the pleasing sounds emitted by its ever-quivering wings, and the glowing associations it awoke in our bosoms, all tended to yield us the purest delight, and call forth our warmest admiration. — *William Gardiner, jun. Dundee, October* 4. 1834.

[In II. 460. is a statement of the fact, that Acherόntia A'tropos "has been found near Catrine, Ayrshire," and that "the specimen was sent to the Hunterian Museum, Glasgow."]

Monónychus pseùd-ácori seems to abound at Pinney Cliff, near Lyme Regis, Dorsetshire, more than at any other Place. — My brother, myself, and Mr. Dale took, one day in July, nearly 200 individuals. We found them on (but not in, as has, I believe, been generally supposed) the seed-vessels, and also on the stems and leaves, of the *I*ris fœtidíssima, which abounds much at Pinney. — *F. O. Morris. Doncaster, September*, 1835.

Plants. — *The Circulation of the Sap in Plants may be distinctly traced* in the *A*lísma *P*lantàgo, quite as distinctly as in the *C*hàra, mentioned in V. 349, 350.; far more distinctly, and so as to be a most beautiful spectacle, in the *C*helidònium màjus and grandiflòrum, and, no doubt, in all the species of the genus. — *Henry Turner. Botanic Garden, Bury St. Edmunds, August*, 1835.

Lophospérmum erubéscens, the seed of, forms a most beautiful opaque microscopic object. — *Id.*

The Hairs of Species of Plants may, the following statement

has suggested to us, prove a source of information to the researcher with the microscope: —

Pimelèa híspida *Lindley*, in the *Botanical Register*, t. 1578., has the calyx closed, at the base densely, at the apex sparingly, with long stiffish hairs. "These hairs are long, uninterrupted, very transparent tubes, with a considerable number of minute particles within their cavity: they are, doubtless, extremely well adapted to show distinctly that curious motion in the fluids of plants which forms so singular a species of circulation in their system, and which seems to be universal in hairs, so long as they are alive." [*Lindley*, in *Bot. Reg.*, t. 1578.]

Silica in Plants. (I. 67.; V. 178, 179.)—Next to the bamboos the sugar-cane probably yields a larger portion of silex than the other Grámina. Under the furnaces, in which the stalks of the cane, bruised and deprived of their juices, are burnt as fuel, in the manufacture of sugar, large greyish masses of silex are always to be found, in quantities that are astonishing, though the exterior enamelled surface of the cane is of great hardness. The small European Grámina yield this substance in very small proportions; though I was once shown by Professor Buckland, a large flat cake which had been detected among the ashes of a hayrick destroyed by the flames. — *Lansdown Guilding. St. Vincent, May* 1. 1830.

[We remember being told that a considerable mass of flinty matter was found in the ashes of a hayrick consumed by fire, not many years ago, in the neighbourhood of London: we think that it was on Chalk Farm.

Since the preceding paragraph was put in type, several hayricks have been burnt in some place beside the road from London to Greenwich: the event occurred early in August, 1835. In the ashes of the hayricks a stony matter was mingled, and the substance formed by the two resembles tufa.]

Localities of certain rarer Species of British Plants, additional to the Localities of them in Hooker's "British Flora," the third Edition; with some slight Corrections and Additions to the Descriptions of some of the Species described in that Edition. — *Valeriàna* rùbra [Centránthus *Dec.* rùber *Dec.*] has the flowers sometimes white, as near St. Heliers, Jersey, 1833.— Cypèrus lóngus is used extensively, in Jersey and Guernsey, for ropes, mats, &c. — Erióphorum pubéscens: plentiful in Northumberland, Durham, and Yorkshire. — Polypògon monspeliénsis I did not gather in Guernsey: the specimen I sent to Dr. Hooker was given to me by Mr. Lukis, of that island, in 1833. As that gentleman informed me that he was about to publish an account of the plants of Guernsey, I did not send

Dr. Hooker the localities of those which I gathered there in 1833. — Brachypòdium pinnàtum is abundant in Sussex. — *Myosòtis* rèpens is not uncommon in Northumberland. — *Lysimàchia* Nummulària: peduncles generally solitary, sometimes in pairs; near Seven Oaks, Kent, 1833. — Prímula vulgàris: colour yellowish white, or reddish; the latter variety in Somersetshire. — Frankèni*a*; in the generic character, for 6 petals, read 5 petals. — *Narcíssus* Pseùdo-*Narcíssus*; generally in meadows. — *Júncus* acùtus, Jersey and Herm, 1833. —Andrómed*a* polifòlia: near Bridgewater, Somersetshire, on moors level with the sea; 2 ft. high. — Silène cónica, Sark, 1833. — *Méspilus* germánica, the thorny variety; hedges between Tunbridge Wells and Penshurst, Kent, June, 1835. —Fragària elàtior: about Wallington, Northumberland, not unfrequent; rare in fruit. — *Gèum* rivàle, the double-flowered variety of, is very frequent in Northumberland. — *Méntha* rotundifòlia, Jersey, 1833. — *Teùcrium* Scorodònia: stamens generally purplish red, sometimes colourless; near Weymouth, 1833. —*Orobánche* ramòsa: stem generally branched, sometimes simple; Sark, 1833. — Lavátera arbòrea: Jersey, 1833. — *Málva* sylvéstris: leaves with 5 or 7 lobes. —*Vícia* angustifòlia: flowers larger and much brighter than in *V.* sativa; not uncommon near Tunbridge Wells, June, 1835. —*Ervum* tetraspérmum: peduncles 1-2 flowered.— Medicàgo maculàta: peduncles 1-5 flowered. — *Cnìcus* acaúlis; generally stemless, sometimes stems from 1-4 inches high; flower [head of flowers] sometimes white; Newhaven, Sussex, 1833. — *Limbárda* crithmòides: Jersey, 1833. — *Centaurèa* nìgra: white, but rare; Hampshire, 1834. — *Centaurèa* Isnárd*i*: sandy pastures. — *Euphórbia Pèplis*: Herm, near Guernsey, 1833. — *Euphórbia* portlándica: Jersey, 1833. — *Carex* dístans: near Hastings, 1835; 4 ft. 6 in. high.—*Urtìca* pilulífera: a weed in gardens, Blackheath, Kent. — *Asplènium* marìnum: abundant in Jersey and Guernsey, where also occurs a very remarkable variety with the pinnæ very deeply cut. — *Equisètum* variegàtum: banks of Tees, Middleton, in Teesdale, Durham, 1828. — *W. C. Trevelyan. London, July* 31. 1835.

Verbáscum Thápsus has "3 *of the Stamens hairy; 2 longer ones glabrous.*" (Hooker, *in his* British Flora.)—I have ascertained the correctness of this remark. In Sowerby's *English Botany, all* the stamens are represented hairy; and in Smith's *English Flora* no notice is given on the contrary, nor in Macgillivray's edition of Withering. — *John Reynolds Rowe. Wimborne, Dorsetshire, Sept.* 21. 1835.

Galeópsis versícolor Curtis *is Hereditarily Constant in its Characteristics.* — In August, 1832, I gathered in a corn field,

at Little Calcott, near Shrewsbury, in which I did not perceive any plants of *G.* Tetràhit, some seeds of *G.* versícolor, which I sowed in four pots in sandy loam procured from a depth of about 16 ft. from the surface. The soil was apparently so pure, that no other plants came up besides those of *G.* versícolor. The result of the experiment was, that in pot No. 1. was one plant; in No. 2. thirteen plants; in No. 3. one plant; and in No. 4., in which no seeds had been sown, no plant. These were carefully transplanted from the pots, and properly marked, and all proved to be *G.* versícolor. The transplanted plants were suffered to disperse their seeds, and their progeny have ever since continued without the least change to be *G.* versícolor. — *W. A. Leighton. Shrewsbury, Aug.* 8. 1835.

[*Galeópsis* versícolor "is doubtless a distinct species, propagating itself by seed unaltered." (*Smith*, in his *English Flora*, iii. 95, 96.)

Bentham, in his *Labiatarum Genera et Species*, p. 524, 525., deems *G.* versícolor *Curt.* a variety of *G.* Tetràhit *L.*, and *G.* pubéscens *Besser*, which his synonyme shows is the same as *G.* Walteri*na* Schlect., a variety too. He has made these remarks: —"I have much observed this plant [he means *G.* Tetràhit *L.* as including all the forms that he deems to belong to it] in Germany, where it is very common, and am fully persuaded, with Fries [He has given in a note this extract from Fries's "Nov. Fl. Suec. ed. 2d, 193." : — Corollæ magnitudine inter Labiatas parum fido. Præcipue Galeopsides hoc respectu variant. Vidi G. Tetrahit floribus G. versicoloris, et versa vice, et plene persuasu meo has plantas mere varietates credas, recedentes circiter ut Viola tricolor et arvensis."], that there is but one species. The size and colour of the flowers are remarkably uncertain, and afford every shade of difference from one extreme to the other; and the difference in pubescence between the G. pubescens and Tetrahit of German authors, is but one of degree. It is but very seldom that a pubescent specimen is to be found absolutely without the long rigid hairs [His character of *G.* Tetràhit is "caule pilis rigidis sæpius hirto sub axillis tumido, foliis ovatis, calycibus glabris hirsutisve"]; and, on the other hand, when these are most abundant, they are almost always accompanied, especially in the upper part of the plant, and on two opposite sides of the stem, by a small quantity of the pubescence. The large variegated-flowered specimens (G. versicolor of authors) have usually less of this pubescence, and more of the hairs, than the smaller ed-flowered ones."]

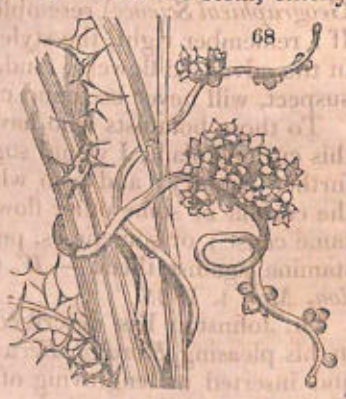
Anagállis cærùlea: Professor Henslow's Question of its Dis-

tinctness, as a Species, from A. *arvénsis.* (III. 537.; IV. 79. 277, 278. 466.; V. 493, 494.) — Professor Henslow sent to me, in 1833, some seeds of *Anagállis* cærùlea collected at Chapel Allerton, which I sowed in sandy loam, in four pots; but, to my great disappointment, no plants made their appearance. Three of the pots being subsequently wanted for other purposes, the soil was turned out, and one only remained filled with soil, in which, to my astonishment, nine plants of *Anagállis* this year (1835) have made their appearance, all with the blue corolla of *Anagállis* cærùlea. — *W. A. Leighton. Shrewsbury, August* 8. 1835.

[Had the seeds of *A.* cærùlea been sown immediately after they had been ripened, thus to parallel Nature's time of sowing them, plants from them would have been produced in the year following. It is known to botanical cultivators that the seeds of several species of plants, after being artificially kept out of the earth for a time, will, after being sown, lie long in the earth before they vegetate; some kinds a year or more. The seeds of some of the Umbellíferæ are in this case.]

The Greater Dodder (Cúscuta *europæ`a*). (V. 506, 507.) — The plan mentioned, in V. 506, 507., "of cultivating the dodder by cuttings, is new to me; but I have cultivated it in the Oxford Garden, for many years, by sowing the seeds among common nettles (*Urtìca* dioíca); and, for some years past, it has established itself on the Solidàgo virgaúrea and the Aspérula odoràta in the garden." [*Extracted from a Letter from Mr. William Baxter, Curator of the Botanic Garden, Oxford; dated May* 30. 1835.]

Mr. Baxter has, since this date, observed the dodder to grow upon the *Achillèa Millefòlium*, in the Oxford Botanic Garden. He has sent us a specimen. It is the stem, chiefly, into which the dodder has rooted; but the mid-rib of the leaf also, we think, in one instance, if not more. Of species of plants which the greater dodder has been known to inhabit, several are mentioned in the *Encyclopædia of Plants*, p. 105. Among them there are, additional to those noted in V. 506., "brambles, woody nightshade [*Solànum* Dulcamàra], fern, hemp, clover, grass, &c." The figure (*fig.* 68.) here repeated from the *Encyclopædia of Gardening* had been copied from *English Botany*,



tab. 378., in the text to which table it is not stated upon what plant the dodder is represented: it may be that *Cirsium arvénse* is the species which Mr. Sowerby had intended. The dodder's "stalk twines . . . . . contrary to the sun's apparent motion, or from right to left." (*Lindley*, in *Encycl. of Plants*, p. 105.)

Lathræ'a Squamària. (I. 407., II. 70. 105. 294., V. 45—48. 505. 543.)—Having lately examined (in Northumberland) several plants of the Lathræ'a Squamària, I think that I have ascertained the cause of one of the apparent varieties of that plant, or, rather, of the variations in the description of it by different individuals. One of the first plants that I gathered not being expanded, I placed it in water; and, shortly after it had opened, observed that the *upper* lip in the most advanced blossoms was *deeply cloven*, as represented in the figure given in *English Botany*, t. 50., but less so in the younger flowers. The cause of this I did not then perceive: but afterwards, having gathered several more plants expanded in their place of growth, I found in them the upper lips *entire;* although, in other respects, they were like those first collected. Having put these, also, in water, I soon observed that, although in the younger blossoms, before the style projected, the upper lip was decidedly entire, yet that, when the style was exserted, the upper lip became cloven; and that the cleft deepened as the blossoms advanced. It then struck me that this was caused by the tendency of the exserted style to rise, and, by its upward pressure against the centre of the upper lip, to cleave it; and I feel now convinced that this, in all the cases I saw, was the cause of the cloven variety. The plants otherwise (except in those points which I formerly noticed in the last number of vol. iii. of Cheek's *Journal of Natural and Geographical Science*) resembled the figure in *English Botany*. If I remember right, the style is sometimes not exserted even in the advanced flowers; and, in those cases, the upper lip, I suspect, will never be found cloven.

To those botanists who have an opportunity of examining this curious plant, I would suggest this as a subject worthy of further enquiry; and also whether varieties in the clefts of the corolla of some other flowers may not proceed from the same cause; or sometimes, perhaps, from the pressure of the stamina against them. — *W. C. Trevelyan. Athenæum, London, May* 4. 1833.

Dr. Johnston has described Lathræ'a Squamària in detail in his pleasing *Flora of Berwick upon Tweed*, vol. ii. p. 284., and inserted an engraving of it, t. 8. The Berwickshire habitats given of the species are, "Damp shaded woods, rare.

In some natural wood above the Retreat, plentiful." From the detailed description we quote as follows:—The branches of the subterraneous stem are "covered with fleshy imbricated leaves, which in shape resemble a horse's hoof in miniature.... Calyx downy.... Upper lip of the corolla entire or merely emarginate.... Style protruding.... Gland [or nectary] semilunar, with an obtuse tooth...." Dr. Johnston has, at the end of the detailed description, thus remarked:—"I have been particular in the description of this singular plant, for there are some particulars in which it differs from the plant of the *English Flora*. 1. The upper lip is not cloven: it is said in Smith's description to be 'deeply cloven.' 2. The leaves are not ovate, as Smith says they are. 3. The segments of the calyx are not smooth, for the whole calyx is covered with down. 4. The style projects considerably beyond the under lip; while in *Eng. Fl.* it is 'scarcely the length of the corolla.' 5. The nectary is not notched, for the centre rather projects."

Cárduus crispus L. *grows on the Brighton side of the steep Chalk Hill on the North of Reigate, Surrey.*—I gathered, while walking up this hill on July 8., a few specimens of a carduus which appeared to me different from any I had before seen in this country. Not finding it described in Hooker's *British Flora*, I requested information regarding it from Dr. Lindley, who informs me that it is the *C*árduus crispus of Linnæus, in the state in which it occurs in dry places, and that it agrees entirely with authentic specimens which he possesses from Scania. Dr. Lindley adds, that "it is said by Reichenbach, to be the *a*canthöides of Schkuhr, and some others." The plant has something of the character of *C.* nùtans, but is much smaller and more elegant in its appearance.—*W. C. Trevelyan. London, August* 7. 1835.

[*Onònis procúrrens* Wallroth *var. rèpens* Dec., in his *Prod.*, 2. 162, 163.; synonyme, *O.* arvénsis *γ Smith*, in his *English Flora*, iii. 267.

Onònis spinòsa Wallroth, Dec. *Prod.*, 2. 163.; synonyme, *O.* arvénsis *β Smith*, in his *English Flora*, iii. 267.]

Lady Arden, York House, near Epsom, Surrey, sent us, on Aug. 1., at the instance of W. C. Trevelyan, Esq., flowering specimens of the above two kinds of *Onònis*, and an expression of her opinion that the plants differ too widely to be of the same species; and of the facts that they grow in quite different places, seldom, if ever, near together; and that they do not come into blossom exactly at the same time. Mr. Trevelyan has informed us that Lady Arden has, for some years, observed that they retain their character both in a wild and cultivated state.

Neóttia spirális Swz. (*Spiránthes autumnàlis* Richard), *Sweet Ladies' Traces.* I found in full flower, on Aug. 28. 1385, in the large sand-pits leading out of the lower road between Greenwich and Woolwich. This is the first time, as far as I am able to say, that it has been met with in the immediate vicinity of London. Mr. Sowerby notices it, in his *English Botany*, as one of the rarer species of British plants. — *Daniel Cooper. 82. Blackfriars Road.*

ART. VI. *Retrospective Criticism.*

ON Birds dressing their Feathers with Matter secerned from a Gland. (375. note *, 514, 515.) — In p. 515. there are one or two arguments of Mr. Waterton's, which I will trouble you with a few lines in reply to. I do not deny (I never did) that the thrush and robin have an oil gland *; they may be seen, before a shower of rain, anointing their feathers with its contents; and I doubt not but that, if they were, under these circumstances, to fall into water, they would receive as little damage (or nearly so), as to their feathers, as the dipper; but the dipper, being an aquatic bird, is constantly ready for his "sub-aquatic promenade," and, probably, has therefore a greater supply of the oil than land birds, who only require it occasionally. Neither do I attach any importance whatever to Mr. Waterton's being able, as he says, to make an equally good, or *better*, specimen of a bird steeped for a whole day in water, as of one only fresh killed; for it matters not at all whether he be able, by some chemical or other tedious process, to restore the pristine beauty of the bird; but the force of my argument is this, and I repeat it: soak a thrush or robin but a few minutes in the water; soak a dipper for an hour or more; lay them both in the sun to dry, side by side; and, when they are dry, what a contrast will there not be! The one, I will venture to say, will be "unscathed, unharmed;" the other will present a miserable clogged appearance, "unlike, oh, how unlike!" its former self. Now, what is the natural inference to be drawn from this fact? for fact, I again repeat, it is: I leave it to others to judge. But "'t is strange, 't is passing strange, that any will allow their eyes to be so blinded by prejudice as to resist what can almost be demonstrated, more especially when they themselves confess that they have no other theory to advance." — *Francis Orpen Morris.*

* By the way, I should feel obliged by any of your correspondents informing me what birds are without the oil gland, or whether any are entirely devoid of it; for, certainly, some have it much less evidently developed than others.

On the Question of the Dipper's Power to walk under Water. (p. 515, 516.) — P.S. A "concluding word" on Mr. Waterton's "concluding word." He objects to the doctrine of a "sub-aquatic promenade;" that is, denies the fact which has been often stated by eyewitnesses; because, forsooth, "First," "the bodies" (*dead* bodies, *of course*) "of birds float on the surface of the water." Who ever denied it? "Secondly," "because birds are obliged to make great exertions with their wings and feet in order to be able to reach the bottom." Who ever denied this either? Even water birds, "qui in aquis degunt," are obliged to do so; "à fortiori," therefore, it would be to be expected in the case of the dipper! "Thirdly," "he is satisfied that, when they have reached the bottom, the force which enabled them to descend to it ceases to act." What is to cause it to cease? Is there a paralysing principle at the bottom of the brook, which does not exist *between* the bottom of it and the surface?

I do not see what "old Nicholas Pesce," or any other "old Nicholas," has to do with the point in question, with which *shallow* brooks are concerned. "*Verbum non amplius addam.*" — *F. O. M. Doncaster, September* 8. 1835.

Is the Dipper capable, or not so, of walking under Water? (p. 514.) — I would refer Mr. Waterton to Mudie's *Feathered Tribes*, article Dipper, in which, I think, the question is satisfactorily proved in the affirmative. — *S. D. W. September* 3. 1835.

Eurýnome ?spinòsa Hailstone, *?áspera in a young state; a Correction of two Errors in the Elucidation of, given in* p. 549, 550. — The shell is described as having two lamellæ behind each eye, and the rest of its margin "set with spines;" and in my drawing, I believe, you will find this the case, and not *serrated*, as in your engraving, the proof copy of which, that I received for inspection, was so confused a one, that it was impossible for me to detect this error. In p. 549. line 6. from the bottom, for "their character," read, "this character." — *S. Hailstone, Jun. London, October* 19. 1835.

REVIEWS.

ART. I. *Titles of Works on Subjects of Natural History, published recently.*

SHEPARD, Charles Upham, A.B., Lecturer on Natural History in Yale College, Member of the Geological Society of France, &c.: Treatise on Mineralogy: Second Part, con-

sisting of Descriptions of the Species, and Tables illustrative of their Natural and Chemical Affinities. In two volumes 8vo, 631 pages; with 500 woodcuts. New Haven, United States, 1835.

The principal feature of this work is, that it takes a dictionary form, and enumerates the mineral species in an alphabetical order. This is certainly a useful plan, because it does not tie the collector or examiner to any particular or individual arrangement, which ought to be left open till the science shall have assumed a more fixed character.

Mr. Shepard has availed himself, in a praiseworthy manner, of the various treatises by Phillips, Leonhard, Mohs, Hauy, Berzelius, Cleveland and Parker, Beudant, Breithaupt, Brand, Allan, Hartmann, &c., and gives as much from each as is suitable to his purpose. The crystallographical works of Brooke, &c., have supplied him with his illustration of the forms of the varieties of crystals.

It is to be regretted, that the synonymes, and derivations and authorities thereof, are not given, as well as the nomenclature Mr. Shepard prefers. Many persons, accustomed to look for minerals under certain designations, may not like the arrangement. We give one instance: Triplite, *prismatic parachrose baryte*, is designated by Leonhard, phosphorsaures mangan, and correspondingly by Phillips, phosphate of manganese. This is a complete revolution: but if the synonymes had been given, there could have been no objection to it.

The first volume is preceded by a natural-historical (natural-history?) arrangement, in which are introduced a new order, Picrosmine (from the Greek, *pikros*, bitter, and *osmē*, odour), in allusion to the smell, when moistened; and a new genus, *Lusine-ore* (from *luō*, to dissolve), for those species which seem to result from the decomposition of others. This latter is a disputed idea; we think justly so. There is no reason whatever to suppose that such things occur. By decomposition the component parts of one mineral may go to form another, when in combination with other agents: but will this justify Mr. Shepard's classification? At the brickpits near Cambridge, selenite may be seen in the act of forming from the decomposition of iron pyrites; yet it could be hardly said, that the former is the decomposed variety of the other. Dr. Johnston's remark, in p. 565. of this volume, respecting the Lernæa uncinàta, applies equally here. Neither this nor that is "transformed agayne nature."

The second volume concludes with a chemical arrangement, suggested by Mr. J. D. Dana, upon the plan of that of Berzelius, Mohs having furnished the model of the natural

arrangement. The elements are divided into two classes, Amphigen and Oudegen, distinguished by the electro-negative properties according to their intensity, the same element being electro-negative in a class of acids, and in a class of bases, which with those acids form salts: thus oxygen and sulphur are of the Amphigen family, nitrogen, arsenic, carbon, &c., of the Oudegen family. The plan of formation of the binary compounds, &c., has all the ugliness inseparable from the usual method of chemical classification. We shall express what we mean by two or three examples from Mr. Shepard's book. Is, then, "ferrous sulphate" a whit more elegant or descriptive than sulphate of iron? or, does the phrase "cupric di-hydrated carbonate" represent the beautiful green malachite better than "green carbonate of copper?" Common salt can scarcely know itself under the title of "sodic chloride;" and a quartz pebble must certainly give itself airs with such a style as "silicic oxacid!" * A chemical cook must in future put upon her fire a shovelful of "hydrous carbonide!" We name these examples, not to throw ridicule on this new arrangement, the value of which must be decided by more serious critics than ourselves, but to show how difficult it is to frame any nomenclature from the atomic analysation of minerals. Surely the great objection to the present barbarous jumble of names might be got over by an agreement amongst mineralogists to classify all the species according to some one language, Greek or Latin, and then to allow those designations to represent the equivalent expressions of the chemical characters in all other languages.

We wish Mr. Shepard had not assumed a numeral scale of hardness. Breithaupt's scale, which he adopts, is good as far as it goes; but to a tyro it is almost as good as nothing at all. To use it requires considerable experience in the science. In the subsequent editions, we hope Mr. Shepard will introduce the few improvements above suggested; and it would not be amiss, for the convenience of European collectors and peripatetic mineralogists, if he would give more cis-Atlantic localities. The book would then have a more catholic character: it would also be more valuable in one volume. As far as execution goes, and the information respecting new, and especially American, minerals, and the general science of the work extends, it deserves great praise; and, humble as may be our opinion, we give it, nevertheless, in testimony of the merit and usefulness of Mr. Shepard's labours.—*W. B. C.*

* A Devonshire quarryman would read this "Silly sick ox ass hide."

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ORIGINAL COMMUNICATIONS.

ART. I. [*Conclusions on the Results on the Vegetation of Nova Scotia, and on Vegetation in general, and on Man in general, of certain Natural and Artificial Causes deemed to actuate and affect them.* By Mr. TITUS SMITH. Communicated by R. G.

R. G. sent the following dissertation, as cut from a colonial paper, and, with it, information that "it has not appeared in any other publication," and that the author of it "is a person of confessedly great and original talent; one who has been almost entirely self-taught in every branch of knowledge with which he is acquainted; and" that "his original genius, and his acquisitions, have been the means of introducing him to the correspondence of Dr. Grey of Edinburgh, and other persons of scientific pursuits."

The dissertation in the printed copy is headed, "Natural History of Nova Scotia;" and this heading is followed by this preface: — "The following Paper was read by Mr. Titus Smith, the Philosopher of the Dutch Village, before the Halifax Mechanics' Institute, on Wednesday evening, the 14th January. It abounds with original views, minute and curious information, and furnishes additional evidence of the richness of those stores which a life of observation and reflection has accumulated in a naturally powerful mind."]

SOME knowledge of the vegetable productions of the earth is necessary to every man. But, to the man who cultivates the soil, it must be particularly useful to learn the means by which its fertility is preserved or increased in those situations where the hand of man has never disturbed the operations of nature. It is found, by long experience in America, that woodland, when first cleared, will yield a succession of good

crops for six or seven years, or, if cleared without much burning, for a longer period; but that it finally "runs out" (to use a common expression), and requires a hundred loads of manure to the acre to make it produce, for three years, as good crops as it did when new. But should it be pastured, the soil, if not originally very fertile, appears slowly to become more barren for thirty or forty years: yet, if bushes should be allowed to overrun this worn-out ground, it will, upon cutting them down, be found to have improved in proportion to the time it has been covered by them.

It appears, therefore, to be necessary to the preservation of the fertility of the earth, that it should be covered entirely with a coat of vegetation, since, from the time that a growth of young wood springs up, till the forest has reached its full size, the ground that it covers is becoming every day more fertile; but when the wood is destroyed, and prevented from returning by the pasturage of cattle, it is for many years constantly becoming more barren. The cause of this deterioration of the soil will be readily conceived, by reflecting that those elements which distinguish a fertile soil easily assume an aerial form, and that they are in that state absorbed by the leaves of plants, and, where these have been in a great measure destroyed by pasturage, are borne by the winds to those situations where they are arrested by a luxuriant vegetation. As we must observe, then, that the soil, so frequently impoverished when managed by man, always retains its fertility in a state of nature, it must be important to the agriculturist to attend to the operations of the great Cultivator. For, rough and rude as our forests appear, they form a portion of the "garden of God." In all their various productions, there is nothing superfluous or out of place.

The student of natural history in America possesses some advantages over the inhabitants of its mother country. He has under his eye tracts where the works of nature have not been disturbed by man. In Europe, some persons of great knowledge appear still to doubt whether there ever was a period in which the land generally presented the appearance of a forest, and whether the soil of peat bogs is formed from decayed vegetables. Strange as these doubts must appear to any person of observation brought up in the woods of America, still it is curious to observe the operations of nature in preserving forest, and in forming this "savings' bank," this reserve of fuel for the use of man, destined for his supply when he shall, by his negligence, have destroyed the forest wood.

Nearly all this province has, it is certain, at no very distant

period, been covered with wood; not excepting the granite hills, which have little or no earth upon them. Upon the fertile soils the vegetation is composed of hardwood (trees with deciduous leaves), and succulent plants with annual leaves. Their growth is rapid, and the outer bark (technically called the epidermis, the only part of a tree that is very durable) is extremely thin. The annual crop of leaves, the trees overthrown by the autumnal storms, or dying of age, and the lowest twigs, which are constantly perishing by suffocation, furnish a large quantity of dead vegetable matter, which, by the operations of the *Fúngi*, insects, and the succeeding process of putrefaction, is soon changed into mould, which must continue to accumulate till the trees are fully grown; thus preparing a soil for the cultivator, by removing to the surface the most fertile part, from the greatest depth to which the roots of a tree can reach. Upon this soil neither turf nor peat earth is formed; but a fine mould lies under the dead leaves. This portion of the forest can rarely be affected by fires in the woods, as the leaves in summer are full of watery juices. Should a part of it (as sometimes happens) be overthrown by a hurricane, it is very soon replaced. Shoots from the old roots and seedlings spring up, among which a few scattered plants of the balsam fir [*Abies balsamífera Mx.*] appear, which, overtopping the hardwood, by their shelter accelerate its growth, and, being short-lived trees, are, in their turn, overtopped and suffocated by the hardwood, when it no longer needs their assistance.

Upon a barren soil the trees are generally of the fir kind, all evergreens, except the hacmetac [*Làrix péndula Lamb.* or else microcárpa *Lamb.*]: the greater part of the shrubs and plants are also evergreens. Their leaves contain more resinous and more woody matter, than the plants of fertile soils; they have also a strong thick epidermis. The trees on this soil grow slowly, and have an appearance which is called "scrubbed:" this is partly caused by the unusual quantity of the epidermis, which increases in an inverse proportion to the growth of the tree (a black spruce [*Abies nìgra H. K.*] with a very rough scaly bark being sometimes a hundred years old, when not more than 4 in. in diameter); and partly by a large quantity of resin, which flows from the knots produced by the dying of the lower branches, and from wounds made in the bark by insects; as the wood of these trees is much more solid and resinous than that of the same species in situations where it grows rapidly.

In addition to the turpentines of the fir tribe, the wax of the candleberry myrtle [*Myrìca sp.*], and the oily substance

on the buds of the Dutch myrtle and the alder, many of the leaves of the plants of barren soils contain a considerable quantity of resinous matter.

The large proportion of these two almost imperishable substances, resin, and the epidermis of trees and other vegetables, appears to be connected with the formation of turf; as it is certain that they are produced in the greatest abundance on the most barren soils, and that in the same situations the greatest quantity of turf is formed. It may also be remarked that there are, in the vegetables of the most barren soils, very large proportions of tannin and gallic acid, well known to be very powerful in resisting putrefaction. The leaves of the kalmia [six species, and some varieties, are known to botanists: the species are all natives of North America] and uva ursi [*Arctostáphylos Uva úrsi*], and the bark and seed cones of the spruces [certain species of *Abies*], contain them in abundance.

Leather may be tanned with the leaves of the kalmia; those of the uva ursi are the principal tanning material used in the north of Europe. The cones of the black spruce appear to the taste as astringent as gall nuts. The taste of these powerful antiseptics is not very perceptible in the scales of epidermis that are perpetually falling as the trees increase in growth; but it is probable that they are contained in them in a state of combination with some other substances *, and that they assist in giving them their uncommon durability.

When the woods of fir become so thick that the kalmia perishes, the soil generally becomes covered with various kinds of dry moss. As this is a vegetable which is not quickly decomposed, it forms a portion of the turf, which is connected by its roots; and it assists in preventing its decomposition by excluding the light and external air; and securing it from being affected by sudden changes in the temperature of the atmosphere; for which purposes it is very suitable; being a bad conductor of heat, as may be proved by the late period at which ground covered with it freezes in winter and thaws in spring.

Although many other necessary consequences of these facts would suggest themselves to the minds of those who are versed in chemistry, enough, perhaps, has been said to give some idea of the causes which prevent the rapid change of dead vegetable matter to mould upon barren soils. At any rate, the fact is certain, that a turf *is* formed, the depth of which, in an

* Probably oxygen, for which astringents have so much affinity, that an infusion of galls will precipitate silver from its solution in a [an omission here] form.

old [? forest, is *] generally in direct proportion to the barrenness of the subsoil. Its utility is obvious, as it produces [? thickets of] timber, which grows to a size fit for many useful purposes upon the barren whinstone plains, where the [? surface is] covered by from 1 ft. to 2 ft. of broken stone [? and upon] hills of granite which have not 4 in. of [? any sort of] soil. It also increases the earthy portion of the [? turf, ? soil] by slowly decomposing the surface of the subjacent rock. I have seen a growth of tall black spruce, about two hundred years old, upon a piece of ground composed of broken whinstone, and rounded pebbles and gravel, mixed with so very small a proportion of earth, that it must, in a dry season, have been impossible for any tree to have lived upon it had it been deprived of its covering of turf, which was about 15 in. thick; yet, by the means of this layer, it was enabled to produce useful timber, some of which was 18 in. in diameter.

This turf appears to the eye to contain considerable proportions of decayed wood, little changed from the state to which it was reduced by the *Fúngi*, and of the epidermis of trees and shrubs, and the cones of spruce very little altered. At the bottom, a very shallow layer, generally mixed with charcoal, approaches to the state of mould. In this bottom layer the seeds of the raspberry [*Rùbus idæ`us L.* is wild in North America; and several other species are too] are to be found in abundance, with [? some †] of those of the wild cherry, red-berried elder [*Sambùcus pùbens Mx.*], [? and other] shrubs that usually spring up after a fire. The [? seeds of] the pigeon berry, and several other plants, may [? be found] occasionally in every part of the turf in [? a dormant] state.

Woods of the fir kind are much exposed [? to fire]. In a dry season, the moss which covers the surface will burn like tow, and soon communicates the fire to dry branches that produce [? a sufficient] flame to reach the green leaves above them, [? that acts] especially upon the spruce [*Abies* sp.] and balsam [(*Abies balsamífera Mx.*), ? which are] more inflammable in a green state than [? when dry]. As they contain a considerable quantity of [? resinous] juices, and extinguish coals when thrown [? upon] them, it is probable that the property they [? possess], of producing an extraordinary quantity of [? flame, is] connected with the unusual proportion of [? resinous] fluids which they evolve during

[* The terminal part of this line, and of the next seven lines, in the copy from which this is printed, is torn off.]

[† The terminal part of this line, and of 23 of 25 lines sequent to this, in the copy from which this is printed, is torn off.]

combustion, [? as the] remarkable crackling, and immense volume of smoke, produced by a fire in a thicket [? of black] spruce, have sometimes been mistaken for [? some kind of] storm, by persons at a distance of a mile [? from the] fire.

By these fires, the leaves and small spray [? of the, ? and the] branches are consumed, together with the [? coat of] litter which covered the surface, and which, by excluding the sunbeams, had kept the turf at a low and equal temperature.

The naked black surface is now exposed to the sun, and the process of putrefaction commences in earnest, affecting the turf as well as the roots of the vegetables which have been killed by the fire. The increased temperature of this natural hot-bed brings into action the vegetative powers of seeds which had lain dormant for centuries; raspberries spring up in abundance, together with red-berried elder, birdcherry, sumach, prickly aralia [? Aràlia spinòsa], and evergreen fumitory. The French willow [Epilòbium angustifòlium *L.*; or some one or more other species] and the cacalias, whose suffocating down is so troublesome to the thresher upon new lands, soon find out their favourite light soil. The whole face of the country is changed. Tracts of a hundred acres are thickly covered by raspberries, loaded with a luxuriant crop. The low barren levels overspread with blueberries; and large tracts occupied by the French willow, which forms so striking an object, with its long spikes of purplish red flowers; together with the large clusters of the scarlet elderberry, which appears occasionally in the low stony ground; altogether give an idea of fertility which forms a remarkable contrast with the sterile appearance of the same soil previous to the fire.

Within three years this fertility disappears; the turf is greatly reduced in quantity; the land becomes hard and cold, presenting that exhausted appearance which always follows the raising of crops on a burnt soil. A few clumps only of the raspberry and French willow remain, in situations where the lightness of the soil is preserved by having the surface covered with broken stones, or the tops of fallen trees. Shoots from the white maple [*A*cer dasycárpon *Ehrh.* (syn., eriocárpon *Mx.*)] (the roots of which are never killed by fires), brakes, sweet fern [Comptòn*ia* *a*spleniifòlia *H. K.*], dwarf willows, and withrod, occupy the ground, presently followed by alder; and, when they have formed a sufficient shelter, the firs again spring up, mixed with white birch [*B*étula *p*opulifòlia *H. K.*: see the *Penny Cyclopædia*] and poplars [several species inhabit North America]. In the lower and more barren tracts the blueberry [? *V*accinium ? venústum *H. K.*] is, by degrees, overgrown by the kalmia and rhodora [*R*ho-

dòra canadénsis *L.*], which are, after the lapse of a few years, in their turn overtopped by the alder, which is always soon followed by a growth of firs. A number of plants whose seeds never vegetate during the fertile period now appear; among which we notice the mayflower, the trailing evergreens (lycopodiums), snakeroot [*A*ristolòchia Serpentària *L.*], mitchella [Mitchélla rèpens *W.*], linnea [Linnæ*a* boreàlis *Gron.*: the American form of this species is different from the European one], pigeon berry, mountain tea [Gaulthèr*ia* procúmbens *L.*], maidenhair [*A*diántum pedàtum *L.*], several kinds of aster, and golden rods [Solidàgo]. The mosses follow, and the thicket, in the course of thirty or forty years, resumes nearly its former appearance, except that the trees are smaller, and that the balsam fir forms a larger proportion of the wood. This tree of rapid growth, by its shelter, covers the more valuable spruce from winds, and prevents it from forming strong lateral branches, which would deteriorate the timber, till, having reached the height of 30 ft. or 40 ft., it is overtopped and suffocated by it. When a very old growth of hemlock [*A*bies canadénsis *Mx.*] and spruce has been destroyed by fire, it sometimes happens that a growth of beech [*F*àgus sylvática *L.* and ferrugínea L. are wild in North America], birch, and maple takes its place. It also sometimes happens that when an old grove of pine is destroyed, it is replaced by white [*B*étula *p*opulifòlia *H. K.*] and yellow birch [*B*étula excélsa *H. K.*: see the *Penny Cyclopædia*], and oak. But these changes are less frequent than is imagined. Most hemlock woods, when killed by fires, are at first overgrown with birch hooppoles, mixed with firs; but, when the birch has reached the height of 20 ft. or 30 ft., it turns mossy, and continues nearly stationary for perhaps twenty years, during which a young growth of hemlock again springs up, and most of the birches perish. In a similar way, the pine woods, when killed, are first covered with alder, followed by white birch [*B*étula *p*opulifòlia *H. K.*], poplars, and a little oak; but these trees rarely reach any considerable size before they are overtopped by spruce and hacmetac, which is, finally, again mixed with pine. Whenever a growth of hardwood, on a poor soil, is cut down, the land burnt over, and exposed for several years to the pasturage of cattle, it will, if left undisturbed, grow up with a mixture of fir and spruce.

Wherever the soil is so poor that turf is formed on the upland, peat earth is formed in the swamps and bogs. It is most abundant on vitriolic soils, and, generally, in situations that have formerly been ponds or shallow lakes: most of the trees that grow on their banks fall, finally, into them. Every

kind of wood sinks after remaining a certain time in the water. The leaves constantly falling in are never returned to the land. Vegetable substances embedded in mud, under water, are remarkably durable. I have taken up a stick of white birch from a beaver pond, which, from the growth of wood on the site of the house, I judged, must have been embedded for near a century. Neither the bark nor the wood was distinguishable from those of a green tree. Yet the inner bark of this tree decays in one summer when exposed to the air. Heavy rains, which send torrents of water into the swamps, make a small addition to the material of the bogs; but it is but a small one while the forest is growing. On a barren soil, the surface is entirely covered with a rough coat of vegetation. Even where the spruce is so thick as to suffocate the shrubs and perennial plants, the ground is covered with a fleece of dry moss, which, like a strainer, retains every thing that can form turf. The brooks on this soil, however rapid they may be, have low banks, and are hardly perceived to wear away any portion of the earth. They run upon beds of stones, which are themselves prevented from attrition by the water moss and byssus which cover them; the dead leaves, twigs, and scales of bark, which fall into the streams, do not go far before they are arrested by the fallen trees which cross the brooks, forming little patches of swamp where the banks are low. But it is after every fire that runs through the woods, that large additions are made to the deposits of peat earth. Very extensive fires in the woods are so generally followed by heavy floods of rain, that there is some reason to think that the enormous pillars of smoke have some share in producing them. The water now rushes over a surface smoothed by the fire, and carries with it into the swamps and ponds considerable quantities of charcoal, fragments of turf, spruce cones, pieces of the outer bark of trees and shrubs, and other light substances; among which the shining shells of coleopterous insects are very perceptible, in quantities fully sufficient to account for the ammonia which is yielded by pit coal, if coal is formed, as seems probable, from antediluvian deposits of vegetable matter. The mud accumulated in lakes and ponds is prevented from passing into the sea by aquatic plants. The bottoms of muddy lakes have a thick growth of water grass wherever the water is about 6 ft. in depth; the shallows are occupied by water lilies [nine species inhabit North America], Sagittària, and other plants, among which the Pontedèr*ia*, which produces such large spikes of blue flowers, is the most remarkable.

The byssus (the green slimy plant that is so common in

fresh water in the hot season), entangled among the stems of these plants when the water is high, and drying as it falls, forms a considerable quantity of paper, like that from which the hornet makes his nest; a substance which I have observed to form a large proportion of peat from Ireland, taken from a part of the bog where it had formerly been dug out, and which had again filled up.* When the lake or pond is so far filled up, that the mud is nearly bare in a dry season, the Andrómeda calyculàta is the first shrub that grows upon it; bog moss with Indian cups follows, and the Indian tea, rosemary-leaved kalmia [Kálmia glaúca *L.* var. rosmarinifòlia *Ph.*], Dutch myrtle, and other bog plants and shrubs, coming in, with a sprinkling of the tough-rooted cotton grasses and sedges, a strong turf is formed, which alternately floats on the water or rests on the mud, according to the moisture or dryness of the season. Many considerable marshes of this description may be found by the sides of lakes which rise with every flood, with the exception of a few spots occupied by small clumps of firs, which will be found, upon removing the moss, to be the sites of old beaver houses. In the great barren plain, in the western part of the province, there are morasses of this description several miles in extent, producing only bog plants and shrubs of a small size, where, in a wet season, the weary traveller sinks, at every step, a foot deep in water, in consequence of the bending of the blanket of mossy turf upon which he is walking; and which he can, at pleasure, shake for 30 ft. around, manifestly perceiving the undulation of the water beneath him. It appears to be necessary to the preservation of peat, that it should be always nearly covered with water. When the water sinks below its surface, as it generally does in dry weather, in swamps which have *large* streams running through them, the upper layer changes to a kind of mould capable of producing grass and alder, and the swamps become natural meadows, which are mostly of a poor quality on stony vitriolic soils, but better where the upland is a sandy loam,

[* At the meeting of the British Association for the Advancement of Science, held at Dublin in August, 1835, Mr. Robert Mallet, 94. Capel Street, Dublin, showed a beautiful white material, prepared from turf, which was declared by a paper-maker to be perfectly fitted for the manufacture of paper. (*The Edinburgh New Philosophical Journal*, Oct., 1835, vol. xix. p. 398.) In this place is the following relative additional information: — "The upper stratum of turf, which covers immense tracts in Ireland, consists of layers. It is acted on by water to separate the leaves; then by caustic potash, or soda; then by an acid. It is then bleached by chloride of lime. During the process, a substance is obtained, possessing the odour of camphor, mixed with that of turpentine, which is fluid at 290° Fahr. The upper stratum of turf may also be employed for millboards, after being soaked in glue, and pressed by a hydraulic press."]

because a portion of it is always carried by rains into the swamps; while on the rocky soils scarcely any earth is mixed with the vegetable matter. The principal collections of peat earth are at the sources of small streams: some water always runs from them; but many of them have no streams which enter them but such as fail in dry weather. These deposits on granite soils are generally collected in basins formed by the rock; but on the vitriolic soils, where the peat is most abundant, and of the best quality, the soil is rendered impervious to water by slate clay mixed with ochre. The wet peat having the property of changing the slate to clay, considerable quantities of vitriol are contained in the water which enters peat bogs; but it is immediately decomposed. Ochre is always deposited where a rill of vitriolic water enters the swamps: the sulphur probably unites with the peat, as the water runs from the swamp soft and free from vitriol, but usually holding a little carbonaceous matter in solution.

As more vitriol is formed on open ground than there could have been when it was covered with wood, it is probable that the peat earth of our bogs is in a different state from that of Europe. We see here that, when the land has been cleared for a number of years, the water runs clear from a swamp, sometimes on granite, and often on slate and whinstone soils; while, in the woods, it is generally brown, except it has passed over limestone. However, in the state in which it is, our peat makes good fuel, and could by many be procured cheaper than wood, did it not interfere with the business of the summer season.

It is worthy of remark that, in tropical climates, no peat earth is formed; the heat causing dead vegetable matter to go through the process of putrefaction in every situation, and, of course, generating great quantities of hydrogen and carbonic acid gas from the same materials that are slowly forming a bituminous fuel in our peat bogs; and, it is probably owing to this circumstance that swampy situations are very unhealthy in those climates; while, in the regions where the severity of the winters makes a greater supply of fuel necessary, the half-decomposed vegetable matter is preserved in a state that prevents it from undergoing the putrefactive process, much to the advantage of its inhabitants; for it is well known that there are no countries more healthy, nor any which furnish greater supplies of hardy men to more fertile and less salubrious regions, than those which abound in bogs of peat earth. When a wood of firs is killed by fire, in the course of a few years most of the trees fall to the ground. If these are consumed by a second fire, the ground becomes so bare

that firs will not live upon it in exposed situations. But the swamps, which escape the effects of the fire always, together with the different species of fir, contain alder. This shrub, producing abundance of light seed, which is spread far and wide by the winds, usually composes the greater part of the first growth upon bleak naked hills, especially upon those that have not more than 3 in. or 4 in. of earth above their rocky basis. When the shrubbery of alder attains the height of 3 ft. or 4 ft., the firs always begin to appear. All the trees of the fir kind, it should be observed, are, as well as the alder, furnished with winged seeds, which fit them for being borne by winds as far as is necessary to cover the intervals between swamps. Thus, it appears that the swamps are the seed-beds from which the land is again sowed with firs as often as they are destroyed by fires; and, also, with alder, whenever its shelter is needed to cover the firs.

This process of nature was favoured by the habits of the Indians, who carefully avoided setting the woods on fire. But the great influx of inhabitants in 1783 produced, in the course of a few years, a complete change in the appearance of the forest. A great number of new settlements were formed. The fires necessary for clearing the land were communicated st the spruce thickets, and spread frequently as far as they th:tended. The profusion of herbage which followed the fire, sur a time furnished a pasture for the cattle. This failed in three or four years. The next dry season the fire was rekindled, for the purpose of renewing it, which it would do in a less degree. Raspberries, French willow, and other vegetables, would appear upon part of the ground, but of inferior growth. The roots of the spruces and balsam fir spread horizontally, and take but slight hold of the ground. Being loosened by the sinking of the turf, they are overthrown by every wind, and furnish fuel for successive fires, which are usually rekindled every dry season by design or negligence, till, the combustible matter being consumed, with the exception of that portion which is washed by rains into the swamps, the ground becomes so much exhausted, that it produces only a growth of heathy shrubs, among which the kalmia predominates; and, in many places, it is necessary that this should continue long enough to form a few inches of turf, before the alder and other large shrubs can be reproduced, as a shelter for another growth of firs.

Near to the cultivated districts, the wood, in time, becomes scarce; and the swamps are finally attacked by the axe; thus destroying the trees which used to furnish seeds to the ground where fires had destroyed the wood: and it is probable that,

at no very distant period, many large tracts will present nearly the same appearance as the naked heaths and downs of the old world.

Although the kalmia burns freely in a dry season, it does not seem possible to destroy it by fires where the surface is covered with broken stones. After it is burnt off, a growth of whortles [*Vaccínium* sp.] often springs up, and bears a plentiful crop for two or three years; but it is finally overpowered by shoots from the roots of the kalmia. It disappears, however, in some situations, where the turf is completely burnt off from sand or gravel, and is replaced by a growth of lower or trailing shrubs, which more completely exclude the light and air from the exhausted soil. These are the uva ursi, the crakeberry heath [*Empetrum nìgrum L.*], the yellow-flowering cistus [Hudsòn*ia ericoìdes L.*], the ceratiola, or Acadian heath [Ceratìola *ericoìdes L.*], and (near the sea) the Acadian savine. Upon comparing what we observe upon our barren lands with the productions of similar soils in Europe, we shall find reason to believe that the heaths and downs of the old country have formerly been forests; and that they might again be covered with wood, without any great expense, by imitating the process by which the forest is reproduced on our barrens. It would, for this purpose, be necessary to form such seed-beds as our swamps are, and theirs must have been at suitable distances, by planting in, and on the edges of, bogs and wet moors, clumps composed of all the trees and shrubs naturally growing in the country; to which it would be necessary to add a sprinkling of such plants as are natives of the woodlands, many of which are necessary to the success of the forest, either as a shelter for seedlings, or for other useful purposes.

The principal trees of our forests are, the white and red pines [the white is *Pìnus Stròbus L.*, the red is *Pìnus resinòsa H. K.*], the spruces [*Abies álba H. K.*, *rùbra Lamb.*, *nìgra H. K.*, and perhaps other species], hemlock [*Abies canadénsis H. K.*], beech, sugar maple [*Acer sacchárinum L.*: sugar is procured in North America from other species besides], grey oak [*Quércus ? ambígua Mx.*], yellow birch, and white ash [*Fráxinus americàna L.*]. The elms, and the large black cherry, common forest trees farther southward, are here nearly confined to alluvial soils. Most of the smaller trees, and many shrubs, are necessary to introduce these upon open land, as they will not succeed unless sheltered when young. Two of these sheltering trees, the red-flowering maple [*Acer rùbrum Ehrh.*] and the balsam fir, extend their protection to all, as they are to be found upon every kind of soil. The fir is a tree of rapid

growth; and the roots of the maple are never injured when the stem is killed by fires, or cut down; and, consequently, always throw out a number of shoots, which, in the course of one summer, after a fire, form clumps of shrubbery 3 ft. or 4 ft. in height. The white birch and the poplars, always with a mixture of fir and maple, and often of oak and spruce, form the shelter of the white pine. The hemlock is sheltered by the yellow birch, mixed with fir, spruce, and maple; and these young groves of birch, and all other groves of young hardwood, are protected on the open side, if such there should be, by a thick belt of firs. Wherever, also, the edge of an old grove of beech or fir is exposed, by the destruction of the wood on the adjoining barren, a very thick belt of fir springs up; which, in the course of a few years, completely shelters it from the wind and sun. The red larch, or hacmetac [Pursh has given *P*ìnus péndula, now *L*àrix péndula *Lamb.*, as the "hacmatack;" and *L*àrix microcárpa *Lamb.* is given, in one work, as the red larch], forms a portion of the shelter for black spruce on rocky barrens. The alder, mixed with withrod, dwarf willows, and shoots from the roots of the red-flowering maple, serves to shelter the white birch, poplar, spruce, fir, and hacmetac. The seedling plants of the alder require the shelter of the kalmia, or of the evergreen, and dead leaves of the common plants of poor land; the hawkweeds [*H*ieràcium sp.], the golden rods, the trailing evergreens, the Mitchélla, &c. The kalmias, spiræas, and rhodora [*R*hodóra canadénsis *L.*] have seeds so minute, that the young plants are scarcely visible to the naked eye, and perish in a few hours if exposed to sun or wind. They are sheltered by the mayflower and other plants. The rhodora (the shrub which produces such an abundance of red flowers in the spring) usually vegetates upon the roots of the horse fern, which it finally destroys. The tough creeping roots of the mountain tea serve to bind the rotten wood and the coarser parts of the turf, and prevent them from being displaced by frost. The creeping vines of the linnea cover broken stones, and preserve the moisture of the small portion of turf or soil beneath them. The lichens and mosses are necessary to the other plants of barren soils: their roots form a sward, and they prevent the ground from freezing early, or to a great depth, and from thawing easily when frozen; while naked patches of poor gravel freeze suddenly, and, thawing with every mild spell in winter, imbibe a great quantity of water, which is retained by the frozen subsoil, till, freezing again, by its increased volume it so shakes and overturns the ground, as to throw out the roots

of small plants; and frequently kills the bark of the large by mechanical pressure.

Where the soil is extremely poor, it frequently happens that rocks elevated by the winter's frost and subsiding in spring, and other accidents, bring a portion of naked soil to the surface, upon which no common plant can live, as a seedling of one summer's growth would be so very small, that the roots would necessarily be thrown out of the ground by the frost. The *Lichen ericetorum* is the vegetable which serves to heal these breaches in the green coating of the earth. This is a white scurfy crust, which, spreading over the naked soil, and shooting up little flesh-coloured tubercles that have the appearance of diminutive mushrooms, strikes its roots some depth into the earth, and forms a sward which prevents the water from easily entering, and secures the surface from being broken by the alternate frosts and thaws of winter. Upon this crust caribou [reindeer] moss, and other lichens spring up, soon followed by hawkweed, golden rod [Solidago], kalmia, and alder.

The ferns, with their very tough matted roots, are useful, in many places, to prevent the turf from breaking. When decayed leaves and lichens have slightly covered a rock or mass of broken stone, on the dark shaded side of a steep hill, a crop of green moss overspreads the shallow soil, presently followed by a growth of polypod, whose roots connect the whole so firmly, that the heaviest rains do not wash it away from the sides of steep hills. We often find it difficult to introduce grass into a drained swamp; the very light soil, being raised upon pillars of ice, throwing the roots out of the ground; but in these swamps, when in a state of nature, the firm matted roots of the sheep polypod and the horse fern are never moved. Some of the sedges, in the same situation, have roots nearly as strong as packthread; and it has been found by experience, that the easiest mode of introducing clover and upland grasses into a drained swamp is, simply, to give it a dressing with stable manure as soon as it is drained, without breaking the natural turf of the swamp, which always prevents the frosts from moving the surface, long enough to allow the roots of the upland grasses to acquire their full growth. The family of lichens comprehends the crusts of various colours which overspread the rocks and stems of trees, the paper-like mosses, the white caribou moss, and the thread-like clusters of yellowish or black moss which hang from the branches of dead trees. Although they contain a considerable quantity of substance resembling starch, and a large proportion of carbonaceous matter, they appear

to derive their nourishment from the air alone; for the largest species, the rock tripe, which our Indians use instead of barley for their soups, grows most frequently upon the perpendicular faces of ledges of rock. These vegetables, besides furnishing food for the caribou, or reindeer, and protecting trees and rocks from the effects of the weather, serve to introduce soil upon hills of naked rock. It is first overspread with the crustaceous species; these are followed by the leafy kinds: when they decay with age and crumble to pieces, their bulk is but little diminished. As soon as an inch of turf is formed, the caribou moss appears. A small portion of the rock is changed to sand by the action of the turf. The Acadian heath [Ceratìola ericòides *L.*] and the Potentílla tridentàta finally spring up, followed, as the turf increases, by black whortle, candleberry myrtle, and other shrubs. The small long-limbed Hudson's Bay pine [*P*ìnus Banks*iàna* Lamb.] is usually the first tree that grows on these shallow soils, which finally, if not prevented by fires, become capable of producing timber of a useful size.

The *F*úngi, those substances which we are accustomed to call mushrooms and touchwoods, are a family of vegetables which have a very different office: it is their business to assist in changing dead vegetable matter to mould or turf. Every dead vegetable; the trees overthrown by the wind; the leaves which fall annually; the low branches and underwood which die of suffocation, are immediately attacked by the *F*úngi, and soon reduced to an elementary state, in which they may serve again to become vegetables. Under their action the greater part of the vegetable disappears; the fungus occupies a considerable portion of the space which was once filled by the wood, not unfrequently the one half; and it is manifest, from the lightness of the remainder, that the greater part must have taken an aerial form. This decomposition is soon performed under the shade of woods, but much more slowly in open situations. A considerable part of the wood killed by fires continues sound till it falls, and is shaded by the plants that spring up near it; that is to say, dead vegetables are very quickly changed to aerial fluids only in those situations where there is a covering of foliage above them, which prevents the dissipation of their elements by absorbing them from the air. It seems probable, that the *F*úngi, the principal agents in decomposing dead vegetables, are, like the corals, formed by animalcula. [This view may not obtain any credit for the author of it, but is given here, that the discredit, as well as credit, due to him may be awarded to him.] The work they perform (an immense quantity) is analogous

to that performed by insects. Like animal substances, some kinds of them are remarkably luminous when in a state of decay; and it appears to be to them that the phosphorescence of rotten wood is to be ascribed.

Some persons have considered it strange that our beech hills should so generally have the best soil near the top of the hill; that it should be of an inferior quality lower down; and that a barren spruce valley or plain should be found at the bottom; as it is certain that some dead leaves and decayed vegetables must be carried by streams of water into the valley, which can never return any to the hill. But, when we consider how often the barren land has had the growth upon it killed by fires, while the beech hill retained its foliage, we shall find reason to conclude that, in the first seasons after fires, while the ground was bare of plants, it must have returned, in an aerial state, to the green hills at least as much as it ever received from them.

When we consider the provision made for covering, immediately, every portion of naked ground with some kind of vegetables, which, by partly excluding the air and light, may prevent the too rapid decomposition and dissipation of the fertile principles of the soil, we shall find reason to doubt the utility of fallowing, especially upon shallow soils. That the practice is very ancient is certain; but it is also certain that man has, by mismanagement, impoverished some of the finest countries on earth. A green crop, cultivated with the hoe, will destroy weeds, and the eggs of insects, nearly as well as a fallow, without exposing the ground in a naked state for a whole season.

For a similar reason, it must be for the farmer's interest not to spread his manure over too much ground, but always to make his land rich enough to produce a crop that shall completely shade it. In a state of nature, the ground is always covered with a layer either of turf or vegetable mould. This would seem to point out to us that a top dressing is the proper mode of applying manure to grass, as it must, in that situation, preserve the heat and moisture of the ground more than it would if mixed with the soil. It ought always to be applied at the time when it will be very soon shaded by the grass. From experiments which I have tried, it appeared that it produced the greatest effect when spread at the time the trees began to unfold their leaves, and that there is a loss of one third upon that which is spread in the month of November. A top dressing, applied to plants in a garden when growing, is very useful: it is said to be the only way in which the land is manured in Japan; and the population of the coun-

try seems to prove that the Japanese render the earth far more productive than any people in Europe. It appears to me to be the most economical method of applying manure, and that those skilful agricultural writers (certainly the majority) who disapprove of it have founded their opinion rather on theory than practice. But the fact, that earth does not confine aerial fluids, was for a long time nearly overlooked, nor was much attention paid to the portion of nourishment which plants receive through their leaves. When manure is ploughed into the ground, a part of it is changed, by putrefying, into an aerial state, and dissipated in the air before there are any leaves to arrest it. I have covered a small piece of ground with manure in December, and dug a part of it. The following spring the whole was sown with parsneps; the part which had been covered with manure through the winter produced a good crop; that which was dug in the fall was so poor, that the manure appeared to be thrown away. It may be useful to the agriculturist to reflect upon the haste with which nature covers every portion of naked ground with some kind of vegetables, which, by excluding the air and light, may prevent the decomposition and dissipation of the fertile principles of the soil. In those barren districts where the vegetation is exposed to be frequently destroyed by fire, the seeds are either furnished with a covering so firm that it can preserve the kernel uninjured for ages [p. 392.], or else fitted, by their minuteness, or their wing-like appendages, to be borne by winds to a considerable distance. We often find it very difficult to cultivate these vegetables, but cannot fail to observe that, in the "gardens of nature," seeds long buried in the soil, or annually strewed by winds over the surface for many years, without producing a single plant, will suddenly spring up [p. 392, 393.] and flourish, when, by one of those vicissitudes to which barren districts are exposed, a proper soil is prepared for them, and they are needed to cover the surface. When, by a long period of cultivation, the seeds of those plants which were the natural tenants of the soil have been destroyed, it is probable that this process could not be speedily renewed. Thus we find that, in those regions (once the site of flourishing nations) that have been depopulated by the necessary consequences of those vices that have hitherto always been introduced by the luxury that follows an immense accumulation of wealth, the fertility of the soil has disappeared with the cultivators. Ancient Syria and the neighbouring countries, we are informed by modern travellers, present such an appearance of sterility, that, were it not for the magnificent ruins remain, it would be almost impossible to credit the ac-

counts that historians have given of their population in former ages. A few small insulated spots remain as examples of their former fertility. The plains of Jericho and Hauran still produce "an hundred fold;" but the foot of man has not passed over what was once the kingdom of Idumea for ages. A few fishermen's huts are all that remain of ancient Tyre; and large districts, once thickly inhabited, present an appearance which seems to say, they will be cultivated no more. The discoveries of modern chemistry render it probable that a portion of the fertilising principles of the soil of these districts may have been removed to more highly cultivated regions, or to those which are still covered by forests, and are in a state of nature. While the once fertile territories which surround it have become deserts, Lebanon, it is well known, has literally become "a fruitful field," and more populous than any similar district in Europe; the mountainous situation having enabled the Druzes to preserve their liberty, and repel the rapacious Turk. If a country were cultivated for such a length of time, that the seeds of the plants which it produced when in a state of nature had all perished, and were then deserted by the cultivators, it must soon become very bare; for the weeds that flourish in cultivated ground require cultivation; and, when it ceased, would either perish or dwindle to a small size, not sufficient to supply the insects who [that] live upon plants. In such a state, it is certain that a portion of the fertile mould could, by the influence of the heat and light to which the surface was exposed, be changed into aerial fluids, which might be borne by winds to regions where they would be absorbed by the foliage of a forest or cultivated district. It is very probable that the unusual proportion of carbonic acid and hydrogen gases, which must be necessarily mixed in the common air where the soil is suddenly abandoned, may have had a share in increasing the malignity of those pestilential diseases, which have so often been observed to follow in the track of "desolating war."

Very large fertile districts have generally been found unhealthy; and it is doubtless necessary to the health of the whole animal creation, that the barren lands should bear to them that large proportion which is every where to be observed. The superior healthiness of the first occupiers of new land in America, has proved that the abundant foliage of a forest renders the air remarkably salubrious. Without entering into the minutiæ of chemical detail, it may be observed, that it has been found that animals constantly emit from their lungs, and the surface of their bodies, an aerial fluid which is unfit for respiration; that this aerial fluid is absorb-

by the leaves of plants when exposed to light, and, being decomposed by their action, the part which rendered the air unwholesome to animals is retained, and serves to nourish the plant; while, at the same time, they emit the remainder in a state of pure perishable [respirable] air.

As a large proportion of the richest manure is quickly changed by putrefaction into noxious vapours, it is for the health of man that nothing which will serve to fertilise the soil should be neglected, and that cultivation should be pushed to the uttermost. It is also both for his health and his interest to preserve the forest, or to permit nature to reproduce it where it has been destroyed by fires, in those situations which are not required for cultivation or pasturage; since it is certain that uncultivated land, exposed to the sun continually, for a long time, becomes more barren, and that land overgrown with wood is for a long time slowly becoming more fertile.

Nature has strongly pointed out to man that he ought not to reside near to putrefying animal or vegetable substances. They are disgusting to his senses; most useful to him as manures. When he neglects his duty, other animals are provided to assist him. Large towns are usually overrun with dogs, most of which are kept for no other reason than the attachment felt by their owners for those humble, loving, and ever-faithful dependents. Were manure as carefully collected here as it is said to be in China and Japan, they might prove a nuisance; but here they are certainly useful. They live principally upon the offal in the streets and yards, and are well entitled to their living. With all our poverty, we have not heard of any person dying of hunger in Halifax; but there is good reason to believe that the removal of the dogs would cause numbers to die of pestilential diseases. The flies in our yards and houses have a similar employment. The effluvia of those substances, which taint the air, point out [to them those substances as] the proper nidus for their young, who [which], by speedily devouring them, in a great measure prevent their decomposition. These, in a few weeks, become flies, and enter our houses in swarms at the close of the hot season, when the air is more than at any other time charged with deleterious vapours. The motion of their wings performs, in our apartments, the same office that the winds do abroad, in preventing the separation of the different kinds of air: for it is well known that the noxious aerial fluids, which are most abundant, are either heavier, or much lighter, than common air; and were they not kept in motion, they would

separate from it as they do in mines, where they are so destructive.

The savage, whose indolent habits are quite opposed to the practice of cleanliness, is never permitted to reside long in an unwholesome habitation. Insects, which our fastidious delicacy will scarcely venture to name, attack him; and, all untractable as he is to discipline, he is soon compelled by these "officers of health" to remove to another thicket, where he again breathes the fresh air of the woods, untainted by any noxious vapour. Together with the spices and stimulants of the East, the Europeans have imported the bug, which compels them to pay an increased attention to cleanliness, necessary, perhaps, to constitutions enfeebled by an increase of luxury. Whenever man neglects the dictates of nature, he is sure to be the sufferer. The awful dispensation by which we have been visited lately must have convinced every one who witnessed it, that they who reside in situations where those substances which make powerful manures are suffered to accumulate, are in a remarkable degree exposed to the attacks of pestilential diseases. It cannot yet be forgotten that the destructive fever introduced some years ago by an overcrowded cargo of emigrants was confined to the same parts of the town, and nearly to the same houses, that were most affected by the cholera. Believing such scourges to be the chastisements of a father, not less kind than just, and that they are not only never sent when not deserved, but also that they are always useful to the nations they visit, I shall (leaving those who are better qualified to notice the important moral instruction they convey) take some notice of the economical lesson which we ought to learn from what we have seen. A most destructive war had ravaged Europe for a long time. At its conclusion an immense body of men were dismissed to seek their support by their labour, after having learned no other trade than war, and being, of course, less qualified to succeed than if they had cultivated the arts of peace: the camp being always a poor school to teach industry, prudence, and economy. The enormous debts contracted during the war bear heavily upon all; and a greater, because constantly increasing, evil is to be found in habits of unbounded luxury and extravagance, which have turned the labour of multitudes from producing the necessaries of life, to furnishing articles of luxury for a few very rich individuals. The pacific dispositions, or the empty treasuries, of the governments of Europe, have prevented any very extensive war for a considerable time; and there is a general complaint of the great and increasing distress of a superabundant population, who can-

find employment by which they can support themselves. This distress has reached such a height in our mother country, that opposite parties are predicting a *bellum servile*, or war of the servants against the masters; and it has been seriously proposed to enact laws to prevent a portion of the labouring class from marrying, by some wise men of that school which believes the earth to have been created, and to be governed, by chance; and who seem really to fear that it may fail to produce sufficient food for its inhabitants, if their wisdom should not interfere to lessen their numbers. At such a time as this, an unknown and new pestilential disease appears, which, baffling the skill of the physician, spreads from country to country, marking, by its victims, the situations where man has neglected accumulations of filth, which, applied to their proper use as manures, might have furnished employment and food for millions; and, at the same time, by the greater danger of a crowded situation, warning a portion of the inhabitants of thickly settled towns to remove to insulated situations in the country.

In every part of Europe manufactories appear to be increasing. The business is overdone; markets cannot be found sufficient to absorb the immense quantities of goods. The motive appears to be found in the great fortunes that some capitalists have acquired; for the condition of the operatives seems to be far from enviable, when compared with that of the agricultural labourer. It does appear to me that a warning has now been given to man, from a source of undoubted wisdom, to turn his attention more to agriculture. In no other employment is the labouring man more comfortable. Some trades require less exertion of bodily strength; but it is not the man who bears the most fatigue that is the least cheerful. It is not in the time that pestilential diseases are abroad only that an inattention to cleanliness is dangerous. I have so frequently observed scrofulous complaints in families that live in uncleanly situations, and particularly in those that inhabit rooms below the level of their yards, that I have long believed that chronic diseases may be induced by a greater than common proportion of irrespirable gases in the air. It has been observed in England, that in the parish workhouses there is an uncommon proportion of scrofula, rickets, and cutaneous diseases, among children. The necessaries of life are drawn principally from the culture of the earth. The annual labour produces the supply for the following season. Money, or what we call wealth, is the power of commanding this labour; but this power is not always wisely applied. From it, men sometimes continue the business which formerly

was profitable. That Being, who knows the failings of our nature, has, in kindness, made our provisions very perishable. Rats and mice, weevils and mites, mould and must, protect the poor from suffering by the avarice of the monopolist. He that possesses more food than he needs must soon dispose of it, or lose it. Like our provisions, the manures that are required to produce them must every season be applied to their proper use, if we would not expose ourselves both to loss and danger. A heap of manure, kept through the summer, loses much of its value; for in the hot season a part of it will take an aerial form, and pass through heaps of earth, which cannot contain aerial fluids; while, at the same time, the exhalations that rise from it endanger the health of those that reside near it. It appears, therefore, that, to preserve a wholesome air in our dwellings, we ought, previously to the hot season, to remove from their neighbourhood every thing that will serve for manure; and that, to render this manure most productive, it should be used immediately, and not reserved for a following season.

The accounts we so frequently receive of the distress of manufactories appear to prove that more hands are employed in them than there ought to be; but the accumulation of manures, that the cholera is constantly pointing out, do prove that agriculture is too much neglected. It is true that this language appears to be addressed to those who will never hear this lecture; but, as I believe it to be an important part of the lesson which has been given to the world, I have thought that it ought not to be passed over. Nor is it wholly irrelevant to ourselves, since, although few are employed in manufactures, many among us, who might have supported themselves by agriculture, are now suffering from the failure of projects for acquiring wealth, in which they would not, perhaps, have engaged, but for the same disposition to follow the beaten track, and to trust to the supposed wisdom of others, which I have conceived may have led the inhabitants of Europe to push their manufactures too far. Nor is there, perhaps, any better mode of retrieving the consequences of our mistakes, than extending our agriculture, while we make our habitations more healthy, and raising greater quantities of provisions for exportation. Indeed, while the present difficulties continue, we may expect numbers to come to our shores from the land of our forefathers, whom I hope we may be always able to welcome to a country where food, at least, is cheap and abundant.

ART. II. *On Snakes, their Fangs, and their Mode of procuring Food.* By CHARLES WATERTON, Esq.

MR. TAYLOR, in his paper which appeared in p. 529—541., says: "I have repeatedly endeavoured to verify Mr. Audubon's account of the rattlesnake ascending trees, which has been confirmed." [p. 541.] Now, a great part of that account by Audubon consists of the description of a rattlesnake chasing a squirrel up and down a tree. Does Mr. Taylor wish us to understand that this part of the account has been confirmed by him? I ask this necessary question, because I cannot suppose that Mr. Taylor would spend his time in repeatedly endeavouring to verify the simple fact that rattlesnakes ascend trees. The fact is already as well established as is the existence of the rattlesnake itself. The merest novice in zoology must know that the muscular power in the bodies of snakes enables them to ascend trees. I anxiously wait for Mr. Taylor's reply. If he has actually seen a rattlesnake chasing its prey up and down a tree, then I will own that I have hitherto been completely in the dark with regard to snakes; and that all the time which I have spent in studying of their habits, while I was in the forests of Guiana, has been unprofitable and of no avail. If, on the contrary, Mr. Taylor informs us that his experience goes no farther than to verify the fact that snakes do get up into trees, then I take the liberty to remark that he has told us nothing new.

I have been in the midst of snakes for many years: I have observed them on the ground, on trees, in bushes, on bedsteads, and upon old mouldering walls; but never in my life have I seen a snake pursue a retreating prey. I am fully satisfied, in my own mind, that it is not in a snake's nature to do so. A snake would follow its retreating prey in a tree with just about as much success as a greyhound would follow a hare through the mazes of a thick wood. Snakes are always in a quiescent state just before they seize their prey; and their mode of capturing it is by an instantaneous spring, consisting of a bound which never exceeds two thirds of the length of the reptile's body.

As we are now on snakes, and as Mr. Taylor informs us that the names of his birds and animals "are corrected from the splendid work of Audubon," I beg leave to draw his particular attention to plate 21. of that work. It represents a rattlesnake attacking a mocking-bird's nest. Mr. Swainson, in his critique upon it [*M. N. H.*, i. 48, 49.], seems lost in admiration at its excellence. He says (after lauding plate 17.) "The same poetic sentiment and masterly execution characterises

this picture." "Pictoribus atque poetis," &c. The mouth of the rattlesnake is wide open, and the fangs are the first things to attract the inspector's notice, being by far the most conspicuous feature in it. There they are on elephant [folio], with their points curved *upwards!* The artist, in his notes on the rattlesnake, addressed to Thomas Stuart Traill, M.D., and inserted in Jameson's *Journal*, says, that he confined a rattlesnake for three years in a cage. Did he never once get a sight of the fangs all that time? I will allow any body the range of the whole world; and if he can produce one single solitary fang of any snake, great or small, with the point turned *upwards*, I will submit to be sent to the treadmill for three years. All fangs of snakes are curved somewhat in the shape of a scythe, with their points *downwards;* and we see clearly that their position in the mouth, and the manner in which they convey the poison, require that their points should be curved downwards.

Mr. Taylor further informs us that "black snakes are called racers, from their occasionally chasing men with great ferocity." [p. 541.] Chase argues pursuit and retreat: now, I affirm that snakes never chase men, nor, indeed, any other animals.

It often happens that a man turns round and runs away when he has come suddenly upon a snake, "retroque pedem cum voce repressit;" while the disturbed snake itself is obliged, through necessity (as I shall show by and by), to glide in the same path which the man has taken. The man, seeing this, runs away at double speed, fancying that he is pursued by the snake. If he would only have the courage to stand still, and would step sideways on the snake's coming up to him, he might rest secure that it would not attack him, provided that he, on his part, abstained from provoking it. I once laid hold of a serpent's tail as it was crossing the path before me; and then, as might be expected, it immediately raised itself and came at me, and I had to fight it for my pains; but, until I had seized its tail, it showed no inclination whatever either to chase me or to attack me. Had I been ignorant of the habits of snakes, I should certainly have taken myself off as soon as I perceived that it was approaching the place where I was standing; and then I should have told everybody that I had been pursued by a serpent, and had had to run for my life. This snake was ten feet long.

In 1820, on my way to the interior of Guiana, I accompanied Mr. President Rough to the hospitable house of Archibald Edmonstone, Esq., in Hobbabba Creek, which falls into the river Demerara. We had just sat down to breakfa-

I was in the act of apologising for appearing barefoot, and in a check shirt, alleging, by way of excuse, that we were now in the forest, when a negro came running up from the swamp, and informed us that a large snake had just seized a tame Muscovy duck. My lance, which was an old bayonet on the end of a long stick, being luckily in a corner of the room, I laid hold of it in passing, and immediately ran down to the morass. The president and his son followed; and I think that Mr. Edmonstone and his late lamented brother joined them. As the scene of action was within a few yards of the ground on which they stood, they had a full view of all that passed, from the commencement of the fray up to its final close. A number of trees had been felled in the swamp, and the snake had retreated among them. I walked on their boles, and stepped from branch to branch, every now and then getting an imperfect sight of the snake. Sometimes I headed him, and sometimes I was behind him, as he rose and sank, and lurked in the muddy water. During all this time, he never once attempted to spring at me, because I took care to manœuvre in a way not to alarm him. At last, having observed a favourable opportunity, I made a thrust at him with the lance; but I did it in a bungling manner, for I only gave him a slight wound. I had no sooner done this, than he instantly sprang at my left buttock, seized the Russia sheeting trousers with his teeth, and coiled his tail round my right arm. All this was the work of a moment. Thus accoutred, I made my way out of the swamp, while the serpent kept his hold of my arm and trousers with the tenacity of a bulldog.

As many travellers are now going up and down the world in quest of zoological adventures, I could wish to persuade them that they run no manner of risk in being seized ferociously by an American racer snake (see p. 541.), provided they be not the aggressors: neither need they fear of being called to an account for intruding upon the amours of the rattlesnake (see Jameson's *Journal* for June, 1827); which amours, by the way, are never consummated in the manner there described. The racer's exploits must evidently have been invented long ago, by some anxious old grandmother, in the back woods of the United States, to deter her grandchildren from straying into the wilds. The account of the rattlesnake's amours is an idle fabrication as old as the hills. When I was a lad, it was said, how that, in the plains of Cayenne, quantities of snakes were to be seen knotted together, and how that, on the approach of man, they would immediately dissolve company, and make the rash intruder pay for his curiosity far

more severely than Diana of old made Actæon pay for an ill-timed peep. She merely changed the hunter into a stag: they chased the man, and barbarously stung him to death.

When a man is ranging the forest, and sees a serpent gliding towards him (which is a very rare occurrence), he has only to take off in a side direction, and he may be perfectly assured that it will not follow him. Should the man, however, stand still, and should the snake be one of those overgrown monsters capable of making a meal of a man, in these cases, the snake would pursue its course; and, when it got sufficiently near to the place where the man was standing, would raise the fore part of its body in a retiring attitude, and then dart at him and seize him. A man may pass within a yard of rattlesnakes with safety, provided he goes quietly; but, should he irritate a rattlesnake, or tread incautiously upon it, he would infallibly receive a wound from its fang; though, by the by, with the point of that fang curved downwards, not upwards. Should I ever be chased by a snake, I should really be inclined to suspect that it was some slippery emissary of Beelzebub: for, I will forfeit my ears, if any of old Dame Nature's snakes are ever seen to chase either man or beast. They know better than to play pranks, which the dame has peremptorily forbidden.

In the village of Walton there is a cross road known by the name of Blind Lane. One summer's evening, as an old woman, named Molly Mokeson was passing up the causeway in this lane, a man, by name Wilson, saw a snake gliding onwards in the same direction. "Molly," said he, "look! there 's a snake running after you." She turned her head to see what was the matter; and, on observing the snake approaching, fear "seized her withered veins." After getting some twenty yards further up the causeway, she took refuge in a neighbour's house, and sat down in silent apprehension, not having breath enough to tell her troubles. In the meantime, Wilson had followed up the snake, and, being without a stick, he had tried repeatedly to kick it, but had always missed his mark. All of a sudden, the snake totally disappeared. Now, the true solution of this chase is nothing more or less than that the snake had been disturbed by the old woman, and had taken its departure for some other place, but, on seeing a man coming up from behind, it had glided harmlessly along the path which the old woman had taken; and then, to save its life, it had slipped into the weeds in the hedge-bottom.

Nothing was talked of in the village, but how that Molly Mokeson had been chased by the devil; for the good people-

of Walton, wiser in their generation than the sages of Philadelphia, never dreamed of taking this animal for a real snake; knowing full well that snakes are not in the habit of chasing men or women. I was consulted on the important affair; and I remarked, with great gravity, that there was something very strange and awful in it. "If," said I, "Molly has unfortunately been interfering with any other woman's witchcraft; or if she has been writing words with her own blood; or, above all, if there was a strong smell of brimstone in the lane at the time of the chase, then, and in that case, there is too much reason to fear that the thing which Wilson took for a snake was an imp from the bottomless pit, sent up here, no doubt, by the king of sulphur, on some wicked and mischievous errand." Poor old Molly is still alive, but nature is almost done within her; and she is now rarely seen on the cold side of the threshold. Many a time have I bantered old Molly on this serpentine apparition; but she would only shake her head and say, she wished she had been at home that evening, instead of going up Blind Lane.

Walton Hall, Oct. 18. 1835.

[In I. 397. is a statement that two snakes had been captured in water close by Portsmouth; one in the sea, close by land; the other in, it appears, the same kind of place. The late Rev. L. Guilding had noted, relatively to this statement, as follows: — "Snakes pursuing their prey on the borders of rivers may often be carried into the sea. I have known the huge *Bòa* constrictor washed (with the large cedar tree on which it was lying in ambush) from the banks of some South American river, and wafted by the currents to St. Vincent." — *Lansdown Guilding. St. Vincent, May* 1. 1830.

Notices of snakes being observed in water are given in I. 397.; III. 450. 510.; IV. 82. 147, 148. 279, 280. 474. 557.; V. 387. These are mostly on the species indigenous in Britain, *Cóluber Nàtrix L.* In IV. 148. is a statement of the fact of a pike being observed to strike at and seize one, and it was not seen more; and, besides, of one being found dead, "with a young pike," dead too, "scarce half swallowed, in his throat, the larger portion of the fish protruding out of the snake's mouth." In IV. 280. is a notice of "a very large black snake ... which lay coiled up among the water-lilies, with his head raised about four inches above the surface, in a small lake in Upper Canada," and a citation of an Indian's testimony that "black snakes" often go into the water, and that "they go a-fishing."

A Species of large Snake has swallowed a small Alligator, on

the Authority of the following Extract, communicated by J. M., Philadelphia. — "On Sunday last was killed, on Plantation Huis't Dieren, belonging to Governor Murray, a camoudy snake, measuring 14 ft. long and 13 in. in circumference at the natural size of the body; but, at the stomach, was distended to the enormous size of 31 in. On opening it, it was found to contain an entire alligator, recently swallowed, and measuring 6 ft. long by 28 in. in circumference. From the appearance of the neck of the alligator, it was evident that the snake destroyed him by entwining round that part; and so severe seemed to be the constriction, that the eyes of the alligator were actually started from their sockets." (*Royal Gazette of Demerara*, Oct. 8. 1822.)

Since the preceding was prepared for sending to the printer, No. 274. of the *Penny Cyclopædia* has been seen. In this number, under the subject *Boa*, is very interesting information on the structure and habits of serpents of the boa kind. The account is not completed in No. 274. It is illustrated by some engravings.]

ART. III. *Illustrations in British Zoology.* By GEORGE JOHNSTON, M.D., Fellow of the Royal College of Surgeons of Edinburgh.

Class CRUSTA'CEA. Subclass C. MANDIBULA'TA.

Legion EDRIOPHTHA'LMA.

Character. — Body composed of segments, of which the first forms a distinct antenniferous head; segments of the thorax separate; eyes two, sessile, immovable, conglomerate or compound; branchiæ in the form of lamellæ attached to the base of the feet, or to the abdominal segments. *

[* The great division [of the class Crustàcea of animals] named by Dr. Leach Malacostraca Edriophthalma, comprises those hard-shelled Crustacea which have three pairs of foot-jaws, five pairs of legs, and two other pairs of organs resembling legs, but which, in the Lobsters and Crabs, are converted into additional foot-jaws; they have also the thoracic portion of the body divided into segments; and their eyes are not placed at the extremity of footstalks.

This division comprises three orders: — 1st, the Amphipoda, or Leaping Shrimps, having the fore-legs generally large and cheliferous, and the body compressed and narrow; 2d, the Isopoda, having the legs of equal size and unarmed, with the body oval and depressed, and composed of equal segments, — containing the Wood-lice and allied groups; and, 3d, the Læmodipoda, a singular group, having the body slender and cylindric, with unequal-sized legs, some being cheliferous, and the segments unequal." — *J. O. Westwood*, in the *Transactions of the Entomological Society of Lon-*

Order Læmodi'poda *Latreille*, in Cuv. Règ. Anim., iv. 126.

Char. — Abdomen none or rudimentary; branchial lamellæ vesicular, attached underneath certain of the middle segments. (Body 7-jointed, the post-occipital segment anchylosed to the head, which carries a pair of labial palpi and a pair of legs; antennæ 4, setaceous, the terminal joint multiarticulate; mandibles without palpi. Inhabitants of the sea.)

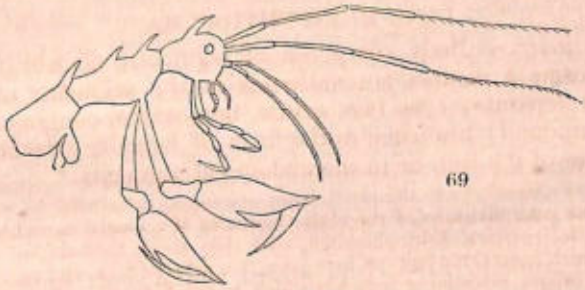
(1.) Branchial lamellæ 2 pairs, attached to the second and third segments, which are apodal - - - - Capre'lla.

(2.) Branchial lamellæ 3 pairs, attached to the base of the second, third, and fourth pairs of legs, which are all monodactyle - Pro'to.

1. Capre'lla *Lamarck.*

Char. — Body linear-elongate, of 7 unequal subcylindrical segments, the two posterior shortened: antennæ frontal, 5-jointed, the basilar joint minute; the superior antennæ longest: eyes placed behind the antennæ: palpi 4-jointed, the terminal joint small and claw-like: legs 10, 4-jointed, monodactyle; the two anterior pairs maniform, the posterior pair longest.

1. *C. Phásma.* — Head rounded in front, with a spine on the occiput: first segment of the body with two spines, one before the other; second segment with a spine in front:



69

Caprélla Phásma.

hands of the second pair of legs oval, pointed, with a tooth at the base. *Lam.*, Anim. s. Vert., v. 174.; Leach, in Edin.

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don, vol. i. part ii. p. 69.; in "Observations on the osculant Crustaceous Genus Arcturus of Latreille, with the Description of a British Species." This species is identical with the Astacílla longicórnis *Fleming*, which is illustrated in this Magazine, VIII. 494—496.]

Encyc., vii. 404.; Suppl. Encyc. Brit., i. 426.; Sam. Ent. Comp., 105.; Desm., Crust., 278. — *Cáncer* Phásma *Montagu*, in Lin. Trans., vii. 66. pl. 6. fig. 3.; Fleming, in Edin. Phil. Journ., viii. 297. — *Á*stacus Phásma *Pen.*, Brit. Zool., iv. 27. edit. 1812, desc. only.

Hab. — Coast of Devon, *Montagu;* Isle of May, *Rev. Dr. Fleming.*

"With a slender body of six joints, independent of the head: on the first joint are two spines, a third on the fore part of the second joint, and a fourth on the head, all pointing forward: the rest of the body smooth: antennæ four, the upper pair nearly as long as the body; lower pair half that length, and the extreme joint of each pectinated with bristles: eyes fixed, reticulated, usually of a reddish colour. Close to the mouth are two very short palpi, or feelers, with hooked claws: behind these are two others, much longer, armed with single movable fangs. On the first joint of the body are two long arms, with very large oblong-oval hands, furnished with a strong spine on the inside, and a long movable fang, which is capable of closing upon the spine, in order to secure its prey. The front of the hand in some is also narrowed and elongated into a spine. The second and third joints of the body are each provided with a pair of flat oval fins; the three posterior joints are each furnished with a pair of long slender legs, with a single hooked claw: the hindmost are the longest, and originate from the extremity of the body, the animal being destitute of tail.

"Length rarely exceeds three quarters of an inch, and seldom so much: colour various; sometimes red, but more commonly pellucid olive green.

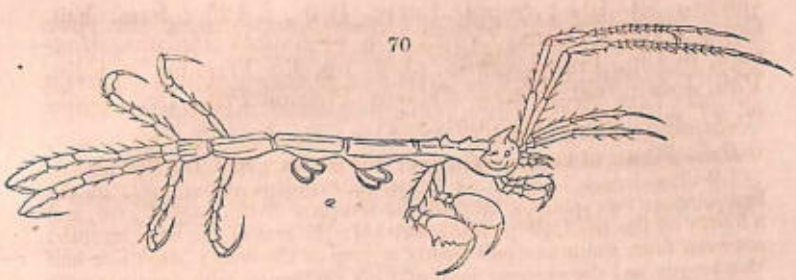
"The female differs in possessing several plates or valves beneath the body, situated between the two pairs of fins: the office of these is to carry and protect its eggs or young, at which time they extend very considerably, and form a kind of pouch. We have seen this receptacle distended with ova from fifteen to twenty, readily distinguished through the transparent plates. In this part a very strong pulsation is observable.

"While examining a female in a watch-glass of sea water under a microscope, we were agreeably surprised to observe not less than ten young ones crawl from the abdominal pouch of the parent, all perfectly formed, and moving with considerable agility over the body of the mother, holding fast by their hind claws, and erecting their heads and arms.

"On a small species of *Fucus* (the name of which was not noted) a vast number of these curious insects were collected, of both sexes, and of all sizes. When at rest, they only held by their hind claws: in motion, the arms were also used, and the progression was somewhat similar to that of the looper caterpillars, or larvæ of the moths of the Linnæan division of Geometræ." — *Montagu.*

2. *C. acanthífera.* — Head armed with a short spine; the post-occipital segment with two tubercles: hands of the second pair of legs ovate, lunate, with a denticle at the base: terminal joint of the antennæ hispid. *Leach*, in Edin. Encyc., vii. 404. — Cap. acuminífera *Desm.*, Crust., 277.; Johnston, in Mag. Nat. Hist., vi. 40. fig. 7. *a.* (The figure is repeated in the present instance (*fig.* 70.)

?*var.* "Head with one little tubercle; hand of the second pair of feet with three teeth on the inner edge." — Cap. lineàris *Leach.*, in Edin. Encyc., vii. 404.



Caprélla acanthifera.

Hab. — Devonshire, where it is not uncommon, *Leach*; Berwick Bay, among corallines dredged in deep water.

Body about half an inch in length, very slender, pellucid, colourless, except at the joints of the legs and the branchial lamellæ, which are spotted with red. Head obtuse, with a short spine on the crown pointing forwards, and two less ones behind. Eyes round, scarlet. Superior antennæ as long as the body, the last joint bristled with very short ciliæ; inferior antennæ half the length of the superior. First pair of hands small; the second much larger, ovate, obtuse, serrulate on the inner edge, with a tooth-like process at the base, and armed with a powerful claw; the joints of the wrist are short, the brachial one lengthened. The three hinder joints of the body are each furnished with a pair of slender legs, the tarsus of which is slightly curved, finely serrulated and grooved on the inner edge for the reception of the claw, which, when closed, meets a tooth near the base of the joint.

Dr. Fleming thinks it probable that this is merely a variety of C. Phásma, which, he says, "is subject to considerable variation in the number and position of the spines, and the hairiness of the different parts." — In conquence of this remark, I have been induced to consider the C. lineàris of Leach as probably a variety of the C. acanthifera. In addition to the character quoted above, Dr. Leach adds, "colour, when alive, brown, inclining to cinereous, beautifully spotted with rust colour."

3. *C. Pennántii.* — "Back without spines; anterior part of the head produced into a spine. Hands of the second pair of feet with one tooth." *Leach*, in Edin. Encyc., vii. 404. — C. acùtifrons *Desm.*, Crust., 277.; Stark., Elem., ii. 172. — Cáncer A'tomos *Stew.*, Elem., ii. 317. — *A'*stacus A'tomos *Pen.*, Brit. Zool., iv. pl. 13. fig. 2. edit. 1812, very bad.

Hab. — Common on the Devonshire coast, *Leach*.

Montagu (*Lin. Trans.*, vii. 68. note *) and Dr. Fleming have conjectured that this may be another variety of C. Phásma, but, if not a good species, it is more likely to belong to the following. Pennant's figure gives us no assistance, and the species for which it was intended must ever remain in uncertainty. The following description of C. Pennántii is translated from Desmarest: — "Head oval, pointed in front; inferior antennæ very much ciliated; body even, its first segment cylindrical, not larger than the head, giving origin anteriorly to the second pair of feet, which are short."

4. *C. lineàris.* — Head very obtuse in front, smooth: body smooth: inferior antennæ ciliated with long hairs: hands of

the second pair of legs ovate with a tooth near the base. *Latr.*, Gen. Crust. et Ins., i. 59.; Desm., Crust., 278. — C. scolopéndröides *Lam.*, Anim. s. Vert., v. 174. — *Cáncer* lineàris *Lin.*, Syst., 1056. — *C.* lobàtus *Stew.*, Elem., ii. 317. — *Squílla* lobàta *Müll.*, Zool. Dan. Prod., 197. No. 2359.; Fabr., Faun. Grœnl., 248. No. 225. — *S.* quadrilobàta *Müll.*, Zool. Dan., tab. 56. fig. 4, 5, 6. — *Gámmarus* quadrilobàtus *Müll.* Zool. Dan., tab. 114. fig. 11, 12.



71

Caprélla lineàris.

Hab. — Found among the *Confervæ* on the sea shore at Leith, *Stewart;* Berwick Bay, among corallines from deep water.

Body 6 lines long, slender, colourless, pellucid, smooth. Head enlarged, very obtuse in front, contracted posteriorly, spineless: eyes scarlet, roundish: superior antennæ about a third shorter than the body, and the inferior about half the length of these, the two basilar joints short, equal, and almost naked, the three outer joints elongate, subequal, and ciliated underneath with long hairs. First pair of legs smaller and shorter than the second, the tarsal joint forming a narrow elliptical hand armed with a stout claw; the hand of the second pair oval, with a single tooth near its base. Four first segments of the body elongate and equal, the fifth and sixth very short; and the second pair of legs arise from the bulged front of the first. Branchial processes small, subcylindrical, with a globular protuberance behind them, which, when the animal is gravid, swell out and unite, and, in this way, form a large uterine pouch; this appears to consist of four valves with fringed margins, which open at the proper season to allow of the escape of the young. Posterior legs sparingly hispid; the terminal pair very long, projected backwards so as to form a sort of tail; the tarsal joints longer and stouter than the others, with a small tooth near their base, and each of them armed with a long claw.

2. Pro'to Leach.

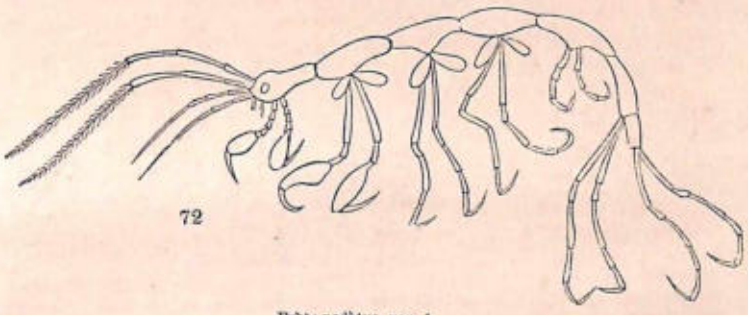
Char. — Body linear-elongate, of 7 subcylindrical segments, the anal short: antennæ frontal, 5-jointed, the basilar joint minute, the superior pair longest: eyes placed behind the antennæ: palpi 4-jointed, the terminal joint small and claw-like: legs 14, 4-jointed and monodactyle, the two first pairs maniform, the 3 intermediate pairs slender, the two posterior pairs stouter, with a small additional patellar joint.

1. *P. pedàtus* Fleming, in Edin. Phil. Journ., viii. 296. — P. pedàta *Leach*, in Edin. Encyc., vii. 433. — P. pedàtum *Desm.*, Crust., 376. — *Gámmarus* pedàtus *Müll.*, Zool. Dan.,

tab. 101. fig. 1, 2. — Cáncer Gámmarus pedàtus *Montagu*, in Lin. Trans., xi. 6. pl. 2. fig. 6. — Leptomere pediare *Desm.*, Crust., tab. 46. fig. 3. [In our p. 672., last line, for "376." read "276."]

Hab. — South coast of Devonshire, *Montagu;* at the Bell Rock, *Rev. Dr. Fleming;* Berwick Bay.

Body slender, arched, pellucid white with a few reddish specks, smooth and naked. Head obtuse in front, contracted into a neck behind; the eyes roundish and of a red colour: superior antennæ about half the length



Pròto pedàtus, var. 1.

of the body, the terminal joint hispid with short ciliæ at the junctures; the inferior antennæ slenderer, considerably shorter, and almost naked. First pair of hands small; the second greatly larger, oval, with a denticle or two near the base; and each armed with a powerful claw, closing along the inner side; the wrist joints small, the humeral linear-elongate. Third and fourth pairs of legs very slender, filiform; the femoral joint elongate, slightly clavate; the other joints shortened outwards; the claw long; fifth pair equally slender and much shorter: the sixth and seventh pairs considerably stouter, longer, and nearly equal, with an elongate femur, the knee very small, the tibia as long as the femur, the two tarsal joints shorter and sparingly hispid: the sixth pair arise from the hinder end of the sixth segment, but the seventh pair is terminal; and just before the origins of the latter there are four minute styles curved backwards and attached to two converging lamellæ.

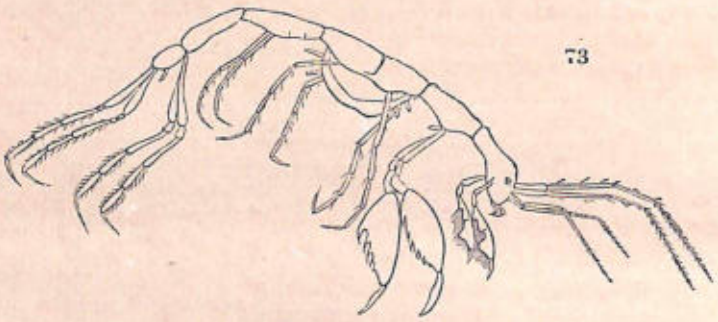
In the female, the ova are produced in a pouch formed by converging scales under the third and fourth segments, counting the head as the first. At first the pouches are distinct, and appear in the form of a globular protuberance between the legs; but at last they coalesce, and form one great uterine cavity, which opens about the middle when the ova or young are ready for birth. Montagu could not discover any styles under the terminal segment, and is of opinion that these constitute a sexual character. They were easily detected in the several specimens which I have had the opportunity of examining, some of which had no protuberances at the branchial lamellæ, and appeared in consequence to be males; but I suspect the animal can conceal these styles at will, and cover them with lamellæ, in the same way as the Astacilla and Idoteàidæ do their caudal appendages.

I have considered our specimens as referable to the species delineated and described by Müller and Montagu, although there are some differences

which might justify their separation. In the present state of our knowledge, however, of this curious animal, it will be safer to regard these differences as the mere variations of the same species.

Variety 1.— Hands oval with a single denticle at the base: head rounded in front: branchial lamellæ larger and elliptical. *Obs.* To this variety the figures of Müller and Montagu belong.

Variety 2.— Anterior hands triangular, somewhat lobed at the base; the wrist deeply sinuate: posterior hands oval, with two teeth at the base, and serrulate on the inner aspect: head very obtuse in front: branchial



Pròto pedàtus, var. 2.

lamellæ smaller and cylindrical. *Obs.* All the specimens I have seen belong to this variety.

Latreille (Cuvier, *Règne Animal*, tom. iv. p. 127.) and Desmarest assert that the figures of Müller and Montagu refer to distinct animals, which do not even pertain to the same genus. There is some error in this; for the figures are in reality more closely alike than could have been anticipated, when it is remembered that they are both original, and taken by different draughtsmen; and they unquestionably represent the same species.

The above, so far as I am aware, are all the læmodipodans which have been ascertained to inhabit the British seas.

Berwick upon Tweed.

[*Corrections by Dr. Johnston to certain of his Illustrations published in this Magazine.*] — At the conclusion of this volume, I take the opportunity of making the following *corrigenda* to my Illustrations in British Zoology: —

1. *Planària cornùta.* (V. 344.) — At p. 429. of the same volume this is considered synonymous with P. vittàta of Montagu; but this is an error, for the two species are quite distinct.

2. *Carinélla trilineàta.* (VI. 232.) — This is the Górdius annulàtus of Montagu, in *Lin. Trans.*, vii. 74.

3. *Sigàlion* Bòa. (VI. 323.) — This is distinct from any of the species described by Audouin and M. Edwards. The

antennæ are 3 in number, the central one larger and longer than the others. The description of the proboscis is incorrect; for the margin is fringed with a double series of papillary tentacula, not with "a series of corneous serrated plates."

4. *Lycòris margaritàcea.* (VII. 231.) — I have since ascertained that this is not the L. margaritàcea, so that the references to Lamarck, Leach, and Stark, among the synonymes, ought to be erased. The other references will, I believe, be found to be correctly applied. The figure is far from being a good one; but I hope soon to give a monograph of this genus with more correct illustrations.

ART. IV. *On the Specific Distinction of Rhynchóspora álba and Rhynchóspora fúsca.* By W. A. LEIGHTON, Esq., B.A.

DURING several unsuccessful attempts to discover that rare British plant Rhynchóspora fúsca, which is stated, on the authority of an excellent and accurate botanist, the late Rev. Edward Williams, to grow at Bomere Pool, near this town, I have repeatedly had occasion to refer to our floras for descriptions of both the species of Rhynchóspora indigenous to Britain, and as repeatedly to lament the indefiniteness of the characters by which they are there distinguished. This constant reference has been rendered necessary, in consequence of my gathering at Bomere Pool, and also on Twyford Vownog, near Westfelton, Shropshire, a plant growing in great abundance, intermixed with the usual state of Rhynchóspora álba, which, so far as regards the comparative length of the spikelets and the outer bracteas, and the somewhat oval appearance of the heads, evidently agrees with Rhynchóspora fúsca as described in Hooker's *British Flora*, 3d ed. p. 27. This uncertainty naturally induced a desire to investigate with accuracy the real specific distinctions of the two species; which I have at length been enabled most successfully to accomplish, through the kindness of my friend C. C. Babington, Esq., furnishing me with dried specimens of Rhynchóspora fúsca, gathered by him at Oughterard, in the west of Ireland, during the last month.

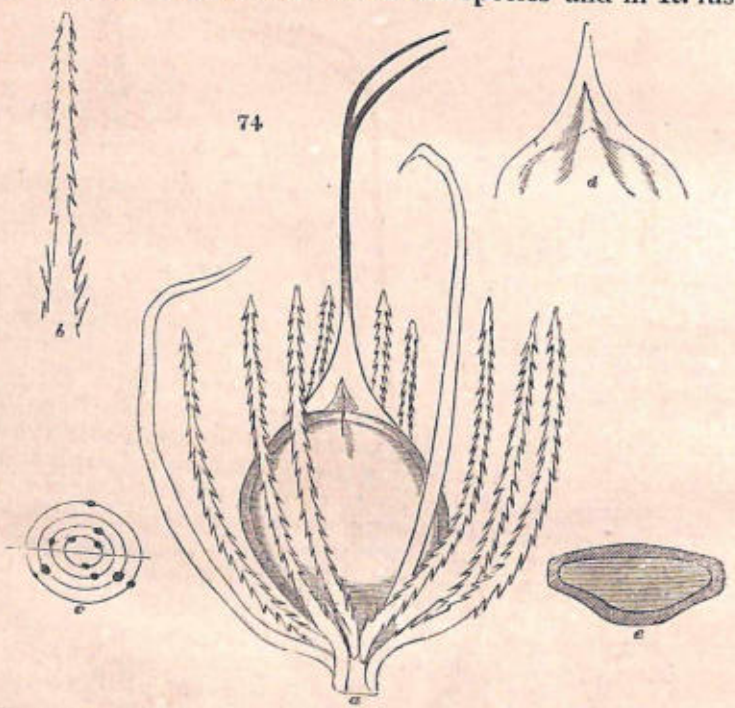
The result of this enquiry has arranged the doubtful state of R. álba, above alluded to, in its proper place, as a variety only of that species, and has also supplied some excellent and very decisive marks of specific distinction, which I have embodied in the following detailed descriptions of the two species, and which, it is confidently hoped, will tend to remove

that vagueness which has hitherto characterised the description of these species in our British floras.

RHYNCHO'SPORA A'LBA. (*fig.* 74.)

Spikelets in a compact corymb shorter than the outer bracteas; stamens two, filaments scarcely broader than the bristles; bristles nine to twelve, with reflexed teeth; fruit obovate, compressed, distinctly margined, minutely reticulated; style without teeth; leaves narrow, linear.

Spikelets of *flowers* white or whitish, collected so as to form a level surface at the top. *Bristles* with reflexed teeth, and a few erect ciliæ at the base, both in this species and in R. fúsca

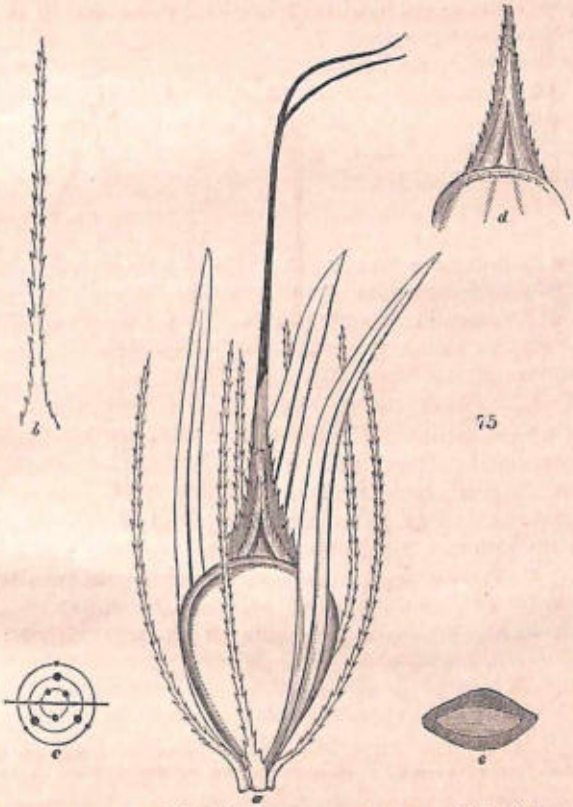


a, Magnified representation of the fruit, style, stamens, and bristles. *b*, Magnified representation of one of the bristles. *c*, Diagram exhibiting the relative position of the bristles, stamens, and fruit; the stamens are represented by the larger dots, and the fruit by a straight line. *d*, Magnified representation of the plain style. *e*, Transverse section of the fruit.

much longer than the germen, apparently arranged in whorls of three, the stamens being situated immediately before the exterior whorl, between that and the other whorls. *Fruit* greenish, tapering at the base into a short stalk. *Style* persistent, in texture and colour like the fruit, dilated at the base, which is not articulated, nor so broad as the seed. *Culm*

leafy, triangular. *Leaves* keeled, their edges and keels, as well as those of the bracteas, and also the angles of the flower stems, scabrous. *Root* creeping. In the spikelets of R. álba are two flowers, both fertile.

At Bomere Pool, and on Twyford Vownog, near Westfelton, Shropshire, I find two varieties growing intermixed with the above state of the plant, and in nearly equal abundance; one having the corymb as long as the outer bracteas, and the other having the spikelets in a somewhat oval head, shorter than the outer bracteas.



a, Magnified representation of the fruit, style, stamens, and bristles. *b*, Magnified representation of one of the bristles. *c*, Diagram exhibiting the relative position of the bristles, stamens, and fruit: the stamens are represented by the larger dots, and the fruit by a straight line. *d*, Magnified representation of the toothed style. *e*, Transverse section of the fruit.

RHYNCHO'SPORA FU'SCA. (*fig.* 75.)

Spikelets in an oval head considerably shorter than the broad outer bracteas; stamens three, filaments dilated, mem-

branous, much broader than the bristles; bristles six, with erect teeth; fruit obovate, somewhat turbinate, compressed, obscurely margined, minutely reticulated; style with a row of erect teeth on each margin; leaves almost filiform.

Spikelets oval, rich brown, longer than in R. álba. *Stigmas* more protruded. *Bristles* six (Smith and Sturm have figured and described only three bristles to each flower). *Fruit* brownish, tapering at the base into a very short stalk, much shorter than in R. álba. *Style* dilated at the base as in R. álba, persistent, thin, pellucid, greenish, thickened at the outer margins, which are each clothed with a row of erect teeth. *Culm* leafy, compressed. *Leaves* narrow, almost filiform, edges and keels somewhat scabrous. *Bracteas* broad, with about seven nerves, edges and keels scabrous. *Root* creeping. In the spikelets of R. fúsca there are two flowers, one of which is abortive.

Shrewsbury, Oct. 1. 1835.

P. S. — As it is my present intention to investigate with similar minuteness the genera *Cypèrus*, *Schœ̀nus*, *Scírpus*, *Blýsmus*, *Eleócharis*, and *Erióphorum*, I shall feel particularly obliged by any of your correspondents furnishing me with dried specimens of any species in those genera from different localities.

[The difference in the direction of the "teeth" upon the bristles of Rhynchóspora *Vahl* álba *Vahl*, and the direction of the "teeth" upon the bristles of fúsca *Smith*, pointed out by Mr. Leighton above, has called to mind that which obtains between *Pánicum verticillàtum L.* and víride *L.*: in verticillàtum the flowers are bracteated with bristles that are "rough with reversed teeth" (*Smith, Eng. Flora*, i. 98.); and in víride with bristles that are "rough with erect teeth" (*Smith, Eng. Flora*, i. 99.)]

Art. V. *Man's Progress in the Extension of the Knowledge of Natural Objects.*

The Shropshire and North Wales Natural History Society. — This was established on June 26. 1835. The forming of a central museum and scientific library, and the accumulating of information, and of means of information, on all the subjects

embraced by the Society, are the Society's objects. The following particulars are from the published prospectus: —

"The museum is principally designed to illustrate the natural history of the district, in its various branches of geology, mineralogy, zoology, and botany, by the gradual formation of complete and systematic arrangements of its productions in each of these departments. It will also be open to other objects of scientific interest, and, in particular, it will be a suitable repository for such remains of antiquity as are found within the district, or illustrate its general history. But, in addition to these more local objects, the museum will, it is hoped, through the liberality of the friends of science in various quarters, be enriched with many specimens from distant localities, which may serve to complete the series, and enhance the scientific value of those indigenous to our own district. For this purpose it is proposed that the council shall be empowered to effect exchanges of the natural products of North Wales and Shropshire, for specimens furnished by the cabinets of societies or individual collectors in other parts of the world.

"The library will consist of books illustrative of natural history and antiquities, and especially, in the first instance, of such works of reference as the funds of the Society will admit of being purchased, for the illustration of the objects in the museum. The library will, as well as the museum, be open to donations from the members and friends of the Institution.

"The Society will, however, have effected but a part, though a most important part, of its objects when it shall have established a museum and library. The collection, from every quarter, of accurate information respecting 'the natural and general history of the district;' its topography, statistics, climate, and meteorological phenomena; its geological structure, minerals, and organic fossils; its mines and collieries; its various animal and vegetable productions; is an object to which, if it hopes to rival in usefulness the Natural History Societies of other districts, the exertions of its members must be strenuously and perseveringly directed. For this purpose, as well as for the diffusion of a taste for science, there will be held periodical meetings, at which scientific communications will be received and read, and conversations held on subjects of science."

The delivering of popular lectures on those of the embraced subjects that most readily admit of that mode of illustration is, besides, proposed.

The Geological Specimens of W. D. Saull, Esq., F.G.S., among which those of the late Mr. Sowerby, are now strati-

graphically arranged in a building which Mr. Saull has recently erected, to contain them, at his residence, 15. Aldersgate Street, City, and may be inspected by scientific gentlemen every Thursday morning at eleven o'clock.

REVIEWS.

ART. I. *Titles of Works on Subjects of Natural History, published recently.*

ANON.: The Penny Cyclopædia of the Society for the Diffusion of Useful Knowledge. In 4to numbers, 1*d.* each.

In some recently published numbers the following subjects in natural history are treated of in a manner likely to render the treatises very interesting to those not already familiar with the subjects. *Bétula*, No. 248.; Bìpes, birds of p radise, 257.; birds, 257, 258., Bírgus, 258, 259.; bison, 262, 263.; bittern, 263.; blackbirds, 264., this number includes, besides, a treatise on bitumen, and one on *Bíxa Orellàna;* blackcap, 264, 265.; blackcock, 265.; blindworm, 270, 271.; bloodhound, 272, 273., the 272. includes a treatise on blood: *Bòa*, 274., and not finished in this; 274. includes, as well, accounts of the bluebird and the bluebreast. Most of these subjects are illustrated by wood-engravings, and some of them by several. The engravings cannot, it is true, be considered of the first quality.

Brown, Captain *Thomas*, F.L.S., &c., assisted by *eminent scientific, and literary men:* The Edinburgh Journal of Natural History, and of the Physical Sciences. With the Animal Kingdom, by Baron Cuvier. 4to. No. I.; 8 pages, inclusive of one woodcut, and exclusive of 1 plate, bearing 6 figures of birds, species of Trògon *L.* Price 4*d.*; with the figures coloured, 6*d.* Oct. 24. 1835.

"The plan of this work is twofold: an attempt is here made, for the first time, to combine the lighter character of a popular periodical with the more solid utility of an eminent scientific work. One half sheet of each number will contain, 'The Edinburgh Journal of Natural History, and of the Physical Sciences;' and the other will be devoted to a new translation of 'The Animal Kingdom, by Baron Cuvier,' with extensive notes and additions."

GENERAL INDEX.

A BERDEVINE, or siskin, the, has bred in confinement at Dundee, and wild in the neighbourhood, 372.
Actínia mesembryánthemum *Solander*, a description and figures of, 81; viduâta *Müller*, a description and figures of, 83.
A'juga réptans *L.*, a variety of, with the corolla pink-coloured, 390; Chamæ'pitys has disappeared, temporarily at least, from one of its habitats, 117.
Albinoes in Mammália and birds, conditions of, 41.
Alísma Plantágo L. is a species of plant eligible for observing the circulation of the sap in, 630.
Alleghany Mountain Range, the north-east extremity of the, an account of geological conditions of, a list of species of animals found upon it, and an account of some of the habits of some of these, 529—541.
Amplëxus coralloides *Sowerby*, the nature of, and localities of, 393.
Anagállis cærúlea Schreber, evidence on the question of its specific distinctness from *A. arvénsis L.*, 633; conditions which have affected the time of the vegetating of the seeds of *A. cærúlea*, 634.
Ancëus, see Crustaceous animals.
America, see Alleghany, see Weather.
Animals: a list of species of animals met with on the north-eastern extremity of the Alleghany Mountain Range, 536; a notice of the low degree of sensibility possessed by some animals, and of the suitableness of this condition to their appointed habits of life, 69; an attempted classification of the variations of animals and a consideration of the effects of food, domestication, regulation of the coupling, of temperature, and of other conditions, in promoting these variations, 40—49; considerations on some periodical and other changes of appearance which naturally take place in various British animals, and which do not constitute these varieties, 49; hybrid animals, considerations on, relative to the conditions of their origin, 198. 228. 509.
Anòmia coronâta *Bean*, a description and figure of, 564.
Arenícola, a description of three species of, and a figure of one of these species, 566.
Ashmolean Museum, the, at Oxford, the state of, so late as 1817, 239.
Aspérula arvénsis is obsolete in its only British habitat, 118.
Astacílla, see Crustaceous animals.
Astërias, facts on the structure and instincts of, and a view of the affinity of, 70, 71; *Astërias* pappósa ?, figures of the young of, 78 note *.
Atmosphere, see Weather.
Audubon's plates of his work on the birds of America, considerations on the history of these plates, 236.
Aurora borealis, notices of several instances of, with particulars on their condition, and that of the weather which followed them, 92—99. 143, 144. 343; a picture of a display of aurora borealis witnessed at Poole, Dorsetshire, 144.
Badger, the, some notice on the materials of its food, 228.
Barley, information on a species of insect deemed to feed upon plants of, 171.
Barnacles, see *Lèpas anatifera*.
Bat (*Vespertílio*), the large (altivolans *White*, Nóctula *Turton*), seen in Essex, on Aug. 22. 1834, a fable in which the bat is one subject, 167.
Bear, the, reputed food of, ants and honey, 228.
Behemoth, see Leviathan.
Bialowicza in Lithuania, the forest of, 473.
Birds: a notice of the resources of some birds for food during the continuance of severe frosts, 115, 116; a list of species of birds met with on the north-east extremity of the Alleghany Mountain Range, 539; a list of species of birds seen in the neighbourhood of Southminster Vicarage, Essex, 573; a continuation of the list of the species of birds which occur in the neighbourhood of Pontnewydd works, Monmouthshire, with notes on the habits of some of them, 545; some species of birds which utter sounds by night, 618; the foot of any species of bird is always adapted to the way of life of that species, 169; notions on the questioned subject, birds dressing their feathers with matters secreted from a gland, and on the effects of this imputed and disputed dressing, 375 note *, 515. 637; have hybrid birds ever been produced from parents in a wild state ?, 228. 509; are all birds in the habit of alluring intruders from their nests ? 505—508; notices of instances of birds in plumage of an unusual colour, 110—112; mental pleasures induced by birds, 186. 325. 611.
Blackbird, the, destroys numerous insects, 242; a wild blackbird that sings like a blackbird, and, besides, crows like the male of the Bantam fowl, 572; the blackbird in plumage anomalous in colour, a reference to mentions of instances of, 112.
Bómbus lapidárius, facts on, 575.
Boston, U. S. of A., see Weather.
Botany, Geographical, observations on the construction of maps in, 498.
Bramble, the, is one of the subjects of a fable, 166.
Brambling, the, one of, shot near York, on May 6. 1835, 512.
British Museum, the, a notice of the condition of, at a stated time past, 328, 329.
Búccinum zetlándicum Forbes, 593; other forms of *Búccinum*, 592, 593.
Bunting, the black-headed, facts on, 505.
Buzzard, the honey, facts on, 615.
Callúna vulgáris *Sal.*, see Heather.
Campánula cruciformis *Johnston*, elucidated, 179.
Canary finch, or bird, societies once extant for promoting the culture of it, 618.
Caprélla, see Crustaceous animals.
Caprimúlgus americánus *Wilson*, 470.
Cárduus crispus *L.*, an English habitat of, 636.
Carinélla trilineáta *Johnston*, 674.
Cat, the domestic, one with eyes of different colours, 610; white cats sleep less in the day than cats of other colours, 610.
Cayman, see Crocodile.
Centaurèa Scabiòsa, three varieties of, 390.
Chæ'nion nigricans *Westwood*, its person elucidated and habits imputed, 171—178.
Chameleon, the, and some kinds of lizards, an abstract of a theory in explanation of the phenomenon of their changing at will the colour of their skins, 229.

Char, facts and remarks on the characteristics of the species of fish so called, and a suggestion respecting the synonymy of it, 231.
Charàdrius pluviàlis and Hiaticula, facts on the habits of the, 505; minor, an individual of, taken in Britain, 510. 615; certain contrasting characteristics of minor and Hiaticula, 616.
Chelidònium màjus and grandifiòrum are very eligible for observing the circulation of the sap in them, 630.
Chrysochlòris capènsis, a mention of, 107.
Climate, the influence of forest-vegetation upon, 473; facts, arguments, and a deduction from them, that the climate of the world, when the species of plants, now fossil, in the coal measures were growing, was different to what it has been generally admitted to be, 536.
Coalhood or bullfinch, 517.
Coal measures, see Climate, see Geology.
Columbus, United States, see Weather.
Comàtula ? rosàcea, facts on the instincts, of, 69; facts on the structure and a view of the affinities of comatulas, 70, 71.
Coot, the, feeds on grass, 502.
Cormorant, the, facts on, 35. 162; notes of a visit to the haunts of the cormorant and facts on its habits, 166.
Crab, see Crustaceous animals.
Crake, the corn, one taken in December, 512; the spotted water, one seen in January, 512.
Crayfish or crawfish, see Crustaceous animals.
Crinoïdea, facts on the structure of, and a view of the affinity of, 71.
Crocodile, the, of the Nile, argument on the identity of this species of animal with the "than" of *The Scriptures*, and, incidentally, in the argument, information on this species of animal, 194; cayman, the, facts on, 309. 321.
Crow, the carrion, on leaving its eggs in the nest does not cover them, 301; the hooded crow has attacked a kestrel possessed of a snipe, 574.
Crustàceous animals: views and facts on the course of their developement, 267, 268. 271. 277. (Æ'ga, &c.) 550, 551; views on transformation in them, 275, 276. 469. 482; the structure of the young of the common lobster and of the freshwater crayfish and of other crustaceous animals, considered in relation to the questions, the occurrence or non-occurrence of transformation in crustaceous animals, 482; the spider crab in a state of moulting, 467; facts on the moulting of the freshwater crayfish, 468; Facts on parasitic crustaceous animals in the West Indies, 205; some minute crustaceous animals about St. Vincent, from their habit of boring wood and their countless numbers, are not less injurious than the Terèdo, 277; a notice of variableness in the characteristics of crustaceans of the same species, according to age, sex, &c., 277; a clew to a description of a mode of preserving specimens of crustaceous animals, 277.
Amphípoda, a cursory definition of the, 668, note *.
Ancèus forficulàrius *Risso*, synonymes of, and other information on, 273.
Astacílla longicórnis *Fleming*, a description and figure of, 494; a clew to further information on, 668, note *.
A'stacus Bartòni, 540.
Branchiópoda stagnàlis, 620.
Caprélla, a monograph on the species and genus of, and figures of three of the species, 668.
Cyclops Geoffroyii Leach, 620.
Cyprìs conchàcea, 620.
Dienècia, see Hippólyte, below.
Edriophthálma, definitions of the, 668, and note *.
Eurynome ? spinòsa *Hailstone*, ? àspera in a young state, a description and figure of, 549; correction to these, 638.
? Hippólyte ? rùbra *Westwood*, ? Hippólyte, macrochèles *Hailstone*, Dienècia *Westwood*, sp. *Westwood*, descriptions, figures and synonymy of, 272, 273, 274. 394, 395. 551, 552, 553.
Hyas sp. "? coarctàta in a young state" *Westwood*, serràtus *Hailstone*, a description of, a figure of, and remarks upon, 262, 263. 267.
Isópoda, a cursory definition of the, 668, note *.
Læmodípoda, definitions of the, 669. and 668, note *; a monograph upon the, 668.
Macropòdia ? *Phalàngium* in a young state, a description and a figure of, and remarks upon, 263, 264. 267. 551.
Pagùri, remarks on the mode of the circulation in, 276; a mention of numerous crustaceous animals supposed to be immature Pagùri, 276; the Pagùri avail conchologists, 564.
Pàndarus albitus *Johnston*, illustrated, 202; làmnæ *Johnston*, illustrated, 203.
Podophthálma, a note on the adjustment of the eyes in the, 277.
Pontóphilus trispinòsus *Hailstone*, a description and a figure of, and remarks upon, 261. 266. 394, 395; bispinòsus *Westwood*, *Hailstone*, a description and a figure of, and remarks upon, 270, 271. 273, 274. 394, 395.
Porcellàna minùta *Westwood*, "Linneana Leach" *Hailstone*, descriptions and figures of individuals of, remarks upon them, and synonymy of the species, 264, 265, 266, 267, 268, 269, 270. 394, 395. 551, 552.
Portùnus (not "Portúmnus," as printed in p. 277.), a mention of a striking species of, 277.
Próto, a monograph on the species and genus of, and two figures of two varieties of the species pedàtus, 672.
Squílla Desmarèstii Risso, illustrated by description and figures, 462.
Cuckoo, the common (Cúculus canòrus *L.*), facts and views contributive to the history of, 283—301. 325—340. 380—384. 394.
Dale's, Mr., rejoinder to Mr. Stephens, 395.
Daphnes, the fruit of, is eaten by birds, 517.
Dicranum, remarks on certain species of, 281, 282.
Dienècia, see Crustaceous animals.
Diósis, a clew to information on species of, 415.
Dipper, the, its affinities, habits, and certain localities of it, 374; its reputed faculty of walking under water cited, 375; its possession of this faculty disputed, 514; contended for, 638; remarks relative to the character of the dipper's nest, 338.
Dodder, the greater, facts on, 634.
Douglas, Mr., biography of, 410.
Dove: the turtle dove in Cumberland, 512; shot in Perthshire so late as Oct. 20., 512.
Dredging, records of the results of, 68. 591.
Drósera rotundifòlia, associations with, 282.
Duck: habits of the mallard, 541, and, incidentally, in 363. 505; a hybrid kind of duck, produced wild, 509; a duck which flew with the power of a crow, supposed to be a tamed wild duck, 45, note *.
Dundee Watt Institution, 410.
Earthquake, an instance of, in Kentucky, 189; Mr. Clarke has, in his essays, 1—28. 129—161. 417—450., mentioned many instances which have occurred in various parts of the world.
Earthworm, see Lumbrícus.
Echinèis, the, a parasite, is preyed upon by parasitic crabs, 205.
Edinburgh Cuvierian Natural History Society, 409.
Eel, the, its habits, 233; it is preyed upon by the cormorant, 166, 167.
Eggs: a mode of removing from eggs their yolk and white in the preparation of their shells for preservation, 470; fowls' eggs for

eating, a mode of preserving them good for months recommended and partly described, 574; the guillemot's eggs, an account of the collecting of them for sale, 164, 165.
Elephant, the, can it crack, with its foot, a nut without breaking the kernel? 396; fossil bones of elephants, see Geology.
Entomological Society, the engravings in the first part of *The Transactions* of, are executed by Mr. Swaine, not by Mr. Swainson, 120.
Entomology, a clew to information on the state of, in Britain, 524.
Eolidia papillòsa *Fleming*, despécta *Johnston*, Embletòni Johnston, rufibranchiàlis *Johnston*, illustrations of, 376—380.
Epping, a notice of the average quantity of rain that falls at, 346.
Erie, Lake, notices of instances of the rise of the water in, 119.
Essex, see Geology.
Eucolia rápæ *Westwood*, described and figured, and conjectures on its habits, 171—178.
Eurynome, see Crustaceous animals.
Eyprepia matrónula *Ochsen.*, an individual without vestige of fore wings, 220. 562.
Falcon, the peregrine, facts on, 162. 510. 543.
Feathers, solution of an optical effect observable in some kinds of, 469, 504.
Fishes and reptiles have the power to assimilate, in some degree, their colour to that of the objects about them, 230; freshwater species of fishes are found in the brackish water of the Albufuera; a species of eel that is of very lage size is found in it, 571. note *, 607; sea fishes are often best killed by immersing them in freshwater, 518; fishes are prodigiously fecund, 455; hostile parasites may influence the migration of fishes, 204; a list of species of fishes met with on the north-eastern extremity of the Alleghany Mountain Range, 540.
Fissurélla græ'ca, facts on, 592.
Flamingo, facts on the geographical range of, 571.
Fossils, see Geology.
Fowl, the common, a notice of an instance of remarkable changes in the colour of the plumage of a, 111.
Fox, the, materials of the food of, 226. 228; an account of a fox's being secured by its tongue being clasped by a *Mytilus modiolus* in its shell, 227; a locality of the fox, 162.
Frog, the, is eaten by the heron, 457.
Galeópsis versícolor *Curt.*, evidence on the question of its distinctness from allied kinds as a species, 632.
Gállium cruciátum, has two tubercles near the apex of its leaf, 280, 281.
Gas, inflammable, arising after boring for salt, notices of instances of, 118.
Geology; a classed synopsis of some of the mineral substances and of the organic remains found in the gravel at Stanway, Essex, and the neighbouring localities within a radius of fifteen miles, 349. 394; and some remarks on the general condition of the gravel in Suffolk and Norfolk, 353; a locality in Essex of specified fossil bones of the elephant and deer found, and geological conditions of the locality, 353; observations on the strata near Woolwich, inclusive of notice of species of shells found in them, 356; some account of the limestone quarries and incrustating spring at Pounceford, Sussex, with preliminary remarks on the Wealden rocks, 597; bones, teeth, and a portion of a tusk, fossil, of elephants have been found in the blue clay near Brighton, 354; fact and situation of the occurrence of seeds and certain species of shells in the lower freshwater formation of the Isle of Wight, 391; an account of a deposit of fossil shells at Burlington Quay, 355; a notice of some geological conditions deemed likely to affect the climate of Kendal, Westmoreland, 345. 346; a list of some kinds of fossils found in the Isle of Man, 119; some of the geological conditions of the north-east extremity of the Alleghany Mountain Range, 529; some information on the geology of Norway, 65. 249. 305; some of the grounds of a deduction that the species of the fossil flora of the coal measures may be in kind distinct from what they have been usually supposed to be, 526.: see, besides, Minerals.
Geránium pyrenáicum grows wild in Cambridgeshire, 388.
Glowworm, the, facts on the habits of, and characteristics of, 623—626.
Gnu; is not the jumaire the gnu? information on the gnu, 395, 396.
Goose; the length of the life of a certain gander, 509; facts on the habits of the Canada goose, 255.
Gorgonocéphalus, facts on the structure of, and a view of the affinity of, 70, 71.
Gravel, see Geology.
Gravelling, see Salmónidæ.
Grebe, the tippet, one shot, 510.
Greenfinch, a notice of an individual, in nestling feathers of a very pale yellow, 112.
Guana, the, facts on, 321.
Guillemot, the, notes on the habits and haunts of, 162; the modes of its using its wings in diving, 617.
Gulls, certain, their defending of their eggs and young, 506; the kittiwake gull, facts on, 162, 163, 164. 168.
Gunpowder, see Weather.
Heather, the, (Callùna vulgàris,) is the subject of endeared associations in the Scottish bosom, 282.
Haloes, solar and lunar, see Weather.
Hawk-moths, a list of species of, which have occurred in Forfarshire, 629.
Hedgehog, the, facts on the habits of, 107. 570; its harmlessness advocated, 322.
Heron, the common, notes on the habits of, 34. 453; facts on the night heron, 509.
Hoopoe, the, two individuals of, shot, 511.
Hornet, the, facts on the, habits of, 627.
Hurricanes, a diagram illustrative of the principles upon which, it has been conceived that, hurricanes are generated, 160.
Hylæosaurus, the, information on, 600. It can scarcely be doubted that this is the species of fossil animal noted on in vi. 75, 76; viii. 320, 321.
Iguánodon Mantélli, some particulars on the fossil skeleton of, found in a stone quarry near Maidstone, 99.
Iguanodon, the, argument on the identity of, with the behemoth of *The Scriptures*, and, incidentally, in this argument, information on the iguanodon, 313; information on the iguanodon, 599.
Insécta myriápoda, the, found in Berwickshire, a descriptive catalogue of, 486.
Insects, a notice of the ravages of a species of insect upon barley, and of another upon the turnip, 171; during a certain interval of dry weather, in 1834, grubs penetrated much deeper into the earth than usual, 113. Tipula olerácea, a notice of the results of the ravages of the grubs of, 114; instances of the subservience of insects to the sustenance of birds, 242. 571., of beasts, 228; a list of species of the diurnal lepidopterous insects known to occur in Switzerland, with notices of the localities of them, 1905—220, 553; a list of species of crepuscular lepidopterous insects, and of some of the species of nocturnal ones, known to occur in Switzerland, with notices of the localities in which they have been observed, 553; a mention of certain insects observed in a tour in Norway, 66; a notice of works on insects suited to enable a student to ascertain the names of pecies, 388, 399.
Iris fœtidissima, some places in England in which it grows wild, 388. 630.
Ivy, eaten by sheep with preference, 92; kil fowls which feed on it, 92.
Jackdaw, the, facts on, 162. 164.

Jungermánnia epiphýlla, certain associations that are connected with, in one mind, 282.
Kendal, Westmoreland, a report on the quantity of rain that has fallen there during the last thirteen years, and a notice of some local circumstances deemed to affect the quantity and the climate, 345, 346.
Kestrel, the, one has wrested a snipe from a sparrowhawk, 574.
Kingfisher, the, notes on the habits of, 251. 514.
Kinglet, the gold-crested (*Régulus* auricapillus) a biography of, 585; facts on, 547.
Kite, the fork-tailed, its defence of its young, 507.
Lámna monênsis *Cuvier*, 203, and note *.
Lamprey, the, some habits of, 235, 236; lamprey and lampern, the, facts on, 236.
Lark; facts on the habits of the skylark and woodlark, 549; some skylarks were singing on the wing on Sept. 27. 1834, in Scotland, 614; individuals of some species of lark have been seen in white plumage, 112.
Lathræ'a Squamária, variations in the flower of, a proposition in explanation of the cause of one of the kinds of variations, 635, 636.
Leech, the flying, so called, facts on, 622. Udonélla caligórum, registered below, is a species of leech.
Lépas anatífera, a figure of, specimens of, and some anatomical and circumstantial information on them, 55; views on the structure and its physiologic function in this species, and some notice of another species of *Lépas*, 116; some notice of Pentelásmis striáta *Leach*, 117.
Lernæ'æ, the, information on, and Lernæ'a uncinâta *Müller*, an elucidation of, by a description and by figures, 565.
Leviathan and behemoth of *The Scriptures*, an attempt to ascertain the kind of each of these species of animals relatively to kinds of animals now known, 193. 307.
Lílium Mártagon, a query on the British habitat of, 117.
Lima, three kinds of, some particulars on, figures of their shells and of the animal of one of the kinds, 593, 594.
Limax variegâtus and Sowérbyi, facts on the habits of, 80.
Limestone quarries, see Geology.
Linum, facts on certain species of, 281.
Lizards, see Chameleon, see Spiders.
Lobster, see Crustaceous animals.
Lophospérmum erubéscens, the seed of, is a beautiful microscopic object, 630.
Lucernária convólvulus *Johnston*, a description and figures of, 90.
Lumbricus capitâtus *Fabr.*, illustrated, 258, 259; lineâtus *Müller*, illustrated, 259, 260; tûbifex *β Müller*, facts on, 620; the common earthworm (*L.* terréstris) during a certain interval of dry weather in 1834, rarely made its appearance, 113; *Lumbricus*? Clitéllio *Savigny*? pellúcida, a doubt whether the animal that has been thus denominated is not the larva of some other animal, 260.
Lýcium, not any species of, is wild in Britain, 117
Lycóris margaritácea, 675.
Macroglóssa stellatárum, habits of, 630.
Málva sylvéstris, with corolla white, 390.
Mallard, see Duck.
Man, conclusions on the results on, of certain natural and artificial causes deemed to actuate and affect him, 641. See Temperature.
Man's progress in the extension of the knowledge of natural objects, 678.
Man, Isle of, records of the results of dredging off the coast of, 68; a list of some kinds of fossils found in the Isle of Man, 118.
Mantell, Dr., some account of the objects in geology in the museum of, 99. 125.
Mántidæ and Phásmidæ, the, are the kinds of insects that most resemble the leaves and stalks of plants, 389.
Marten, the, is reputed to feed upon shelled mollusceous animals, 227.
Megalosaurus, the, argument on the identity of, with the leviathan of *The Scriptures*, and, incidentally, in the argument, information on the megalosaurus, 308.; other, 599.
Meteoric phenomena, information on, included in a series of essays which have a wide scope, expressed in their title, "On certain recent meteoric phenomena, vicissitudes in the seasons, prevalent disorders, &c., contemporaneous, and in supposed connexion, with volcanic emanations:" these occur in 1. 129. 417. See, besides, under Weather.
Minerals, a list of certain kinds of, obtained on a tour in Norway, 67; information on certain kinds of minerals, 639.
Mole, facts on the habits of, 103. 107; the mole is rare, or not extant, in Ireland, 107; the mole believed to feed upon the common slug, 227; the mole is preyed upon by the fox, 227; individuals of the mole in fur anomalous in colour, 105. 107.
Molluscous animals: an illustrated essay on the food and digestive organs of herbivorous or phytophagous Mollúsca, 71; an enumeration of the phytophagous and zoophagous families of Mollúsca, 72. See, besides, Shells; see Testaceous animals.
Monónychus pseûd-ácori, a locality in which many individuals of it have been taken, 630.
Muscle, the eatable (*Mýtilus* edûlis); a fact in proof that it may be poisonous at the time at which it produces its spawn, 619.
Myriápoda, see Insécta.
Mýtilus modíolus, facts on, 227.
Náis L. serpentina *Gmel*, a doubt on the identity of the animal that had been deemed identical, 260.
Narcissus moschâtus has been found wild in Meriden, Warwickshire, 118.
Natural History, the facilities available to Londoners in the pursuit of, 400; obstacles extant in the acquisition of specimens of natural objects, 402, 403; a sketch of the scope, offices, and excellencies of, 403; societies for promoting the extension of the knowledge of natural history, 403. 410.
Neóttia spirâlis found between Greenwich and Woolwich, 637.
Néphtys margaritácea illustrated, 341—343.
Newcastle natural history society, 410.
Nightingale, the, has sung in the winter time in Britain, 614.
Nomenclature: criticism on the arbitrary alteration of established terms in natural history, 36
Norfolk and Norwich museum, 410.
Norway, notes of a tour in, in quest of objects of natural history, 65. 240. 305.
Nova Scotia, conclusions on the results on the vegetation of, of certain natural and artificial causes deemed to actuate and affect it, 641.
Nummulites in a recent state, 619.
Nuthatch, the, a notice of an individual of, in plumage of unusual colours, 112.
Onònis procúrrens *Wallroth* var. rèpens *Dec.* and spinòsa *Wallroth*, grow near Epsom, Surrey, 636.
Ophiûra rósula and lacertòsa, a notice of a locality in which they abound, 68; facts on the structure and instincts, and a view of the affinities, of ophiuras, 69, 70, 71; illustrations of these species of Ophiûra: bracteâta *Fleming*, 465; neglécta *Johnston*, 467; bèllis *Fleming*, 594; granulâta *Fleming*, 595. Views on the classification of the ophiuras and allied animals, 70.
Organic remains, see Geology.
Origanum vulgâre, with corolla white, 390.
Othònia Fabrícii Johnston, illustrated, 181.
Owl, the tawny, notes on the habits of, 322; one of the snowy owl (*Strix nýctea*) has been captured alive, and kept in confinement, 508.
Pagûri, see Crustaceous animals.
Pándarus, see Crustaceous animals.
Pánicum verticillâtum and viride, a contrasting characteristic of each, 678.
Peafowl, the, a notice of individuals of, in white plumage, 111.
Pentacrinus europæ'us *Thompson*, some notice

of the structure of, and an opinion of the affinity of, 71.
Pentelâsmis striâta *Leach*, a mention of, 117.
Panopæ'a Glycýmeris *Turton*, illustrated, 562.
Paraselenæ, see Weather.
Parhelia, see Weather.
Partridge, acts of, for preservation, 506.
Patélla pulchélla *Forbes*, and other species, 591.
Patélla tricórnis, the shell of, is the operculum of the tube of Sérpula vermiculâris *L.*, 621.
Petrel, the storm, 513.
Phásmidæ, information on the, 304. 329.
Pheasant, the common, in parks, an approved mode of promoting the welfare of, 33; instances of the common pheasant in plumage white and pied, 112.
Phyllosòma sarniénse *Lukis*, and other species, 461.
Pigeon, the rock, a mention of a locality in which it breeds, 162; some of the habits of the passenger pigeon (Colúmba migratòria), 535; the carrier pigeon, achievements of certain of the, 619.
Pimelèa hispida *Lindley*, condition of the hairs of, 631.
Planária cornúta, 674.
Plants: species of plants in which the circulation of the sap is more obvious, 630; hairs of plants show a motion in the fluids they include, 631; certain views on the variations which occur in animals, which views are, it is stated, equally applicable to plants, 40—49; silica in plants, 631; species of plants observed in a tour in Norway, 66. 249. 305; a list of species of plants which grow on the slopes of the Sharpestones Hill, close by Shrewsbury, 278, note *; observations concerning the indigenousness and distinctness of certain species of plants included in the British floras, 84; facts and opinions in question of the distinctness, as species, of certain plants reputed to be species, which inhabit Britain, 89; remarks in relevance of the question of the indigenousness of certain species of plants, reputed to be aboriginal in Britain, 386; instances of man's dispersing of species of plants, 389, 390; habitats of certain species of British plants additional to those stated of them in Hooker's *British Flora*, the third edition, and corrections and additions to some of the descriptions, and notices of uses, in that work, 631; facts and views on the subject, the length of time that seeds, sown, will retain their power of germinating, 392, 393; directions for producing skeletons of the leaves, calyxes, and seed-vessels, or other parts of plants, 221; a mention of certain sentimental associations that are connected in one mind with plants of certain mentioned kinds, 282; fossil kinds of plants, views on those of the coal-measures, 525; species found in the Wealden rocks, 600.
Plovers, see Charádrius.
Podophthálma, see Crustaceous animals.
Polecat, the, is reputed to feed upon shelled molluscous animals, 227.
Portúnus, see Crustaceous animals.
Pounceford, see Geology.
Prionops Geoffroýii Vieillot, a figure of, and some information on, 372.
Pròto, see Crustaceous animals.
Puffin, the facts on, 162, 163, 164.
Pulmonária officinâlis and angustifòlia, grounds of an opinion that these are not distinct as species, 89.
Quail, the, instances of its being met with in winter, one in February, 512.
Quércus Æ'gilops and Cérris, 472.
Rabbit, the wild, a remarkable locality for, 162.
Radiâta, see Ophiúra, Astèrias, Gorgonocéphalus.
Rain, a notice of the quantity which has fallen at Kendal, Westmoreland, during 13 years, 345; a notice of the average quantity that has fallen at Epping, 346.
Ranúnculus Ficária, a list of observed variations in the number of sepals and petals in, 280.
Rattlesnake, see Snakes.
Raven, the American, habits of, 186; a locality in which the raven of Britain breeds, 162.
Razor-bill, the, facts on, 162, 163, 164. 167.
Reptiles have the power to assimilate, in some degree, their colour to that of the objects about them, 230.
Reynolds, Messrs., Thetford, Norfolk, a testimony of their skill in stuffing and setting skins of birds for preservation, 113.
Rhinoceros, the, has it an elastic ball to its foot that enables it to spring like a deer? 396.
Rhynchóspora álba *Vahl* and fúsca *Smith*, an elucidation of the distinctive characters of, 675.
Rice plant, a question on the possibility of cultivating the, so far north as Westphalia, 399.
Roach, the, is very fecund, 455; a locality of the variety with lips chestnut-coloured, 471.
Robin, the, facts on its habits, 241, 242. 516. 518. 545; reference to mentions of individuals of the robin in white plumage, 112.
Rook, the, facts on, adduced in argument that it consumes more of insects than of grain, 113
Salmónidæ of Scotland, a notice on, 232, 233, and note *; the gravelling of the river Taw, Devonshire, an account of, 54. 470; incidental information on the skegger trout of the Thames, 54. See Char.
Salt, remarks on the deposition of, in the Mediterranean sea, 225; see, besides, Gas.
Sandpiper (Tótanus hypoleúcus *Temminck*), facts on the habits of, 303.
Sauli's, W. D. collection of geological specimens, 679.
Sérpula vermiculâris *L.*, the shell of Patélla tricórnis is the operculum of the tube of, 620.
Shells, a notice of certain works on, 396—398; a list of species of shells found in the neighbourhood of Sudbury, Suffolk, 580; see, besides, Testaceous animals.
Shrike, the red-backed (Lánius collúrio *Lin.*), a notice of a very remarkable individual of, and some observations on this species, 364. 371; facts on the large shrike (Lánius excúbitor *L.*), 371; Geoffroy's shrike (Prionops Geoffroýii Vieillot), 372.
Shropshire and North Wales Natural History Society, 678.
Sigâlion *Bóa*, 674.
Sipho *Brown*, 592.
Siskin, see Aberdevine.
Snails and slugs, a mode of decoying them, 81; the species of snail, Hèlix aspérsa, has eaten of Clématis Flámmula *L.*, 518.
Snakes: views on the manner in which the rattlesnake's poison is communicated from the fang to the object bitten, 190—192; the mode in which three snakes have taken live frogs as their food, 183; notes on snakes, their fangs, and their mode of procuring food, 663.
Snipe, 574. 612; ? Sabine's snipe, 613, 614.
Snowdrop, the (Galánthus nivâlis), facts relating to the question, Is it native in Britain? 386. 388.
Sparrow, the, destroys numerous insects, 242.; an individual of the sparrow in plumage anomalous in colour, 111; a notice of a very light-coloured tree sparrow, 111.
Sparrowhawk, the, its defence of its nest, 507.
Spiders: some habits of the diadem spider, 575; egg-cases of species of spider, 575—579; "the spider" of the English *Version of The Bible* has been deemed to be a species of lizard, 321.
Squilla, see Crustaceous animals.
Starfishes, see Radiâta. Views on the classification of the starfishes, 70.
Starling, an incidental notice of the agency of the, in freeing grass lawns of larvæ of insects, 114; the starling nidificates in the fissures of certain cliffs, 162.
Stickleback, a notice of six British species of, 280, 281.
Stoat and water-rat, a contest between, 609.

Studer, Professor, the late, of Berne, a notice of the extent of the collection of preserved specimens of insects that he had possessed, 220, 221.
Swaine, Mr., see Entomological Society.
Swainson, Mr., see Entomological Society.
Swallow, the, a young one of, detained after the departure of swallows generally by being accidentally fettered into the nest, one of its parents had stayed to attend it, 513; means conducive to the keeping of the swallow alive through the winter in Britain, 572; earliest and latest dates of seeing the swallow in Britain, 572; of the window swallow (*Hirúndo úrbica*), and chimney swallow (*H. rústica*), light-coloured, and even albino, individuals have been known, 111.
Sweet, Robert, biography of, 410.
Swift, the, one of, seen alive, wild, in Perthshire, on Nov. 8. 1834, 513.
Switzerland, a superstition which is extant in, similar to that of the rupture-ash in Britain, 569. See Insects.
Teal, the, facts on, 165. 363.
Temperature exerts no permanent gradual influence in altering the characteristics of the races of man, 47; a consideration of its connexion with the seasonal variations in the colour and nature of the coats of animals, 49. 53. See Weather.
Testaceous animals: notices of certain marine species of testaceous animals dredged up off the coast of the Isle of Man, 68; a list of the land and freshwater shells of the Isle of Man, 69.
Tit, the blue, a notice of an individual of, in plumage of a very light colour, 112; a notice of the nest of a tit being found buried in the decayed wood of a tree, 364.
Trichiosòma lucòrum, facts on the habits of, 628.
Tritònia pinnatifida *Cus.*, a description and figures of, 61; a notice and figure of the jaws of a Tritònia, 75.
Turnip, information on species of insect deemed to puncture or feed upon the tuber of the, 171—179.
Udonélla *Johnston* [? An abbreviation of Hirudonélla: the animal is a tiny leech.], caligòrum *Johnston*, illustrated, 496.
United States of America, see Alleghany, see Weather.
Vegetation, the, of Nova Scotia, and vegetation in general, conclusions on the results on, of certain natural and artificial causes deemed to actuate and affect it, 641.
Vegetation, relatively to elevation, 400; the influence of forest vegetation upon climate, 473.
Verbáscum Thápsus, its stamens, 632.
Viola imbérbis Leighton, the characteristics of, 277; this identified with the *suávis Bieb.*, and information given on this species, 384, 385; *lácteа*, facts in proof that this is a variation of *canina*, 279; a variation of *canina*, 280; odoráta, images of certain endeared scenes that are connected with it in one mind, 281.
Vertebrate animals, the number of British species of, 359.
Volcanic emanations; an attempt to trace meteoric phenomena, vicissitudes in the seasons, prevalent disorders, &c., to these as the effecting agent, in which attempt many instances of volcanic emanations are cited, 1. 129. 417.
Wagtail, facts on the yellow, pied, and grey species, 547; one of the grey-headed wagtail shot at Walton on the Naze, 617; the hybridism of the genealogy of a kind of wagtail deemed a hybrid of *Motacílla lúgubris* and *M. álba* questioned, with reasons, 228.
Walton Hall and park, the demesne of Charles Waterton, Esq., some account of, 28.
Water-rat, the, is preyed upon by the common heron, 454, 455; by the stoat, 609.
Waterton. See Walton.
Wasps of the species *Vespa británnica*, vulgàris, and holsática, facts on the habits of, 626, 627.
Wax-wing, or chatterer, the Bohemian, individuals of, some seen, some shot, 511; one living in a state of domestication in England, 511, 512; one shot with five appendages on one wing, seven on the other, 615.
Wealden rocks or beds, information on the, 597—604.
Weasel, the, destroys mice in stacks of corn, 609; facts on the weasel, 547.
Weather, facts and views on the effecting agents of; see in the essays on meteoric phenomena, &c., 1. 129. 417; facts and views on the relation of displays of aurora to the state of the weather after and before the occurrence of the displays, 92—99. 343; specified instances of solar and lunar haloes, parhelia, paraselenæ, and meteors, viewed as harbingers of the falling weather which followed, 501; a proposition, and grounds of it, that the explosion of large quantities of gunpowder effects extensive changes in the condition of the atmosphere, 223; state of temperature in various parts of the United States on Jan. 5. 1835, 347; state of the weather at Columbus, United States, in January and February, 1835, 347. 394; state of the weather at Boston, United States, in March, 1835, 347; see, besides, under Rain.
Wheatear, the, facts on the habits of, 547.
Wigeon, the, notes on the habits of, 361: it has been found breeding, wild, in the north of Scotland, 509; a fact on the, 166.
Wind, argument on certain instances of, that they were connected with terrestrial heat, 27, 28. 129—139; the gales in the autumn and winter of 1833, facts adduced in argument on the operating causes of the, 1: see Hurricanes.
Wolf, the last, that was killed in Scotland, 571.
Woodcock, the (*Scólopax rusticola L.*), the date of its appearing in inland localities, 611; instances of its breeding in Britain, 612; an unusual individual of the *Scólopax rusticola L.*, or an individual of a distinct species, 612.
Woodpeckers, an opinion on the habits of, 34.
Woolwich; see Geology.
Worcestershire, natural history society, the, condition and scope of, 403. 522.
Wren, the, facts on the habits of, 242. 545. 547. 617; the gold-crested wren, facts on, 547. See Kinglet.
Wryneck, facts on the habits of, 303.
Yellowhammer, or, yellow bunting, a, with a white head and tail, 110.
Yew tree, the: its green leaves are fatal food to horses, 91; its withered leaves are fatal food to chickens of the Guinea fowl, 91; opinions, on the safety of eating the fleshy portion of the fruit of the yew differ, 92.
Zoology, remarks incentive to the promotion of the study of, in Britain, 519.
Zoology, British, Dr. Johnston's illustrations in, 59. 81. 179. 202. 258. 341. 376. 465. 486. 494. 565. 594. 668. 674.
Zygæ'na filipéndulæ, habits of, 629.

INDEX TO WORKS NOTICED.

THE GENERAL SUBJECT.

Allies's Observations on certain indentations in the old red sandstone of Worcestershire, &c., considered as the tracts of antediluvian animals; and on other subjects, 471.
Analyst, the, No. 12. of, 581.
Arcana of science and art, eighth year, 248.
British Association for the advancement of Science, its report for 1834, 519.
Brown's Edinburgh journal of natural history, and of the physical sciences. With the animal kingdom, by Baron Cuvier, 680.
Howitt's Sketches in natural history, 415.
Jesse's Gleanings in natural history, third and last series, 580.
Linnæan Society's transactions, vol. xvii. part ii., 415.
Nouveaux mémoires de la Société Impériale des Naturalistes de Moscou, tome iii. 120.
Parent's, the, cabinet of amusement and instruction, 584.
Royle's Illustrations of the natural history of the Himalayan Mountains, and of the Flora of Cashmere, 414. 584.
Russell's History of the Barbary states, 358
Society for the Diffusion of Useful Knowledge, its Penny Cyclopædia, 415. 680.
Swainson's Discourse on the study of natural history, 238.
Waterton's two letters to Professor Jameson, 190. 244.
West of England journal of science and literature, 359.
Westall's Views of certain lakes of Cumberland, 416.
Worcestershire Natural History Society: the proceedings at the second anniversary festival, 522.

GENERAL ZOOLOGY.

Anatomy and physiology, cyclopædia of, 415.
Bryce's Manual of zoology, 359.
Grant's Outlines of comparative anatomy, 360. 472.
Harewood's Dictionary of sports, 471.
Houston's Descriptive catalogue of the preparations in the museum of the Royal College of Surgeons in Ireland, vol. i. anatomy, 242.
Kirby's Treatise on the power, wisdom, and goodness of God, as manifested in the creation of animals; and in their history, habits, and instincts: the seventh of the Bridgewater treatises, 471.
Swainson's Treatise on the geography of animals: the natural system, and the principles of classification, 527.

VERTEBRATED ANIMALS.

Jenyns's Manual of the British vertebrate animals, 248.
——— Systematic catalogue of British vertebrate animals, 304. 359.

MAMMALOGY.

A veterinary surgeon's account of veterinary surgery; its schools and practitioners, 243.
Beale's Observations on the sperm whale, 244.
Bell's History of British quadrupeds, 584.
Elliotson's Work on human physiology, 304.
Jardine's Naturalist's library: deer and antelopes, 127; dogs, 127.

ORNITHOLOGY.

Audubon's Biography of the birds of America, vol. ii., 64. 184.
Baker's and Prince's Ornithological index, 411.
Bechstein's Treatise on cage birds, translated into English, with notes by the translator, 127. 412.
Fowler's Illustrations of British birds, 248.
Gould's Illustrations of the birds of Europe, 510. 615.
Jardine's Naturalist's library: British birds, 527; game birds, part ii., 121; parrots, 128.
Meyer's Illustrations of British birds, 128. 303.
Morris's Guide to an arrangement of British birds, 360. 472 581.
Mudie's Natural history of birds, 357.
Partington's British Cyclopædia, natural hist. some parts, including treatises on birds, 127.
Perrott's Illustrations of selected species of birds frequenting Worcestershire and the adjacent counties, 248. 523.
Selby's Natural history of the pigeon family (Columbidæ), 128. 523.
Taylor's Work, the boy and the birds, 414.
Wood's Account of the rise and progress of ornithology, 584; and sketches in British ornithology, 584.

ICHTHYOLOGY.

Jardine's Naturalist's library: fishes, 128
Yarrell's History of British fishes, 128. 244. 584.

CONCHOLOGY.

Brown's Conchologist's text-book, 397.
Lea's Observations on the Naiades, and descriptions of new species of that and other families; and observations on Lamarck's Naiades, 196.
Sowerby's, G. B., Genera of recent and fossil shells; general conchology; and species conchyliorum, 397.
———, J. D. C., Mineral conchology, 583.
Swainson's Elements of modern conchology, 127. 397.
Turton's Manual of the land and fresh-water shells of the British Islands, 397.
Wood's Index testaceologicus, 397, 398.

ENTOMOLOGY.

Bagster's Management of bees, 63.
Donovan's Figures and descriptions of selected insects of India, and of the islands of the Indian seas, 527; figures and descriptions of selected insects of China, 528.
Duncan's Natural history of beetles, 128. 527.
Entomological Magazine, 128. 360.
———, Society of London: Transactions, vol. i. part i., 62; part ii., 368, note*; Children's address at the first anniversary, 245; Westwood's address on the recent progress and present state of entomology, read at the Society's second anniversary meeting.
Gravenhorst's Ichneumonologia, 398.
Gray's Synopsis of the Phasmidæ, 64. 304.
Gyllenhall's Work on the Insecta Succica, 398.
Haworth's Lepidoptera Britannica, 398.
Jardine's Naturalist's library: natural history of British butterflies, 128.
Kirby's Monographium Apum Angliæ, 398.
Kirby and Spence's Introduction to entomology, 398.
Meigen's Work on dipterous insects, 398.
Newman's Grammar of entomology, 128. 247.
Purchas and Bagster's Spiritual honey from natural hives, 122.
Shuckard's Manual of entomology, 360.
Stephens's Systematic catalogue of insects, 398.
St. Fargeau's Monograph on the Tenthredinidæ, 398.

RAYED ANIMALS.

Agassiz's Monograph of the Echinodermata, 128.

BOTANY.

Baxter's Illustrations of one species in every genus of the British flowering plants, 528.
Bohler's Lichenes Britannici, 416. 525.
Burnett's Outlines of botany, 123. 360.
Deakin's and Marrock's Florigraphia Britannica, 524.
Don's General system of gardening and botany, vol. iii. 122.
Francis's Catalogue of the species of British flowering plants and ferns, 582.

Hooker's British Flora, third edition, 472; Companion to Curtis's botanical magazine, 528.
Jacob's West Devon and Cornwall Flora, 582.
Library of useful knowledge: certain parts of, in which are treatises on botany, 192, 247. 304.
Loudon's Arboretum Britannicum, 64.
Macgillivray's Withering's Arrangement of British plants, 528.
Nees ab Esenbeck's Genera plantarum floræ Germanicæ iconibus et descriptionibus illustrata, fasiculus iii., 123.
Partington's British Cyclopædia, natural history, some parts, which include treatises on plants, 247.
Popular botany, physiological and systematic, 192
Sowerby's English botany, second edition, 416.
Stewart's Outlines of botany, and hints for the management of a small garden, 524.

GEOLOGY.

Analyst, the, No. July, 1835: it includes Hastings's lecture on the salt springs of Worcestershire, 416.
Bertrand's Revolutions of the globe, translated by S. C. Horry, 124.
Bowerbank's purposed work on the fossil fruits and seeds of the London clay, 360.
Fischer's Bibliographia Palæonthologica animalium systematica, editio altera, 125.
Higgins's treatise on the earth, its physical condition and most remarkable phenomena, 416.
Lindley and Hutton's Fossil flora of Great Britain, 525.
Mantell's Descriptive catalogue of the collection, illustrative of geology and fossil comparative anatomy, in his museum, 125.
Murchison's Geology of specified West of England and Welsh counties, 528.
Phillips's Guide to geology, second edition, 128. 523.
——— Illustrations of the geology of Yorkshire, 248.
Sowerby's Mineral conchology, 583.

MINERALOGY.

Allan's Manual of mineralogy, 416.
Shepard's Treatise on mineralogy, 583. 638.

ASTRONOMY.

What is a comet, papa? 528.

CORRECTIONS.

In I. 55. line 4. from the bottom, for "Pæ'cilus" read "Pœ'cilus," and for "Öf P." read "Lepidóptera. Lycæ'na."—In VI. 461. line 7. from the bottom, for "Rhone" read "Rhine." In the General Index, under Cicada, for "686." read "668."—In VII. p. vi. line 29., p. viii. line 36., and in p. 630. line 17. for "Coby" read "Coley." In 251. line 6. from the bottom, for "1833" read "1832." In 532., and in the General Index, for "Aglaia" read "Aglia." In 590. line 15. for "in the Number for December" read "in VIII. 105."—In VIII. 28. 450. are noted some corrections relative to VII. In VIII. the following are additional to those indicated in 120. 131. 394. 450. 553. 638.:—In '34. line 17. from the bottom, for "redstart" read "redwing." In 64. line 5. for "applied" read "supplied." In p. 94. line 5. from bottom, for "Perthshire" read "Forfarshire." In 222. line 9. cancel "IV. 469." In 262. line 5. for "coarctāta" read "coarctātus." In 277. line 8. for "Portúmnus" read "Portùnus:" this latter was the word in the MS. In 279. line 10. for "ten" read "fen." In 388. line 8. for "Woodstock" read "Hodstock." In 439. line 17. for "notices" read "vortices." In 445. line 44. for "Glisau" read "Eglisau." In 470. for "Matthews," in every instance, read "Mathews." In 484. line 4. from the bottom, for "p. 469—484." read "p. 469. 484." In 491. line 5. from the bottom, for "bosses" read "bases." In 503. line 9. for "Benetwach" read "Benetnach." In 507. line 3. for "Dec. 18." read "Dec. 8." In 509. line 24. for "birds" read "bird." In 512. line 4. from the bottom, for "Rennie" read "Rannie." In 518. line the last but one, after "Drummond" supply "has treated." In 524. line 13. for "Addresses" read "Address." In 539. for "*Passerines*" read "*Passerina*." In 571. line 28. for "Reus" read "Reuss." In 572. line 17. for "Catalonia" read "Calabria;" in line 9. from the bottom, for "Lindsiltown," read "Lindsetown." In 573. line 29. for "ratch" read "rotch." In 577. line 6. for "slight web," read "slight open web." In 578. line 8. from the bottom, for "yellow or brown" read "yellow on a brown." In 625. line 27. for "decator," read "decaton." In 636. line 10. for "York" read "Nork."

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