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NATURAL HISTORY.

Contributions towards a Flora of Ceylon. By George Gardner, F.L.S., *Corresponding Member of the Royal Botanical Society of Ratisbon, and Superintendent of the Royal Botanical Gardens, Ceylon.*

ORD. NAT. STERCULIACEÆ.

Durio ceylanicus, *Gardn.*

D. foliis exacte oblongis basi rotundatis apice longe acuminatis, umbellis sessilibus nodosis multifloris, floribus cylindricis apetalis, tubo stamineo elongato, capitulis echinatis, spinis elongatis validis.

Durio *zibethinus, Moon Cat. Ceyl. Pl. p.* 56. *(non Linnæus.)*

Hab.—Wooded hills near Galle, in the Southern Province, but little above the sea level, and very common in forests in the Central Province at an elevation of about 3,000 feet. Flowers in May.

Descr.—A *tree* from 60 to 120 feet high. [illegible] old *branches* and stems covered with ash-coloured bark, the branchlets with small imbricated, peltate, lobed, brownish coloured scales. *Leaves* alternate, petiolate, oblong, rounded at the base, much acuminated at the apex, glabrous, green, and shining above, covered beneath with brown scales, similar to those on the young branches, pennivenous, the veins very slender and included, the midrib prominent beneath, 6-7 inches long, 21-27 lines broad, in texture between membraneous and coriaceous: *petiole* about 10 lines long, round, curved, and thickened from below the middle upwards. *Flowers* somewhat umbelliferous, numerous, arising from large irregularly lobed woody protuberances on the larger branches, pedicellate. *Pedicels* cylindrical, thickened upwards, marked about the middle with the scars of two deciduous bracts, covered with scales similar to those on the leaves and branches, 9 lines long. *Involucrum* cylindrical, 2-4-lobed at the apex, deciduous, covered with brown scales, about 8 lines long. *Calyx* cylindrical, somewhat conical, $1\frac{1}{2}$ inches long, $4\frac{1}{2}$ lines broad, irregularly 5-dentate at the apex, fleshy, covered externally with brown scales, similar to those of the pedicels and involucrum, and the lower two-thirds internally with scales which are also peltate, but thinner, less lobed, more ciliated, and of a paler colour, the upper third quite glabrous. *Corolla* none. *Staminal tube* cylindrical, 18-20 lines long, whitish, glabrous, dividing into five portions at the apex, which are linear, flattened, much acuminated, puberulous externally, and each bearing about five shortly pedicellate anthers: *anthers* globose, fixed by the base, entirely surrounded by naked pollen grains. *Pollen* globose, pedicellate! echinate. *Ovary* superior, sessile, cylindrical, covered externally with roundish, peltate, whitish scales, 5-celled. *Ovules* about two in each cell, superposed, attached to the inner angle, ascending, anatropous. *Style* filiform, densely covered with whitish coloured peltate, deeply ciliated scales: *Stigma* globose, yellowish. *Capsule* globose, about 5 inches in diameter, of a fibrous woody texture, densely covered with long, rigid spines, rising from a broad conical base, 5-celled, 5-valved, with a loculicidal dehiscence. *Seeds* about two in each cell, ascending, irregularly triangular, 15-18 lines long, nearly entirely surrounded by a deeply laciniated [illegible]ite, fleshy arillus. *Testa* hard, shining, and of a chestnut colou[illegible] line of the *raphe* running along one side of the external angle. [illegible]*mbryo* exalbuminous: *cotyledons* fleshy, firmly adhering to each other: *radical* next the hilum, retracted, inversely conical, obtuse, greenish.

Obs. I.—I much regret, that I have neither specimens nor a good recent figure of *Durio zibethinus*, with which to compare the present plant, though I have no doubt of its being a congener, notwithstanding its apetalous flowers. With the assistance of the figure which Rumphius has given of the former species, I have, however, been enabled to draw up a specific character by which to distinguish the Ceylon one from it. It is not a little singular that, though they are so nearly related to each other, the fruit of the Ceylon species has neither the fœtid smell nor the edible property of the Malacca one. The tree is called *Katu-Mōda* by the Singhalese, but is not so far, as I can learn, applied by them to any useful purpose. Monkeys are very fond of the nuts.

Obs. II.—There are one or two points connected with the structure of the anthers in this tree that are worthy of being more fully alluded to. While examining these organs, I was surprised to find them quite destitute of cells, the pollen grains being naked, and entirely surrounding a globose fleshy receptacle. I was then led to enquire how far this might be owing to the age of the organ, but the same structure was found in the bud as in the expanded flower. Although this globular anther is densely covered with pollen, yet it only forms a single series, and each grain is echinate and distinctly pedicellate, the whole forming a beautiful microscopic object. I have never before met with so remarkable a departure from the normal structure of the anther, nor am I aware, that any such is recorded among the many peculiarities of this organ enumerated by Mr. Brown, in his valuable paper on *Rafflesia*, in the 13th volume of 'The Linnean Transactions,' nothing of the kind is alluded to; nor is it mentioned in the 'Leçons de Botanique' of St. Hilaire, which is the latest work I possess on vegetable morphology. In a morphological point of view, the peculiarity is a most interesting one, as a greater remove from the original type of an exogenous anther cannot well be conceived.

ORD. NAT. CLUSIACEÆ.

MESUA NAGAHA, *Gardn.*

M. foliis lanceolatis basi obtusis vel acutiusculis apice acuminatis, acumine obtusis, coriaceis supra viridi-nitentibus subtus glaucis, floribus axillaribus terminalibusque solitariis vel geminis, pedicellis petiolo plus duplo brevioribus, petalis obcordatis sessilibus margine undulatis, capsulis globosis depressis.

Mesua *ferrea, Moon Cat. Ceyl. Pl. p.* 51. *Wight Icones Plant. t.* 118. *(non Linnæus.)*

HAB.—On the west side of Ceylon, from the sea level to an elevation of about 2,000 feet. Flowers in May.

DESCR.—A tree 20 to 60 feet high. *Leaves* 4-7 inches long, 16-24 lines broad, when young of a blood-red colour: *petiole* 5-7 lines long, subterete. *Pedicels* 2-3 lines long. *Flowers* white, 3½ inches in diameter. *Sepals* 4, in two series, roundish, concave, slightly puberulous, ciliated, those of the external series much smaller, an , connate at the base. *Petals* 4. *Stamens* numerous, monodelphous at the base: *filaments* filiform, yellow: *anthers* oblong, orange coloured. *Ovary* conical, depressed, glabrous, white, imperfectly 2-celled, with two erect, compressed ovules in each cell. *Style* filiform: *stigma* peltate, concave: *capsule* globose, depressed about an inch in diameter, nearly 1-celled from the almost entire absorption of the dissepiment, 2-valved, with a septicidal dehiscence, 2-4-seeded. *Seeds* large, erect, concave, or flattened on their inner surface, convex on the outer: *testa* coriaceous, of a chestnut colour. *Embryo* exalbuminous, orthotropous: *cotyledons* very fleshy, of a yellowish colour, distinct, but adhering rather firmly together: *radical* small, -ior, directed towards the hilum.

OBS.—This, the *Na-gaha* of the Singhalese, and the Iron-wood of the English, has been confounded by Moon and Wight with the *Mesua ferrea* of Linnæus, a very different species, as I have been able to determine from excellent specimens of the latter from Malacca, which I owe to the kindness of the late Mr. Griffith, and which perfectly accord with the figure of Rumph. *(Amb. 7, t. 2.)* In that species the leaves are comparatively very small, and the fruit ovate, and much acuminated. Dr. Wight in a more recent publication *(Spicil. Neilgh. 1. p. 27)* states, that he now believes the Ceylon tree to be identical with the *Mesua speciosa* of Choisy, a native of the Neilgherries, where I had the pleasure of collecting specimens along with Dr. Wight in February 1845. A comparison of those specimens with Ceylon ones has enabled me to determine, that the trees are distinct. The latter differs in having leaves which are broader in proportion to their length, obtuse at the base, and with an obtuse, not acute, acumen. The pedicels are more than twice shorter than the petioles, while in *Mesua speciosa* they are about equal to them in length. In the latter the calycine segments are covered with a short tomentum, while in the present species they are only slightly puberulous. Although the flowers are about the same size in both species; the anthers of the Neilgherry one are twice as large as the Ceylon ones, and the capsule about three times larger, and ovate, acute, not globose, depressed.

The tree is a very handsome one, and is one of those usually planted near Budhist temples. The wood is very hard, hence the English name. The young leaves give it a very striking appearance at certain seasons, being of a bright-blood colour. The flowers are not unlike those of some large Cistus, and, as in that genus, the petals are very fugaceous.

ORD. NAT. ROSACEÆ.

Rubus fairholmianus, *Gardn.*

R. scandens fruticosus, ramis teretibus petiolis pedunculisque dense cinereo-tomentosis sparse aculeatis, aculeis deflexis vix curvatis, foliis coriaceis latè ovatis basi cordatis 5-lobis margine minute denticulatis supra rugosis glabriusculis subtus dense cinereo-tomentosis eleganter reticulato-venosis, lobis ovatis obtusis terminalibus acutiusculis subtrilobis, stipulis profunde fimbriato-incisis, lobis setaceis, paniculis axillaribus petiolo brevioribus vel terminalibus compositis confertis bracteatis, bracteis fimbriato-fissis, calycis lobis ovato-lanceolatis acuminatis margine inciso-fimbriatis utrinque tomentosis, petalis calyce duplo brevioribus obovatis obtusis apice subdenticulatis, filamentis complanatis, carpellis numerosissimis glabris atro-sanguineis, stylis elongatis.

Hab.—Bushy places on the Bopatalawe Plains, between Adam's Peak and Newera Ellia, at an elevation of about 6,000 feet. Flowers in March.

Descr.—*Stems* and *branches* with very few prickles. *Leaves*, exclusive of the petiole, 3-8 inches long, 2½-4 inches broad: *petiole* 1-2 inches long, together with the midrib below slightly prickly. *Stipules* 6-8 lines long. *Flowers* compact. *Calycine segments* 5 lines long, 2½ lines broad, the internal ones more acuminated and less incised than the others. *Petals* white, 2½ lines long. *Fruit*, when ripe, about 8 lines in diameter, nearly black.

Obs.—This beautiful, and very distinct species of Rubus, was found on my return from a most interesting journey which was made to Adam's Peak, in February and March 1846, during which I was accompanied by my excellent friend W. Fairholme, Esq., who shared with me all the pleasures of the journey, as well as the pains and anxieties of being lost for five days in the dense forest which stretches northward from the Peak, during which period we had to live principally on what roots and herbs we could pick up. It is to this gentleman that I dedicate the species.

Rubus micropetalus, *Gardn.*

R. scandens, fruticosus ramis teretibus petiolis pedunculisque minutè cinnamomio-tomentosis aculeatis, aculeis deflexis curvatis, foliis ovatis basi profundè cordatis 5-lobis inæqualiter, acutè serrulato-dentatis, supra lævis sparse pilosis demum glabratis subtus cinnamomio-tomentosis grossè reticulatis, stipulis profunde incito-fimbriatis, lacineis setaceis, paniculis axillaribus petiolo subæqualibus vel terminalibus compositis confertis bracteatis, bracteis linearibus fimbriato-fissis, calycis lobis lanceolatis acuminatis integriusculis utrinque tomentosis, petalis obovato-oblongis basi cuneatis apice obtusis subdentatis ciliatis calyce triplo fere brevioribus, filamentis complanatis, carpellis numerosis glabris atro-rubentibus.

Rubus *micropetalus*, *Gardn. Herb. Flor. Ceylon, n.* 263.

Hab.—In forests on the Rambodde Pass and the Elephant Plains, at an elevation of about 5,000 feet. Flowers in June to October.

Descr.—*Stems* and branches very slender, the older ones at length glabrous. *Leaves* distant, membraneous, exclusive of the petiole, 3-4 inches long, and as much broad, the middle lobe very much larger than the others, and often acuminated, the two lower ones small, and sometimes almost obliterated : *petiole* slender, 1½-2 inches long. *Stipules* about 8 lines long. *Panicle* small, compact, rachis, somewhat flexuose. *Calycine* segments 6 lines long, 2 lines broad. *Petals* minute, white, about 2 lines long. *Fruit*, when ripe, about 6 lines in diameter, hemispherical, and of a dark-red colour.

Obs.—The very slender habit of this species, the membraneous leaves, thin acute lobes, readily distinguishes it from all the other simple-leaved Ceylon ones, as well as from all the hitherto described Indian ones. It will stand next to *R. rugosus*, *Sm.*

Rubus macrocarpus, *Gardn.*

R. scandens fruticosus, ramis teretibus petiolis pedunculisque ferrugineo-tomentosis, aculeolatis, aculeolis vix deflexis, foliis suborbiculatis basi profunde cordatis 5-lobis minute et acute subinæqualiter denticulatis, lobis obtusissimis, supra rugosis glabriusculis subtus ferrugineo-tomentosis grossè reticulatis, stipulis inciso-lobatis, lacineis lanceolato-subulatis, paniculis terminalibus parvis coarctatis bracteatis, bracteis obovatis ad apicem fimbriatis, calycis lobis ovatis obtusis margine denticulatis utrinque tomentosis, petalis oblongis obtusis longitudine calycis, filamentis valde complanatis, carpellis numerosis glabris magnis nigris.

Rubus *macrocarpus, Gardn. Herb. Flor. Ceyl. n.* 262.

Hab.—Common by the margins of woods on the plains of Newera Ellia, at an elevation of about 6,000 feet. Flowers in June to October.

Descr.—The old *branches* at length nearly glabrous. *Leaves,* exclusive of the petiole, 3-5 inches in length, and about equal in breadth: *petiole* 1½-2 inches long. *Panicle* about 2 inches long, contracted, subracemose. *Calycine segments* 4½ lines long, 2½ lines broad. *Petals* 4½ lines long, rose-coloured. *Fruit,* when ripe, black, hemispherical, and about an inch in diameter.

Obs.—A very distinct species, admirably characterized by its small compact panicles, petals, the length of the calycine segments, and its very large, black, flattened fruit, which, when fully ripe, but only then, has a very pleasant acidulous taste. During my visit to the Neilgherry mountains in 1845, I collected specimens of this species along with Dr. Wight, both of us taking it for *R. rugosus,* but from which it widely differs.* The Ceylon and Neilgherry specimens agree in every thing except that the tomentum of the latter is whiter. The fruit is the same in both, large and black, while that of *R. rugosus* is much smaller and bright-red.

ORD. NAT. SANGUISORBACEÆ.

Alchemilla indica, *Gardn.*

A. foliis radicalibus subrotundo-reniformibus 8-9-lobis supra sparse villosis subtus dense sericeo-villosis, lobis semiorbiculatis circumcirca acute serratis dense ciliatis, petiolis sarmentisque longe patente villosis, stipulis membranaceis grosse reticulatis lanceolatis acuminatis demum glabriusculis, corymbis parvis axillaribus dichotomis.

Alchemilla *indica, Gardn. Herb. Flor. Ceylon, n.* 273.

Alchemilla *vulgaris, Arn. Pugil. Plant. Ind, n.* 48. *Wight Icon. Plant, t.* 229. (*non Linnæus.*)

Hab.—Common on the open grassy plains of the interior, at an elevation of from 4 to 8,000 feet: very abundant between Newera Ellia and the Horton Plains. Flowers in June to September.

Descr.—*Stem* short, somewhat woody. Lower *leaves* from 2½-3 inches in diameter: *petioles* 6-7 inches long. *Stipules* adnate to the petiole, about an inch in length. From the axills of these leaves proceed leafy runners from 1-2 feet in length, which frequently take root at their extremities and form new plants. The leaves of these shoots are much smaller than the radical ones, and are borne on much shorter petioles: it is from the axills of these that the corymbs proceed. *Corymbs* pedunculate, 1½-2 inches long, villous, dichotomous, the divisions bearing small leafy bracts at their base. *Floral bracts* simple or trifid, acute, about as long as the flowers. *Pedicel* about half a line long, villous. *Flowers* hermaphrodite. *Calyx* free: tube urceolate, the throat nearly closed by an annular disk: *limb* 8-parted, the divisions in two series, all ovate, acuminate, ciliate, somewhat 3-nerved and reticulated, those of the external series smaller than the internal ones. *Corolla* none. *Stamens* 4, inserted on the external margin of the broad ring in the throat of the calyx, opposite the external calycine segments: *filaments* flattened, glabrous: *anthers* subglobose, 1-celled, dehiscing transversely. *Ovary* solitary, shortly stipilate, free, glabrous, 1-celled, with a single ascending ovule. *Style* basilar, filiform, glabrous: *stigma* capitate. Ripe *fruit* not seen.

Obs.—This, which is the only species of the genus hitherto described from India, and which is common to Ceylon and ovato-ellipticis subcordatis apice obtusis emarginatis obscure crenatis triplinerviis, pedunculis axillaribus 1-3-floris, floribus parvis octandris, antheris basi 3-calcaratis.

HAB.—On trees on Ettapolla rock, in the Matele district, at an elevation of about 4,000 feet. Flowers in December.

DESCR.—An epiphytal *shrub*, about 2 feet high, very much branched. *Stems* climbing, rooting, very thick and fleshy towards the base. *Branchlets* rather compressed, subquadrangular, the angles with membraneous undulated margins, glabrous, of a dark-purple colour. *Leaves* opposite, very shortly petiolate, elliptical, or obovate-elliptical, subcordate at the base, obtuse and emarginate at the apex, broadly and obscurely crenate, 3-nerved, the lateral nerves not reaching to the apex, rather fleshy, glabrous, of a dark-green colour, with scattered purplish spots, 10-12 lines long, 6-8 lines broad. *Peduncles* 3-4 lines long, 1-3 flowered, round, glabrous, of a reddish colour. *Pedicels* about as long as the peduncles. *Flowers* small. *Tube* of the *calyx* obpyriform, round, glabrous, of a greenish-red colour: *limb* cup-shaped, obscurely 4-toothed. *Petals* 4, imbricated, obliquely obovate, slightly maronate, of a pale rose-colour, about 3 lines long. *Stamens* 8, equal: *filaments* round, white, glabrous: *anthers* subulate, somewhat triangular, each of the angles shortly calcarate at the base, 2-celled, the cells opening by a single pore, whitish, the spurs yellowish. *Ovary* 4-celled. *Ovules* numerous, attached to axile placentæ. *Style* erect, subulate: *stigma* small, subcapitate. *Berry* small subglobose, crowned with the persistent limb of the calyx.

ORD. NAT. UMBELLIFERÆ.

PENCEDANUM (EUPENCEDANUM) CEYLANICUM, *Gardn.*

P. caule tereti ramoso fistuloso, foliis radicalibus quinqueis tripartitis glaucis, laciniis linearibus acuminatis interiusculis vel distanter grossè, inciso-serratis, involucro nullo, umbellæ radiis 10, involucello oligophyllo, foliolis setaceis, fructibus the Neilgherry mountains, was unknown to Moon, and by Arnott has been confounded with the *Alchemilla vulgaris* of Europe. It is, however, a totally distinct species, both as regards habit and structure. The principal distinctions between them are the great villosity of the present plant, its orbicular leaves, and semi-orbicular lobes, the lower of which overlap each other in the larger leaves, and the differently shaped stipules; while the upright stems of the European plant are represented by runners in the Indian one. The flowers are besides, much larger than those of the *Alchemilla vulgaris*, and the venation of the calycine segments of the two species when examined side by side, is very different.

Poterium indicum, *Gardn.*

P. caulibus angulatis basi ferrugineo-villosis, foliolis ovatis obtusis grossè dentato-serratis basi subcordatis inferioribus multo minoribus, capitules polygamis, bracteis ciliatis, calycibus fructiferis osseo-induratis reticulato-rugulosis quadrangularibus, angulis alatis.

Hab.—Adam's Peak,—*Mr. Alwis.*

Descr.—*Stems* several from the same root, 1½-2 feet high, branched, angular, and striated, the lower portion, as well as the petioles of the leaves, covered with long brown articulated hairs. *Leaves* alternate, 6-8 inches long, impari-pinnate: *pinnules* numerous, distant, alternate, or subopposite, petiolate, ovate or ovate-oblong, obtuse, subcordate at the base, deeply inciso-dentate, teeth ovate, shortly mucronate, pennivenous, with the intervenium reticulated, glabrous on the upper surface, glabrous or somewhat hairy on the under, 9 lines long, 6 lines broad: *stipules* adnate to the petiole, foliaceous, inciso-dentate, about 4 lines long. *Heads* ovate, about 8 lines long. *Flowers* polygamous. *Bracts* obovate, cuneate at the base, densely ciliated. *Calyx* adherent: *limb* 4-parted: *segments* ovate-elliptical, obtuse, bluntly mucronate, margins somewhat membraneous, glabrous. *Corolla* none. *Stamens* numerous: filaments filiform: *anthers* subreniform, 2-celled, the cells somewhat distinct, dehiscing longitudinally inwards. *Ovaries* 2, included within the tube of the calyx, each 1-celled, and containing a single pendulous ovule. *Style* terminal: *stigmata* numerous, pencilliform, as long as the style. *Achænia* 2, contained within the indurated tube of the calyx, which is rugose and 4-angled, with all the angles winged. *Seed* inverse. *Embryo* exalbuminous, with the radical superior.

Obs.—The specimens from which I have made the above description, I found in the herbarium belonging to the Royal Botanic Garden which had been formed previous to my arrival in the Island. There are about a dozen specimens, but with no note attached to them; my draughtsman, Mr. Alwis, however, informs me that they were gathered by him on Adam's Peak in the year 1835. It is the first species, so far as I am aware, that has yet been found in India, and is well distinguished from all known ones by the long ferrugineous hairs of the lower part of the stem and petioles, and the decidedly winged fruit.

ORD. NAT. MELASTOMACEÆ.

Medinilla walkeri, *Wight.*

M. ramulis confertis teretibus, foliis oppositis breviter petiolatis ovato-oblongis obtusis basi obtusis quintuplinerviis, pedunculis 2-3 terminalibus unifloris, floribus octandris, antheris basi postice longe unicalcaratis.

Medinilla? *walkeri, R. W. Illust. Ind. Bot.* 1, *p.* 217, *(name only.)*

Hab.—On the stems of trees; not uncommon in forests of the Central Province, at an elevation of from 3 to 5,000 feet. Flowers in April to June.

DESCR.—*Stem* shrubby, scandent, radicant. *Branches* round, glabrous, leafy. *Leaves* opposite, petiolate, oval-oblong, obtuse, glabrous, entire, 3-nerved at the base, with other two springing from the midrib a little higher up, dark green and shining above, pale and opaque beneath, about 3 inches long, and from 15-18 lines broad: *petiole* 4-6 lines long, slightly channeled above. *Peduncles* terminal, in threes about 1½ inch long, round, glabrous. *Calyx tube* obovate, obtusely 8-angled, 3 lines long: *limb* 4-lobed, lobes broadly ovate, obtuse, very much thickened at the apex, the whole of a reddish colour, except the tips of the lobes which are greenish. *Petals* 4, fleshy, alternate with the lobes of the calyx, and inserted on their base, obliquely obovate, obtuse, of a beautiful rose colour, 15 lines long, 11 lines broad, in æstivation twisted from left and right. *Stamens* 8, about equal, a little declinate: *filaments* flattened, of a yellowish colour, about 5 lines long, inserted on the top of the tube of the calyx: *anthers* oblong, compressed, 2-celled, the cells opening by a single pore at the apex, 5 lines long, of a yellow colour, the connective produced at the base into a curved horn-like process, about 2 lines long. *Ovary* enclosed in the tube of the calyx, to which its lower half adheres, the free portion 4-sulcate, glabrous, 4-celled, the cells with numerous ovules in each, attached horizontally to a fleshy placenta, which projects from the inner angle. *Style* filiform, longer than the stamens, curved at the apex. *Stigma* simple. Ripe *fruit* not seen.

OBS.—Of the three species of this genus, which are natives of Ceylon, and now described for the first time, the present is by far the most beautiful. It runs up the large stems of forest trees like ivy, and produces its beautiful, large, rose coloured blossoms in the greatest profusion in the months of May and June. I have met with it on the Hautane range, above Rambodde, at Dimboold, and on Adam's Peak.

MEDINILLA FUCHSIOIDES, *Gardn.*

M. ramis dichotomis, ramulis, teretibus, foliis oppositis sessilibus elliptico-oblongis basi sabcuneatis obtusis parcè retusis quintuplinerviis, pedunculis axillaribus solitariis 1-3 floris, floribus octandris, antheris basi 3-tuberculatis.

Hab.—On trees in forests between Newra Ellia and the Horton Plains, at an elevation of about 6,000 feet. Flowers in February.

Descr.—*Epiphytal*, dichotomously branched, glabrous. *Branches* round, covered with ash-coloured bark. *Leaves* sessile, opposite, elliptical-oblong, narrowed towards the base, obtuse, and slightly retuse at the apex, 5-nerved, the three middle ones united to about half an inch above the base, nerves prominent beneath, dark-green above, pale beneath, 3-4 inches long, 15-23 lines broad. *Peduncles* axillary, solitary, but only appearing where the leaves have fallen off, 3-4 lines long, 1-3 flowered, with two small acute bracts at the apex. *Pedicels* about 8 lines long, articulated in the middle, with two small, subulate, reflexed, bracts at the articulation, of a purplish-crimson colour, the upper half rugose, and thickened towards the apex. *Tube* of the *calyx* adherent, obovate, glabrous: *limb* cup-shaped, about 4-dentate. *Petals* 4, subcampanulate, conniving at the apex, fleshy, broadly obovate, obliquely emarginate, or somewhat truncated, upper half of a transparent white, the lower of a brilliant lake colour, running into each other, 6 lines long, and about 6 lines broad. *Stamens* 8, inserted along with the petals on the top of the tube of the calyx: *filaments* filiform, erect, white: *anthers* linear, attached by their base, where they are tritubercular, 2-celled, the cells opening by a single pore, slightly exserted, of a yellowish-red colour. *Ovary* inferior, 4-celled. *Ovules* numerous, anatropous, attached to axillary, fleshy placentæ. *Style* filiform, exserted. *Stigma* simple. *Fruit* subglobose, crowned by the persistent limb of the calyx, of a deep purple colour, about 4 lines long.

Medinilla maculata, *Gardn.*

M. ramulis compresso-quadrangularibus, angulis undulato-alatis, foliis oppositis brevissimè petiolatis ellipticis vel ellipticis basi subcordatis margine, angustè, alatis pedicellis umbellularum duplo brevioribus.

HAB.—In open, steep, rocky, grassy places on the descent from the Horton Plains to Galagama, in the district of Saffragam. Flowers in February and March.

DESCR.—An *annual*. *Stem* erect, 3-5 feet high, much branched above, entirely glabrous. Radical *leaves* about a foot long, *segments* 1-1½ line broad. *Primary rays* 1½-2 inches long, *secondary* 9 lines long. *Flowers* small, white. *Fruit* flat, crowned by the persistent styles, 3½ lines long, 2½ lines broad, with three rather prominent ribs and two less prominent lateral ones. *Vittæ* 4.

OBS.—The whole plant when bruised gives out a rank odour similar to that of Fennel. It is called *Wal ænduru* by the Singhalese. As a species it will range with *P. glaucum*, D.C., a native of Nepaul.

ORD. NAT. GENTIANACEÆ.

TRIPTEROSPERMUM CHAMPIONI, *Gardn.*

T. foliis ovato-ellipticis acutis basi subcordatis petiolum duplo et ultra superantibus, pedunculis axillaribus solitariis brevis calycem triplo brevioribus, calycis campanulati lobis setaceis tubum vix æquantibus, corollæ clavatæ lobis 5-6 ovatis acutis cum plicas intermediis rotundatis integris.

HAB.—Among bushes at the margins of woods on the Horton Plains, on an elevation of about 7,000 feet. Flowers in February to August.

DESCR.—*Perennial*. *Stems* herbaceous, twining, glabrous, round. *Internodes* 2-6 inches long. *Leaves* 3-nerved, glabrous, pale underneath, 1½-2 inches long, 10 lines broad. *Peduncles* 2 lines long, bractless. *Flowers* pent, vel hexameris, about one inch long. *Lobes* of the *calyx* setaceous, scarcely the length of the tube. *Limb* of the *corolla* 5-6 lobed, lobes ovate, acute, the intermediate plaits broadly rotund, entire, of a greenish-white colour, with longitudinal purplish stripes corresponding to the folds. *Stamens* included: *anthers* subsagittate. *Ovary* superior, pedicellate, the base of the pedicel surrounded by a small urceolate, entire disk. *Capsule* fleshy, at length dry, oblong, obtuse, 9 lines long, borne on a pedicel which is equal in length with the persistent corolla, 1-celled, with numerous seeds attached to two parietal placentæ. *Seeds* large, of a brownish colour, compressed, triangularly suborbicular, the angles winged: *testa* minutely muricated.

Obs. I.—This very interesting addition to the Flora of Ceylon was first found by Capt. Champion at the Horton Plains, about four years ago, and I was fortunate enough to find it myself, last year, at the same place, but only sparingly. It seems to be a rare plant.

Obs. II.—From the berry being fleshy, and the seeds not immersed in the placentæ as in *Crawfurdia*, I refer the present plant to Blume's genus *Tripterospermum*, although it is doubtful whether these two genera should not be united into one. This I cannot at present determine, as I have no specimen of either of the two described species of *Crawfurdia* with which to compare my plant. The true *Crawfurdias*, are natives of Nepaul, while Blume's *Tripterospermum* is from the Island of Java.

On the introduction and use of the Natural Mineral Waters at Landour. By John Murray, M.D., *Assistant Surgeon, late in Medical Charge.*

[Communicated by the Medical Board.]

In laying the following paper before the Medical Board, my object is to record the effects of the natural mineral waters, on the different diseases of the convalescents at Landour, during the period that I was in medical charge of that Sanatorium.

I endeavoured to reduce within the limits of regular practice, remedies of acknowledged power, but whose use is still, in a great degree, empirical. This is the first Military or General Hospital, in which they have been extensively used. In deviating from established custom, difficulties arose; but they were not insurmountable. The success has been so manifest, that I trust their use will soon be permanently established. Then will the poor soldier in India, enjoy advantages available to the wealthy alone, in Europe: and the increased health and efficiency of its servants, amply repay the benevolence of the State.

In commencing the investigation of the action of the mineral waters on tropical diseases, I found little assistance from any of the authors on these affections: and on European diseases, the effects are vaguely described; some even doubt their having any power, beyond the diluent effect of the water, combined with change of scenery, society, and habits. *Iron* and *sulphuretted hydrogen* are active remedies when manufactured in the apothecary's laboratory. Do they lose their efficacy by passing through nature's alembic, and appearing as the *chalybeate* and *Harrowgate waters?* On the contrary, there is an instinctive prejudice in favour of *simples*, and *faith* in the efficacy of natural productions, which is not always placed in the remedies of the physician of the present day. I found this *faith*, for which there is no chemist's test, increase their efficacy by inspiring hope, and guarding off despondency, during the protracted treatment of long standing disease. Those who imagine, that such cheering feelings are confined to the wealthy, and are unfelt by the poor soldier, because he lives mechanically and dies numerically, forget that the mind is unshackled, though the body may not be free.

At the watering places in Europe, many complaints, from which the idle, the over-tasked in brain or body, and the over-physicked suffer, would yield to nature, as their exciting causes were removed; yet assisting nature, by the use of the mineral waters, accelerates, and renders the cure more perfect.

In the hills, the watering places of India, but till now without mineral waters, there are also many diseases caused by the climate of the plains. Where the cause has been removed, it does not, in many cases, require active treatment to remove the effects; nor in general are the changes sudden. Many *medicine-chest*-invalids came from the plains, dragging their bane along with them, to which they cling with the tenacity of a drunkard to his dram, who think it absolutely necessary, to be taking physic, and who would be injured by active medicine. In these cases, even if inert, the waters would be better than physic; but that they are not inert *for evil*, has frequently been proved, by the injury produced by people unadvisedly taking the wrong water. I have, in several occasions, seen unfavourable symptoms induced by their use. If, when injudiciously used, they be active *for evil;* it may be inferred that, when judiciously used, they will be active *for good*.

The difficulty of determining the action of remedies in chronic diseases, is increased, in the present instance, by a favourable change of climate occurring at the same time that the remedies were employed. It may be inferred, that the mineral waters acted beneficially, on the diseases of the convalescents sent to Landour.

1st.—From the diminution of sick in Hospital compared with former years, when similar cases were sent to Landour.

During the last rainy season, the daily average number of sick in Hospital was 17.90 per cent. whilst, in 1842, when similar cases were sent from Kurnaul, the daily average was 24.42 per cent. As the diseases were analogous, and the season not more favourable, this diminished sickness must depend, either on the more skilful employment of *old* remedies or the use of *new*. To the former I lay no claim, as the usual means were skilfully employed by Surgeon Dempster; to the latter, the use of the mineral waters, I attribute the success.

2nd.—From the opinions of the convalescents at the depôt, and of the visitors at Landour, who said that they benefitted by their use.

In August, when for economical reasons, the allowance for the porters, who brought the waters to the Hospital, was discontinued, the following day, 128 (out of 148 men at the depôt) voluntarily subscribed to defray the expense of the waters being brought to the Hospital, as usual. The men have frequently applied to be *put on the waters*: many natives said they did them good, even the cook-boys from the barrack went to the baths.

3rd.—From the professional and popular opinion in Europe which has stood the test of ages of their being useful in analogous cases in that country and in America.

4th.—From my own observations, of the progress of the diseases in the accompanying tables; and in the visitors at Landour, during the last two years.

I have endeavoured to guard against the partiality with which one views any peculiarity in his own mode of treatment. The mineral waters were never used to the neglect of remedies of ascertained efficacy. They were never persisted in, when their action was unfavourable. They were used as *auxiliaries to the usual remedies*, which previous experience had taught me to be beneficial, when these proved insufficient to remove the disease or to restore health. I have attempted to ascertain their real action and value by deductions, from cases carefully recorded in a Military Hospital, where the sick are under strict dietetic control, and where their speedy recovery is the sole object of the physician.

A search for mineral waters was one of the objects to which my attention was directed, on receiving medical charge of Landour in 1842. From the men who went out shooting, I heard of a *bad smelling spring* at Sansattarah; and of various *red springs* in the neighbouring ravines. These were used at the hospital, till the cold season, when I examined the surrounding country, and found the springs now in use.

Chalybeate springs are to be met with, in all directions; but generally at low elevations. The strongest, that I found, is situated on the right bank of the Agglewass River, about seven miles north-east of cantonments. The water drops from the roof of a cave, the end of which is covered with stalactites. An ounce of the water contains a grain and a half of the salts of iron, alumina, magnesia and lime. The proportion of iron is greatest, with a large proportion of alumina; a small quantity of magnesia, and a trace of lime. During the winter months the snow occasionally renders the path to this spring impracticable, and occasionally during the rainy season the river rises above the entrance of the cave.

About three miles south from the Hospital, on the road to the sulphur springs, there is a strong *chalybeate spring*, containing a smaller proportion of similar active ingredients, which, from its being more accessible, has lately been more generally used. When discovered, there was a small ledge near the source, which had evidently been much frequented by deer.

There is a strong *aluminous spring* about 500 yards below the first mentioned chalybeate spring; with a copious efflorescence of alum, on the face of the intervening portion of the hill. This is more important in a commercial than in a professional point of view.

Sulphuretted or Harrowgate springs are only found in the bed of a stream, which rises at the Dhobees' ghat, under the Hospital, and runs through the hills, at first southerly, then westerly, till it reaches the valley of the Dhoon, and ultimately, in the Soong river, joins the Ganges near Hurdwar. One spring at Sansattarah, has long been known, though not used. I found several others, about two miles nearer the hospital, from whence the depôt is now supplied. They are situated on the right bank of the stream, in the vicinity of a stratum of gypsum. They are strongly impregnated with sulphuretted hydrogen, which is very perceptible on approaching the spring, and they contain a small proportion of sulphate of magnesia and lime. I consider that the sulphuretted hydrogen arises from the decomposition of the gypsum (sulphate of lime) by the action of water and decomposed vegetable matter. The decomposition of pyrites (the sulphuret of iron) may possibly be the source, as there are numerous chalybeate springs in the vicinity.

The springs are about 3,000 feet above the level of the sea, in a narrow valley, surrounded by steep-wooded hills, they are about three miles from the valley of the Dhoon, and eight miles from Landour. The scenery, in both directions, is most wild and picturesque. During last cold season, Capt. G. Cautley and I laid down a road from the Dhobees' ghat to the springs. It gradually descends, at an angle varying from four to eight degrees. The road is too narrow for nervous people, whose personal alarms are not absorbed in the admiration of the beauty of the surrounding scenery.

The temperature of the upper springs in December was 57° Fahr., whilst that of the stream was 54° Fahr. The temperature of the lower springs at Sansattarah was 72° Fahr. One of the upper springs forms a natural bath, about ten feet square; and from three to five feet deep. During last rainy season a considerable quantity of sand was deposited in this bath which has choked the spring; the main stream of which now opens at the foot of the bath; this will require to be cleared out; this bath was much used by the convalescents during the last cold and hot seasons.

There is a *saline spring* in the bed of the river near the upper Harrowgate spring; but I have not investigated its properties.

In October 1843, I sent down a tent; and afterwards built a hut for the men, on the left bank of the stream, on a level piece of ground, formed at the junction of two branches of the river. The climate was very agreeable. During the cold season, the snow did not lie so low down. During the hot season, there was a cool breeze during the night from the hills, and a refreshing breeze came up the river from the plains during the day. It was very hot in the direct rays of of the sun. In September and October several officers and their servants, resided in the grass bungalows built near the springs. The temperature was agreeable. As the surrounding jungle has not yet been sufficiently cleared away, I anticipated attacks of ague: yet none occurred. This is a strong argument against the present prevalent theory, that sulphuretted hydrogen is the cause of miasmatic fever in hot climates. At this season of the year, the most dangerous forms of miasmatic fever are very prevalent in the Dhoon, and in similarly situated low-wooded vallies near the foot of the hills. The usual sources of miasm were present, and in addition, a copious supply of sulphuretted hydrogen, sensible to the most obtuse olfactory nerves: yet I did not hear of a single case of ague originating at the baths. The supposed *bane*, appeared the real *antidote*.

The accommodation which I could provide for the men, was very imperfect, and the means of supplying warm baths was wanting. These are of essential consequence in several diseases, particularly when there is great debility. Only a few of the men who remained during last cold season were such as would likely benefit from the sulphuretted baths. The result, in some, was most gratifying. Several men who were suffering from the extreme cold at Landour were sent down for change of air. The venereal and rheumatic cases that arrived in April, 1844, were sent down, and were benefitting very satisfactorily; when it rained, in the beginning of June, and I was obliged to bring them up, as the hut leaked. The residence was too short to remove completely or permanently, constitutional diseases of several years duration. I intended sending them down again after the rains; but my tour of duty at the depôt expired, and the investigation has not been followed up.

The marked advantage in some of the cases (see Rourk No. 6,) from the use of the sulphuretted baths, together with their acknowledged efficacy in Europe, in syphilitic, rheumatic, hepatic, cutaneous, and dyspeptic diseases, render it probable that much advantage would be derived from the construction of a small hospital near the springs. It would prove peculiarly valuable in the vicinity of Landour, as independently of the cases that would benefit from the use of the baths, the pulmonary, rheumatic, extremely debilitated, or old Indian cases, would benefit by a change of climate during the cold season. At all seasons, there are certain stages of many diseases, in which a change of air proves most sanatory. Such an hospital would be advantageous to the extremely debilitated, on arriving at the hills, as the mortality amongst these is very great within a few days of their arrival. The breeze that fans the dull fire, quenches the flickering lamp.

On the arrival of the convalescents at the depôt, the effects of the change of climate from the plains were watched, and recorded weekly. When the improvement was satisfactory, no medicine was given: when the disease or debility remained stationary, a slight preparatory treatment (generally one or two purgatives) was employed; after which they came every morning to the hospital for the mineral waters. Where the disease was very obstinate, an occasional dose of medicine was given; and a drachm of sulphate of magnesia was added, where more free action on the bowels was required. When the disease was severe on arrival, or when acute relapse occurred, regular hospital treatment was employed till convalescence was established; after which the mineral waters were generally given, to eradicate the sequelæ of the disease, or the medicines, and to restore, and confirm the general health. *They were powerful auxiliaries*, and the result was favourable. The progress of each case, and the remedies exhibited, were recorded at first weekly, then monthly. The tables appended, show the general result in the different diseases for which the convalescents have been sent to Landour during the seasons 1843 and 1844, with those of the season 1842, who remained a second season.

In estimating the value of these tables, the beneficial influence of the change of climate, combined with regular medical treatment, must be taken into account; as well as the nature and extent of the organic disease, on arrival: as many died within a few days, and others could not be rendered fit for service, more than an infantry soldier, whose leg had been shot off.

Of the cases which arrived in 1844, one was *moribund*, and six died a few days after their arrival. Of thirty cases sent from Sukkur, nineteen died on the march.

A large proportion of the cases in Table No. 2, in the columns "not cured," will ultimately recover after another year's residence; and some in the column "benefitted" will have to remain a second season to complete the cure.

The chalybeate waters proved very beneficial in the sequelæ of miasmatic fevers, viz. *debility*, diseases of the *spleen* and *bowels*, and in some forms of *rheumatism*. They were of the greatest value in the intractable form of *dysentery* which originated in Affghanistan, and in *diarrhœa* following acute dysentery, in the plains. They were useful in *scrofula:* and in many affections of females, connected with *debility of the uterus.*

The usual dose was from 8 to 12 ounces, taken every morning, and occasionally repeated at noon. It had generally to be intermitted for a short period, after eight or ten days. In spleen cases, it was often necessary to add sulphate of magnesia, to prevent constipation.

The Harrowgate waters proved very beneficial in chronic affections of the *liver*, *syphilitic*, *rheumatic*, and *mercurial* complaints; *cutaneous* diseases, *dyspepsia*, and *diarrhœa*, connected with affections of the liver, and long residence in India. The usual dose was 12 ounces, once or twice a day; some cases drank three or four quarts. The sensible action was laxative and diuretic: the addition of sulphate of magnesia was useful in some old hepatic cases.

An accurate analysis of the chemical ingredients of the different springs is desirable. I have not the means of conducting this delicate and difficult process, with perfect accuracy. The active ingredients, with a rough estimate of their relative proportions, were easily ascertained; and a little experience showed the diseases, in which they proved beneficial or injurious.

The following observations on the diseases for which the convalescents were sent to Landour, are limited to the effects of the hill climate and the use of the mineral waters; leaving the hospital treatment for future remark.

Fevers with *debility*, without organic disease.—Of 305 cases sent to the depôt from 1828 to 1842 inclusive, 289 or 94.75 per cent. recovered; 14 or 4.59 per cent. returned to the plains "not cured;" and 2 or 0.65 per cent. died; 53 or 17.37 per cent. had to remain a second season, and the annual mortality was 0.55 per cent.;—of 25 who have been sent to the depôt during the last two years, 21 or 84.00 per cent. have recovered, and 4 or 16.00 per cent. are still at the depôt. They are men of the present season, and will probably recover during the cold weather.

I have given the statistical report under this head, since the depôt was established, as affording the best criterion of the eligibility of Landour, as a Sanatorium for tropical diseases. *The annual mortality is not half so great, as that of healthy troops in any other part of the world.* The recoveries in many cases of organic complications with fever, and the tropical diseases, were equally satisfactory; though from the previous extent of organic destruction, some died a few days after their arrival, and others could not be restored to robust health, yet had they remained in the plains, few would have lived, and most of these would have been invalids.

In the class of cases under consideration, the climate alone, in many cases, completed the cure. Relapses of continued fever, occasionally took place during the hot season; and relapses of ague, during the rains; primary attacks were exceedingly rare. When the debility continued, with an exsanguine appearance, the chalybeate water proved very beneficial in restoring the appetite, colour and strength. The Harrowgate water was useful, when there was a tendency to constipation, and when much mercury had been used.

Fevers with determination to the *head*.—The recovery in these cases was slow; but when no acute determination continued, or organic disease existed on arrival, the result was favourable.

The Harrowgate water proved useful; and the chalybeate injurious, being apt to cause headache, and a return of the fever.

Fevers with determination to the *liver*.—The climate was favourable to recovery when abscess had not formed, and even then, the chance of recovery, *after the abscess had been opened*, was greater than in the plains.

The Harrowgate water was very beneficial: it was preceded by mercurial purgatives, which were occasionally repeated; and in some cases, the sulphate of magnesia was added with advantage. It removed the weight and uneasiness in the side, and increased the appetite and strength. The chalybeate water was injurious, causing an increase of the pain with looseness, except in cases of spongy congestion, in which there co-existed enlargement of the spleen; in these cases the alternate use, of both the waters, proved beneficial.

Case 1st.—Sergeant Thomas Dynon, H. M's. 16th Lancers, aged twenty-seven years, suffered at Meerut from a severe attack of fever complicated with liver complaint, and pain in the left hip. He arrived at Landour on the 17th April, 1844, extremely emaciated, (scarcely able to turn himself in bed) with pain in the right side, and enlargement of the liver, and acute pain in the left hip,—purgatives, with fomentation to the hip, were employed till the 23rd, when the following pills were ordered.

℞ Pil. Hydr., Ext. Hyosciami, Ext. Urticæ, Ext. Colocynth c. a. a. ℈j. m. divide in pil. xviij. ssj. mane and vespere.

A stimulating liniment was ordered for the hip. This was continued till the 6th May, when vesication appeared, and the liniment was omitted; and he got a pill every second night, with twelve ounces of the Harrowgate water every morning. On the 9th the pills were omitted, and he got a dose of jalap. After this date he got no medicine except the Harrowgate water, which he drank daily. He gradually regained strength, and the pain slowly diminished. In July he was free from pain. In October he was florid, muscular, firm, and free from complaint.

Fevers with enlargement of the *spleen*.—The climate is favourable for these during the hot, and more particularly during the cold season; but unfavourable during the rainy season, which is apt to cause relapse. This season may be escaped, by crossing the snowy range in June, and returning in October. I followed this course in 1836 with the greatest advantage. This course is only open to officers; and under ordinary circumstances, the long sea-voyage to Europe is preferable.

In many of the cases from Sukkur and Kurnaul, the spleen extended below the umbilicus. In all cases, in which there was extensive enlargement, even though it disappeared, a residence at the depôt during the cold season, was advisable, to confirm the cure. It is a *local indication* of a *constitutional disease.* It varies much, and rapidly; and is not at all times perceptible, but when found, it generally indicates years of precarious and uncomfortable existence.

The chalybeate water proved an invaluable auxiliary in renovating the shattered constitution, in reducing the spleen and preventing return of ague, in removing the ex-sanguine appearance and restoring the strength and spirits. The addition of sulphate of magnesia, was useful in some cases, in keeping the bowels freely open. In cases where the liver was affected, or mercury had been used, the Harrowgate water was beneficial. Fruit and green vegetables were relished, and they formed an important part of the diet.

Fever with *dysentery.*—The climate is favourable to these cases, particularly in children, who suffer much in the plains during dentition. In the extremely emaciated cases, the mortality is great within a few days of their arrival. The termination appears to be accelerated. A certain degree of strength is requisite to induce reaction, from the primary depressing influence of the cold.

Preliminary hospital treatment was generally required, till the ulceration in the colon had assumed a healthy or chronic form; at which stage, the Chalybeate proved very beneficial in completing the cure, preventing relapse, and re-establishing health.

Diseases of the *head.*—Except in cases of functional derangement, Landour is unfavourable from its elevation, to diseases of this class.

Two men, who had long suffered from pain in the head, following injuries, derived benefit from the Harrowgate water. The chalybeate proved injurious in cases subject to determination of blood to the head.

Diseases of the *lungs.*—Landour is unfavourable to all cases in which there is *extensive obstruction* to the passage of the air through the lungs, as *hepatization, advanced phthisis and emphysema.* Colds are common in April and September. The climate is favourable to chronic bronchitis; and there have been several cases of incipient phthisis, in whom the subsidence of the symptoms was most satisfactory.

The progress of the following case was minutely traced by the stethoscope. A vomica formed in the left lung, burst, was evacuated and the cavity cicatrized.

Case 2nd.—A. B., aged nineteen years, of a delicate appearance, thin and weak, with a contracted chest; subject for two years, to a frequent dry cough; a sister died from phthisis. The sound on percussion was dull, the respiration bronchial, and the voice resonant at the superior part of both lungs, during the hot and rainy seasons 1843. Counter-irritation was employed with milk diet and the daily use of the chalybeate water. The cough had diminished much, and he had improved in appearance at the commencement of the cold season, when he went to the plains. He returned in March 1844. The cough was occasionally troublesome, and the bowels irregular. Three days after his arrival, during a severe fit of coughing, he suddenly expectorated a large quantity of dark pus. There was pectoriloquy at the superior part of left lung. Blisters were kept open at the superior part of the chest during the season; and he used milk and farinaceous diet: he got a bitter tonic, till his bowels became regular; he then used the chalybeate water daily during the season. The expectoration gradually diminished, and the cavity contracted; and when I last examined him in October it was imperceptible. The resonance in the right lung had very much diminished: he had not coughed for three months: he had gained colour and flesh; and his chest was expanding.

Diseases of the *liver*.—The climate is favourable to recovery from acute hepatic disease: two recovered out of three cases in which I opened hepatic abscesses.

Chronic enlargement without pain, and the large *drunkards* liver, are not benefitted at Landour. The hepatic attacks were all relapses, and yielded to less active treatment than is required in the plains, where the patient remains under the influence of the exciting cause. A residence during the cold season is advisable, in all cases when the substance of the liver has been extensively affected.

The Harrowgate water proved very beneficial after the acute inflammation had been subdued: in chronic inflammation, in torpor, or congestion of the liver with dyspepsia, and in cases where much mercury had been used. I anticipate great advantage, from the sulphuretted baths, in many of these cases.

The chalybeate water proved injurious in hepatic cases.

Diseases of the *bowels*.—The climate is favourable to recovery from dysentery, when there is no other organic disease. There have been many recoveries, from what, in the plains, would have been a hopeless state of disease. Cases complicated with induration of the liver, disease of the kidneys or mesenteric glands, (except in children) ought not to be sent to the hills.

The result, in the Affghan dysenteric cases which arrived in 1843, was very favourable when compared with similar cases sent to the depôt in 1840. They were in an extreme state of emaciation on arrival. Preliminary hospital treatment was employed, followed by the chalybeate water. The indolent chronic ulcers in the colon, assumed a healthy action, and cicatrized; the general health improved, and relapse rarely occurred. Relapse is a common and fatal characteristic of this intractable form of dysentery. The alum, in the chalybeate water, formed a valuable adjuvant to the iron.

Case 3rd.—C. D., aged thirty years, suffered very much from dysentery during the Affghan campaign, and arrived at Mussoorie on the 17th March 1843, extremely emaciated; with frequent, whitish, watery stools with little red, mucus masses, no pain on pressure over the abdomen. He got worse after arriving at the hills, and came to Landour on the 21st very weak, and much depressed in spirits, with constant nausea and vomiting, stools like inspissated yellow pus, with a few detached masses of red mucus: the pulse was feeble, and the extremities cold. Effervescing draughts, wine, opiates, calomel and opium and enemata, were given and sinapisms and blisters applied to the epigastrium, but the vomiting continued, and the stools remained of the same character till the evening of the 25th, when feculent matter was passed. The bowels were regulated by anodyne enemata and effervescing draughts, till the 29th, when a pill, composed of equal parts of extract of gentian and colocynth, was ordered every morning with suppositories of assafœtida and nitrate of silver. These were given as injections dissolved in two ounces of water, from the 1st April till the 7th, when small injections of acetate of lead were substituted. On the 11th he passed no blood by stool, and was feeling stronger, when he commenced using the chalybeate water every morning. The pill was continued every night till the 18th, and then occasionally till the 1st May. The bowels were then regular, and he was regaining strength. To continue the chalybeate.

1st June.—Continues regaining strength and flesh, bowels regular, occasionally passes pure blood after his stools. To continue the chalybeate.

1st January, 1844.—Continues in good health, using the chalybeate regularly every morning, with an occasional dose of castor oil, when his bowels are costive; occasionally passes blood from piles.

1st April.—Has been in the Dhoon; continues regaining flesh and colour. Uses the chalybeate regularly.

1st September.—Bowels were irregular for a few days last month, but after starving and taking four pills, composed of equal parts of blue pill, ipecacuanha, and gentian, they became regular, and have continued so. He still occasionally passes blood from piles. This is a safety valve, which it would be injudicious to close.

Remarks.—The only medicines used in this case from the 1st May 1843 to the 1st October 1844, besides the chalybeate water, were four or five doses of castor oil, and four alterative pills, he was very exemplary in his diet, and when he felt uncomfortable, he starved. The bleeding from the piles is inconvenient, but salutary. He now (1st October) eats, drinks, and sleeps well, and is nearly as muscular as ever he was.

I have learned, since leaving the hills, that from the inspection of one day's evacuation, in which he passed two formed stools with some detached blood and mucus, he was declared to be still labouring under chronic Cabool dysentery. If the chalybeate water merely saved this officer's life, and restored him to the usual enjoyments of health, it would not be valueless. It restored the following case to duty.

Case 4th.—Private Edward Skinner, H. M's. 31st Foot, aged twenty-four years; suffered severely from dysentery during the Cabool campaign, and arrived at Landour on the 1st April 1843, labouring under general anasarca, ascites, oppression of breathing, with cough at night. He had twelve whitish, creamy stools during the day; no local pain. Pulse 112; tongue clean; skin dry. He got quinine and opium pills, with assafœtida enemata, with an occasional calomel and tartar emetic pill, till the 15th; he had then five or six yellow feculent stools, and the anasarca was considerably diminished. As he had been stationary for some days, twelve ounces of the chalybeate water were given in the morning, and the quinine pills at noon and night. The purging returned on the 22nd; eight ounces of the chalybeate water, with half a drachm of laudanum were then given morning and evening. On the 27th he had only two consistent and feculent stools. On the 28th he got twelve ounces of the chalybeate noon and evening, without the laudanum, after which he required laxatives to keep his bowels free. He used digitalis from the 1st to the 7th of May. His bowels were costive, his strength improved, and the dropsy much diminished on the 21st, when he got one grain of quinine and five drops of nitric acid. This was continued in diminished doses till the 7th June, when he had slight pain in the epigastrium, which was relieved by eight leeches, after which he required no medicine except the chalybeate water. The bowels became natural, the dropsy completely disappeared, and he regained strength and flesh, and continued free from complaint. He was florid and muscular, in October 1844, when he told me, that he attributed his recovery to the chalybeate water, which he still used regularly. He returned to the plains in December "recovered."

Rheumatism.—Under this head many diseases are sent from the plains, differing widely in their causes, complications, and treatment. The climate of Landour is generally unfavourable to these diseases, particularly in old men, and where abdominal disease co-exists, or when the *cause* was mercurial or venereal. These cases derived great benefit from using the sulphuretted baths, in the warmer climate at the springs. The internal use of the Harrowgate water was beneficial in these cases. The climate was more favourable to recovery from incomplicated cases of articular and muscular rheumatism; and in some cases where it formed a sequela of miasmatic fever. The following is an interesting case of this nature, in which the chalybeate water proved efficacious, after the change of climate, and the usual remedies had failed.

Case 5th.—Private John Ryan, H. M's. 3rd Buffs, aged twenty-three years: suffered much in 1841 at Kurnaul, from remittent fever; and in 1842 at Landour, he had repeated attacks of ague and rheumatism. When I received charge in October 1842, he was a bedridden skeleton, with large, stiff, painful joints, and œdema of the feet, with great enlargement of the liver and spleen. The usual remedies had been employed during the preceding six months, by Surgeon T. E. Dempster, and various remedies were used by me till the 18th December, without any improvement except a diminution in the size of the liver. The chalybeate water was then given. The local applications were continued with occasional doses of medicine. The pain gradually diminished; the swelling and stiffness in the joints, subsided; the enlargement of the spleen disappeared; and he slowly regained strength and flesh. He was discharged from hospital on the 17th April 1843, and continued free from complaint, regaining flesh and colour, till the end of the rainy season, when he had an attack of dysentery, which, ultimately, proved fatal.

SYPHILIS SECONDARY.—The climate has proved injurious to a large proportion of these cases; more especially during the rainy and cold seasons.

The Harrowgate water has proved very beneficial in these cases, it was drank to the extent of from three to six bottles per diem, in some cases. The most decided benefit was derived from bathing in the water, during the short period the men resided at the baths last hot season; but it was only temporary in some of the cases. The advantage was most marked in cutaneous affections.

Case 6th.—Private Rourke, H. M's. 16th Lancers, aged twenty-four years: suffered from repeated and most dangerous attacks of dysentery at Meerut in 1842, and was much debilitated, and still suffering from the same disease, on his arrival at Landour in March 1843. He used the compound ipecacuanha pills for a few days, followed by the chalybeate water, under which he gradually regained colour, strength and flesh. When the rains set in, his bowels again became loose, and in August a scaly eruption appeared over his body. He used sudorifics, alteratives, local applications, &c. without advantage. His mouth became aphthous; his stools white and watery; his appetite failed; and his strength rapidly diminished. Many of the patches on the body became sores, with prominent crusts, (Ruppia Prominens) and his head was completely covered with scales. In this state he was sent to the sulphur bath on the 9th November 1843. His general health rapidly improved, his bowels became regular, the eruption faded and assumed its original scaly appearance. He used the bath two or three times a day, and drank much of the water. The only medicine given was mudar in December, which had no apparent action, and hydriodate of potass in January 1844. On the 1st of March the eruption had completely disappeared; he was florid, muscular, and in perfect health, and he has continued so ever since.

Scrophula.—This climate has proved very beneficial in strumous debility, ulcers, and enlargement of the absorbent glands. The chalybeate water has proved a valuable auxiliary.

Case 7th.—E. F., aged twelve years: suffered for two years in the plains, from painful swelling of both knees. On arrival in April 1844, there was great enlargement of both knees, with loss of motion in the right, which was since dislocated, with a prominent, red, soft part on the inner surface. The inguinal and axillary glands were much enlarged. She was extremely emaciated; appetite very bad; bowels irregular. A few leeches were applied to the knee, and the bowels were regulated by bitter laxatives, after which she used the chalybeate water daily during the season. It was omitted for a few days, when from an exacerbation of pain and redness, leeches were again applied to the knee. The appetite slowly improved, the enlargement of the absorbent glands disappeared; the pain and swelling were removed from the left knee, and had very much subsided in the right, (which became anchylosed) when she left the hills in October.

Other diseases.—Under this head are included *accidents, ulcers, ophthalmia, scorbutus, &c.*, diseases not peculiarly modified by a tropical climate. Where the general health has been debilitated by the treatment or disease, a residence at Landour proves beneficial.

I cannot conclude these remarks, without expressing my ardent hope, that the efficiency of the most valuable Sanatorium at Landour, will be increased by these powerful, natural remedies, being rendered available.

To the *State*, they will produce increased efficiency in its servants, and a diminished pension list: to the *profession*, they will afford information and new means of combating disease: and on the *sick*, they will confer comfort and health.

Umballah: 1st January, 1845.

MEMO.—Accompanying are specimens of the salts from the mineral springs.

No. 1. From the chalybeate, on the Agglewass, one ounce of which contains a grain and a half of the salts.

No. 2. Salt from the upper sulphuretted or Harrowgate spring, one grain in the ounce of the water, chiefly sulphate of lime.

No. I.

Table of the Diseases for which the Convalescents were sent to Landour during the season 1843, and those of 1842 who remained a second season, shewing the result, where the use of the mineral waters formed the chief, or an important part of the treatment, or were not used.

Arrivals, 146.			Fevers with Debility.	Fevers with Liver.	Fevers with Spleen.	Fevers with Bowels.	Diseases of Head.	Diseases of Lungs.	Diseases of Liver.	Diseases of Bowels.	Rheumatism.	Syphilis secondary.	Scrophula.	Other diseases.	Total.	Ratio per cent. to arrivals.
Chalybeate.	Chief remedy,	Recovered, ...	8	9	9	2	0	0	0	9	0	0	1	1	31	21.23
		Not cured, ...	0	0	0	0	0	0	0	1	0	0	0	1	2	1.37
		Died, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	...
	Important remedy, ...	Recovered, ...	1	0	5	3	0	0	0	7	0	0	0	0	16	10.95
		Not cured, ...	0	0	0	1	0	2	0	1	0	0	1	1	6	4.11
		Died, ...	0	0	1	0	0	0	0	7	0	1	0	1	10	6.85
Harrowgate.	Chief remedy,	Recovered, ...	2	2	2	3	0	2	7	2	1	0	0	2	23	15.75
		Not cured, ...	0	0	0	0	0	0	0	0	0	0	0	1	1	0.68
		Died, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	...
	Important remedy, ...	Recovered, ...	2	4	0	1	2	2	8	2	0	2	0	0	23	15.75
		Not cured, ...	0	2	0	1	0	0	5	0	0	1	0	0	9	6.16
		Died, ...	0	2	0	0	0	0	3	0	0	1	0	0	6	4.11
Total using the mineral waters, ...		Recovered, ...	13	7	16	9	2	4	15	20	1	2	1	3	93	63.69
		Not cured, ...	0	2	0	2	0	2	5	2	0	1	1	3	18	12.32
		Died, ...	0	2	1	0	0	0	3	7	0	2	0	1	16	10.95
Cases not using the mineral waters, ...		Recovered, ...	2	0	1	2	0	0	0	2	0	0	0	2	9	6.16
		Not cured, ...	0	0	0	0	0	1	0	0	0	0	0	2	3	2.05
		Died, ...	0	0	0	0	0	2	0	3	0	0	0	2	7	4.79
Total, ...		...	15	11	18	13	2	9	23	34	1	5	2	13	146	...
Of these remained a second season, ...			2	3	4	2	1	0	4	8	0	1	0	1	26	17.80
Died, second season, ...		...	0	1	1	0	0	0	2	0	0	0	0	1	5	3.43

No. II.

Table of the Diseases of the Convalescents of 1844, shewing the result where the use of the mineral waters formed the chief, or an important part of the treatment, or were not used.

Arrivals, 139.				Fevers with				Diseases of							
			Debility.	Head.	Liver.	Spleen.	Bowels.	Lungs.	Liver.	Bowels.	Rheumatism.	Syphilis secondary.	Other diseases.	Total.	Ratio per cent. to arrivals.
Chalybeate.	Chief remedy,	Benefitted, ...	1	0	2	22	2	1	0	1	0	0	2	31	22.30
		Not cured, ...	0	0	0	2	0	0	0	0	0	0	0	2	1.44
		Died, ...	0	0	0	0	0	0	0	0	0	0	0	0	...
	Important remedy, ...	Benefitted, ...	2	1	0	11	3	0	2	1	0	0	1	21	15.10
		Not cured, ...	1	0	1	10	1	0	0	0	0	0	2	15	10.79
		Died, ...	0	0	0	0	2	0	0	0	0	0	0	2	1.44
Harrowgate.	Chief remedy,	Benefitted, ...	0	2	3	0	0	0	2	1	2	6	1	17	12.23
		Not cured, ...	0	0	0	0	0	0	0	0	0	1	0	1	0.72
		Died, ...	0	0	0	0	0	0	0	0	0	0	0	0	...
	Important remedy, ...	Benefitted, ...	0	2	3	2	0	0	1	1	0	0	0	9	6.47
		Not cured, ...	0	0	0	0	1	0	0	0	0	0	2	3	2.16
		Died, ...	0	0	0	0	0	0	0	0	0	2	0	2	1.44
Total using the mineral waters. ...		Benefitted, ...	3	5	8	35	5	1	5	4	2	6	4	78	56.11
		Not cured, ...	1	0	1	12	2	0	0	0	0	1	4	21	15.10
		Died, ...	0	0	0	0	2	0	0	0	0	2	0	4	2.87
Cases not using the mineral waters,		Benefitted, ...	3	0	2	6	2	0	2	1	0	1	1	18	12.97
		Not cured, ...	3	0	0	2	1	1	0	1	0	1	1	10	7.19
		Died, ...	0	0	0	2	3	1	0	1	0	1	0	8	5.75
Total, ...			10	5	11	57	15	3	7	7	2	12	10	139	...

Abstract from Tables Nos. I. and II., shewing the Ratio per cent. to the cases treated.

		1843.			1844.			Total.		
		No. Treated.	Total, 146.	Ratio per cent. to treated.	No. Treated.	Total, 139.	Ratio per cent. to treated.	No. Treated.	Total, 285.	Ratio per cent. to treated.
Cases using the mineral waters, ...	Benefitted, ...	...	93	73.23	...	78	75.73	...	171	74.35
	Not cured, ...	127	18	14.17	103	21	20.38	230	39	16.95
	Died, ...	...	16	12.59	...	4	3.88	...	20	8.69
Cases not using the mineral waters,...	Benefitted, ...	...	9	47.36	...	18	50.00	...	27	49.09
	Not cured, ...	19	3	15.79	36	10	27.77	55	13	23.63
	Died, ...	...	7	36.84	...	8	22.22	...	15	27.27

JOHN MURRAY, M.D.,
Assistant Surgeon.

Remarks.

The rage for the use of mineral waters seems still to be on the increase in Europe, and it would be no easy task to attempt to keep progress with the *balneological* literature of the

Continent. In the year 1845, no fewer than twenty-six works on mineral waters issued from the press in Germany alone. New springs are constantly discovered, and new works published lauding their virtues, chiefly by parties who hope to make a livelihood by them. In these days, when facilities of communication have almost removed from the mind of the traveller the calculation of distance, baths in the most remote localities are eagerly visited, and yet this resort to new candidates for public favour seems hardly to affect the flow of visitors to springs of more established reputation. Every season produces its new spas and its new flock of visitors.

Very different is the state of things in India. From time to time no doubt a few notices of the existence of mineral waters had come before the world, and occasionally some suggestions to Government regarding their use had been thrown out, but their chemical and medicinal qualities were never accurately examined. Thus the wells of Sonah near Delhi were described by Mr. Ludlow; those on the new Benares road, in the Hazarebagh district, were mentioned by H. H. Wilson; and two springs in the valley of the Nerbudda, were noticed by Mr. Spilsbury. All of them appear to belong to the class of sulphuretted or Harrowgate water; most of them possess a high temperature; and have been more or less resorted to by natives chiefly for the cure of cutaneous complaints. But their real or supposed virtues have never induced an European to resort to them in the hopes of imbibing renewed health.

The first systematic attempt to rouse the attention of the authorities to the value of mineral waters was made by Dr. Murray in the report which these remarks accompany. In it he details the circumstances which led to the discovery of them: and it appeared at first a most fortunate coincidence that these wells should be found close to our chief sanatorium.

In May last we walked down the beautiful valley which leads from Landour to the springs, and on reaching them were disappointed at finding the spot where they rise a wilderness frequented by a few cowherds; there were a few huts near, and one scarcely habitable thatched bungalow, tenanted by a single European Sergeant, the only patronizer of the mineral waters. The scenery was exceedingly pretty, although the heat in the bottom of the narrow valley was of course at that season of the year oppressive. Had these springs been in any corner of Europe, a large village with hotels and bathing rooms would long ere this have transformed the appearance of this secluded valley, and Government and the shop-keepers and gamblers, would be reaping a rich harvest of gain. Such things are not of course to be expected in India, but it might have been hoped that some small expence would have been incurred, in the way of fitting up a hospital and baths for the invalids of Landour, to many of whom these wells might have been rendered of invaluable service. Dr. Murray's evidence is quite sufficient, even if it were not supported by the experience of all Europe, to show that these springs, especially the sulphuretted ones, may be extremely useful in the treatment of chronic diseases, although an accurate analysis of them is still a desideratum. But it so happens that Dr. Murray's valuable hints have been quite overlooked.

After all, the springs labour under great disadvantages of situation. If they had been on a level with Landour, or in any part of India at a distance from the hills, nothing could have prevented their coming into use, but unfortunately they are about 4,000 feet below the Sanatorium, and eight miles distant from it, and of course never enjoy so cool a temperature as the higher regions. Yet this offers no reason why, for five or six months of the year, accommodation should not be provided for those who are likely to benefit by their use. Supplies are readily procurable from the Dhoon, to which the access for mules is easy, and in many cases it would be desirable to remove invalids in winter from the piercing cold of the heights, to the milder climate of the valley. The expence that might accrue from making the experiment of a small establishment there, is one from which a liberal government ought not to shrink, and it is but fair to add that Dr. Murray's plans might have been carried into effect, but for the want of cordial co-operation on the part of the intermediate medical authorities.

J. M. P.

Observations on the Manners and Structure of Prionodon Paxdicolor. By B. H. Hodgson, *Esq.*

It is now nearly twenty-five years since Dr. Horsfield defined that singular half-feline, half-viverrine genus Prionodon, of which he described one species peculiar to the mountains of Java. To this genus no second species was added until 1841, when I described another proper to the Sub-Himalayas in the 5th No. of this Journal, from skins procured in Nepal and Sikim. I have lately been so fortunate as to obtain a living specimen of the mature animal, and, though it has since died, I have thus been enabled to make a few observations relative to its manners, as well as to complete the examination of its structure; and on these grounds I recur to the subject, Dr. Horsfield's statement of the organization being confessedly deficient in some material points.

This exceedingly elegant and amiable little creature measures in length from fourteen to fifteen inches, and the tail twelve to thirteen more. Its height is about five to five and a half inches; the girth of its chest five and three quarters, and the length of head to the occiput, about three inches. The ear is one and a quarter inch long: the fore-leg, from elbow to tip of toe, three inches, with a palm of one and a half inch: the hind leg from knee to heel two and three quarters, and heel to toe two and a quarter. The weight about one pound. In form and proportions there is a very great resemblance to the lesser civets of India (Viverrula mihi), none of which, nor of the weasel group, exhibit the vermiform or slender and elongate structure in greater perfection, the head, neck and body being long, attenuated and cylindrical. The head in general shape and even in details, bears an extraordinary likeness to that of the Rasse; but its expression is more gentle conformably to the milder disposition of the animal.

The head is conical depressed and exhibits very little curve in profile, either along its upper or lower outline; the back part of the head is very slightly arched, and the nose quite straight: the muzzle or nude extremity of the nose is clearly defined, small, round, and faintly grooved between the nares, which are opened chiefly to the front with a curved prolongation to the sides. The large dark lustrous eyes are about equidistant from the nose and the ears, and their pupils are apparently round, though the glittering and dark hue of the irides renders it difficult to distinguish them. The thin lips are furnished with long full and strong mustaches, and there is a smaller tuft of bristles over the eye, and still smaller ones behind the gape, and on the chin. The moderate sized and rounded ears have the helix anteally a good deal attached to the head, running forwards towards the eye. Posteally the helix is fissured, while in the interior of the ears are various lobate processes analogous to the antihelix, tragus and antitragus. The ears have free motion and are softly but scantily furred outside and on the fore margin of the inside, the rest of the interior being nude but nearly concealed by the long hairs springing from the base. Both neck and body, as already noted, are much elongated and slender, the neck being ordinarily more or less curved in the living animal, so as to add to its graceful aspect. The short slight and well-formed limbs terminate in small compact extremities, exhibiting in their perfectly sheathed, sharp, compressed, and highly curved talons, concealed in the softest fur, a genuinely feline character. The toes are five and similar before and behind, whereof the two central are longest and equal; the two laterals, less advanced, are also equal or nearly so; and the innermost, still more withdrawn from the front, are the least in size, as in the cat's anterior extremities. The animal's action is purely digitigrade; and the feet throughout their soles are well furred, except the balls or pads, which are nude and soft, five to support the ends, and four to sustain the basses of the toes. There is also a round metacarpal ball, but no metatarsal one. The long and perfectly cylindric tail is equal to the body and neck in length, and the hair upon it is scarcely longer or less smooth than upon the body. The tongue is aculeated backwards as in the cat; and, like the cat's, the Prionodon is void either of anal or pubic glands or pores, so that the living animals are perfectly free from all offensive odour or peculiar scent. The females have four teats, of which two are inguinal, and two placed entirely at the other end of the abdomen, may be called sub-sternal. The membraneous stomach is bagpipe-shaped rather, the upper end being somewhat the wider: its orifices are terminal, and it measures five and a half inches along the greater arch, and one and three-quarters along the lesser. The liver is six-lobed, and the small gall-bladder half buried in a cleft of the largest lobe, whence a large duct conducts the thin greenish-yellow bile into the intestinal canal. The intestines, twenty-six to twenty-seven inches long, are somewhat larger in diameter below the cæcum, which is fully three quarters of an inch long and nipple-shaped, or cylindric with a round end.

In the brilliancy of its colours and the smoothness of its soft fur, this beautiful little animal rivals the leopards. The ground colour is rich fulvous or ruddy yellow, and the marks are jet black. Upon the neck the marks are linear; upon the body and limbs, globose. The head is nearly or quite unmarked, but it is shaded with dusky black on the dorsal surface.

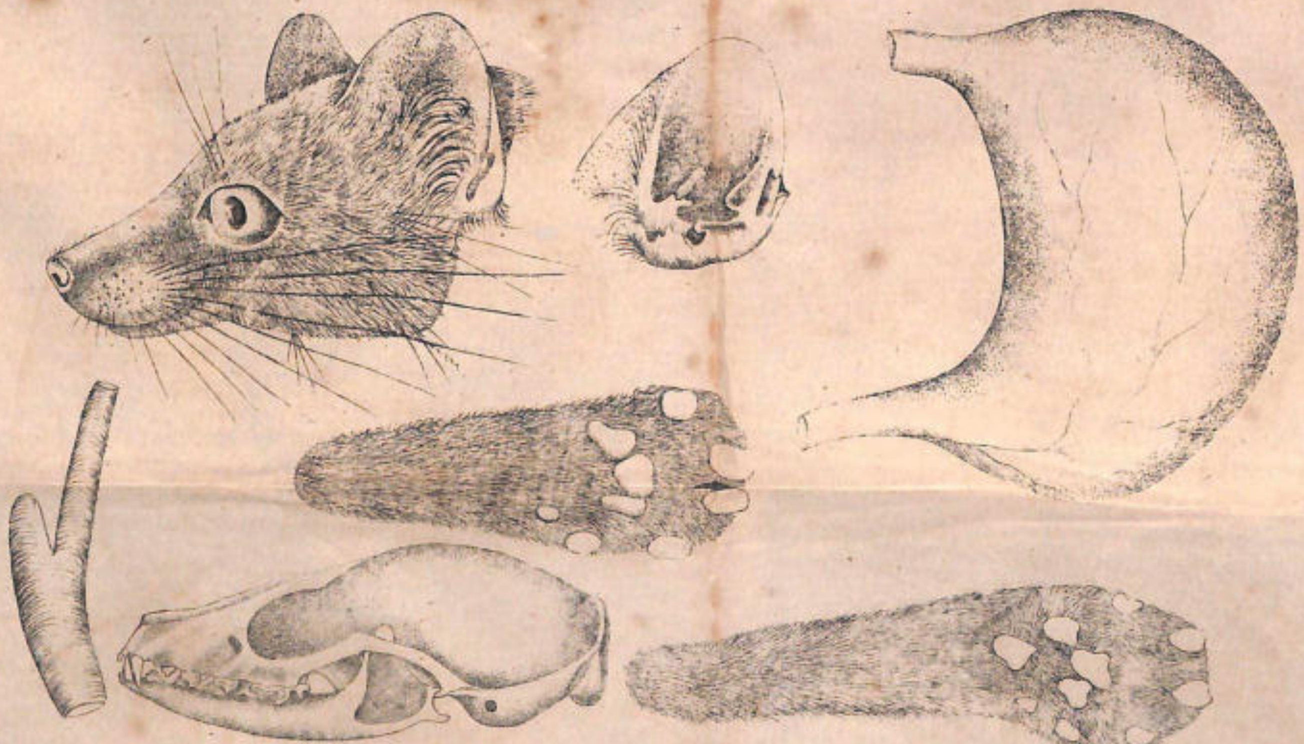
From the nape to and beyond the shoulders proceed two unbroken lines, and two others, less unbroken, run below and parallel to them from behind the ears. The ridge of the back has also an interrupted line extending from the shoulders to the middle of the back. The body and outsides of the limbs are adorned with large elliptic or squarish marks, which descends to the wrist and heel with gradual diminution of size and are disposed in pairs on either side of the spine. The belly and insides of the limbs, as well as the inferior surface of the head and neck are immaculate. The brilliant hues of the body are annularly disposed on the tail, which exhibits eight dark and eight pale rings going all round the tail and of which the dark ones are rather the larger, and of these the largest are towards the centre of the tail. All these rings are complete save the uppermost, and near the dusky tip of the tail the colours are blended vaguely but still incline to an annular arrangement. In regard to habits and manners it is remarkable that though the Prionodons belong to the most typical group of the fierce carnassiers, the present species would seem to be wonderfully docile, gentle, and tractable. Mine had been taken in maturity only one month before I got it, and yet it was as gentle as a dormouse, and like that little creature, loved above all things to nestle itself in its keeper's bosom, being very sensitive to cold and very fond of being petted: nor did it ever show the least irritability. It was fed with raw meat, and refused fruits, fish and eggs. Any sort of sound it never uttered, so that I know not its voice. The species is very numerous in the eastern half of the Sub-Himalayas, or Nepal and Sikim, but is not usually caught for taming. Equally at home in trees or on the ground, it dwells and breeds in the hollows of decayed trees. It is not gregarious at all, and preys chiefly upon small birds which it is wont to pounce upon from the cover of the grass, using, it is said, a deal of strategy occasionally, to draw its wary prey within reach of its spring.

The times of breeding are said to be February and August, and the litter to consist of two young, there being two litters each year. Dr. Horsfield has so fully described the teeth of Prionodon, that I have purposely omitted to say any thing on that head. As however the Doctor has neither figured nor described the scull, I may as well add that in its general form it resembles that of the small civets, but is contradistinguished by the nearly total absence of the longitudinal and occipital ridges or keels, albeit the posteal part of the encephalon, next the occiput, exhibits a keel-like depression. The scull is elongate, low, very slightly arched or curved along the culmenal line, and has a long but feeble and little bulged zygomatic arch, and a large elongate auditory cavity. The orbits are incomplete, as in the cats and civets. The dental formula, I need scarcely add, is $\frac{6}{6}\ \frac{1.1}{1.1}\ \frac{5.5}{6.6}$. The sharpness of the coronal process of the molar teeth seems to indicate that the animal is somewhat insectivorous, which, I hear, is actually the fact. Admirable illustrations from the pencil of my Newár artist are subjoined to this paper, and they are the more necessary in that this species has never been depicted, and that the only other species or Gracilis, is miserably distorted in Horsfield's delineation. I have added some organic illustrations of the genus from the same skilful pencil.

P. S.—While penning the above, I received specimens of a wild cat which, appearing to me new, I subjoin a summary description of it.

Felis Ogilbii.—A small wild cat, of a deep sordid fulvous ground colour, covered throughout and uniformly with numerous small black marks of a round or somewhat elongate form. Aspect and size of the domestic cat but with longer and more cylindric tail, equal to the body and neck. Length of the animal eighteen and a half inches; of tail with hair

Prionodon Pardicolor



Illustrations of Prionodon and of Merua

fifteen and a half; of tail only, fourteen; of ears, from the crown of head, two; of head to occiput, four.

HABITAT.—The woods of Sikim.

Remark.—This is the third species of small true wild cat, discovered in the eastern Sub-Himalayas, the other two being *murmensis* and *pardochrous* (olim *nipalensis*). The great cats of these mountains are, Tigris, Leopardus, and Macroceloïdes *(olim Macrocelis.*)*

In the Tarai of plains below the mountains are found only, of the above, the tiger and leopard; also a small cat which never enters the hills, viz. *viverriceps vel viverrinus.* One species of lynx is common to hills and plains, viz. the *chaus.*

Darjeeling: December, 1846. B. H. H.

On a New Genus of Insessorial Birds. By B. H. HODGSON, *Esq.*

Insessores, Dentirostres, Merulilæ, Myotherinæ.

Genus New.—Merva mihi.

Generic Character.—Bill elongate, slender, cylindric, more or less arched, hard, entire: both mandibles towards the tips solid, and the tips equal, blunt and entire: base and gape smooth. Tongue, elongate, cartilaginous, simple, tip jagged. Nares elliptic, basal, lateral, free, placed in a short groove, membraned towards the head.

* The species enumerated in the Catalogue of Nepal Mammals as Nepalensis and Macrocelis, however allied to those species, yet seem distinct, and hence the new names. Macroceloïdes is found also in Tibet, as well as Felis uncia, and Felis nigripectus, which last is possibly the Manul, of Pallas.

Plumage lax and soft.

Wings short, bowed, round.

Tail short, feeble, imperfect even.

Tarse elevate, strong, and smooth.

Toes and nails suited to walking and clinging, with large thumb and nails.

Type.—Merva Jerdonii mihi. *Habitat*—The Sub-Himalayas.

Specific Character.—Merva: above olive-brown, streaked down the shafts with fulvous. Below fulvous, shaded laterally with olive. Vent rusty. Bill and legs smoky-grey. Iris brown. Length $5\frac{1}{4}$ inches, of bill to gape $1\frac{1}{8}$, to brow $\frac{13}{16}$. Tail $1\frac{1}{16}$. Wing $2\frac{1}{8}$. Tarse to sole 1. Central toe and nail $\frac{15}{16}$. Hind toe and nail $\frac{13}{16}$. Weight $\frac{3}{4}$ oz.

Whatever Swainson's errors as a systematist, his arrangement of the Insessores and particularly of the Dentirostres, is, I think, on the whole, superior to any other, and therefore I have followed it, as above, though I apprehend there is a deal to be done in the determination of the entire organization and habits of birds before their classification can be at all satisfactorily accomplished. The singular type, with which I now present the reader, in its general structure is closely related to those remarkable birds first discovered by myself and named Tesia, and subsequently Micrurus by Gould, and of which I now possess seven species divided into two genera.* These minute tailless thrushes, are characterised by strong walking legs and feet, of which the thumb however is large and the nails acute; by short, bowed, feeble wings; a still shorter and imperfect tail, and a moderate meruline or sylvian bill; and they dwell silently and solitarily in moist woods and copses, near to rills, feeding solely on the ground on small

* See Proceed. Zool. Society for last year.

scaly insects, and even breeding on, or close to the earth. Now, such in organization and manners is the bird before us, except that it has a bill of a totally different character, approximating it to the Pomatorhini and Upupæ. It is therefore a remarkable type, and I hesitate as to its fitting position in any system of classification known to me. But, without further remark upon the question of classification, I will now proceed to a full description of the form and colours of the only species I yet possess, which was shot at an elevation of about 6,000 feet in Sikim.

The bill is a third longer than the head, slender, and somewhat arched, but with the margins entire and the tips blunt, strong and suited to digging, with none of the delicacy of structure that is proper to the bills of suctorial birds. It is cylindric and compressed, but not so much so as in the Pomatorhini, nor is the base so suddenly expanded as in them. The frontal feathers are quite soft; the moderate gape free from bristles entirely, and the elliptic nostrils completely exposed. The tongue, like the bill, is long and narrow, but fla simple and not projectile, cartilaginous, with bifid or jaggea up. The plumage is very soft and lax, and is elongated over the rump, but not so as to hide the tail, short as it is. The wings do not exceed the base of the tail, and are galline in form, but feeble as well as bowed, round and short: four plumes are distinctly gradated; but the rest very gradually run into one another, and then fall off towards the short tertials. The tail-feathers are nearly of equal length, and but eight in number, narrow and feeble like the wing-quills. The smooth strong tarse exceeds the central toe and nail in length. The toes are compressed; the laterals nearly equal; the central elongate; and the hind large, equal to the laterals without the nails, much exceeding them with those appendages, but not depressed or wide. The nails, especially in the hind digits, are large and acute, but not much curved. The sternum is flat, short, truncated or square posteally, and exhibits there, one deep notch on either side. The furcula is long and feeble, and is joined to the low keel of the sternum merely by cartilage. The intestines are six and a half inches long with grain-like cæca placed about one inch from the anal end. The stomach is muscular and red: its outer coat of trivial unequal thickness: its inner, tough and striated: food, hard scaly insects of the ground, with ants. Of the sexual diversities of colour I am unaware. My specimen is, above, olive-brown (or black on the outer vanes) streaked down the shafts with buff, and below, fulvous, more or less emarginated laterally with the olive of the upper surface, thus resembling, even in its colours, the birds I have suggested its affinity to. The alars and caudals are dusky internally, and the lower tail-coverts very ruddy, almost rusty-red. Bill and feet, dusky-grey, or brownish horn colour: iris dark brown. Of the manners I have already spoken; and as they, as well as the structure, are so much assimilated to the little tailless thrushes (Tesia vel Micrurus) I cannot doubt that our proposed new genus should be located near to them, whatever may be adjudged *their* place.

Darjeeling: December, 1846. B. H. H.

Topography and Medical History of the Settlement of Malacca, for the year 1845. *By Residency Assistant Surgeon* J. A. Ratton.

Malacca, ceded to the British Government by the Dutch in exchange for Bencoolen in the year 1825, is the central British settlement in the Straits. It is situated on the western coast of the Malayan Peninsula, and with the opposite coast of Sumatra, assists in part to form the Straits to which it gives its name. It is situated, as it were, half-way between the Island settlements of Penang and Singapore, being 260 miles below the former, which constitutes the north-west extreme to the Straits, and 120 miles above Singapore, which forms its eastern terminus, or south-east extreme.

The Settlement embraces an area of 1,000 square miles, comprised in a line of coast of mean length forty miles, by a mean breadth of twenty-five miles.

It is bounded to the north-west by the Malay state of Salangore, from which it is separated by the river Lingie or Linggy, about twenty-five miles from the town; and to the south-east by the state of Johor, from which it is likewise separated by a stream, the Muar river. Interiorly it is bounded to the east by the Malay states of Rumbome and Johole, and to the west by the Straits Proper.

The town of Malacca founded A. D. 1252; Heg. 650, by Sri Iskander Shah, or Rajah Secunder Shah, is situated about the centre of this line of coast, in Long. 102° 12′ E. and Lat. 2° 14′ N. upon the mouth of a small river, which it names.

As approached from seaward, it presents a very striking and interesting, nay picturesque, appearance. To this the luxuriance of its surrounding vegetation, by giving it the appearance of being as it were imbedded in the neighbouring topes of cocoa and areca nut, together with the prominent feature of St. Paul's ruin-crowned hill with its beautiful verdure, greatly contributes, and gives to the eye of the stranger as a whole, a view of retirement and health; to both of which its claims are justly acknowledged throughout the Straits.

The once noble church which crowns the summit, of St. Paul's is now a powder magazine.

Malacca, comprises the fort so termed; the town proper; and the suburbs of Tranqueirah, Bander Eller, and Baumgarayah or Boonga Rya; and includes a mixed population of about 15,000 inhabitants. These may be conveniently classed as follows: about 200 Europeans and Dutch; 3,000 Indo-Portuguese; 3,000 Klings and Chuliahs or natives of India, viz., from the Malabar and Coromandel Coasts, as well as a few Bengallees; 3,000 Malays; and 6,000 Chinese. The cantonment or fort as it still continues to be called "*pro formâ*," though its once massive fortifications have long since been demolished (and of which the only standing relic is now a picturesque-looking gateway), is separated from the town by a mean-looking, though serviceable, wooden bridge, once likewise a drawbridge. It extends from and along the eastern or left bank of the river, running in the form of a circle around the base of St. Paul's hill, and comprises the house of the officer commanding, and of the other officers belonging to the detachment, with private houses situated on its southern aspect or sea-face; the Convict and Garrison Hospitals to the east and opening upon the parade ground; to the north the Convicts' Lines, Government Stores, Land Office, and House of Correction; and to the west H. M. Gaol, Government Store, Police Office, and Stadt House; the last facing the west, but having also an aspect to the south or seaward.

The mouth of the river which, together with its approaches, is defended by two 4-gun batteries, is about fifty-six feet wide. The draught at high water being eleven feet; at ebb four feet six inches; and at spring-tides thirteen and a half feet. It is entered by a narrow channel extending over an extensive mud-flat, is very inconvenient at times even for small boats: admits with the flood native craft of light burden, but does not permit the approach of square-rigged vessels, which anchor in safety at about two miles distance. Extending in continuation along the south-east coast to the extent of half a mile, is the populous but very poor suburb of Bander Eller, inhabited chiefly by the Indo-Portuguese, for the most part fishermen, an extremely poor, ignorant, and immoral set, nominally Catholics.

The town of Malacca itself, is situated on the right bank of the river. Though unpretending, it is built with a certain degree of regularity, and consists principally of two parallel streets, intersected at right angles by minor ones. Of these two streets, the one called "Hein Street," forms the high or principal street of the town; it is clean, inhabited by the better orders of the Dutch part of the population, (who for the most part reside in the town) and likewise by the better order of Chinese; the Chinese artizans engrossing the bazars.

The houses of the Dutch are old, massive, and substantial in their structure. Those of the better class of Chinese neat, clean, and quaint in their devices and appearance.

The continuation of this street runs into the extensive and very populous suburb of Tranqueirah, inhabited by some Chinese, but chiefly by Indo-Portuguese. It is sufficiently wide, and considering its inhabitants, a surprisingly clean street. Outskirting the town is the Malay population; their houses being raised on piles, and each surrounded by a small piece of garden, or small sugar or paddy plantation, poultry, &c.

The Chinese are the principal mechanics and tradesmen of the place, and mostly industrious; excepting the very lower orders, who are a vagabondish, opium-smoking, arrack-drinking, gambling set, and who, together with those of them who profess beggary as a calling, usually form the admissions into the Pauper Hospital.

The Klings, Chuliahs or Malabars, and natives of the Coromandel Coast, are the cow-keepers and dairy-men of the place; the Malays the boatmen, coolies, and cultivators.

The aspect of the country for some miles round, is pleasing, undulating, and agricultural; presenting tracts of flourishing paddy fields. These, during the rainy season, are of course flats of water, and during the dry season so much barren-looking dried soil.

A prominent feature in the aspect of the country immediately surrounding Malacca, and one connected with its economy, is the Chinese burying-ground, consisting of five hills; and which, with their white horse-shoe form, singular looking tombs, present a rather picturesque appearance. The two principal hills are contiguous to each other, and around their base runs in a circular direction of four miles in extent, a very good carriage road, the usual drive of the inhabitants. Two good wells of excellent drinking water are likewise situated at their base, a quarter of a mile from the town bridge: and from which the inhabitants are amply supplied.

Malacca may be said to be extremely well supplied with water: for besides these two public wells, other large public wells are situated in prominent and convenient places; such as one facing the Pauper Hospital, and another to the south of St. Paul's hill, immediately to the east of the battery.

To the north-west, two miles from the town, another hill termed "Pringit," the residence of the Resident Councillor, is very salubrious and healthfully situated, leading to which is a good road, and the country on either side under excellent cultivation, either as Chinese gardens, sugar plantations, or paddy fields; the soil in these situations being sand, clay, and vegetable mould. The rising grounds, hills more inland, and around the base of which these paddy flats spread out, consist chiefly of laterite super-imposed on granite. Thus the town of Malacca, may, speaking generally, be said to be surrounded on its three land-sides by much flat or swampy land. Its fourth side or coast, likewise, twice in the twenty-four hours, or at the ebb of each tide, presents an extensive mud flat, stretching out a distance varying from half to one and a half mile; the bank itself extending from one and a half to two and a half miles; yet the town is allowed to be very healthy.

Fevers contracted in the town are rare, though intermittents and even fevers of a malignant type are contracted in the interior, either by the natives, or occasionally by some of the inhabitants themselves, visiting those parts; or, as these mostly come under the notice of the medical officer, by the convicts when employed on road-work in the interior. Even the worst forms of congestive fever are said to be contracted in the interior, but no case of any such fever has been brought to hospital, though many cases of intermittent and slight remittent fevers, contracted when at work at Jyer, Panus, Rheim, to the east; or at Roombiyah; or at the out-post of Alor Gajah, to the north-west have been admitted.

The base of Mount Ophir would, under peculiar circumstances of temperature and season, seem likewise pregnant with malaria or morbific influence, of a very deadly nature; as exhibited in the account of Dr. Oxley's trip to Mount Ophir in January 1839, when this officer, and five of his native attendants, were taken ill of fever accompanied with violent delirium. He was the first attacked, but recovered by active treatment. The natives, refusing all European medicines, died from between the 3rd to the 7th day from the first attack. However, Lieut. Newbold, Sir W. Norris and son, and their respective parties, at a different time and season, all visited the same with perfect impunity from any ailment whatever; and I am likewise aware, that persons from the town are in the habit of occasionally visiting the same neighbourhood at all seasons for the purposes of traffic, and with perfect impunity. This is however readily accounted for, by the fact of the danger being dependant on the development of the morbific agency by the heat following immediately upon the rainy season, bringing the same into powerful activity in these pent-in forest jungle tracts. This, to the European, or uninured native constitution, is fatal; but to the Jakoon, or child of the forest, whose breath has been drawn in with the same effluvia for years, even from his infancy, it is innocuous. Dr. Oxley and his party, however, could not boast this guarantee, and they suffered for their imprudence. It is perfectly safe to visit Mount Ophir at any time during the dry season; not so safe during the rains, were it indeed practicable; and unsafe and attended with imminent danger to do so immediately after the rains. A month should be allowed first to elapse, to evaporate the condensed moisture, &c.

On advancing further into the interior, the country becomes more mountainous, a series of elevations, these being covered with dense forest; trees of gigantic growth, and great beauty. The vallies are mostly converted into paddy fields, termed *sawahs:* occasional partial clearances are likewise met with on the more elevated grounds, near to the Malayan villages, these are sown with rice, and termed *ladungs;* of course less productive than the former, but requiring less labour, and the Malay abominates extra labour.

Within the territory of Malacca, three hot sulphurous springs are met with, of these two are most deserving of notice. The first is that in the Nanning district, situated two and a half miles beyond, or to the north of Fort Lismone, and nineteen miles in that direction from town. The other is situated in the opposite direction from the town, viz. at Rheim, in Assahan, to the north-east, and distant sixteen and a half miles. I have visited the former, tasted its water, and bathed in it. It arises from several springs, dispersed over a surface of some twenty yards square, forming a pond of this extent; the surface of which is continually covered with a dense vapour, and bubbles of gas are here and there seen rising to the surface. Contiguous to these, public baths have been erected by Government. The individual spring from which the baths are supplied, is bricked in as a well, 6 feet deep; water clear, with possibly a shade of bluish-green; temperature 120° Fahrenheit, and evolving sulphuretted hydrogen. It contains sulphur and iron; I however send a bottle of the water for chemical analysis by the Company's Analytical Examiner at Calcutta, as I am not aware whether it has yet been subjected to as critical an analysis as it seems to deserve; and I hope to be favoured with the results of the enquiry. Its immediate neighbourhood is flat, excepting a small hillock, covered with jungle, which forms one of its sides; nor are there any traces of volcanic action present.

Bathing in this water is much esteemed by the natives, especially in cutaneous, rheumatic, syphilitic, epileptic, and a variety of other diseases. I consider that it has frequently proved beneficial, this doubtless in connection with the change of air offered by the neighbourhood, quiet, and the impulse given to the mind. Thus it proved of great service in one of two cases I had occasion to send there from the Convict Hospital, viz. Marukary—case of chronic syphilitic rheumatism, whom I found in the hospital, on assuming charge in February, a bed-ridden cripple, and who after every treatment, was sent there from the hospital in that state on the 12th of April. He returned to Malacca on the 25th of May, perfectly recovered in his limbs, having the free use of them, and able for light work on the roads; he is now engaged on the flag-staff duty. The other was a case of phthisis pulmonalis in the last stage, was sent there for a change as a "dernier resort," he returned three months after, no better, and died subsequently in hospital. This last of course affords no criterion of the waters. The average range of the thermometer during the day, is said to be in the shade from 74° to 85°, and 108° in the open air at noon, is by the accompanying Return taken for the last three years, shewn to have averaged a mean daily variation of 8°. There is no opportunity (want of a self-regulating thermometer) of ascertaining the lowest temperature during the night, which it is very desirable to know.

The barometrical variation is said to be very slight, ranging from 29.83 to 30.3. As, however, there is no barometer attached to the station, there are no means at command at present for observing these changes. Having indented for this, and the above-named instrument, as well as for an hygrometer, I trust to be able in next year's Report to afford some more correct information on this subject. On reference to the accompanying Tables, it will be at once seen, that rain fell during the last year on 111 days, amounting to inches $68\frac{9}{10}$: in 1844 on 115 days, amounting to inches $84\frac{4\frac{1}{2}}{10}$: and in 1843 on 122 days, amounting to inches $76\frac{5\frac{1}{2}}{10}$. That the greater portion of rain fell during the past year from the beginning of April to the end of

September, comparatively little in August, and again much rain in November and December. This last month shows the greatest number of days upon which rain fell, though not the greatest fall of water in the aggregate amount; which took place in November.

In 1844 rain fell from the beginning of April to end of September. In December the Table also shows much rain to have fallen; the greatest number of days that rain fell being in the month of December; but the greatest amount of water that fell, being in the months of May and July; the quantities being equal.

In 1843, rain likewise fell from the beginning of April to end of December. In this year no rain fell in February, though there was much variable wind; and in this month occurred too, the hottest day; and together with March, the mean hottest weather. The greatest number of days upon which rain fell being in May; the greatest aggregate amount of rain fallen, being in July.

A want of an accurate knowledge of the climate and seasons met with in the Straits, seems not unfrequently to exert a prejudicial influence on the Medical authorities at the Indian Presidencies, when recommending the climate of the Straits to invalids, proceeding for change of air, after severe attacks of acute disease, either dysentery, fever, &c., both in respect to the climate itself, and to the season chosen for such change; and which frequently occasions disappointment to all parties, to say the least.

The variation of the thermometer in the day during the past year never exceeded in the shade $16\frac{1}{2}°$, viz. from 6 A. M. to 3 P. M.; the mean daily variation being 9°, and its mean range or variation at 3 P. M. throughout the year has not exceeded 6°.

In 1844 the variation never exceeded 15°; the mean daily variation being 9°, and the mean range at 3 P. M. throughout the year did not exceed 5°.

In 1843 the variation never exceeded 17°; the mean daily variation being 8°, and the mean range at 3 P. M. throughout the year did not exceed 5°.

South-west winds are said to prevail from April to November; and the influence of the north-east monsoon to be felt during the other months.

The Tables for the last three years, show, that during the past year this wind prevailed in November, and as a secondary wind, from

May to November, excepting in September, when only three days of SE. occur, two of these equally. The SE. has very evidently been the prevailing wind during the other months; not the NE.

In 1844, we see SW. in March equals the NE., and that it is the prevailing wind in the months of April, May, and October; and again as a secondary wind, in February and September. The NE. prevailed in January, north in February, November, and December; and the SE. in the months of July and September. We must also notice that in the month of June and July the SW. did not blow at all.

In 1843 SW., the prevailing wind in July, August, September, and December, prevailed; as a secondary wind in April, blew only one day in May, not at all in June, and two days in November; north in January; NE. in February, SE. in March only. It is to be observed that the wind was, throughout this year, more inclined to the west; also, that the number of rainy days was greatest this year; though not the aggregate amount that fell, which is greatest in 1844.

The land and sea-breezes, usually alternate with a certain degree of regularity, an interval more or less intervening, according to the season of the year. This interval is proportionally close and oppressive, and takes place irregularly, likewise according to the season: either at any time between 11 A. M. and 2 P. M. as in the months of December, January, and February, or earlier in the day, as often experienced during the other months. The nights, generally speaking, may be said to be cool at times, even cold; a warm oppressive night is rarely experienced at Malacca, the land wind, or that from the NE., having here, when blowing at night, every property of refreshing cool sea-breeze, which in fact it is, reaching this side of the peninsula from the China Sea after merely sweeping across a strip of dense forest land about 100 miles wide.

Thus the prevailing wind the year round, as far as I can learn from the experience of others (for the past year from its said irregularity has offered but little opportunity for correct observation) is the SW. This wind, the above resumé of the Tables, would seem to show mostly obtains; though the past year, the SE. wind prevailed most. Health is said to prevail during the continuation of this wind, this refers especially as it is more observable during the SW. monsoon, and as noticed in contradistinction to the NE., when much sickness prevails; especially affections of the chest, as catarrhs, coughs, sore-throat, and fever. Likewise, at the change of this monsoon, and when the weather is become variable, a variety of diseases appear, principally rheumatic, catarrhal, and pulmonic.

The following classification of the prevailing winds or monsoons, as received in the Straits, may be attempted, according to the limited opportunities of judging from a comparison of but three years, as offered by the accompanying Tables. Though far from being strictly correct, still it is offered as the nearest approximation which the experience at command permits of for the present want of other sufficient data; thus—

In January, February, March.—The northerly monsoon is said to prevail, and inclining to the E. It is roundly called the NW. monsoon. There is, however, mostly a sea breeze from the W. or S. during the afternoon.

April, May, June.—The easterly monsoon is said to prevail, but the wind is seen going round the compass most irregularly, even to the W. to S. and SW.

July, August, September.—The SW. monsoon is said to prevail, ESE. and SE. winds however being frequently the prevailing wind; E. wind and squally weather are likewise shown to prevail during these months.

October, November, December.—The north-west monsoon is said to prevail. The SW. to N. and NW. winds however blow irregularly with variable and rainy weather during these months.

The energetic and frequent occurrence of electrical phenomena in the Straits, especially as experienced in the well-known squalls termed Sumatras, is an interesting feature in the physical constitution of this settlement; and to which undoubtedly much of its healthfulness at these seasons is due. These mostly occur attended with considerable violence and heavy rain, accompanied with vivid lightning and reverberating peals of thunder, and chiefly in the months of September and October, the wind blowing from the SW., consequently across Sumatra, hence its name. At these times the wind likewise blows with violence from the East. These squalls, I have however seen described in more general terms as occurring between the months of May and December.

Again, we are informed that the NE. monsoon commences in January, and continues until some time in March, when the SW.

commences and continues until September; again that September, October and November, is considered the NW. or squally season; but that squalls both from the SW. and NW. occur indifferently in these months. This, though seemingly paradoxical, makes good what we so frequently observe, that violent squalls usually come from the opposite direction to that in which the wind is blowing. During January, or the NE. monsoon, the squalls (if any) come from the NE. and from the W.

It has been remarked that at any time during the year when the wind prevails from the NW., rain is pretty sure to fall in the course of the day.

The returns for the past three years show, that both as to the number of days in which rain fell, and the amount that fell, in the months of November and December, the difference between the three years appears to have been extremely slight.

	No. of days rain fell.		Inches.	Tenths.
Viz. 1843, November & December	22	Amount fell,	14	$7\frac{1}{2}$
1844, ditto and ditto, ...	23	Ditto, ...	14	$1\frac{1}{2}$
1845, ditto and ditto, ...	29	Ditto, ...	15	7

Relative to the salubrity of Malacca and of the Straits generally, the climate may be called a relaxing one.

In fact, it is said to be a climate which offers no hope of the constitutional powers, once debilitated, being able to rally, unless removed from its debilitating influence, and transported to a more bracing climate; one more congenial to, and in accordance with European habits and constitutions; and for which Australia, the Cape, or rather the mountains of Ceylon offer favourable remedies; nay China may now to many be equally eligible and preferable as a change, suiting of course the season and the station sought, to the end required.

That this is a correct description of the climate generally is, I believe, perfectly true. But its internal resources are, I likewise think, under-rated, because not attended to at a seasonable time of the debilitating disease itself, and without a sufficient respect to the season at which to seek a change, when some change is felt to be required, I allude to changing from one station to the other as the case may be; to the Penang hill, and to cruising in a cool latitude, outside the Straits: in which very great cold may at many seasons be expected; so much so, as to require for the greater part of the twenty-four hours, woollen clothing. Therefore I infer that previous to having tried, under judicious direction, the beneficial effects of these changes, a change from the Straits altogether cannot in such cases be pronounced by the medical officer to be *absolutely requisite;* especially where from official station or otherwise, such change would either to the public service, or to the individual prospects of the party himself, be highly undesirable.

Again, many of the cases being sent from the comparatively bracing climate of the Indian Presidencies to the Straits for a change of air, when just recovering from or while even yet labouring under dysentery, liver, and other similar cases, must be considered as injudicious. For *such,* a more bracing climate than the one they are leaving, and surely *not* a more relaxing one, is requisite; yet this is frequently the case. The sea voyage and a short trip being probably more held in view than the nature of the climate about to be visited, or the particular season, or perhaps even the station to which a preference is in the first place to be given. These are left to the sick person to find out, as best he may, or rather perhaps to the discretion of the Medical officer under whose hands he may first find himself on arrival.

The prominent features of the climate of Malacca are its moderate degree of temperature, its comparative equability during the twenty-four hours, as well as throughout the year, (its mean range from 6 A. M. to 3 P. M. shown for the last three years to have been but 8°; the mean range between the extremes taken at 3 P. M. being the hottest in February, March, and January, 91¼°, and coolest in December and January, 74⅓° or about 17° variation) the humidity of its atmosphere, and the absence of any cold season, so requisite to brace up the exhausted energies of the European constitution.

This sufficiently accounts for the diseases prevailing, viz. catarrhal, pulmonic, rheumatic affections, fevers of a certain type, and diarrhœas, following upon loss of tone of the stomach and bowels; together with indolent action of the liver, enlarged spleens occasionally met with, and ulcers of an indolent and obstinate character; these form the principal, all depending as a primary cause upon relaxation of the tone of the system, and lastly dropsical affections, which are very common, particularly amongst the lower orders, Chinese especially, this in them being combined with poor living; acute inflammatory diseases occurring as primary affections, are comparatively rare.

The comparative absence of malaria in a Settlement, seemingly surrounded by generating sources, may be accounted for by the varying atmosphere, the alternating breeze or prevailing wind, the free circulation of air unopposed by neighbouring mountains, or natural obstructions, the porous quality of the mineral and vegetable soil, and indeed by the extensive and dense forest tracts themselves; their very deneness by preventing the direct action of the sun's rays prevents likewise a too rapid decomposition of the decaying vegetable mass, and moreover assists with the atmospheric air, in absorbing much of the noxious exhalations evolved.

The average number of transmarine convicts during the year has been 166. They are divided into four classes (formerly into 5).

The 1st Class.—Are out on bail, perfect masters of themselves, men of good character, find themselves in every thing, as they are permitted to employ themselves in any manner they choose.

If brought to the Police Office for any offence, they revert to the last or rather the chain class, No. 4.

The 2nd Class.—Of these some are given, or as it is termed rented out, to gentlemen by the Company. The persons so employing them give them 2 $ monthly, for their food, the Company providing them with two suits of clothes every six months. Others formerly classed as a 3rd class, but now included under the 2nd class, reside in the Convict Lines, men who behave well, work on the roads, &c. and are allowed by Government Co's. Rs. 4 a month.

The 3rd Class.—Men of bad character, most of them work in chains; at present and during the past year there have been no men under this class. (The men seen about in chains, being local convicts, mostly Chinese). This class are allowed by Government 12 annas a month, together with 1½ ℔ of cocoanut oil, 1½ ℔ of salt, and eight gantons or 50 ℔s of rice each.

The 4th Class.—Mostly invalid and old men, employed in sweeping and other easy work, are allowed by Government each monthly Co's. Rs. 1-10 annas and six gantons, or 37½lbs of rice, 1lb of oil, and 1lb of salt.

There is at present no Superintendent of Convicts. They are under the charge of five Christian Tindals, inclusive of overseer, and under whom are 4 Sirdars or belted Peons, chosen by Government from the 2nd class for their good behaviour. They are allowed Co's. Rs. 6 in the month, and one cloth in the year.

Local convicts are all classed under the same head, receive all 1.8 monthly; are not found in any thing; are employed in repairing the public roads and buildings; are paid by the assessment; and are under the immediate orders of the Police Magistrate.

They are under the surveillance of two Christian Tindals and of two Sirdars. The former accompanying them when working on the roads, the latter only when they are employed in town, such as sweeping the bazars, &c.

The average number of local convicts throughout the past year has been 26.

No change beyond the above named division in the convict lines of the transmarine from the local felons has taken place, with the exception of one addition to the former, viz. a man of bad character who had made his escape from Singapore, was retaken, and sent here. All unruly characters become orderly and well-behaved on arrival here, and simply from the fact being well-known amongst them, that this is the easiest of the Penal Settlements, best climate, and cheapest; where they are exceedingly well-lodged, and have every comfort and convenience in their lines. The difference between the comforts here and the reverse at Singapore is very striking; flogging here is a complete rarity; I have not been called upon to attend once during the past 12 months. At Singapore rarely a month passes without some flogging. There have been 33 additions to the local convicts. I cannot suggest any improvement either as respects diet, clothing, employment, exercise, or in any other respect, as the whole seems to be conducted in a very wholesome and efficient manner.—*Extracted from a report to the Medical Board.*

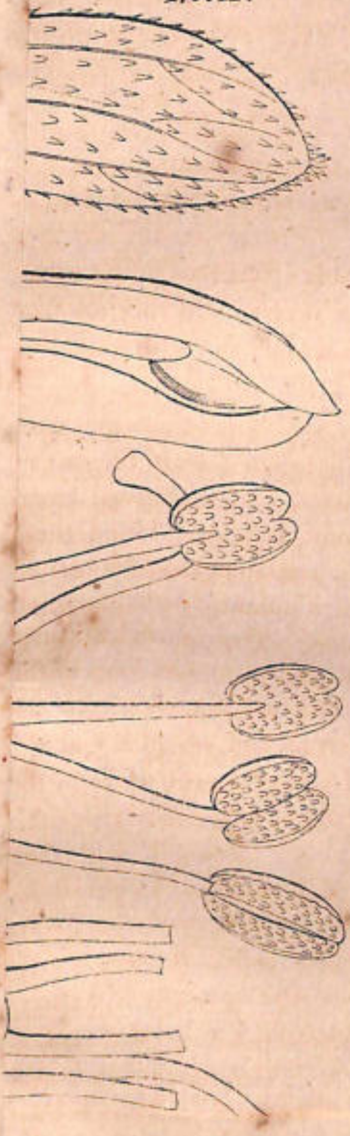
Anatomy and Physiology.

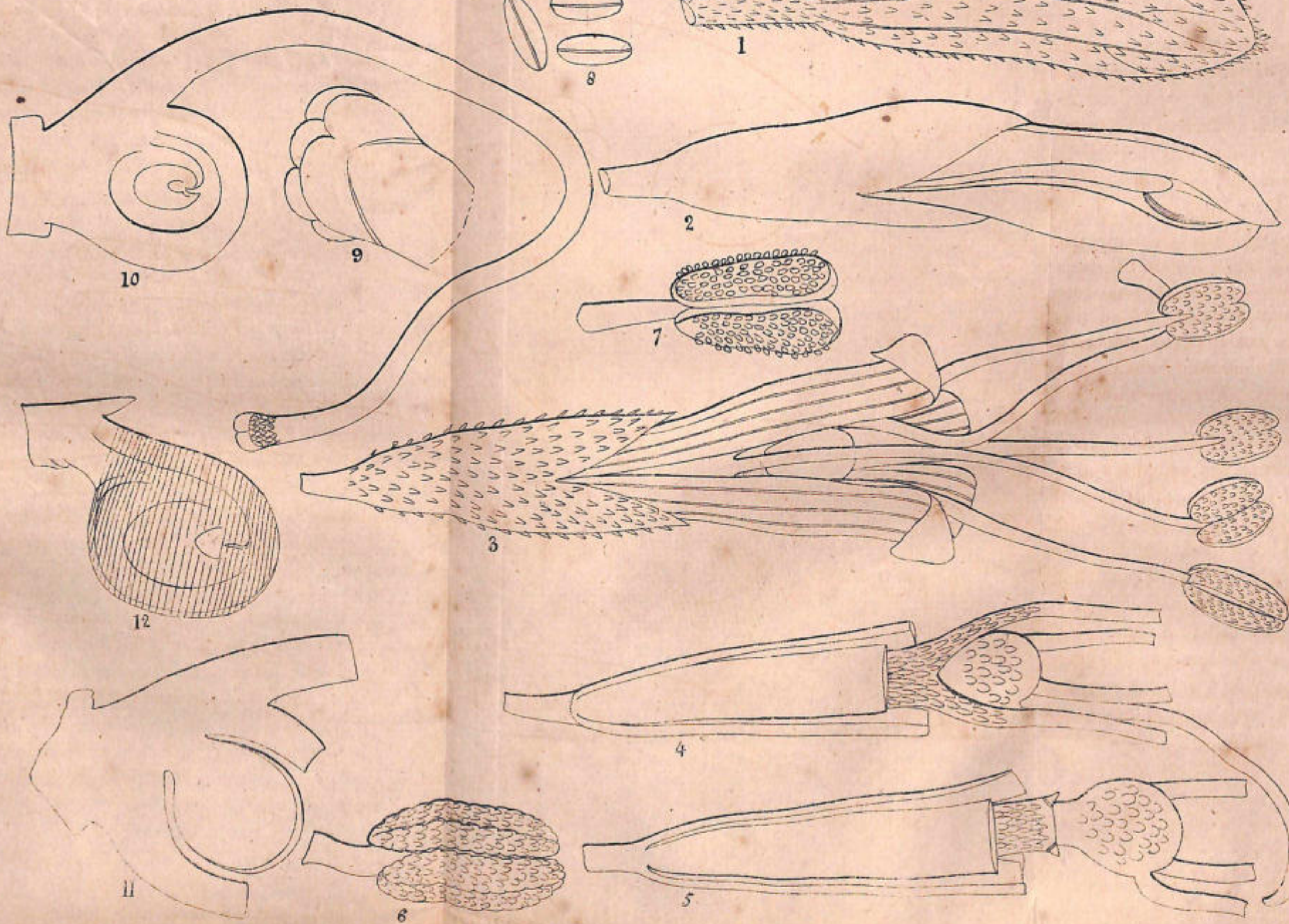
1.—*Review of the latest investigations regarding the intimate structure of the Liver.* *By* Mandl.

The researches of authors have left it still quite undecided in what manner the biliary canals terminate, and what their relation is to the hepatic cellules.

The existence of hepatic cellules is a fact recognized by all microscopic observers. Every one knows that they are true cellules provided with a special envelope, and with a nucleus containing granules, and at times little drops of fat. In our researches among different animals, we have at times met with livers whose cellules could be easily isolated, as in the ox; at times they formed irregular masses, or longitudinal rows, composed of more or less coherent cellules. In all these cases, it is only required to place a portion of liver for half an hour, or an hour, in a concentrated solution of caustic potass, to make the cellules plainly visible. Their nuclei are also then much more distinct. Retaining them too long in the potass, or making pressure on the cellules, destroys the cellular membrane, and the contents, the granules and the drops escape. The abundance of granules or of drops in the interior of the cellule, renders it difficult at times to recognise the nucleus: the potass extracts the granules, and then the nucleus can easily be seen. By the side of the cellules we often also see primitive corpuscles (nuclei) swimming freely. Like all other cellules, those which constitute the hepatic tissue, undergo different degrees of development; and therefore we must not wonder at observing great differences in their dimensions, not only in different animals but in the same species and in the same individual. In stating their dimensions, we of course speak of those of perfect cellules. According to our observations, they measure in the duck from 0.015 to 0.02 millimetres, in the mouse 0.008 to 0.01, in

Pl. II.





Syndesmis Wallichii,

the ox from 0.02 to 0.03, in man from 0.01 to 0.02. Their nuclei are in diameter from 0.005 to 0.008 millimetres. They are sometimes round, sometimes flattened, and of a distinct polygonal form in man. These facts sufficiently refute the opinion of Dujardin and that of Guillot, according to whom, the cellules are irregular particles, not limited by any envelope, and of a consistence between fluid and solid. We have not convinced ourselves of the fact advanced by Huschke, that each cellule distributes a filament which connects it with the biliary *canalicle*, and by which the bile escapes.

The hepatic cellules when pressed against each other form little *islets* surrounded by blood vessels. We owe the actual state of our knowledge of the distribution of the blood vessels of the liver, almost entirely to Kiernan.

It is easy to convince ourselves of the existence of the capillaries, even without making injections, by examining with a microscope that magnifies 100 to 150 times the free and transparent edge of the liver of a small animal, for instance, a duck or a mouse. In using a duck's, we should use individuals whose livers are free from black pigment, and we should avoid as much as possible all compression. Under these circumstances it is quite easy to recognise a very pretty network of capillary vessels with distinct walls, and the hepatic tissue placed in rounded off, or slightly polygonal meshes. On tearing the preparation, we meet with very fine capillary vessels, whose delicate structure agrees with that of the vessels of other tissues, and is proportionate to their diameter. We then frequently recognise the trunks of arteries or of veins, the latter covered by pigment cellules, to which again are appended the capillaries. Those who are not familar with the use of the microscope, may best convince themselves of the existence of those capillaries by previously injecting the blood vessels with tincture of iodine. The capillaries are then turned to a lively yellow, and are easily recognised among the hepatic cellules.

We do not therefore share the opinion of MM. Dujardin and Verger, who suppose that the blood circulates freely through the hepatic tissue, without being confined in special vessels. We are equally obliged to differ from Guillot, who supposes that the blood circulates in the liver through non-membranous canals. All microscopic observations are opposed to these opinions, and an attentive examination of the hepatic tissue demonstrates their inaccuracy.

We have hitherto spoken of masses of cellules surrounded by capillaries; we have still to make out the termination *of the biliary canals:* it is an extremely difficult subject, and one which probably still requires many new researches. To elucidate it, we have thought it useful to study first the liver of inferior animals, and we have chosen with this view the crustaceæ, and especially the crawfish.

In these animals, as is known, the liver is composed of isolated lobes, of a tube shape. Each of these tubes, when placed in a drop of water, without being covered by another glass, and examined by a magnifying power of 150 to 200 diameters, is composed, according to our observations, of a very fine exterior membrane, of a parenchyma, and an interior cavity filled with bile. The parenchyma is thickest at the free end of the tube, and gets thinner towards the other extremity. It is composed of cellules in various stages of development. The internal cavity or biliary *canalicle* is filled with little drops of fat, and of a white amòrphous substance, which we have had occasion several times to allude to. These drops sometimes accidentally enclose granules, or even hepatic cellules, which gives them the appearance of true cellules. By degrees they become opaque, and one, two, or even more transparent little drops of a brownish-red tint form in their interior.

These researches had long been completed when we received several Memoirs on the same subject, which appear to us to contain inaccurate results. Thus the parenchyma of the tube has been taken by Karsten and by Nicolucci for a peripheral blood vessel, while the little drops of the white amorphous substance figure in Meckel as hepatic cellules. The parenchyma is quite distinguished from blood vessels by the cellules of which it is composed, while in every blood vessel we find true blood-globules. We sometimes find by the side of the tube a line (traînée) of cellular tissue, on which a few hepatic cellules of a torn tube are accidentally placed, at other times the latter are to be found on a line of coagulable substance. These different lines have been taken by Karsten for the peripheral blood vessels detached. Nowhere have we been able to discover the trace of a blood vessel on the tube. By compression it is emptied, and folds are then apparent. We have sometimes found at the extremity of a tube some transverse fibres. It is probably these fibres or the folds that have been taken by Karsten for peripheral vessels. Nicolucci declares as such the intervals between the little drops of the white amorphous substance, which he takes, as we have already said, for hepatic cellules.

The facts which we have just cited, prove evidently that the hepatic cellules in the crustaceæ do not detach themselves to be carried along in the bile, as is the case with the cellules of other glands. M. Tereboullet first advanced the opinion that in the *cloportides* the cellules of the liver are carried into the interior of the alimentary canal: but I immediately combated this view, and it seems to have been given up by its author.

What reason is there to prevent the hepatic cellules in the crustaceæ from falling into the biliary canal? It is the presence of a special membrane which bounds this canal, of which we have formerly announced the existence, and which has been also seen by Meckel and Karsten.

The researches of which we have just been speaking are very delicate and difficult to make: but these difficulties are further augmented when we have to deal with the livers of the higher animals, and especially of the vertebratæ. Does then a distinct membrane exist round each lobule? Valentin is induced to admit the existence of this membrane, and Krause affirms that he has been able to see it. We too are induced to believe in its existence, not as surrounding each lobule, but as encircling each *islet* situated within the meshes of the capillaries. The capillaries would then be outside the proper substance of the liver, and would expand only on the surface of the lobules: the *islets* lying between the meshes would, in consequence, present the *culs-de-sac* of glands, which in the liver adopt a polygonal form. In short in no gland do we see the blood vessels penetrate into the parenchyma itself, and we cannot suppose an anomaly in the case of the liver. We are not therefore to consider the lobule or *acinus* of the liver as analogus to the *culs-de-sac* of lobulated glands, but these last are in reality separated by the polygonal *islets* which the capillaries enclose.

As to the origin of the biliary *canalicles*, we do not yet know whether they commence by a radicle from each islet, or by a common trunk in the lobule: further, we do not know whether, as in the inferior animals, these radicles are provided with a special membrane, though it is probable they are. For the rest, the hepatic cellules are in general very coherent in the inferior animals, through the medium of an inter-cellular substance which connects them, and this ought to be enough to account for their absence in the bile. Thus to sum up, each lobule is composed of a number of *islets* pressed against each other, which gives them their polygonal form. Provided with a special membrane, like the *culs-de-sac* of all other glands, they are encircled by capillary vessels. The portal vein encircles the lobules: the hepatic vein reaches their centre accompanied probably by a biliary *canalicle*, the origin of which is still unknown. No portion of the blood vessels penetrates the real substance of the liver.

In conclusion, we must express our regret at finding some authors deny facts, such as the existence of hepatic cellules, and of walls to the capillaries, facts which are palpable to every one familiar with microscopic observations.

2.—*Experiments on the share taken by the bile in the vital economy. By* Schwann.

Professor Schwann arrives at the following conclusions :—

1. The bile is not a purely excrementitial substance; after its secretion it plays a part essential to life.

2. The bile is quite as indispensable for young as for adult animals. The former seem to be still less capable of doing without it than the latter.

3. If the bile does not reach the intestine, its absence shews itself in dogs, commonly from the third day in a diminution of their weight. Death occurs in adult dogs usually in two or three weeks, sometimes earlier, sometimes later.

4. Death is preceded by symptoms of imperfect nourishment, great leanness, muscular debility, loss of hair; at the close, these are slight convulsions.

5. The bile which in the normal state reaches the duodenum, cannot be replaced by the bile which dogs lick, and which may, in that way, reach the stomach.

6. The bile when swallowed, does not disturb the digestion in the stomach, it does not exercise any influence whether favourable or injurious on the nutrition of the animal.*

M. Schwann is continuing his experiments, and proposes to determine the part which it plays in the digestion of aliments. We may add that the dogs who have survived the separation of the ductus choledocus, and who have been afterwards killed, have all shewn its reproduction; this reproduction always takes place if the fistula closes without there being any symptoms of jaundice.

* Yet a good deal has lately been written about the medicinal virtues of ox gall.—Tr.

3.—*Vital contractions of nervous matter* have been observed by Mandl in leeches. He separated in a living leech a portion of its ganglionic chain, composed of 2 or 3 ganglia, and placed it in a drop of water after stripping it of its dark envelope, so as to isolate completely its ganglia and its nerves. On examining it directly under a magnifying power of 50 or 40, he perceived very distinctly vital contractions, both in the nerves which issue laterally from each ganglion and in the terminal portion of the cord of connection. These movements completely resemble the contractions of muscular fibre. Their vivacity differs much in individuals. In some cases, he was not able to make them out at all.

MM. St. Hilaire and Serres confirm the accuracy of M. Mandl's observation. M. Serres in 1826 expressed his belief that the ciliary nerves possess contractility.

4.—*Memoir on the Trace of an Uterus in the males of the Mammiferæ. By Professor* E. H. WEBER.

1. In all the male mammifers that I have hitherto examined (the beaver, the rabbit, the horse, the pig, the dog, and the cat,) there is a hollow uneven organ placed in the median line, between the extremity of the urinary bladder and the rectum, which is the rudiment of an uterus, and which I term the *uterus masculinus*.

2. In man it is of the shape of a small elongated bladder, contained in the posterior part of the prostate and contributes to form the *verumontanum*.*

3. In newly born rabbits, male as well as female, it is impossible to determine with accuracy the sex merely by the examination of the external genital organs. The internal genital organs too are so similar, that it requires much atten-

* This organ has been often described and variously named, as *uterus cystoides*, *sinus pocularis*, *vesica prostatica*, &c.

tion to be able to distinguish the males from the females. In both there is a *sinus urogenitalis,* and a part which may pass for the bottom of the vagina and the body of the uterus. Into this organ enter in the females the horns of the uterus; in the males the deferent canals, extremely like the horns of the uterus, with this only difference, that the horns open into its upper part, while the deferent canals open into its lower. The organ corresponding to the rudiment of the vagina, to the body, and to the horns of the uterus, is also found in the adult rabbit: it is a sac provided with muscular fibres which receives the semen, and is so irritable, that in an animal recently killed it contracts under the influence of mechanical or galvanic stimuli.

4. In the male adult beaver and in the pig, the rudimentary uterus is, as in the females of these animals, a two-horned uterus, situated in the same place between the rectum and the bladder, and like it in a fold of peritoneum.

5. In the dog, the orifice of the uterus appears to be obliterated, so that its cavity has no opening; it is the same with the cat. In the horse and in man this orifice is also at times obliterated; but this is exceptional: commonly the male uterus of the stallion opens into the urethra at the colliculus seminalis by a single orifice. This organ is seldom short in the horse. It is sometimes nine inches long, and has two horns at its extremity. In fine, in the beaver and the rabbit, the orifice of the male uterus is never obliterated, and in the latter the different canals pour out the seminal fluid into its cavity a little below this orifice.

6. According to the observations of Rathke on the sheep and the pig, the uterus of the male embryos, is at a certain stage so exactly like that of the female, that there is extreme difficulty in distinguishing them, (this accords with the published observations of MM. Serres and St. Hilaire.)

7. From the description by Ackermann of the genital organs of a human hermaphrodite, in whom the male form

predominated, and from some other similar cases it follows, that the rudiment of the uterus of a male hermaphrodite may resemble considerably the female uterus; and inversely the uterus of a female hermaphrodite may also resemble the rudimental uterus of a male. (Is the third lobe of the prostate Weber's rudimentary uterus enlarged ?)

5.—*The re-establishment of the voice in dead bodies. By* M. BLANDET.

Physiological anatomy has been my sole guide in arriving at the artificial emission of sounds from the larynx: being acquainted with the play of the muscles of that organ, I have imitated their action by a mechanism analogous in its effects: my finger supplying the muscular contraction. I fix the thyroid cartilage between four fingers which are thus held as a clarionet, because the hyo and sterno-thyroid muscles cause a similar tension. I then press the index finger on each of the pyramidal apophyses of the arytenoid cartilages which are brought into contact as if by the thyro-arytenoid muscle. This pressure is so constant during life that it produces at this point on the cordæ vocales a nodule, which is not yet described. In the last place I blow through the trachea, and I produce sounds clear and shrill, such as theory would lead us to expect, because the contact of the two apophyses diminishes the length of the cordæ vocales where it establishes the nodes of vibration. The action of the crico-thyroid muscle is imitated by pressing on the base of the thyroid cartilage, and that of the lateral crico-arytenoid by lifting with the nail the external edge of the arytenoid cartilages. I here approximate these cartilages as the arytenoid does, or I draw them down by the base as the posterior crico-arytenoid do. By these operations I produce very extended gamuts, such as the voice of expiration; that of inspiration is still stronger and more easily obtained, because the vibrating plates of the larynx, i. e. the cordæ vocales present their bodies edge-ways to the blast of inspiration: they are not however *(anches)* curves: for the reversing these same curves ought to render sounds impossible before the blast of inspiration to which their backs are turned. These different sounds of the larynx are the voice without the *timbre*. When I operate on the dead body the *timbre* re-appears, and the illusion is perfect.

It is thus the pharynx that gives the *timbre*. The tonsils also take a part, and their action is of importance. Exciting them makes four of the higher notes to be lost and two low ones gained. The epiglottis and the base of the tongue have two principal functions. They cause the sort of vocal gurgling, known by the name of variation of shake: besides this, when they close the air passage, they favour the sounds of the lungs in which the air is accumulated; when they open again on the other hand, the sounds rise up and cause the treble. The thyroid cartilage contributes in the living to a lateral pressure which produces three more high notes, and which connects several of the treble notes into long sounds. The arytenoid cartilages and the superior ligaments vibrate and strengthen the sound. When the bow of a fiddle is passed across the cordæ vocales, laid bare by the removal of the larynx from above, clamorous tones are produced. When these same cords are bent to the extent of their superior third, sounds of superlative acuteness are produced: when the two cords are cut, we may blow in through the trachea, but only hear ronchi, as in snoring. When only one of them is cut, the voice may continue, which is found to be the case when disease has destroyed one; a phenomenon which shows that we may speak with one cord (?) as we may see with one eye, and that double organs are a sort of luxury to the system.—*Translated from the Archives de Médecine, for Oct., Nov. and Dec.*, 1846.

Notes on the Botanical Geography of the Tenasserim Coast. By the late WILLIAM GRIFFITH, ESQ., F.L.S., *Memb. Royal Ratisbon Bot. Soc., Royal Acad. of Sciences at Turin, Imper. Acad. Nat. Curios., Madras Med. Service.*

The Coast of British Burma, which extends from Moulmein to about eighty miles south of Mergui, or between the parallels of 16° 30′ and 10° 40′ north latitude, is exceedingly hilly. These hills do not attain an elevation exceeding 4,000 feet, and even this is extremely rare. From these hills being, with a few exceptions, entirely covered by trees, or rather low vegetation, the Coast presents to the eye a great sameness. The ranges of hills are intersected by a great number of rivers, of which several attain a considerable size. The Salveen, which forms the northern boundary of our provinces, being much the largest. At the mouths of these rivers, tracts of Rhizophoreæ, frequently of enormous extent, occur, and form one peculiar and vast feature of the flora. At different places along the courses of these rivers, plains, frequently of great extent, occur. The extent and frequency of these plains is however much diminished about Mergui. These plains are, I believe, alluvial; their level is very little higher than that of the rivers, and they are consequently inundated during the rains. They are almost exclusively occupied by grasses and Cyperaceous plants.

At Tavoy, and very partially at Mergui, part of the surrounding country consists of a series of gently undulating hills, covered with underwood, and presenting a special flora. That at Mergui, which is the only one I have been able to examine, consists of low shrubs, as Cnestis, Omphalobium, Elodea, Euphorbiaceæ, Hippocratea, Rubiaceæ, &c. among which Henslovia, here a small tree, exists in abundance.

NOTE.—Capt. Munro, who kindly perused this paper at the request of the Editor, has increased its value by the addition of several Notes.

Calcareous hills of a peculiar form occur, scattered here and there, but are most common about Moulmein, especially at Kogoon, on the Salveen, the habitat of Amherstia nobilis. At Trochla, on the southern side, one of these hills occurs of great height, forming a precipice of perhaps 3,000 feet. These peculiar formations arise abruptly from plains to the height of generally 400 feet.

Their ridges are exceedingly sharp and rugged, and very generally they are sheer precipices and totally inaccessible. Their vegetation is scanty, but that at their base is exceedingly rich. They are, without exception, excavated, and frequently perforated, so as to form internal caves which have been at one time the favourite places of Burmese worship.

The birds' nest rocks, from which a revenue is derived at Tavoy, exceeding 10,000 rupees per annum, and at Mergui 5,000, belong to the same formation. They likewise rise perpendicularly through and from the sea, and are still more bleak and rugged from their greater degree of exposure and exceedingly scanty vegetation, chiefly indeed of a species of Ficus. With the exception of Casuarina muricata, which occurs in abundance from Chittagong to Yeayla, near Tavoy, there is no plant which impresses a peculiar feature on the landscape, scarcely excepting several species of bamboo, which, in addition, are associated with a local flora.

The remaining tracts are either of mangroves, or Gramineæ and Cyperaceæ; the plains and the hills are covered from top to bottom with an exceedingly rich, varied, and magnificent vegetation.

With respect to the probable number of species known, Dr. Wallich's Catalogue contains about 1,650, of these the majority perhaps are from the Burmese dominions. My collection from Moulmein and Mergui, made during a residence of fourteen months on the Coast, amounts to about 1,700 species; of these about 1,300 are from Mergui, which may be considered new ground. Taking this into consideration, the materials already formed towards a flora, may be estimated, I think, at 3,000 species.

The flora of Mergui appears to me almost entirely different from that of Moulmein; the difference in latitude being 5°. The climate is, perhaps from its immediate proximity to the sea, more equable than either Moulmein or Tavoy.

In the following remarks, I shall follow the arrangement laid down by Dr. Lindley in his Nixus Plantarum, not that I profess myself to be a judge of its merits, but simply because it is convenient.

Ranunculaceæ are represented by Naravelia zeylanica, which occurs both smooth and pubescent, and by a distinct species of Clematis, with simple fleshy leaves, and which although it has erect seeds, has an inverted embryo lodged in the apex of the albumen.

Nymphæaceæ.—In addition to two species of Nymphæa, a Barclaya, probably B. oblonga, occurs. The placentæ of the mature fruit are very spongy and almost farinaceous. The seeds are immersed in a transparent gelatinous fluid, and contain a minute inverted embryo lodged in a cavity in the albumen near its base. The albumen consists of a congeries of sacs, within which the fecula is deposited.

Nelumbiaceæ.—Nelumbium speciosum occurs cultivated. The structure of the leaves is sufficiently remarkable. The stomata are confined to the callous discoloured spot, visible on the centre of the lamina, and opposite to the termination of the petiole. The remainder of the vast limb is merely minutely papillose on its upper surface. The stomata are crowded on the above spot, and open into irregular cavities, which communicate directly and freely with the cavities existing in the petiole, and with the continuations of these which run along each side of the peltately disposed veins. These cavities have no communication with that part of the parenchyma in which the green colouring matter is formed. There is however a slight communication between this parenchymatous portion and the stomata, but only in that portion immediately surrounding the callous disc. We may therefore infer, that the numerous papillæ are connected with the necessary aëration of the parenchyma, a function which it is well known is occasionally performed by hairs. The cuticle of the green portion of the limb is remarkably fine.

The existence of two membranes in the pollen of this plant is very evident when immersed in water, the outer thick yellow coat expels the inner with a jerk, but this inner membrane undergoes no change of form during this expulsion.

The callous spot visible on the surface of the ovarium always points outwards. The opening, or the membranes of the ovule, are very distinct, and the foramen which they form is invariably turned *away* from the termination of the stigmatic canal, which is exceedingly distinct and lined with papillæ. These papillæ are, especially towards the apex of the ovary, connected by what appears to be a fine membrane. This is, on the side nearest the ovule, reflected on to the short funicle, which it envelopes and terminates by forming a remarkably fine membranous cap which covers the foramen. By this the boyaux are guided into the ovulum, one only, but occasionally two, passing in and reaching to the apex of the nucleus. In one instance of a branched boyau both divisions passed in and reached the same place. The first part of the embryo, that is formed, is its *radicular* extremity. The vitellus, I may remark, embraces only the plumule, the cotyledons are developed between it and the remains of the nucleus. The term vitellus is, I think, preferable to that of quintine, which is obviously only applicable when five membranes exist or have existed.

Myristiceæ.—Only one species apparently referable to Loureiro's genus Knema.

Anonaceæ.—About eighteen species exist. Among these there are two species of a genus, with the habit and peculiar peduncles of Artabotrys, but in which the contracted portions of the backs of the petals are club-shaped.

Dilleniaceæ.—The *perfect* seeds of Dillenia speciosa have the cells of the inner integument marked with longitudinal incomplete fibres. This is one among several instances that I could adduce in corroboration of Dr. Brown's remark that the fibres are not developed until after impregnation.

Memecyleæ.—Among the species, I may mention one, that so far as may be judged by the examination of the calyx of the fruit, appears to have the stamens equal in number to the petals. In several of these the number of ovula appeared to be always nine, of which number 6 to 7, or generally 8, subsequently become abortive. One species occurs abundantly about Mergui, the leaves of which are furnished with pellucid glands! A genus likewise exists which, with the flowers of Memecylon, has the fruit and seeds of a widely different structure, and which is a proof of the accuracy of Dr. Brown's statement; (Appendix Congo)? that Memecyleæ are not sufficiently distinct from Melastomaceæ. This genus may be thus characterized.

APTERIXIS.—*Calycis* tubus globosus, limbus intus eplicatus brevissime 4-dentatus. *Petala* 4. *Stamina* 8. Connectivum eglandulosum. *Ovarium* 4-loculare, ovula 00, placentis 4-carnosis, parietalibus, affixa. *Fructus* dentibus calycinis obsoletis coronatus 4-locularis. *Semina* 00, angulata placentis 4, parietalibus affixa. *Embryo* orthotropus. *Cotyledones* plenæ! sub-reniformes.

A. trinervis, arbuscula, folia ovata basi 3-nervia, floribus racemoso paniculatis pallide cæruleis.

The placentæ only occupy the lower half of each cell.

Among the *Melastomaceæ*, two species of Sonerila occur, and one species of the curious epiphytical genus* with fleshy, very smooth, and indistinctly 3-nerved leaves. The æstivation of the stamina, or rather the stamina during æstivation, are lodged in a corresponding number of cells, formed by the partial adhesion of the calyx with the apex of the ovarium. The fertile part of this organ is wholly

* Medinilla.

inferior. This curious arrangement was first made known by Dr. Brown.*

Among the *Capparideæ*, is a species of Capparis, the flowers of which are exquisitely fragrant, and the ovaria have 4-parietal placentæ.

Cruciferæ are represented by two or three cultivated species, and an indigenous species of Nasturtium.

Hypericineæ.—An Elodea, of Jack.

Ternstrœmiaceæ.—A species of Gordonia, and a genus apparently intermediate between Cleyera and Eurya, which I propose calling Erythrochiton.

ERYTHROCHITON, *Griff.*†

Flores dioici, bibracteolati. *Calyx* inferus profundè 5-partitus. *Petala* 5, hypogyna, libera, sepalis opposita ! ! *Stamina* 00, hypogyna, multiplici serie. *Antheræ* adnatæ, apicibus truncatæ. *Ovarium* 2-loculare, 4 ovulatum. *Styli* 2. *Stigmata* 2-reniformia, foliacea. *Bacca* supera, 2-locularis 2-4 sperma. *Semina* pendula, arillo ? punctulato carnoso inclusa, albuminosa. *Embryo* curvatus.

Cl. Linneana. DIŒCIA. POLYANDRIA.

Ord. Naturalis. TERNSTRŒMIACEÆ.

Habitus.—Arbor, mediocris, foliis stipulatis perennantibus integris, pedunculis extra axillaribus.

ERYTHROCHITON WALLICHIANUM.—Herb. prop. No. 866, Dec. 1834. In sylvis secus littora Insulæ Madamacan Mergui proximæ.

Arbor mediocris, dioica ; ramulis teretibus. Folia alterna et ad apices ramularum subverticillatim conferta, oblongo-obovata obtusa et breviter acuminata, integerrima, coriacea,

* This arrangement is also remarked in Wight's Illust., part I. page 217, where the species of Medinilla referred to is also mentioned.

† Erythrochiton has been published by Nees and Martius as a genus of Rutaceous plants, and the present name by Griffith is consequently superseded.

parce venosa, supra atro-viridia, infra lutescentia. *Petioli* basi articulati. *Stipulæ* minimæ subulatæ deciduæ. *Pedunculi* extra axillares (foliorum abortu ?) solitarii, 2 unciales, flores paulo infra alternatim, bibracteolati. *Flores* majusculi, albidi, odorati, facie Camelliæ.

Mas.—Calyx profunde 5-partitus: laciniis rotundatis æstivatione imbricatis persistentibus.

Petala 5, hypogyna sepalis opposita, ovalia, subæqualia, patentia, carnosa, æstivatione imbricatâ, posticâ reliqua obvàlvente, basis versus longitudinaliter rugosa. *Stamina* plurima multiplici serie, hypogyna, sub-libera. *Filamenta* brevissima, subclavata. *Antheræ* lineares, adnatæ, biloculares, longitudinaliter dehiscentes, directione variæ. Connectivum apice truncatum et dilatatum. Pollen oblongum hinc longitudinaliter sulcatum.

Fœm.—Calyx corollaque ut in masculo, sed multo minus patulæ. *Stamina* abortiva plurima, hypogyna, filiformia planotruncata. *Ovarium* subglobosum 2-loculare: loculis 2 ovulatis, ovula pendula (ex-apicibus loculorum ?) campylotropa reniformia. Tegumentum duplex, foramen hilum prope. *Styli* 2 brevissimi. *Stigmata* 2, maxima foliacea reniformia; marginibus obtuse inciso-dentatis, *anticum et posticum*. *Fructus*, bacca exsucca, globosa, citri medicæ parvæ magnitudine, basi calyce persistenti et subampliato cincta, bilocularis, 2-4 sperma longitudinaliter et irregulariter, dehiscens subquadrivalvis. *Semina* pendula ab apice placentæ centralis liberæ, (funiculis elongatis) arcuata reniformia, arillo, carnoso, rugosulo, pulcherrime coccineo, tecta. Tegumentum duplex, exterius subosseum, interius membranaceum; albumen semini conforme, carnosum, copiosissimum. *Embryo* in axi albuminis curvatus, hippocrepidiformis, indivisus! secus peripheriam cum albumine coalitus! Radicula teres longissima ? hilum versus spectans, cotyledones carnosæ inter se albumine cum coalitæ! Plumula inconspicua.

Genus Euryam Cleyeramque intermedium: structura fructus et seminum ad Annesleam Wall. accedens. Formâ stigmatum embryonisque, cum albumine coaliti, indivisi, distinctum.

I believe that Hopea eglandulosa of Roxburgh, which Mr. Colebrooke in a MS. note, appended to the description in Roxburgh's MSS. synopsis, long ago stated not to belong to Hopea, Sarcostigma Roxburghii, Wall. MSS., and which Mr. Brown in his MSS. formerly called Wahlenbergia, not only belongs to this order, but will be found to be very nearly allied to this genus. Of this genus Sarcostigma,* there appears to be a second species from Sylhet.

Among the *Polygaleæ* are, one species of Polygala, three of Xanthophyllum, and three of Salomonia, among which is a most remarkable species, which may be thus indicated:

"Salomonia parasitica, Aphylla."—Species decolorata, vix spithamæa, floribus dense spicatis, *pentandris*, capsula ecristata.

Hab. Ad pedes Bambusarum inter-lignum vetustum, ad Palar, cum Sarcocodon (Rhizanthearum) et speciebus duabus Burmanniæ parasiticis consociata.

Dipterocarpeæ abound about Mergui, but from their enormous size the flowers are frequently inaccessible. One genus appears to have perigynous stamens.

Of *Hippocrateaceæ* about six species occur, one of these is arborescent and pentandrous.

Among the *Malpighiaceæ* are a species of Hiræa and four species of Ancistrocladus.

Erythroxyleæ are represented by a species of Sethia, apparently Sethia indica.

Among *Rosaceæ* and its sub-orders, occur one species of Rubus and one of Amygdaleæ, the fruit of which abounds with prussic acid.

Leguminosæ occur extensively, and form about one-sixteenth of the whole; among these I may mention a species of Pon-

* Sarcostigma is now applied by Wight and Arnott to a genus of Thymelaceæ.

gamia, in which the perigynous disc is divided into ten distinct glands. The pollen of Inga mimosa and entada I find to be composed of twelve granules, four of which form, as it were, a nucleus for the remaining eight.

Several Connaraceæ occur, belonging chiefly to the genus Cnestis. Eurycoma, Jack, is abundant; it is a genuine Connaracea with pendulous seeds. The ovula are however erect, but the subsequent change in situation of the seeds is due to an unequal growth of the ovarium.

Anacardiaceæ are represented by the usually cultivated genera, Mangifera and Anacardium, of the former genus M. oppositifolia, the *Mariam* of the Burmans, is not a constituent, as has been mentioned by Messrs. Wight and Arnott.* A species apparently M. sylvatica, Roxburgh, is likewise met with. In addition to these genera, Melanorrhæa, Syndesmis, and a new genus nearly allied to the former occur. This I propose to call Swintonia.

CASSUVIEÆ.

SWINTONIA, *Griff.*

Sepala 5, basi coalita, persistentia. *Petala* 5, hypogyna, subfructû demùm ampliata. *Stamina* 5, toro cylindrico parum elevato insidentia. *Ovarium* subæquilaterale in apice tori staminiferi sessile. *Stylus* filiformis. *Stigma* peltato capitatum. *Fructus* siccus, indehiscens subglobosus, exstipitatus, petalis ampliatis foliaceis suffultus.

Cl. Linneana—PENTANDRIA MONOGYNIA.

Ordo naturalis, ANACARDIACEÆ, Br.

Habitus.—Arbor, polygama resinosa maxima altaque, facie quâdam mangiferæ, folia lanceolata coriacea, irregulariter pellucide punctata! Paniculæ axillares terminalesque.

SWINTONIA FLORIBUNDUM, *Griff.*

Hab.—In insulæ Madamacan. *Pator* dicto, copiosè. Florens Novembri, Decembri, fructus profert Februario.

* This is now Bouea of Meisner.

Arbor vasta. *Folia* alterna exstipulata longiuscule petiolata apices ramorum versus conferta, elongato lanceolata, acuminata, coriacea, repanda, penninerva, punctis pellucidis 2-irregularibus notata. *Flores* paniculati parvi, numerosi, viridescento-albidi, suaviter odorati. *Paniculæ* amplæ axillares terminalesque; ramulis cymosis divaricatis. *Calyx* 5-fidus, *persistens*, tubo brevi, laciniis rotundatis, breviter ciliatis, æstivatione imbricatis. *Petala* totidem, toro nempe parum elevato inserta, et verosimiliter adnata, unguiculata, unguibus gynophoro adnatis, hypogyna, oblonga, patenti-reflexa, sepalis alternantia, æstivatione imbricata. *Stamina* 5, libera, hypogyna, toro nempe parum elevato inserta, vel potius adnata, petalis alternantia. *Filamenta* subulata basi incrassata et gynophoro-adnata, petalis breviora. *Antheræ* oblongo-lineares biloculares, longitudinaliter dehiscentes, subversatiles. Pollen oblongum, leve, hinc sulcatum. Glandulæ 5, minutissimæ, staminibus alternantes. *Ovarium* sub-æquilaterale sessile, subrotundum, 1-loculare, 1-ovulatum. *Stylus* fere terminalis, filiformis, crassiusculus. *Stigma* peltato-capitatum, 4-sulcatum. *Ovulum* in apice funiculi deorsum curvati sustentum, foramen hilum prope. Fructus paniculati, sub-globosis, sessilees, basi petalis foliaceis ampliatisque, lineari-spathulatis, venoso-reticulatis, rubro-viridibus, patentissimis reflexisve, involucratis, sicci, indehiscentes, 1-loculares, 1-spermi. Semen erectum? sub-rotundum. *Cotyledones* maximæ, plano-convexæ, carnosæ. Radicula teres hilum spectans, in commissuram cotyledonum replicata. Plumula conspicua.

This genus is most nearly allied, especially in the structure of its fruit, to Melanorrhæa, Wall. In the mode of adhesion of the petals and stamina with the torus it approaches to Syndesmis. If my description of the ovarium be correct, it differs from all the nearly allied genera, which have a more or less oblique style. I suspect that two species are present in my collection.

The one referred to in my description is numbered 645, the other is 691. This appears to have no glands alternating with the stamens.

The tree is very conspicuous when in flower, and has a decided influence on the landscape, from its dense mass of inflorescence. No. 691 does not appear to have punctate leaves.

SYNDESMIS, *Wall. Pl.* 2.

Flores Polygami—*Calyx* tubulosus, hinc fissus (coloratus.) *Petala* sæpissime 4, a medio infra cum staminibus gynophoro elongato adhærentia. *Stamina* 4. *Ovarium* lenticulatum 1-loculare. *Stylus* lateralis, stigma obtusum. *Fructus* ignotus.

Cl. Linneana, TETRANDRIA MONOGYNIA.

Ordo Naturalis, ANACARDIACEÆ.

Habitus.—Arbores fruticesve, foliis oblongis coriaceis, impunctatis-glabris. Flores cymosi.

Syndesmis elegans, Wall. in Roxb. Fl. Indica, p. 314.

Hab.—Ad marginem sylvæ inter Kulweng et Mergui. November, 1834.

Frutex vel arbuscula, vix resinosa, folia lanceolato-oblonga, breviter petiolata, ad apices ramorum conferta, coriacea, sub-integra, obtuse acuminata, glabra, penninervia. Paniculæ cymosæ terminales, sæpius 2-3 aggregatæ: pedunculi presertim secundarii compressi. Bracteæ ovalæ, membranaceæ, deciduæ. Flores polygami numerosi fortiter odorati. *Calyx* miniatus, tubo cylindrico ad anthesin hinc longitudinaliter fisso et subtrifido. *Petala* 4, interdum 5, subæqualia lineari-spathulata calyce fero duplo longiora, apicibus revolutis, hypogyna et infra gynophora connata, æstivatione imbricata. *Stamina* semper 4 petalis alternantia usque ad-medium gynophoro-connata, libera. *Filamenta* filiformia subæqualia. *Antheræ* erectæ basibus affixæ, biloculares longitudinaliter dehiscentes. Pollen ovatum, leve, hinc sulcatum. *Stylus* lateralis filiformis stamina excedens. *Stigma* obtusum fere subcapitatum medio sulcatum. *Ovulum* ascendens funiculo brevi sublaterali sustenso; foramen hilum prope fundum loculi versus spectans. *Fructus* nondum visus.

Of this very distinct genus I believe two species exist in my collection: the above description and the drawing, refers to S. elegans, Wall. which appears to be a shrub. Its number is 675. The other is a considerable sized tree, with much fewer flowers.

Nothing can be more apt to mislead young botanists than the statement that Anacardiaceæ are perigynous. In all the genera I have examined, viz. Anacardium, Mangifera, Syndesmis, and Melanorrhæa, they are essentially hypogynous, and the type of this formation is easily traceable from those, in which the hypogynous insertion is least evident, up to Melanorrhæa, in which it is most evident. I am aware that Mr. Brown is of opinion, that the perigynous insertion of the stamina may be admitted in doubtful cases from analogy. "This reasoning being founded on the existence of a (then) unpublished genus Holigarna? with an inferior ovarium." This genus is still, I believe, a solitary exception, and with the utmost deference to the opinion of Mr. Brown, I should think that three instances (Melanorrhæa, Syndesmis, Swintonia,) of undoubted hypogynous insertion are worth more than one of perigynous. I subjoin a list of this order which I have found to be, natives of the Tenasserim Provinces.

Mangifera indica, Linn.
——— sylvatica, Roxb. Mergui.
——— oppositifolia, Mergui. } Now Bouea,
Cambessedea, Wight and Arnt. } Meisner.
Anacardium occidentale.
Syndesmis elegans, Wall. Mergui.
Swintonia floribundum, Mergui.
Melanorrhæa glabra, Wall. Mergui.
——— visitata, Moulmein.
Holigarna longifolia, Martaban.

Description of Plate 2.

1. Bud.
2. Ditto before expansion.
3. Flower.
4. Ditto calyx and petals removed.
5. Ditto two stamens removed, to show the ovarium.
6. Stamen front view.
7. Ditto after dehiscence.
8. Pollen.
9. Stigma.
10. Long section of ovarium.
11. Section of ditto, part of the parietes of ovarium removed.
12. Ovulum removed long section.

Helicia (Rhopala) represents the family of *Proteaceæ*.

Stilagineæ.—The affinity of this order with Euphorbiaceæ is very strong, so much so, that it appears to me that no truly distinctive mark exists except perhaps the dehiscence of the fruit.

Several species exist about Mergui. The fruit is not always drupaceous.

Gymnobotrys, Wallich, which I refer to Stilagineæ, abounds in milky juice.

Myrsineæ.—Several species of Ardisia and one of Samara* represent this order, in which the presence of pellucid glands in the leaves is by no means an uncommon character.

Two species of *Lobeliaceæ* and one of Codonopsis of *Campanulaceæ* occur; with regard to this last genus, it appears to me questionable whether the tube of the corolla is not united to the ovarium as in Barclaya: in this view of the case, the involucrum of M. Alphonse DeCandolle will be referable to the calyx.

Stylideæ.—Two very distinct species, neither of which appear to have an irritable column, are found about Mergui. A third species exists at Moulmein.

* Myrsine, Linn., fide Alph. D'C.

Apocyneæ—Among several others, a curious genus occurs with 1-*celled ovaria*, the placentæ being 2, and parietal! The same genus is remarkable for a monstrosity, in which the hypogynous glands become largely developed, osseous, and assume the form of stamina; the true stamina being small and abortive.

Asclepiadeæ.—This order is rather numerously represented. Five species of Dischidia exist, among which is one beautiful species with pink flowers; the processes of the corona staminea being rather incompletely formed. I would beg to dedicate this to Dr. Brown, under the name of D. Brunoniana.

Finlaysonia obovata occurs abundantly, its stigma is remarkable for having a deep transverse foveolus on each of its flat faces, or on each of its faces opposed to the anthers.

Loganiaceæ is represented by one species of Fagræa; probably *F. fragrans*.

Among *Ehretiaceæ*, there occurs a curious species of Ehretia, with exceedingly long, prostrate, and rooting stems. To the existence of this plant, the permanence of many of the beds of sand, so numerous up the Mergui river, is to be attributed.

Verbenaceæ occur numerously. The placentæ I find to be either formed on the plan of those of Cyrtandraceæ, or Olacineæ. To the former type, belong those with bilocular ovaria, in which case cellular tissue is developed between the plates. I believe, however, that many described as having 2-locular ovaria have them in reality 1-locular. Among the Burmese species, most have pendulous ovula.

To the latter type, viz. of Olacineæ or Santalaceæ, belong Congea and its *congeners*, which may be judiciously subdivided, and Avicennia. Congea has two incomplete septa, which from their nearly reaching the placenta, may easily give rise to the opinion of the ovarium being 2-locular.

Among *Lentibulariæ,* a small species of Utricularia exists, which is found growing among moss on damp walls, and rocks; it is furnished with bladders.

Plumbagineæ are represented by Plumbago and Ægialitis rotundifolia.

One species of Cycas, one of *Coniferæ,* and Agathis loranthifolia exist in the flora.

Of *Gnetaceæ*, three species exist, Gnetum gnemon, scandens, and an erect one, which I have in my account of Gnetum called G. Brunonianum.

Burmanniæ are represented by Burmannia, of which three species occur; of these two are aphyllous and parasitical, one being entirely of a deep blue colour, the other entirely white. These, as well as the aphyllous Salomonia with which they are associated, throw considerable light on the seeds of parasitical plants, and prove that this peculiar manner of growth is not necessarily connected with a peculiar formation, or rather deformation of the embryo. Salomonia parasitica has the usual form of embryo, while the whole three species of Burmannia have no other embryo than a grumous divided mass. This fact proves, I think, that no very great stress is to be laid upon the existence of these anomalous embryos, the study of whose germination will prove highly interesting.

This structure of the seeds will probably suggest new ideas as to the affinities of the order which it composes.

Orchideæ form about one-twentieth of the vegetation; subsequent researches will, I think, increase the ratio considerably.

Apostasieæ (Lindl.), are represented by one species, probably A. nuda.

On the Four-horned Antelopes of India. By B. H. Hodgson, *Esq.*, F.L.S., Z.S., *With Plates.*

It is I believe generally acknowledged, that no group of Mammals stands more in need of thorough revision than that of the Four-horned Antelopes. These constitute the Tetracerine racemus of H. Smith, whose definition of the group and enumeration of the species may be seen in the English Regne Animal, Vol. iv. pp. 253 to 257. We owe to Dr. Leach's sagacity, the discrimination of these animals as a separate genus at a period when there were very few and insufficient materials to guide him. Colonel Smith reviewed the group in 1827 with his usual ability; but he was necessitated to leave most of the influential generic characters unnoticed, and even to hesitate as to the specific independence of the only two species then known, or Antelope Chickara of Hardwicke, and Antelope Quadricornis of Blainville, with which latter, after communicating with Dr. Leach, the Colonel identified the Striaticornis of that gentleman.

Since the period of the publication of the Regne Animal, now twenty years, nothing further has been done to elucidate the genus or its species, save by that able Indian Zoologist Walter Elliott, of the Madras Civil Service, who, in 1839,* by giving an accurate and full description of the species proper to Southern India, afforded some valuable help towards clearing up the general subject. My note books contain a good deal of information touching the structure and habits of the Tetracerines, of which two species are found in the Tarai of Nepal; and I shall now endeavour, with the help of my own stores, eked out by what I find recorded in books, to exhibit the essential characters of the genus, and to enumerate and define all the known species, adding two new ones of my own to the three already adverted to.

These beautiful little animals possess high interest, as being the only truly four-horned quadrupeds known, and also as forming with the Muntjacs, a link between the solid and hollow-horned ruminants; for they are allied to the antelopes by their general structure and obvious characters, but to the deer by having four teats and a large moist muzzle, both features of primary importance!

* Catalogue of Mammals, Madras Journal, No. 25, p. 225.

ANTELOPIDÆ VEL CAPRIDÆ.

GENUS TETRACERUS, *Leach.*

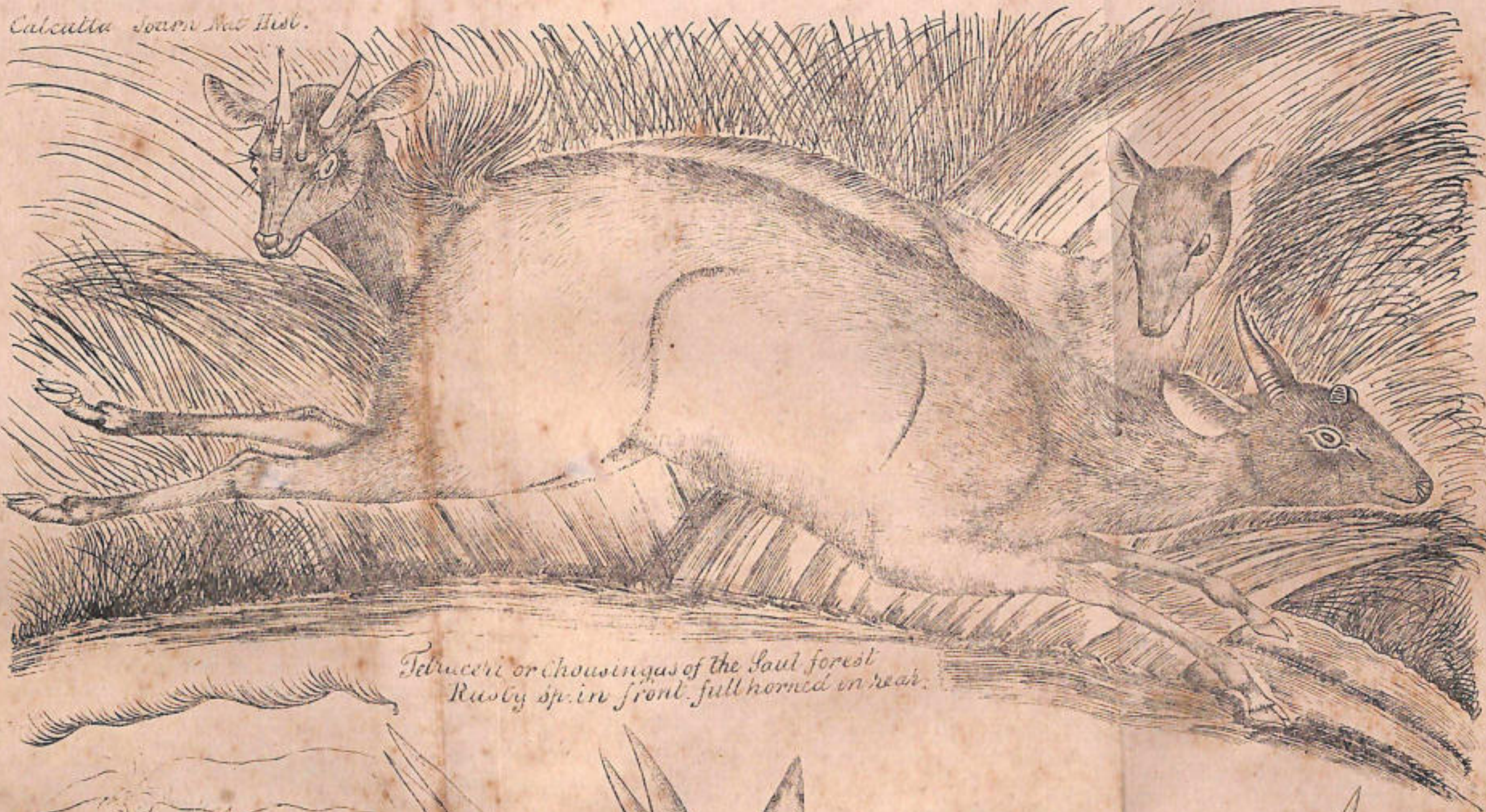
ESSENTIAL CHARACTERS, *Mihi.*

Horns in the males only, four in number, two interorbital, and two set on behind the orbits but below the frontal crest. Anteal horns hollow cored: Posteal horns solid cored. Large moist muzzle. Lachrymal sinus medial, forming a straight longitudinal slit. Feet pores in hind feet only, or none: Inguinal pores none. Teats 4? 2?* No calcic tufts or glands. Sexes of same size, but females unhorned, and wanting the facial marks of the male, where he has any.

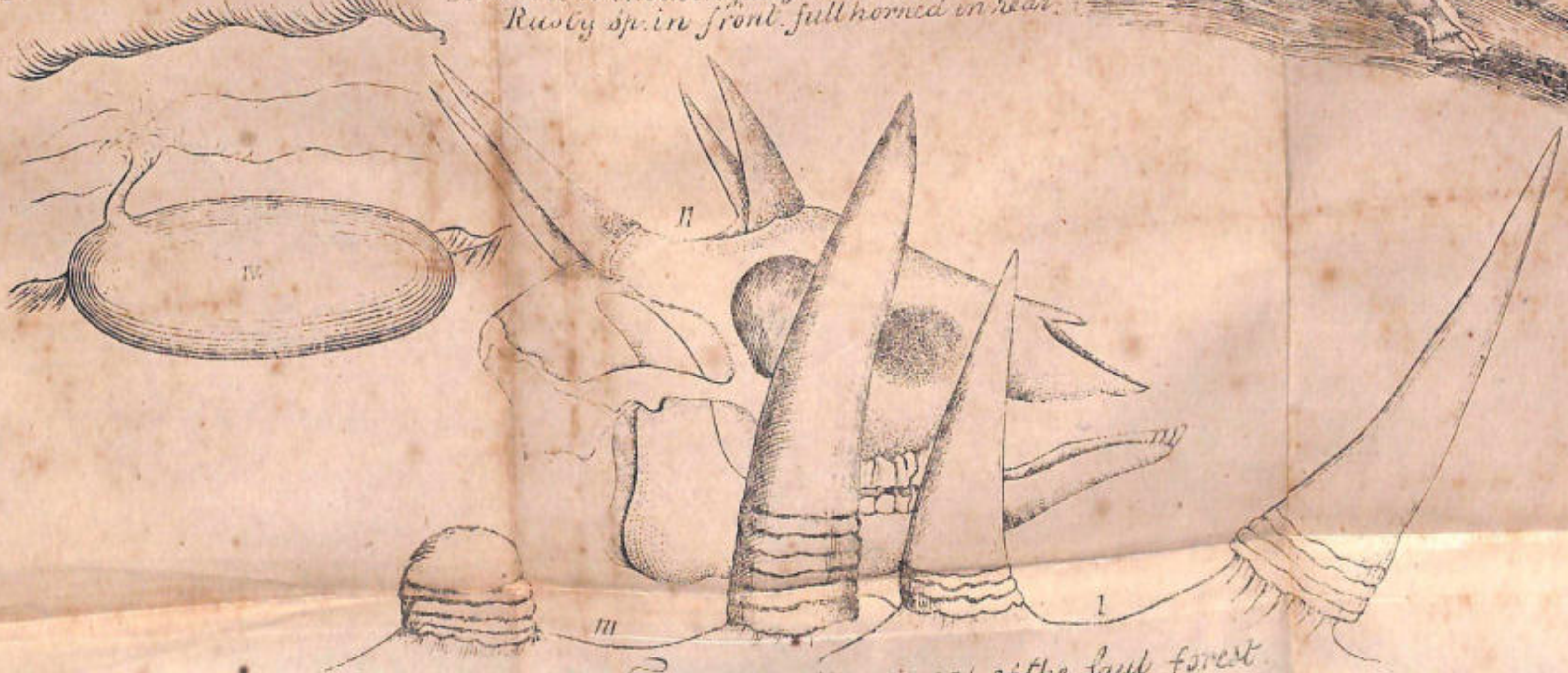
Manners and habitat.—Not gregarious. Monogamous. Found usually in pairs or solitarily. Exclusively confined to primitive forests and to the parts where thick undergrowth, especially of reeds, abounds. Never frequent plains or mountains, but dwell in the forests at the base of the latter, and are found all over India in such situations, and in no other country apparently. Their droppings are at a fixed spot, and thereby the hunters are guided in finding them, as they are in finding the rhinoceros. The four-horned antelopes frequent salt licks, and wear away their incisors by grubbing for the salt which they are very fond of, as indeed are all ruminants. They are shy, and when hunted, either lie very close, creeping often under one's elephant's belly, so that it becomes impossible to get a shot, or they go off far ahead, moving by high bounds, like the common antelope (Cervicapra). In rapid motion they carry the head low and the buttocks high, with the tail reverted over the back. They breed but once a year: the rutting season being autumn, and the period of parturition early spring or late in winter. Most young are born in January and February, some in December, and some in March. The period of gestation is six months, and the female usually produces two at a birth, but sometimes only one. The Indian names are *Chouka*, from *Chouk*, a bound or leap, and *Chousinga*, from the four horns: the word being precisely equivalent to the Greek *Tetrakeros;* Latin *Tetracerus.*

* Latest specimen examined had 4, so had Mr. Elliott's: but two others had 2, or I made a mistake.

Pl. IV.



Tetraceri or Chousingas of the Saul forest
Rusty sp. in front. full horned in rear.



Tetraceri or Chousingas of the Saul forest.

I now proceed to a summary but very carefully compiled description, or definition rather, of the five species thus far discovered.

1. T. CHICKARA, *Hardwicke.* Uniform bright bay; chin, abdominal, centre of neck, belly, insides of limbs near it, edge of buttocks and of tail, and lining of ears, albescent. Horns and hoofs and muzzle, black. Snout to vent *2ft. 9in.* Height *1ft.* 8½*in.* Head 7½*in.* Ears 4¾*in.* Tail *5in.* Posteal horns *3in.*, rounded, smooth, unringed, straight, erect, curved slightly forward, subdivergent; their basal interval ¾*in.*; their terminal, 1⅕*in.* Anteal horns ¾*in.* long, stumpy, erect, cylindric, smooth, wholly unringed, blunt; their basal interval ¾*in.* Female, size of a male, but paler coloured.

Habitat—Bengal, Behar, Orissa.

2. T. QUADRICORNIS, *Blainville.* Size of the precedent. Colours above brownish, beneath greyish. Head 7½*in.* Posteal horns longitudinally striate, transversely striolate, with rings at the bases. Anteal horns 1⅔*in.* long, subtrigonal, robust, acute, basally ringed, yellowish inside, black for the most part, like the upper pair and the hoofs. Anteal horns set on anteriorly to mid line of orbits, whereas in Chickara they are posterior to that line.

Habitat—India, the part of, unknown: described from sculls and horns and Du Vaucel's drawings. Distinguishable at once from the last by its acute and perfect fore horns, in place of the blunt stumps of Chickara, a permanent distinction, though Mr. Gray inclines against the notion, and therefore confounds the two species. He should have adverted to the next species, long since on record, and which settles that question.

3. T. SUBQUADRICORNUTUS, *Elliott.* Dull brown, approaching to fawn, darker than in Cervicapra, less bright and less deep than in the Gazelle. Mid belly, and chest, insides of limbs near them, and lining of ears, albescent gradually. Bridge of nose, fronts of entire limbs and fetlocks posteally, dark: *3ft. 6in.* long and *2ft.* 1½*in.* high. Head *8in.* Ears 4½*in.* Tail *5in.* Posteal horns 4½ to 4¾*in.*, black, reclining, straight but with a very slight bowing to the front, parallel, three or four small wrinkles at their bases. Anteal horns, a mere rudiment.

Habitat—Southern India.

4. T. IODES.* Pl. IV. Fig. III, Rusty-red, *Mihi.* Clear full yellow-red, between rust and cinnamon, becoming pale on the belly and front of the neck, and pure white below the entire head, on the insides of ears and of limbs to mid flexures, and on edges of buttocks and of tail. Chaffron and entire fronts of the limbs, to the feet exclusive, blackish. Fetlocks posteally dark-brown. Horns and hoofs black, muzzle dusky-grey. Eye large and dark. Length 3*ft.* 4*in.* to 3*ft.* 6*in.* Height 1*ft.* 11*in.* to 2*ft.* Head 8½ to 9*in.* Ears 4*in.* Tail only 6*in.*: tail and hair 8*in.* Posteal horns 3½*in.*; their basal interval 1½*in.*; their terminal interval 2*in.* Interval of anteal and posteal horns 1¼*in.* Anteal horns ¾ to 1*in.* Posteal horns reclining dorsally, remote, divergent, smooth, obtusely pointed, more or less angular, that is, not perfectly rounded on the sides, bowed slightly outwards and forwards, with the blunt points a little reverted to the front. Towards their bases presenting five to seven crowded rings; but no trace of longitudinal striation. Anteal horns small, blunt, cylindric, with broadly rounded tops, and the cylindric bodies marked with four to five rings. Female, size of male, and fronts of limbs similarly darkened, but *not* the chaffron.

Habitat—Saul forests beneath the Sub-Himalayas.

5. T. PACCEROIS.† Pl. IV. Figs. I, II, Full-horned, *Mihi.* In size and colours much resembling the last but distinguishable at once by its larger and acute fore horns, which approach in size and shape to the posteal horns as in Quadricornis. Colours duller or luteous-fawn, but with the dark face and limbs of the last, which Quadricornis has not: size larger than Quadricornis but rather less than Iódés, and the *whole* inferior surface gradually albescent. Length from snout to vent 3*ft.* 1½*in.* Height 1*ft.* 10½*in.* Head 8*in.* Ears 4½*in.* Tail 5*in.*, or 7*in.* with the hair. Posteal horns 3½ to 4*in.* Anteal horns 2*in.*: interval of the two pairs 1¼*in.* Basal interval of posteal pair 1½*in.*: terminal interval 2*in.* Posteal horns reclining still more than in Iódés, but less divergent in the same degree, and bowed inwards and backwards, not outwards and forwards as in the last, nor the tips reverted as in

* ιωδ ης rust-coloured.

† πας *et* κεροεις, full-horned: Zul karnain, arabicé. This is the species alluded to by Capt. Brown in the Bengal Sporting Magazine; and his ring-horned Antelope is Bennetii vel Christii.

it; very acute, smooth, long, conic, accurately rounded; basal rings vague or wanting, not clearly marked as in the last. No longitudinal striation. Anteal horns erect, shape of posteal pair and but one-third less, very acute, rounded, smooth, with two to three vague striæ at their bases.

Habitat—Saul forests. Sexes alike, save the dark mask proper to the male.

The two last species have been carefully compared with Chickara and Quadricornis, to which they are respectively assimilated. The resemblance they bear to these species is considerable at first view, but they may be discriminated as follows—

Iódés from Chickara by its greater size, angular and (conspicuously) ringed horns, reclining posteal horns, anteal horns strictly interorbital, dark chaffron and fronts of limbs, the latter mark being invariably found even in females and the young.

Pacceróis from Quadricornis by superior size, horns void of longitudinal striation, suborbital sinus linear* and straight, and anteal horns strictly interorbital and perfectly rounded on their sides. I shall conclude the above tedious but necessary details with a more popular description of the general aspect and structure of these beautiful and interesting little antelopes, instancing more especially the blunt horned species, or rusty-red Chousinga.

This elegant little tenant of the deep recesses of the Saul forests, much resembles in size and aspect the Ratwa, Kaker or barking deer, which likewise abounds in the same site, but is also found in the mountains above the forest, whereas the Chousingas never ascend the hills. The rusty-red Tetracerus has a moderately-sized finely shaped head, a bowed neck, a longish yet full body, limbs exquisitely delicate but of moderate length, and a medial, rounded, and attenuated tail, very full of hair, and reaching nearly to the base of the buttocks. The bridge of the nose is straight and much compressed. The frontals are considerably arched in the region of the anterior horns. The nose ends in a nude moist muzzle or mufle, as large as in the axis, on which the wide lunate nostrils are opened laterally.

* Is not the roundness of this sinus in Quadricornis a merely cranial peculiarity? I am satisfied of it by analogy.

The eye is large and dark, and about three-quarters of an inch below the eye is the lachrymal fissure, which presents externally the appearance of a straight cleft running in the direction of the bridge of the nose, and about as long as its interval from the eye. This fissure leads to a shallow sinus, which is nude within and furnished with scattered small glands secreting an aqueous viscid humour, having a slight and agreeable odour, such as we are sensible of in approaching most deer and antelopes. The suborbital sinus in the Chousingas has the same character as in the deer, but is smaller and less mobile than in the Rusas or Muntjacs, and opens upwards rather than downwards from its external base, from a depth of about half an inch.

The ears are of good size, fan-shaped and deer-like, nude and rubescent, of flesh-colour within, and marked with three striæ or stripes of hair. The delicate elastic limbs are void of knee-tufts or callosities, and end in small, low, compressed hoofs, slightly scooped below; and in false hoofs which are fully developed but not pointed, obtusely conic and approximated, with a tuft of hair between them, as in the Chirú. The fore feet have no interdigital pores, but the hind feet I think possess them, though my memoranda are dubious on that point. It may be as well to add that these peculiar organs* are placed in the hollow in front of the pastern between the two bones, and that by their presence or absence, in the fore or hind, or both extremities, they help to characterize the groups of deer, antelopes, goats and sheep. For example, the goats have them in the fore feet only: the sheep in all four feet: and the Rusans (Sambers, Jerrows), the Gowrers are devoid of them: the axines have them in the hind feet only; and so also the Muntjacs or barking deer In the goat antelopes (Thár and Goral) thçy are very large in áll four feet; and likewise in the unicorn antelopes of Tibet (Pantholops) whilst the Hemitrages (Jháral or Tehr) of the Himalayas, are devoid of them entirely. In the four-horned antelopes of the Saul forest there is not, I think, any trace of the calcic† gland or tuft, so common, according

* See accompanying sketch of them in the Thár.

† Placed on the hock or rather stifle, inside and out, or only the one where there is a whorl or callosity in most quadrupeds.

to Mr. Gray, among the deer* and antelopes and musks, and which organ he employs extensively (Zool. Journal, June 1836,) to separate the groups of the last named sub-family (Moschinæ). The tail of the Chousingas resembles that of the barking deer, and is of moderate length, rounded, attenuated gradually to a point, half nude below, and very full of hair which is spread out sideways when the animal is excited. The anterior horns stand exactly between and above the eyes, and they are erect. The posterior horns stand midway between the eyes and the ears; and they are reclining or sloped towards the back. In this species (Iódés) both pairs are blunt, especially the anterior, which may be called even stumpy, though far larger than in Elliott's species; and both pairs are conspicuously ringed at their bases, whereas in the other species of the same region (Paccerόis), both pairs of horns are acute, nearly or quite unringed, and much more equal and similar to each other than in the subject of our present description, or the rusty-red Chousinga. The pelage or coat of both our species is of one kind only of hair, and is abundant, rather harsh, and somewhat elongated, precisely as in the Góá, not glossed nor short, and closely pressed to the skin as in the barking deer; more as in the Rusans, but finer in quality than in those large and coarse haired animals.

The peroneum and genital regions are quite void of hair, and covered with a smooth, nude, white skin, whence depends the neat small scrotum. There is no sign whatever of the inguinal gland and pore, so conspicuous in the typical antelopes (Cervicapra), and which are very clearly traceable† in sheep, though not in goats, nor perhaps generally in deer. The teats are, I believe, normally four, though, unless I noted too carelessly, there are sometimes only two. These species of antelope are quite devoid of the knee-tufts, as well as of the bands on the flanks, characterizing many of the more typical genera of the group. But the fronts of the entire limbs, down to the

* There is no trace of this organ in the Ratwa Muntjac. I have just examined three fresh ones.

† The last and ablest writers say otherwise: see Zool. Journal, December 1836, p. 137. I can only say that, being apt to seek primary evidence, I have found the gland with a copious secretion (though a vaguely defined sinus), in six kinds of tame sheep, and also in the Hog-deer.

feet exclusively, are darkened almost to blackness in both sexes, as in Náhúr and Burhel, and the chaffron or bridge of the nose is so likewise in the males, though not in the females.

I have named the present species Iódés or the rusty-red, because such is conspicuously its general colour, which prevails throughout over the body and neck, only somewhat diluted on the lower surface of both. The head also, both above and laterally, is rusty-red, but inferiorly pure white, which likewise is the colour of the insides of the limbs near the body, and of the edges of the buttocks and tail, the rest of the tail being rusty-red, like the general surface. The females of both my species are as large as the males, but are distinguished by the total absence of horns and by the want of the dark mask proper to the males, the fronts of whose limbs also are darker than in the females, and yet more so than in the juniors, though even in them, after a few months, the blackening of the limbs may be traced.

Description of Plate IV.

Fig. 1, Portraits of Tetraceri or Chousingas of the Saul forests. Rusty sp. Full-horned behind.

Fig. 2, I. Senior, II. Junior, of *Pacceróis* or Full-horned. III. of *T. iódés* or Rusty-red.

Fig. 4, Interdigital sac of the Thár, with skin of pastern dissected off the leg: natural size.

Darjeeling: May, 1847.

On the Buzzards of the Himalaya and of Tibet. *By* B. H. Hodgson, *Esq.*

Unlike the Moor Buzzards and the rest of the Harriers (Circus) which abound in the plains of India at all seasons of the year, the true Buzzards (Buteo) and the Booted Buzzards (Archibuteo) seem to affect cold regions; only one, or possibly two, species of Buteo being found in the plains even in the cold months, and no species of Archibuteo whatever. Mr. Jerdon's ample and accurate Catalogue gives but one species of Buteo, (Longipes) which it appears is identical with my Canescens, and both with the African species Rufinus of Ruppel. This bird is very common in the Tarai and lower hills in the cold season, and permanently so in the central hilly region, where it breeds and abounds, especially in the more level and rice-growing tracts, such as the valley of Nepaul proper. Another small species named Nana is on record; and there ends the enumeration, so far as the plains are concerned. But, in the juxta-nivean region of the Sub-Himalayas and in Tibet, are found in the several other species, some of which are visitants of the central hilly region in the cold months.

These additional species, which affect the cold regions, are—

1. Buteo Plumipes.
2. Buteo Leucocephalus vel Aquilinus.
3. Archibuteo Cryptogenys, *n. s.*
4. Butaquila Strophiata.

In the first the elongation of the tarse, the acuteness of the talons, the slenderness of the whole figure, and lastly some vague indication of the facial disc, are so many approximations towards the Moor Buzzard, a species of Circus. But the bird is no doubt properly retained in the genus Buteo, though it differ yet further from the type of that genus by having its tarse nearly two-thirds plumed, as in the next and very large species from Tibet, which again deviates from the type, as well by this additional plumage on the legs as by having the naked portion of the tarse anteally reticulate, and not scutellate. As however the reticulation is coarse and inclining towards scutellation, I leave this species also among the proper Buzzards, because the type of that genus likewise sometimes exhibits this tendency to reticulation in front of the tarse, whilst the length and form of the wings, and the compact and massive structure of Leucocephalus, accord as entirely as do the other details of its structure with the type of Buteo. Not so, however, the fourth species above enumerated, though Mr. Gray supposes these two to be identical, and accordingly sets down Archibuteo Strophiatus vel Leucocephalus as one and the same species! This however is a mistake; for I have young and old birds to refer to, and can safely affirm that, whatever the approximations of size and colour may be, there are structural differences rendering it impossible to identify these two species, or, as I conceive, to class either of them with Archibuteo. Leucocephalus vel Aquilinus is decidedly a Buteo, though deviating somewhat from the type of the genus. But Strophiatus is, as decidedly, *no* Buteo, *nor* Archibuteo, but a type osculant towards Aquila from Archibuteo. Accordingly, as my suggested sub-generic terms Butaquila and Hemiætus have not been adopted in the sense in which I used them, I shall make a fresh appropriation of both, applying the former to Strophiatus and the latter to Imperialis, a form which it is impossible to retain in the same genus with Chrysaetos. The coarse massive structure and necrophagous habits of Imperialis, are entirely alien from the noble form and habits of Chrysaetos, a bird whose structure is as much more highly raptorial in its superior lightness of figure, and enormous development of talons, as might be expected from his exclusively, or almost exclusively, life-destroying habits. This species it appears is the Daphéni of the Himalaya and of Tibet, to which regions it is nearly confined, whereas the imperial Eagle (Bifasciata vel Crassipes vel Heliaca, vel Nipalensis) is common all over the plains, where I have very often seen and shot him, whilst scavengering with the vultures and contending with them over putrid carcases. Such diversities of form and manners as characterize Chrysaetos and Imperialis cannot, with any propriety, be overlooked, and accordingly, I shall consider Imperialis in future as the type of Hemiætus, and apply the term Butaquila to Strophiatus, a type having a general resemblance to Archibuteo, and belonging to the Buteoninæ, but differing therefrom, and approaching Hemiætus of the Aquilinæ by the greater length and straightness of the bill, the longer and more lunate nares, the total absence of festoon in the bill, and lastly and chiefly, the longer wings which, as in the Eagles, are fully equal to the tail, and have the fourth quill longest, and the fifth longer than the third. I am persuaded that closer comparisons will induce Mr. Gray to adopt these views. I now proceed to our third species, which is a novelty just obtained from Central Tibet, and I think a typical Archibuteo, the only one yet discovered in these regions.

Archibuteo cryptogenys, *n. s.* or *Booted Buzzard of Tibet.* Pl. III, Fig. 1.

Single specimen brought from Lassa by Bhotias employed to shoot mammals in Tibet. Sex unknown. Tail and wings slightly injured, but otherwise a good sample: in full plumage.

Form. Head rather small, and moderately broad, rather rounded than flat. Eye medial, with a strong brow. Bill short and much curved from the brow; broad and ample at the gape, which passes under the eye, and gradually compressed forwards. Festoon distinct. Hook moderate. Tip of lower mandible obliquely truncated without notch. Cere large, but nearly hid by the thick-set soft plumuli which cover the lores and sides of the cere, and advance so far forward as nearly to hide the ovoid longitudinal nares. Wings ample, reaching within 1 or $1\frac{1}{2}$ inch of end of tail; third quill longest. Emargination of the great quills strong and high up as in Buteo. Tail slightly rounded, nearly even. Tarsi plumed to the toes, somewhat elevate, more so than in Buteo. Toes short, unequal, Buteonine: the outer, basally membraned: the inner, nearly free. Acropodia reticulate, with four perfect scales, next each talon. Talons medial, unequal, Buteonine.

Colour. A saturate dull brown, like the Moor Buzzard, largely emarignated on each plume of the head and neck, with brownish-cinnamon; and the great alars and caudals internally blanched; the dark *hue* showing like bars, large and remote, upon the inner vanes of those plumes. Cere and legs greenish-yellow. Bill leaden-blue with black tip. Talons black. Iris said to be pale, probably whity-brown, or brownish aureous.

Dimensions. Length 25*in.*; of bill to gape $1\frac{3}{4}$*in.*; to brow $1\frac{1}{8}$*in.*; of tail 12*in.*; of tarse $3\frac{5}{8}$*in.*; of central toe and talon 2*in.*; of hind ditto $1\frac{5}{8}$*in.*; of closed wing 18*in.*

Habitat.—Tibet: never met with on this side the Himalaya.

Description of Plate III.

Fig. 1, Archibuteo cryptogenys or Booted Buzzard of Tibet; *b.* foot and leg.

Fig. 2, Merva Jerdonii, Hodgson, of preceding article, p. 46.

Darjeeling, May, 1847.

Note on the Kiang. *By* B. H. Hodgson, *Esq.*

Since my paper on the Kiang was printed in the last No. of your Journal, it has been suggested to me, that the seventh molar tooth of this species is merely a deciduous tooth, constantly forthcoming in the tame Equines. I can only say in the way of excuse for my own statement, that Cuvier, his Commentator, and H. Smith, in his recent monograph of this very family, were all consulted by me, and all found silent anent this extra tooth of the tame Equines; and that whilst three perfect sculls of horses and mules procured by me for the sake of comparison, *none* of them showed this tooth, first one and thereafter two more perfect sculls of Kiang, *all* of them showed it. Moreover, the opposite anomaly of deficient molars in the Dziggatai, resting on the high authority of Pallas, naturally and justly confirmed my view of the permanent and normal character of the extra molars of the Kiang.

It may be that I was therein mistaken, but at least it will be allowed, that I spoke not without pains and deliberation; having consulted all the authorities within my reach, and having fetched my sculls of tame Equines for the mere sake of comparison, from distances varying from twenty to thirty miles.

If the fact be that this seventh molar is constant as a deciduous tooth throughout the horse family, tame and wild, it is most strange that my six specimens should exhibit uniformly an appearance to the contrary, for the Kiang sculls are none of them of animals under four years, though those of the tame Equines are no doubt older and aged. From further examinations made here and enquiries at the Government Stud, I find that young horses occasionally exhibit that extra tooth, whilst renewed examination of my Kiang sculls satisfies me, that all three are young, though none under four years. This tooth may therefore possibly yet prove normal and constant in the Kiang, abnormal and inconstant in the tame horse and ass; and Pallas' anomaly, as well as mine, may yet prove stable; and at all events, it will be admitted that the question raised, is one of interest and importance.

But, it is further objected, that my new specific name is superfluous as well as erroneous, the species having been priorly named by myself and others—not to add that it is really as old as Aristotle, and no other than the Hemionus.

Upon the questions of the identity of the Kiang of Tibet with the Ghorkhar of the Indus and the Dziggatai of Mongolia, much has been said and will be said, as upon the further questions of their identity with the Yo-to-ze of China and the Koulan of Tartary. The curious in such matters will, of course, consult travellers and systematists, as I have done. My own impression derived from such references, carefully enough made I hope, was, that the tattle of travellers cannot be relied on, and that systematists, who attempt to build upon such foundations, and thereupon to divide the wild asses of Asia into many species with H. Smith,* or to lump them all into one with Col. Sykes,† are rather adding to, than lessening our doubts and perplexities. Col. Sykes' paper is very ingenious, and, in part, equally sound, leaving no room for future question that the wild ass of Cutch, Scinde, and Southern Persia, is one and the same species, viz. the Ghorkhar, live specimens of which were imported into Europe by Messrs. Dussumier, Clarkson, and Glasspole. The same arguments and statements of Col. Sykes, however, which convince me of that, likewise convince me that Pallas' Dziggatai and the Kiang of Tibet, are perfectly distinct from the Ghorkhar above limited; whilst in regard to the distinctness of the two latter, one from the other, I know not that I can or need add any thing to what my original paper assumes, viz. that *if* Pallas has accurately described the Dziggatai, *then* the Dziggatai is not the Kiang. In my Tibetan Catalogue I cited the Kiang and another alleged species of Tibet; but upon no better grounds than the conflicting and utterly insufficient statements of Moorcroft,‡ Gerard, and my own informants. But when I came (with sufficient materials before me for the scientific determination of the Tibetan species) to look closely into those statements relative to the animal, it seemed to me the better course to leave unheeded what I had said on such frail and shifting grounds, and to describe the Kiang upon a *tabula rasa*, neither Moorcroft, Gerard, nor any one else having anticipated me, by either naming or

* Nat. Library, Vol. xii. † Zoological Journal, Oct. 1837.

‡ See Capt. Cunningham's Notes on Kanaver, Journ. As. Soc., for confirmation of this assertion.

describing the animal in any terms or manner consistent with science is used, or the interest and nature of the subject.

The dental formula of Felis is $\frac{4}{3}$, of Ailurus is $\frac{5}{6}$, of Viverra is $\frac{6}{6}$: and yet these animals constantly exhibit the respective forms $\frac{3}{3}$ and $\frac{5}{5}$ and $\frac{5}{6}$ or even $\frac{5}{5}$, the other teeth being deciduous and wanting in old animals generally. So again, Ursus has the dental formula $\frac{6}{7}$, though all the three premolars above and below are hardly ever found save in juniors. It follows therefore, that the *rule* is to give the teeth, *inclusive* of deciduous ones, and if Equus have normally the 7th tooth, as alleged, why have all the highest authorities heretofore uniformly given $\frac{6}{6}$ for the Equine formula? That they *have* done so is a fact sufficient to excuse and justify my insisting on the extra tooth commonly found in Kiang, and *not*, I believe, commonly found in Equus. Such at least is the result of observations made for me at the Stud, but which will be repeated and extended at my request, and the point thus decisively set at rest.

ERRATA IN THE PAPER ON KIANG.

Page 2, for *callositics* read callosities.

„ 5, for *binary* read laniary.

And N.B.—Dental formula that of *male*, the female, as usual, wanting the Canines. So put under female scull for the sake of comparison with male Tanghan.

The Mammals of the Sub-Himalayas or Sewaliks and of Tibet.

TO THE EDITOR OF THE CALCUTTA JOURNAL OF NATURAL HISTORY.

SIR,—In your last issue No. 28, you have given insertion to a very bitter critique upon Dr. Jameson's "Zoology of Chinese Tartary;" for so the author of this article is pleased to style certain extracts from a traveller's careless letter, priorly published by you. In a foot note you admit, that in this point of view the critique was uncalled for, but you conceive the observations it contains to be nevertheless "perfectly fair" as well as "very valuable." I differ from you in your estimate of this performance; and if I succeed, as I hope to do, in showing that the value is nihil, I think I may leave the fairness to the discernment of your readers, and yet trust to have helped to put an end to all such doings for the future. I proceed, then, to examine the value of your critic's observations. Value in Zoology must respect either the announcement of new species or of new facts in relation to the structure, the habits, or the geographic range, of known animals. Mere carping at another writer cannot have value. And yet *that* is positively all the paper in question contains, as I purpose to make apparent to every one. The writer begins with the wild sheep of Tibet (very clumsily called Chinese Tartary), and upon this topic the sum of his communication amounts to a sheer expression of his indignation because Dr. Jameson had neglected to recognise the distinctions between Ovis Nahoor and Ovis Barhel—Ovis Ammon and Ovis Montana, and had presumed to indicate a new species allied to both the latter, and inhabiting Western Tibet. Now, the Barhel *may* be distinct from the Nahoor: the Argalis of Siberia and Tibet *may* be identical: and both (or the one) *may* be distinct from the American Argali vel Montana. *But*, it is *certain*, that no one has yet demonstrated these differences and identities; that the distinctions are of that minute kind which Zoologists may eventually recognise, whilst anatomists will continue recusant; and that in the present state of recorded facts, to dogmatise in the style of your critic upon such points, is mere 'bow-wow-ism.' With regard to the supposed new species it is further certain, that we had no full or sufficient description of the Tibetan Argali before the last number of the Asiatic Society's Journal came out; and I may add, what Mr. Robert informs me of, viz., that when he was in London two years ago, and proposed to test the identity of the Argalis of Siberia and of Tibet, he found that there were no spoils whatever of the former, nor any adequate ones of the latter, forthcoming in any English Museum, nor, as he was told, in any Continental one, unless perhaps that of Petersburg. And such would seem to have been the case when Mr. Blyth last treated the subject, who, therefore, then spoke hesitatingly. If he can now speak confidently, it is very desirable he should do so; for until he or some one else do so, any alleged verification of the accuracy of the original conjecture as to the identity of the animals can of course influence no one not having access to the Museum (if the Museum contain the proof*); nor can any blame whatever be attached to Dr. Jameson for supposing the wild sheep of Tibet to be a distinct species, nearly allied both to the Siberian and American animals: and the throwing out such a conjecture is the substance of what Dr. Jameson says. In like manner is still *to be* demonstrated the specific independance of the Barhel on the Nahoor; and until that has been done, and it has been shown moreover, that Dr. Jameson met with the former and not the latter, your critic cannot have the least solid ground for his censure, seeing that both animals occupy the site spoken of by Dr. Jameson, whilst their resemblance is confessedly extreme! In a word, the observations I am remarking on, add not one syllable to our knowledge of the wild sheep of Tibet, neither as to their number of species, nor their habitats, nor their habits. In what, then, does the value of the observations quoad hoc consist?

Your critic's next topic is the hares of Tibet; and the amount of new information furnished on this topic is a republication from the Naturalist's Library of the measures of the hares of Britain! in order to prove Dr. Jameson's ignorance, he having casually said, that the changing hare, is the largest British species, and your critic *not* having proved the contrary by his array of measures of length merely, without weights. For any thing produced by your critic the changing hare may still be the largest species of Britain. But how idle thus to press a point like this, the real question being the hares, not of Britain, but of Tibet. There are three imperfectly described Tibetan hares, viz. Tibetanus, Oiostolus and Pallipes; and if your critic had in any degree helped to remove the obscurity hanging over them (by showing, for example, that Pallipes is the Tolai, and Tibetanus the same as Oiostolus), he would have done some good. As it is, his observations in re *Hares*, add not a particle to previous knowledge, and therefore can have no value.

Your critic next proceeds to the wild goats and goat-antelopes of the Sub-Himalayas, Himalayas, and Tibet. These are, as is

* What is that proof? what spoils of Ammon exist there? None can I think, and as for allegations, *they* will not suffice; for abundant materials for testing Ammonoides have lately been sent home, and the result of their examination is just announced, viz. that the *latter is a good and distinct species.*

well known, the *skin* or *kin*, the Jháral, the Thár, and the Goral: the respective types of Capra, Hemitragus, Nemorhœdus, and Kemas.* It had long ago been explained that the second type is distinguished from the first by having a small moist muzzle, no feet-pits, and four teats; and the fourth from the third type by the absence of those enormously glandulous eye-pits, which form the special character of the Continental and Insular Nemorhedines, or the the Thár and the Cambing Utan. Moreover, the Jháral had always been spoken of as distinct from the Hemitrage of Jemla, having horns less compressed and less incurved at the points, a keel less prominent and less nodose, and colours considerably different. Your critic has overlooked this distinction of species, and therefore might just as reasonably be lashed on that score as Dr. Jameson, for overlooking the difference between the common and Himalayan Ibexes (skin). Both distinctions are in truth minute, and perhaps false. At all events, the contrary has not yet been demonstrated, and until it be so, to dogmatise in the fashion of your critic, is again mere bow-wow-ism. On this head of goats and antelopes your critic's observations are not illuminated by one glimmer of new light. They amount in fact to a mere enumeration of native names; and, I may add, a very questionable enumeration; for the Eimu of one dialect is the *skin* or *kin* (not *Sakeen*) of another, and so of the Tehr and Saráv. But of a verity the people apply their vernacular names with extreme carelessness: Tehr and Thár are besides almost or quite identical words: and if Dr. Jameson so considered them, and adverted to a Hemitrage under the appellations of Thár and wild goat, why he committed no error at all, save overlooking the suggested new caprine type. His surprise at finding a four-teated goat was

* Kemas is erroneously applied as a generic term by Mr. Gray to the Chirú, the type of Pantholops. Colonel H. Smith, who applied the Greek term Kemas to the Chirú, as a *specific* appellation, recognised in his Mammalia (Nat. Library) the propriety of the amendment of nomenclature, he never having defined the type, and having been anticipated by Dr. Abel in the application of a specific name. Kemas, as a genus, has for type the Goral (see Zool. Journal for December 1836). Subsequently (same work for Aug. 1837,) the "Jháral was associated" to it, but erroneously. Hylochrius again is but the female of Jháral, teste Gray.

just and sagacious, and his application of native names precisely such, as has just been repeated by that accomplished and elegant writer, Capt. Madden, (see As. Jour. No. 176.)

The Marmots are next spoken of by your critic. Of these animals there were described in 1843 two species, respectively inhabiting the Himalayan region and Tibet; and if your critic had confirmed or refuted the supposed identity of the latter and larger of these with the Bobac, he would have done some little service. As it is, he has done nothing but carp at the careless language of a private letter.

The bears form the next topic, the last and the gravest of your critic, who, however confident and emphatic on this head, adds not a particle of new information to our recorded stores, but, on the contrary, materially obscures the clearness of former lights. That there are three Zoological regions between the crest or spine of the Himalayas and the plains of India; that the first region, comprising the saul forest and lower hills, has little elevation, and consequently a climate essentially plain-like; that the second region, including the central hills with elevations of from 3 to 9,000 feet, has a climate similar to that of Southern Europe, or of the Mediterranean shores; that the third region embracing the higher mountains between the elevations of 9 and 16,000 feet (the Zoological limit), has a climate passing from that of central to that of Northern Europe; that among quadrupeds the three species of bear,* and among birds the jungle fowls (Gallus), the fowl pheasants (Gallophasis), and the Monaul pheasants (Lophophorus), belong so exclusively to these respective regions, as to furnish an excellent popular demonstration of the soundness of the triple division: all these are points long since laid down in the first edition of the Catalogues of Nepalese and Tibetan Mammals, wherein, as in subsequent editions, *all* the Mammals of those regions are located upon that principle. What then does your critic add to former knowledge upon this head? Precisely nothing. Nay, he furnishes a considerable array of errors; which might be made a good deal of to his disparagement, if paraded against him in the spirit in which he has displayed Dr. Jameson's slightest inaccuracy. Your

* Popularly so-called; in fact the animals belong to three distinct genera or Ursus—Helarctos and Melursus.

emphatic critic, in flat contradiction of what he erroneously alleges Dr. J. to say, affirms 1st, that "the black Bhálú" is not Ursus Tibetanus, which is the Reech: 2nd, that Tibetanus is not found above Rajpúr, nor at any places so low as from 2,500 to 3,500 feet above the sea: and, 3rd, that there are no less than three black bears between the plains and the snows.

Now, mark, how the case stands on these three points! Upon the first point the fact is that the words Bhálú and Reech are Hindu generic names for all bears whatever, and Tibetanus being just as black as Labiatus: unquestionably the former is just as much *the* black bear as the latter: your critic's appropriation of the words Bhálú and Reech so dogmatically to Labiatus and Tibetanus, being nothing more or less than a blûnder! and the contradiction hurled at Dr. J. founded thereon, as futile as it is rude. In the next place, the Tibetan bear certainly *is* found constantly and habitually at elevations so low as 3,000 feet, and frequently at 2,000, above the sea, and consequently 1,000 above the plains—with reference to which basis, and not to the sea level, Dr. Jameson may have spoken, and spoken without violation of facts or of usage. In the third place, the assertion of your critic that there are three species of black bear between the plains and the snows, is perfectly gratuitous, and improperly made the ground of a point blank contradiction. We all know that according to native reports given to Mr. Hodgson, fifteen years ago, there are two sorts of the black bear of the central region which are called Bhúmia and Kathia, or ground and tree bears, whereof the latter is alleged by the mountaineers to be the smaller and more scansorial. But the distinction rests on no solid foundation: the real state of the case being that the Tibetan bear is in youth very active and a great climber,* as well as gregarious or social to the extent of living a good while with his fellow cubs of the same litter, but that advancing years add so much to his weight from proneness to obesity and to his unsociableness from sexual impulses, that he can climb no longer nor endure the presence of males, and therefore

* I have seen the young bears of this species climb trees as agilely as monkeys, in order to get at the locusts, a flight of which had just appeared, and which they handled very oddly, and ate up as fast as could be!

abides solitarily or with his mate only, on the ground. More shy he is in age than in youth, but not less destructive to the crops; nay, far more so, in proportion to his greater appetite and greater weight in trampling the grain, and because the villagers dare no longer drive him off, as they do the juniors. Nor are his marks or colours different in nonage and maturity, "the rusty-red of the muzzle, white chin and pectoral crescent," all belonging to Tibetanus at all ages, though cited by your critic as the designations of his imaginary 3rd species, Tibetanus being his 2nd, and Labiatus his 1st. But Labiatus does *not* penetrate into the hills, as alleged by your critic; and Dr. Jameson, speaking of hill bears, probably omitted all mention of it on that account, or because, there being no forest below the hills *west of the Ganges, there is no Labiatus found there;* and not from the ignorance so promptly imputed. The ignorance here again is your critic's, not Dr. J's.; for the sloth bear or juggler's, or long-lipt bear, which may be known at once by its long shaggy coat, very mobile lips, enormous digging claws, and small and feeble hind-quarters; is not a hill but a plain bear, preferring to live outside of the forest even, and never ascending the hills at all. I think, certainly, not dwelling nor ever found, at half the elevation named by your critic. And now, Sir, how stand your critic's three points? But common sense must indicate that there is no being rigidly precise as to the exact number of feet which marks the habitat, or the occasional wanderings of species: and if Dr. Jameson err in that respect, yet more seriously and more variously does his censor err as to the number, as to the location, and as to the habits, of these species, of whose location all that can be truly said, is, that the white or isabelline bear (Ursus) belongs to the northern region, the Tibetan (Helarctos) to the central, and the long-lipt (Melursus) to the southern; and of their habits, that, while all are essentially omnivorous, the 1st is the most carnivorous, and the last, the least so; the 3rd holding the mean in appetite as in habitat. But to say, like your critic, that this species is at all averse to flesh, is an additional error; for, some years ago, three of them, kept by me at Simla, seized and devoured two others of *their own kind* of smaller size, belonging to Mr. Ross Bell, ate them up, bones, skin and all, with a fierceness and rapidity more than Tigrine! and many were the geese, ducks and fowls, previously seized and devoured by these fully fed eschewers of the fleshpots! Facts of similar tenour, from another witness, may be found in No. 176 of the Asiatic Journal, pp. 245 and 250.

April 15*th*, 1847. PHILOLETHES.

NOTE.—We disapproved of the critique alluded to, conceiving it as we said at the time, to be quite uncalled for. Our observation as to fairness, was intended merely to imply that every remark published in our pages, should be open to animadversion, relying of course on the good taste and feeling of our correspondents; when these are violated, which rarely happens, the error will correct itself as in the present case.—EDS.

Professor BRANDE *on the properties and uses of Gun-cotton—Announcement of Professor* SCHONBEIN'S *Process.*

The weekly evening meetings of the members of the Royal Institution commenced for the season on Friday, the 15th instant. The theatre was completely filled with the members and their friends, the subject proposed for the lecture being the principal source of attraction.

Prof. Brande commenced by observing that, within the last few months, the manufacture and uses of gun-cotton had received an unprecedented degree of attention, not merely from scientific men, but from the public in general. So soon as the discovery had been announced, the honour of making it was claimed by various individuals. It was unnecessary to dwell upon their claims: a simple statement of the facts would, however, show to whom the merit of the important applications of the discovery was really due. In the year 1833, Braconnot first announced, in the Annales de Chimie, that he had procured a new substance, possessed of very singular properties, by acting on starch, saw-dust, linen, and cotton, by concentrated nitric acid. The product from starch was a white powder, without any acid reaction, and looked like the original starch unaltered. It differed from it, however, in being exceedingly inflammable, taking fire at a comparatively low temperature, and leaving scarcely any residue. A portion of starch thus prepared was placed on paper, and held over a lamp, when the whole was speedily consumed. Paper which had been soaked in concentrated nitric acid, washed, and dried, was found to be entirely changed in its physical and chemical properties. It was tough, and had somewhat the character of parchment. When heat was applied to it, it burnt rapidly, and was entirely consumed. If these substances were heated with nitric acid, they became dissolved, forming a mucilaginous solution: on adding water to the solution, a white pulpy matter separated, to which Braconnot gave the name of *xyloidine*, to signify its derivation from woolly fibre. Subsequently the properties of xyloidine were examined by other chemists. Pelouze confirmed the results obtained by Braconnot, and determined that the new compound inflamed at a temperature below that required for the singeing of paper; *i. e.* under 400°. He suggested that the material thus prepared might be made useful for certain purposes in the artillery, but without stating how or in what way he proposed to apply it.

The subject attracted no further notice, until, in the course of the last summer, Professor Schönbein announced to the British Association that he had succeeded in procuring from cotton-wool a very explosive substance, which might be made a useful substitute for gunpowder: to this he gave the name of *Gun-cotton*. For some time before this announcement, he had been engaged in researches which had led to the discovery of a singular principle called *ozone*, one of the most powerful oxidizers with which we are acquainted; and it is probable that these researches led to his perfecting the process, the first foundation of which had been laid by Braconnot. Schönbein ascertained that the inflammable compound of cotton was produced in a much more perfect degree by the mixture of sulphuric with nitric acid than by nitric acid alone; and the proportions which he employs are, *two parts* by measure of sulphuric with *one part* by measure of nitric acid, both of the acids being in their most concentrated state.* Professor Brande having mixed the acids in these proportions, the mixture formed a colourless liquid of a high temperature, and evolved copious acid fumes. He then observed that it was probable that some new substance *(ozone?)* was here produced, since the two acids thus mixed had properties entirely different from those possessed by either separately. Thus neither nitric nor sulphuric

* We observe that Schönbein in his patent specifies three parts of sulphuric acid to one of nitric.—Ed.

acid had any bleaching power separately: but, upon pouring a coloured liquid (indigo?) into the mixture, the colour was discharged as readily as if chlorine had been present. Again, the action of this compound on sugar was widely different to that of either nitric or sulphuric acid. Thus, by digestion in it, sugar became converted to a kind of yellow resin: it was no longer soluble in water, but quite soluble in alcohol, forming on evaporation a kind of varnish. It took fire at a low temperature, and burnt like a resin, with a yellow smoky flame. Experiments were performed to illustrate these properties. The most remarkable effects were, however, produced when any form of lignin or woody fibre was immersed in the mixture. The chemical properties of the substance were entirely changed, although, in appearance, it was but little altered. Tow, saw-dust, linen, or paper, might be used; but no substance was so well fitted for the purpose as finely carded cotton wool. All that was required was to soak the cotton wool, well pulled out, in a vessel containing a *large quantity* of the acids, in the proportions above-mentioned. When fully impregnated with the mixture, the cotton was to be removed, or it would in time become dissolved: it should then be transferred to water, and washed until no trace of acidity remained about it. It should be dried at a gentle heat, and it was then fit for use. [Some of the cotton was here prepared by the Professor.]

It was difficult to give a satisfactory theory of the change produced in the cotton. Lignin consisted of C12, H8, O8: it was, no doubt, oxidized during the process, but, whether by the action of a new principle formed (ozone), or by the mere transference of the elements of nitric acid to it, it was difficult to say. Nitrous acid might be obtained from it by distillation. The cotton was considerably increased in weight; 100 parts of the wool yielding 160 parts of gun-cotton. When well prepared, it was white and flocculent, and, to all appearance, unchanged physically; but the microscope showed a peculiar difference; for whereas the fibre of ordinary cotton, when polarized in the microscope, had a certain lustre, the fibre of gun-cotton appeared in the form of a black streak.

The prepared cotton, when heated to about 350°, was entirely resolved into gaseous matter with flame; and if confined, it exploded with a loud report. It became inflamed at a temperature much lower than gunpowder, which required a heat of 575° in order to explode it. This was proved by placing portions of each on paper and holding them over a jet of gas, when the cotton exploded without the gunpowder. Any substance in the slightest state of ignition would suffice to kindle it, and it would be observed that it left no residue whatever. Its explosion took place more rapidly than that of gunpowder. This was ingeniously illustrated by laying equal trains of each on a board, the trains running in opposite directions, and touching only at one point, *i. e.* the centre. A little detonating powder was placed at the extreme end of each train in order to indicate by sound the difference in the time of explosion. The trains were fired by applying a hot iron to the central point where they met: the gun-cotton burnt with much greater rapidity than the powder, and there was a distinctly perceptible interval between the detonations at the two ends. It was also evident, that while the powder produced a visible smoke in burning, there was no visible vapour from the cotton. Although so highly explosive, gun-cotton presented an anomaly; for if a train of it were firmly pressed in the centre by any hard body, it might be ignited on one side without the explosion being communicated to the other half. This experiment was successfully shown. A portion of cotton was then placed on an anvil, and it was proved that by a smart blow it easily and entirely exploded on percussion. The electric spark would ignite it, but the same precaution was required as in the case of gunpowder. *i. e.* to slacken the course of the electric fluid by making it pass through water, or it produced no effect. The cotton might be made to explode *in vacuo*, but without any report, showing that air was not absolutely necessary to its combustion. This fact was illustrated by placing a small portion in a receiver provided with wires through which the electric spark could be easily passed, and made to traverse the cotton. When the receiver was exhausted, the discharge was made: a very faint diffused light appeared at the time of explosion, but there was no sound, nor was there any residue. The cotton, therefore, contains enough oxygen for its own combustion. The height of the barometer after the explosion would indicate the quantity of gases evolved from a given weight. These gases had been found by analysis to be carbonic acid, carbonic oxide, deutoxide of nitrogen, nitrogen, cyanogen, and aqueous vapour. There was undoubtedly an acid product formed, *i. e.* nitrous acid, from the deutoxide of nitrogen. This was proved by placing in a bell-jar, having some cotton at the bottom, a long strip of litmus paper, and another strip of paper soaked in a solution of iodide of potassium. On discharging the gun-cotton by a heated wire, the litmus paper was reddened, and, on the other strip of paper, iodine was set free. Beside this, it was made evident that the bell-glass contained ruddy fumes indicative of the production of nitrous acid. The fact was also subsequently illustrated by discharging a small pistol loaded with gun-cotton at a sheet of litmus paper wetted and placed on a board: the vapour in the discharge reddened the paper. On firing an equal weight of gunpowder, it was proved that an alkali (sulphuret of potassium) was evolved. It was stated that, weight for weight, the explosive force of gun-cotton was as six to one compared with gunpowder.

Even when the cotton possessed no acidity whatever, an acid resulted from its combustion. The Professor exploded on a sheet of litmus paper some of the cotton prepared by Schönbein himself, and also an excellent specimen prepared by Mr. Bell, of Oxford Street.* In both cases a wide red stain was left after the explosion.

Gun-cotton is remarkably *hygrometric*, and absorbs water with great rapidity. This interferes with many of its properties, and it requires to be thoroughly dried before use. If a portion well dried be balanced in a scale, it will be found to increase rapidly in weight by a very short exposure. It also possesses another curious property, namely, that it is remarkably *electrical*. The slightest friction developes in it a large quantity of negative electricity. In order that this property should be manifested, the cotton should be previously well warmed, to deprive it of hygrometric water. A thin strip dried was drawn between the fingers, and then placed over a gold-leaf electroscope; the leaves diverged to a great degree in an instant. The Professor remarked,—what all who have prepared this substance

* This cotton, which appears to be even superior to that of Schönbein, is prepared with the two acids in the same proportions poured over the cotton in a perforated funnel for about five minutes. It is well washed in water, then in a weak solution of ammonia, and afterwards dipped in a very weak solution of nitrate of strontia, which causes it to burn with a bright red flame. The suddenness of explosion in this cotton is perfectly astonishing.

must have observed,—that, when warm and dry, it adheres in small masses to the fingers on attempting to pull it out. Such is not the case with ordinary cotton. Here, then, we have a new and curious property developed. Xyloidine, in all its forms, manifests highly electrical properties. Professor Schönbein, by a singular process, has succeeded in making from cotton a transparent paper or skin which is highly electrical. He digests the gun-cotton in ether: a portion is dissolved, and, by evaporation, it is obtained in a thin coherent film as transparent as glass. This experiment has been tried by many persons without success, even where pure washed ether was employed. It would appear, however, that the addition of alcohol to the ether facilitates the solution.

Independently of its use as an explosive, gun-cotton has been already employed by the pyrotechnist, and many pleasing effects are produced by soaking the cotton in solutions of various salts which give colour to flame, and burning it. The theatre having been darkened, three strips of cotton prepared with a solution of strontia, baryta, and soda, were burnt: each was rapidly consumed, with the production of a red, green, and yellow coloured flame respectively.

It has been stated that any kind of woody fibre may be converted, by the mixture of nitric and sulphuric acids, into an explosive compound. Saw-dust, tow, and other ligneous matters thus prepared, were now produced and burnt; but the result in these cases is to leave more or less residue; they are, therefore, far inferior to cotton-wool for practical purposes.

The Professor concluded an interesting lecture by comparing the advantages and disadvantages of gun-cotton as a substitute for gunpowder. Among the principal disadvantages were, the low temperature of explosion,—irregularity of effect,—the production of acid and a large quantity of steam or aqueous vapour. He considered, however, that the gun-cotton had not yet had a fair trial: that in fact, the discovery was too recent to allow of a proper judgment being formed, and that its applications to practical purposes might hereafter become much more extensive and useful than they were now supposed to be.—*London Medical Gazette.*

Professor FARADAY *on Gunpowder.*

The Professor observed that much had been lately said respecting Schönbein's gun-cotton, and at the previous meeting this curious discovery had formed the subject of a lecture by Mr. Brande. Under these circumstances, he thought it only fair to come before them on this occasion, and put in a claim for gunpowder. Gunpowder was nothing more than a mechanical mixture of three substances, nitre, sulphur, and charcoal, each harmless in itself, and producing no particular phenomena when an ignited body was applied to it. When, however, these substances were reduced to a fine powder, and brought into close proximity by trituration, the most extraordinary effects resulted on the application of any ignited body. The black solid was instantly converted into gaseous matter of enormous bulk, compared with the mass of powder producing it, and possessing a power of overthrowing and rending asunder every thing which opposed its expansive force.

Although a mechanical mixture, it was necessary to observe certain proportions in mixing the materials, or the maximum effect could not be obtained. One hundred parts of good gunpowder consisted of 75 nitre, 15 charcoal, and 10 sulphur. The materials were merely well mixed by the agency of water, and a perfectly homogeneous paste was obtained, from which the gun-*powder* was afterwards procured. The name given to this substance was inappropriate, since it could not be considered as a powder: on the contrary, when properly prepared, it consisted of distinctly rounded *grains*, having a polished surface, and leaving, in consequence of this spherical structure, an enormous interspace filled with air. This was highly important with regard to its properties, as would be hereafter explained.

Each constituent of gunpowder had its own mode of action. The nitre furnished oxygen: the carbon furnished gaseous matter, and served to maintain a high temperature: while the sulphur tended to spread the heat with greater rapidity throughout the mass. The action of nitre was illustrated by dropping a piece of ignited charcoal into a flash containing this salt in a melted state: the charcoal continued to glow and burn at the expense of the oxygen of the nitric acid for a considerable time, and volumes of gaseous matter poured from it. The action of sulphur was shown by projecting a small portion of a mixture of one part and a half of charcoal to one of sulphur through the flame of spirit, when there was an uniform sheet of flame produced during the burning of the charcoal. When the charcoal was projected separately, it burnt in small detached scintillations. Some gunpowder was fired in air; and it was thus proved that the whole was converted into gaseous matter, the white vapour being sulphuret of potassium.

The quantity of gas evolved from gunpowder was shown by plunging an ignited fusee under water and collecting the gases in a glass vessel inverted. The volume of the gases thus obtained, was many hundred times that of the gunpowder producing it, and its bulk was still increased by the high temperature of explosion. The chemical nature of the gases produced, might be inferred from the composition of powder. Taking the proportions above given the following equivalents would represent the relative proportions of the constituents of the gases. Potassium 1, oxygen 6, carbon 3.4, sulphur 0.85. The nitrogen with the carbon and oxygen as carbonic acid and carbonic oxide, represented the gases, while the sulphur united to the potassium. So complete was the combustion that even the potash of the nitre gave up its oxygen. The mode in which the oxygen of the nitre maintained combustion was beautifully illustrated by collecting near a portion of powdered nitre, a quantity of the pyrophorus of tartrate of lead, and suddenly mixing them,—a violent combustion ensued, in which even the lead was burnt.

Gunpowder might be exploded by percussion. The Professor had even fired it by percussion between two pieces of *copper*: it was, however, much more difficult to explode it in this way than fulminating mercury or even gun-cotton: hence it might be more safely kept, and would admit of more handling than the latter. Gunpowder required a much higher temperature than gun-cotton for its explosion. A portion of gunpowder was gradually dropped into a wide flame of spirit, but it did not explode on contact with the flame; it fell through and collected in the saucer. The flame was then extinguished, the unconsumed spirit poured off,—the vessel gently heated, and the gunpowder was obtained in a dry mass below: it was then exploded by a heated wire. On dropping iron filings into the flame they became white hot, and burnt on contact with it. That a higher temperature was required for the explosion of gunpowder than of gun-cotton, was further proved by heating a wire in a flame, placing it on a mass of gunpowder, which did not ignite, and then passing it rapidly onwards to a mass of gun-cotton, which immediately exploded. The Professor remarked, that there was a great difference in the products of the two substances when burnt in the open air,—the gases derived from gunpowder had a very high temperature, but this was not the case with those resulting from the combustion of gun-cotton.

The mere contact of flame will not readily ignite gunpowder. A quantity of powder being placed on a plate, a gas flame was passed repeatedly over it without igniting it; and when it was allowed to remain playing on the powder, several seconds elapsed before this exploded :—in fact, it remained quiescent until it acquired the high temperature requisite for its combustion. It was important, however, to state, that the raising of the temperature of the smallest particle would suffice to kindle the whole mass : it was by no means necessary that all the particles should be simultaneously heated. The heat given out, in its own combustion, was sufficient to convert the whole into gaseous matter, and to expand the gases to such a degree as to render them equal to from 3500 to 3800 atmospheres. The cause of the rapid explosion of ordinary gunpowder was, that when one particle was kindled, the heat and flame rapidly spread through the interstices of the little spheres, and raised the temperature of each. If the kindled particle were below, the flame spread upwards, if above, downwards; and each grain was, therefore, wrapped in a sheet of flame, at a high temperature, within a very short interval of time. Nevertheless, compared with fulminating compounds, the explosion was not instantaneous but gradual, the clear interspaces between the little spheres allowing the flame to penetrate the whole mass, and thus to act with a progressively increasing force upon the projectile. Supposing these interstices to be filled up, and the particles to be closely packed, so as to be everywhere, in contact, the explosion is slow, the gunpowder then burns only on the surface, and so it continues upwards or downwards until the whole is consumed. A piece of gunpowder, in lump, was ignited: it burned rapidly, but without sudden explosion, gave off torrents of gas, and moved from the part where it was placed, being carried backwards by the force with which the gas was evolved. The fusees used for exploding bombs were nothing more than wooden cases, containing gunpowder closely packed and ramed into them. When one of them was ignited, it burnt steadily, without explosion. Had the wooden tube been filled with gunpowder *grains*, the whole would have been blown to pieces. These facts accounted for many curious and apparently anomalous results obtained with gunpowder. The same material which burnt slowly like a fusee out of a paper case, would sometimes explode suddenly when confined in one. This was well known in pyrotechny, although the cause might not be understood. A cylinder of gunpowder, closely pressed, was taken from a case and ignited: it did not burn with explosion, but was steadily consumed like a fusee from the ignited end. When a similar cylinder was ignited in its paper case, the whole suddenly exploded. The Professor explained this by stating that the gunpowder, when ignited at the mouth of the case, stretched or expanded the sides of the paper tube, and the flame could then travel along the whole surface of the cylinder of powder, and thus heat to a high temperature every portion at once. Accidents might arise from an ignorance of this principle. The miner's fusee formed a familiar illustration of the effect of mechanical compression on the explosion of gunpowder. A long channel was made by stretching pieces of string side by side, so as to form a kind of trough. This was then filled with gunpowder. If in this state one end were ignited, the whole would explode; but the miner, wishing the fusee to burn slowly and steadily, winds iron wire firmly round the strings, so as to compress the grains of gunpowder into the closest possible contact. A complete cylinder of metal, enclosing gunpowder, flexible, and easily cut to any length for blasting purposes is thus obtained. Professor Faraday here produced one of these fusees. Two equal lengths were then taken: one piece was fired at the end, and the powder burnt steadily through from end to end without explosion; the other piece was cut open, the powder shaken out, and a heated wire applied to it, when the whole suddenly exploded;—thus proving that the powder had undergone no change, but that the difference in the results was merely owing to the mechanical disposition of the grains. By this simple arrangement flame might be made to traverse water; the prepared fusee was coated over with bituminous matter, to render it impermeable to water, and it was then fit for use. This fact was beautifully illustrated by bending a long piece of miner's fusee across a bath full of water, the two ends of the fusee projecting over the opposite ends of the bath. A heated wire was applied to one extremity, and the gunpowder continued to burn slowly; it traversed the water, and, after a short interval, the combustion was made manifest by the appearance of flame at the other end, and the entire consumption of the powder.

The connecting pieces of the pyrotechnist were made alternately to burn and explode on a similar principle. If a long narrow cylinder of paper were filled with powder, and the gunpowder compressed by tying the cylinder tightly at certain lengths, an alternate effect of combustion and explosion resulted. This was experimentally shown. The common cracker was another familiar instance, but here no other means of compression were employed than that arising from merely bending closely and firmly one part of the paper cylinder on another. In each straight piece of cylinder there was explosion, at each angle or bend there was combustion. The slow combustion of powder by compression and consolidation, was made a source of motion in the rocket, which consisted of a cylinder of compact powder, enclosed in a case, and hollowed out in the centre by a conical mass being plunged into it. This presented a much greater surface than if merely one extremity was ignited; and there was a proportionately rapid evolution of gas, which, reacting on the air, caused the rocket to ascend.

It has been stated, that the explosion of grain gunpowder is gradual and progressive; hence its force on a projectile is measured by the length of time which it has the power of reacting on it; and where resistance is offered for some time, the combustion is more complete, and the quantity of gaseous matter evolved, greater. In short-barrelled pieces the projectile is not carried far, and much of the powder escapes combustion; in long barrels these conditions are reversed. This progressive explosion renders gunpowder more certain and regular in its effects than gun-cotton. A body which is very suddenly explosive is apt to shatter the parts immediately in contact with it without conveying an impulsive force; hence all fulminating compounds are unfitted to act as substitutes for gunpowder. They would shatter the piece instead of throwing the projectile out of the barrel. This accident has occurred with gun-cotton, which approaches nearer to the character of a fulminating compound than gunpowder, and therefore renders caution necessary in its employment. The Professor here showed the barrel of a gun which had been completely burst and splayed open by a comparatively small charge of gun-cotton, although the piece had been well proved by gunpowder. The accident could only be ascribed to the suddenness of explosion: it had produced serious injury to the individual. This remarkable property of fulminating compounds was illustrated by some experiments with the iodide of nitrogen, a body which, when dry, explodes by mere contact with air or water in letting it fall. A few grains were put on a plate and touched rather sharply by a wooden rod. The plate was shattered. Some more of the iodide was put on a plate and touched gently: the plate was not shattered, but a circular and tolerably regular hole was blown through it at the point of contact. A portion of the thick end of the stick used in the performance of this experiment was also blown off, although the Professor stated that not the slightest impulse or upward shock was perceptible to his hand while holding the stick, the cause of this being that motion is instantaneously given to those particles only which are in immediate contact with the fulminating body, and they are rent by mechanical force before this motion can be uniformly distributed through the mass. Some plates were shown in which four and five distinct holes had thus been produced by separate explosions of the iodide of nitrogen without fracturing the plate. Hence, on firing gunpowder between two layers of card, the upper layer was raised. On discharging the iodide of nitrogen in the same way, no motion was given to the card, but a hole was blown completely through it. —*Ibid.*

Electricity and Galvanism, in their Physiological and Therapeutical relations. By Dr. GOLDING BIRD, F. R. S., *Fellow of the College, Assistant Physician to Guy's Hospital.*

More than twenty-three centuries have passed away since the great father of physic, the "divine old man" of Cos, felt the necessity for the adoption of some conventional terms by which he could express the influence under which the different phenomena, as well of the macrocosm of the world at large as of the microcosm of man himself, were developed. We are indebted to his ingenuity for the invention of the hypothesis of a principle which is supposed to influence all the manifestations of creative power observed in the universe. To this he applied the name of φυσις, viz. "nature." Hippocrates, however, invested his φυσις with a kind of intelligence, under which it was supposed to exert a tendency to promote all actions which were beneficial, and repress those which were injurious, to the well-being of man. He, indeed, seems to have regarded it as a kind of tutelary deity; in which dark notion he appears to have been followed by others, on whom a light had beamed which had not reached the distant ages of the Coan sage, and thus leaves them without an excuse for the adoption of such an opinion. We indeed know that—

> "Nature is but the name for an effect,
> Whose cause is God!"—

and in this light we profess to be investigators into its laws and phenomena. The different sections into which such investigations have been divided, have received the name of physical sciences, or sciences of nature. Of these, the departments devoted to an investigation of the structure and laws of the animal frame, in health and disease, become the especial object of pursuit of the practitioner of the healing art. If, however, his information be limited to such portions of knowledge exclusively, it will indeed be scanty. He can never be expected to extend the domains of the art he professes, or hope to add fresh appliances to the science of healing. "*Medicina est ars conjecturalis*" was the remark uttered some eighteen centuries ago, and such must ever be the case so long as the practitioner of medicine limits himself to his own exclusive pursuits. The light such a man can hope to throw upon any of the phenomena of life, will be often just sufficient to render his darkness visible. But he who, whilst devoting his attention chiefly to the art he professes, at the same time reflects upon it all the light he can derive from the collateral sciences, will often succeed in throwing upon it a beam which illuminates the phenomena he is studying to an extent previously unhoped for. Witness the influence of chemistry and general physics in unravelling the intricate web of many of the vital functions. There have, in all ages, existed mèn of narrow minds who have heaped their ridicule upon those who have possessed the advantages to which I have just alluded, as if medicine were the only science in which the element of excellence must consist in a profound ignorance of all other subjects. This miserable delusion is still not without its influence; but no better apology can be offered for the cultivation of the physical sciences than was made by the elegant Celsus:—"Quæ quidem studia, quamvis non faciunt medicum aptium orem tamen medicinæ faciunt." If these views should influence the practitioners of medicine in all nations, how much more ought they to throw a weight of responsibility on those of England. In all other of the European nations the appellation applied to the professor of our art has always some reference to his individual occupation. Whilst ιατρος, medicus, medicin, arzt, or their inflections, constitute his title in the Greek, Latin, French, and German tongues respectively, it is in our language alone that he is dignified by the title of *physician*, thus arrogating to himself a title derived from the φυσις of Hippocrates, and which it ought to be his greatest honour to deserve. It must ever be the high and deserved boast of this college,* that it first sanctioned the application of the then heterodox and infant science of chemistry to medicine. Its illustrious founder, the great Linacre, was the first physician who, in spite of the then degraded and despised condition of the votaries of chemistry, dared to lend the weight of his high authority and illustrious name to the support of their dogmata, and by effecting an amicable union between the chemists and Galenists, laid the foundation for most, if not all, the improvements which the art of medicine has undergone since the era of our first president.

* The Royal College of Physicians.

I am sure that all whom I have the honour of addressing will concede to me the importance of the physician frequently making excursions into the domain of the physical sciences, and culling from it whatever blossoms he thinks likely to bear fruit in his own peculiar department. That he may often find his cherished sucklings abortive is *probable ;* but that he will as often thus graft a vigorous shoot on the venerable trunk of medicine is *certain.*

I have, Sir, ventured to make these remarks as in some sense apologetic for the subject-matter of these lectures, which, at your own wish, are no longer to be limited to the mere details of the materia medica, but are permitted to be devoted to a consideration of some of the applications of physics to medicine. I could only wish that I were more fitted for this honorable task, and would beg to deprecate your patience should I fail in performing this duty properly: for if, used as I am to the duties of the lecture room, I find it impossible to enter the theatre of Guy's Hospital without a deep sense of my responsibility, how much more must be that feeling enhanced when I find myself addressing the fellows and licentiates of this College! many of whom may truly be said to be the conscript fathers of my profession, and to whose example and guidance I have long looked up with feelings akin to awe and veneration.

Few subjects have more frequently, or with greater interest from time to time, attracted the notice of the physician than the nature and applications of electricity, and its modifications to medicine and physiology. Too frequently, however, has the importance of this wonderful and ever-present agent been overlooked, and its application to medicine left to the empiric. Recent researches have invested this matter with the deepest interest, both to the physiologist, the chemist, and man of general science; more particularly when, from late investigations, it appears that we are constantly generating this agent, and that *quoad* the supply of electric matter, man far exceeds the torpedo or the electric eel, and is only prevented from emitting a benumbing shock whenever he extends his hand to greet his neighbour, from the absence of special organs for increasing its tension. I therefore purpose, as the first subject of these lectures, to draw the attention of the College to the part played by electricity in a physiological as well as therapeutic point of view, and hope to shew that the functions this agent fulfils in health, and its applications in disease, are of far greater importance than have been hitherto considered.

More than 2000 years have elapsed since Thales discovered that pieces of amber, when rubbed, attracted light bodies, and explained the phenomena he observed by supposing that the amber possessed a soul, was endowed with animation, and was nourished by the attracted bodies. Nothing further was added to the observations of the Milesian philosopher until the 13th century, the knowledge of electricity remaining for 1500 years in the same state as among the Indian children on the banks of the Orinoko at the present day, who according to Humboldt, amuse themselves with exciting by friction the dry and polished seeds of rushes, and attracting filaments of cotton with them. About the time alluded to, a celebrated physician, Gilbert, of Colchester, a contemporary, according to Dr. Friend, of our first Edward, in his essay "de Magnete," recorded several phenomena connected with electrical excitation, and gave to them the title of electricity—a term derived from the Greek word ἤλεκτροη. Notwithstanding the very considerable developments which the science of electricity received, it was not until the beginning of the present century that anything of real value was done towards elucidating its connection with physiology.

Few things are more interesting and instructive than to trace the birth and progress of an infant science,—to watch the labour-pangs by whch it struggles into existence against the obstacles opposed to it by ignorance, prejudice, and those influences which the illustrious father of the inductive philosophy, the great Lord Bacon, so happily denominated idols, inasmuch as men are too apt, in this blind fealty to the *idola specus, theatri et fori*, to shut their eyes to the first bursts of truth; nor is it until the light of a discovery blazes out with sufficient brilliancy to dispel the mists and fogs of error and preconceived opinions, that much is done towards giving it its proper position in the circle of the sciences. With all such difficulties had the infant science of galvanic or physiologic electricity to contend with; and, had time permitted, it would have afforded me no small pleasure to have pointed out its course from its discovery to the present time. I must now, however, content myself with the briefest glance at its history.

Philosophers have almost universally adopted the opinion of matter being constituted by the aggregation of atoms possessing a spherical figure. No one can cast a glance upon a diagram representing a series of spheres without at once perceiving that such bodies cannot touch each other except at certain parts of their peripheries, and consequently the existence of interspaces is obvious; and few subjects in the range of physical science have attracted more attention than the question of the condition of these insterspaces, whether they were merely empty voids, or full of some form of matter—whether, in a word, they were *vacua* or *plena*. They have now long been considered to be filled with a light ethereal form of matter, identical, it is presumed, with that which extend beyond the confines of our atmosphere into infinite space, constituting that great ocean of scarcely ponderable medium in which the great orbs of our system roll on in their respective spheres. The existence of such a medium is now beyond all doubt or question, from the evidence of its retarding influence upon some of those light cometary satellites, some, probably, scarcely denser than mere whisps of vapour, which occasionally visit the neighbourhood of the earth, and which, from their levity, become excellent tests of the influence of a retarding medium. Sir Isaac Newton attempted to calculate the density of this ether, and found that it must be at least 700,000 times less heavy than the air we breathe. Compared to it, therefore, our atmosphere would be far denser than is the solid mass of a granite rock in comparison with air. We know that gaseous bodies, when thrown into a vibratory motion, give rise to certain curious phenomena very different from those observed when in a state of rest. When such vibrations are performed with a certain regularity and rapidity, they give rise to musical sounds or tones. In like manner, when the interstitial ether is made to assume analogous movements, a new set of phenomena are displayed, differing in their character according to the amplitude and rapidity of their undulations. Then, when the particles of ether undulate with a rapidity not exceeding 458 millions of millions in a second of time, we have the well-known phenomenon of heat or caloric evolved; when the undulations are increased, so as to range from this number to 727 millions of millions, the various tints of light become developed in addition to heat; whilst, if the vibrations exceed this number, little heat and scarcely any light is to be detected, but they are replaced by the actinic or tithonic phenomena, under whose influence the magic results of the daguerréotype and photography are produced.

Whether electricity is distinct from this ether, or whether the phenomena it produces when it is in what is called a free state, and which are regarded as characteristic of its presence, depend upon ether assuming vibratory movements differing in amplitude and velocity from those producing light, heat, and photographic effects, is yet unknown. That there is a remarkable connection between light, heat, and electricity, is, to say the least, quite certain; for one can never be excited without calling into existence one or both the others. The *conventional* theory now generally adopted is, that electricity is a compound imponderable form of matter composed of two elements, denominated the positive and negative electric fluids, which, when separated, produce analogous phenomena, but, when united, neutralise each other so effectually that the existence of the neutral fluid can never be detected, save by separating its component elements. Whilst heat and light are readily detected when set free, by their well-recognised effects, we have, in dealing with the subtle agent whose properties we are investigating, to use a new series of tests. These are either founded on the law that bodies similarly electrified repel each other, or on the development of the phenomena of light and heat. Nothing is easier than to demonstrate the existence of electricity in ponderable matter, for it can scarcely be submitted to any mechanical, chemical, or thermal influence without decomposing the combined electric fluids.

I will now abruptly draw the corner of my handkerchief over the cap of the gold-leaf electrometer before me, and thus in an instant shall decompose its neutral electricity, wiping away (as it were) the positive fluid, and leaving its gold leaves negatively electrified, which thus diverge to the extent of an inch or two. On touching the cap with my finger, I give back the positive fluid in sufficient quantity to neutralise the negative electricity of the gold leaves, and equilibrium is restored.

To shew the influence of chemical action in disturbing the normal electric equilibrium, I have here a few glass vessels in which a little nitric acid is undergoing decomposition. The result is, that the electricity of the decomposing atoms is resolved into its two elements, the negative fluid being impelled towards my right hand, and the positive towards my left; and, if the two ends of the series of platinum and zinc plates are connected by these wires, the separated elements unite, and equilibrium is restored. With these separated fluids I can produce remarkable effects, depending upon the energy with which their union occurs. I now allow their union to be effected by means of this piece of platinum wire, which becomes brilliantly ignited, from the violence of the neutralisation or discharge of the two fluids, being sufficient to set in active vibration the interstitial ethereal elements of the platinum, and thus produce the phenomena of heat and light you are now witnessing. I now allow the discharge or union to take place between these fragments of carbon; the intense evolution of light well attests the violence with which the ether is made to vibrate. Now I will compel the two elements to traverse this water before they unite: so powerful is the influence of these wondrous agents, that chemical affinity is annihilated, the water is resolved into its elements, and torrents of oxygen and hydrogen are evolved. Lastly, I have before me two bars of iron surrounded by wire; these are at present merely inert metal, possessing nothing peculiar save in figure. Let us now compel the two fluids to traverse the wire round these bars before they unite. In an instant the bars assume new properties, becoming magnets of enormous power, rapidly and violently attracting the iron ball suspended over them, and seizing, with almost uncontrollable power, the bar of iron I now present to them.

I said that change of temperature is sufficient to disturb the electric equilibrium of bodies. This is invariably true, and a single illustration will, I hope, be regarded as sufficient.

On the table before me is a large magnetic needle suspended on a pivot; some coils of insulated copper wire pass above and below the bar, the apparatus being, indeed, the well-known galvanometer. Here is a bar of the metal bismuth; and I will twist the terminations of the wire coil round the ends of the bar. The needle remains at rest; no disturbance of electricity occurs. But observe what occurs the instant the flame of a spirit-lamp comes in contact with one end of the bismuth. The magnetic needle, large and heavy as it is, begins to move, and soon traverses an area of thirty degrees. By the propagation of the calorific vibrations through the bismuth, its electric equilibrium is restored, and a current of the positive and negative fluids traverses the wire coil, and produces its well-known effects upon the magnet.

I trust I have not trespassed too long upon your patience in thus bringing before you facts with which I am sure all present are familiar. I felt, however, that your time might not be uselessly spent in thus recalling to mind the well-recognised effects of electricity, before passing to its more occult phenomena.

All are ready to admit the presence of electricity in inanimate matter, and, perhaps, to extend it to those animals which are endowed with the mysterious property of benumbing the hand which grasps them; still, all may not be so willing to accord these attributes to man, and to regard him as endowed with a large accumulation of electric fluid.

But nothing is easier than to elicit ample evidence of this truth; and I can readily produce the phenomena of divergence by my own electricity. For this purpose I will stand upon a stool with glass non-conducting legs, and thus, in an electrical sense, am no longer an inhabitant of earth, being insulated from its electricity. Placing a finger of one hand in contact with the cap of the electrometer before me, I with the other will briskly draw a non-conducting comb through my hair, the comb being connected with the earth by a wire. Immediately the gold leaves diverge; indeed, I have evolved so much electricity, that one of the leaves has become torn by the violence of its divergence from its companion.

In inanimate nature, we find electricity, playing a part so important, that it could scarcely be dispensed with. Many of the most important of the chemical phenomena of the universe would disappear in its absence. *Little* of the intensity of chemical affinity, as it is termed—*few* of the marvellous phenomena so profusely scattered for our inspection and use in the great mineral districts of this and other countries would be developed,—were it not for the presiding influence of the wonderful thing we call electricity. There can, indeed, be little doubt of its being one of the most energetic and most generally diffused means employed by the All-wise Creator for the production of most of the phenomena of the material world.

If, then, this agent exists so freely diffused in the animal, can we doubt its having some important function to perform? In the torpedo and silurius its influence is obvious, in furnishing them with powerful weapons of defence and attack; but where its presence is not so evident—where it does not arrest our attention by endowing the animal with a power which enables it to simulate the effects of the lightning flash—can it exist without fulfilling some important purpose? *Natura nihil agat frustra* is a universally admitted axiom; nor must we presume otherwise even when the subject we are investigating appears less endowed with useful applications.

Prof. Galvani, of Bologna, in 1791, published a Commentary "de Viribus Electricitatis in Motu Musculari," and announced those facts which laid the foundation of that science which bears his name. He then stated that a particular form of electricity, denominated by him *animal electricity,* existed in animals; and he believed he merely excited and rendered sensible this electricity by coating a nerve and muscle with metals, but did not regard the latter as the real source of the electricity.

This celebrated experiment is well known I am sure to all present, but is one of really so marvellous and remarkable a character that, repeat it as often as we may, it can never be looked at without a feeling of wonder and delight. I will take the legs of a frog denuded of their skin, and attached by the lumbar nerves to a portion of the spine. Allowing them to rest on a glass plate, I will place a piece of zinc in contact with the nerves, and allow the feet to rest on a thin slip of silver. They are now at rest, and appear, as they indeed are, dead and powerless. But there exists a power I can call into action which will endow these dead limbs with an apparent life. The only spell required to evoke this power is this piece of wire, with one end of which I will touch the zinc, and with the other the silver. Instantly the legs violently contract, and kick away the silver plate.

It has been lately stated by Prof. Matteucci, that this curious observation was not original with Galvani, but was made some time before by the celebrated Swammerdam; and the experiment was exhibited by him in the presence of the Grand Duke of Tuscany.

Shortly after the announcement of this discovery, Prof. Volta, of Pavia, in repeating this and other analogous experiments, arrived at a different conclusion; and he showed that the electricity was really excited by the metals, and the contraction of the muscles of the frog was only an index of its existence. Although these and other discoveries of that great man obscured for a time the views and researches of the illustrious Galvani, attention was again drawn to them by the experiments of his talented nephew, Prof. Aldini, of Bologna. He was inspired with so much zeal in the defence of his uncle's theory, that he travelled through France and England for the purpose of demonstrating the truth of his views; and, in the presence of the medical officers and pupils of Guy's Hospital, he, in the year 1803, supported and defended a series of propositions so satisfactory and conclusive, that he was presented by his auditors with a gold medal commemorative of his labours. On leaving England, these propositions, and the arguments in support of them, were published in a quarto volume, which seems to have attracted but little notice either here or on the continent of Europe. Scarcely any mention is made of Aldini by more modern writers; and not many weeks ago I removed the volume from the library of the Royal Medical and Chirurgical Society with its leaves uncut.

Prof. Aldini's propositions and conclusions are so important and of such high interest, that I shall now briefly refer to some of them, as they demonstrate to my mind, in a most satisfactory manner, the existence of free electricity in animals, and, as will appear to all conversant with this branch of physiology, most remarkably anticipate the late researches of his countryman, Prof. Matteucci.

Prop. I.—Muscular contractions are excited by the development of a fluid in the animal machine, which is conducted from the nerves to the muscles without the concurrence or action of metals.

Exp. A.—In proof of this statement, Aldini procured the head of a recently-killed ox. With the one hand he held the denuded legs of a frog, so that the portion of the spine still connected with its lumbar nerves touched the tip of the tongue, which had been previously drawn out of the mouth of the ox. The circuit was completed by grasping with the other hand, well moistened with salt and water, one of the ears. The frog's legs instantly contracted; the contractions ceasing the instant the circuit was broken by removing the hand from the ear.

The intensity of these contractions was much increased by combining two or three heads so as to form a sort of battery, just as Matteucci forty years after found to be the case with his pigeon and rabbit battery.

Exp. B.—Aldini, having soaked one of his hands in salt and water, held a frog's leg by its toe, and, allowing the ischiatic nerves to be pendulous, he brought them in contact with the tip of his tongue. Contractions instantly ensued from a current of electricity traversing the frog's leg in its route from the external or cutaneous to the internal or mucous covering of the body. By this very interesting experiment Aldini demonstrated the existence of the musculo-cutaneous current and completely anticipated its re-discovery by Donne some five-and-thirty years after.

Aldini in connection with this experiment, declares that the pendulous nervous filaments were distinctly attracted by the tongue ; and to this marvellous and hitherto uncorroborated statement calls to witness the then physicians and professors of Guy's and St. Thomas' Hospitals, as well as two well-known fellows of this College, Sir Christopher Pegge and Dr. Bancrost, to whom he states he shewed this experiment at Oxford.

Exp. C.—The proper electricity of the frog was found by Aldini to be competent to the production of contractions. For this purpose he prepared the lower extremities of a vigorous frog, and, by bending up the leg, brought the muscles of the thigh in contact with the lumbar nerves : contractions immediately ensued. This experiment is now a familiar one, and has been repeated and modified lately by Müller and others.

Exp. D.—A ligature was loosely placed round the middle of the crural nerves, and one of the nerves applied to a corresponding muscle : contractions ensued ; but, on tightening the ligature, convulsions ceased.

This statement is very important, as upon its accuracy or error depends what has been regarded as one of the tests of the identity or diversity of the electric and nervous agencies. It was repeated soon after Aldini's announcement of the fact by an Italian physician of celebrity, Signor Valli, who commenced his researches indeed in 1792, only a year after the publication of Galvani's discovery, and he found if the ligature were applied *near the muscle it did not allow the contraction to occur, but if nearer the spine it did not prevent it.* This was afterwards corroborated by Humboldt. I may here remark that it has been since found by Prof. Matteucci, that if care be taken to insulate the nerve, a ligature does arrest the contraction, as well as the passage of a very weak artificial electric current.

Little occurred during the subsequent 35 years to modify these conclusions or add to their interest, repeated and extended by numerous observers, especially by Humboldt, and more lately by Müller. They were almost lost in the blaze of novelty surrounding the vast discoveries made on the constitution of inorganic matter by the magic pile of Volta, an instrument which, in the hands of our late talented countryman, Sir Humphry Davy, resolved many bodies previously considered simple into their constituent elements, and quite changed the face of chemistry; and still more recently, directed by the gifted genius and vast attainments of a Faraday, has led to the discovery of new sciences, and of properties of matter before undreamed of; indeed, have promised to lay open to us the secrets of the working of the invisible agents presiding over the ultimate constitution of material masses.

I cannot in this place pass over in silence the neuro-electric theory of Galvani. He assumed that all animals are endowed with an inherent electricity appropriate to their economy, which electricity, secreted by the brain, resides especially in the nerves, by which it is communicated to every part of the body. The principal reservoirs of this electricity he considered to be the fibres of muscles, each of which he regarded to have two sides in opposite electric conditions. He believed that when a muscle was willed to move, the nerves, aided by the brain, drew from the interior of the muscles some electricity; discharging it upon their surface, they thus contracted and produced the required change of position. This theory was adopted and defended by Prof. Aldini.

Valli, to whose experiments I have before referred, believed the neuro-electric fluid to be secreted by the capillary arteries supplying the nerves, by which it became conveyed to the muscles, which he believed to be always in an electric condition, the interior being negative, the exterior positive. He also noticed the curious fact, that in experiments on frogs, the nerves lose their irritability to the stimulus of electricity at their origin first, retaining it longest at their extremities; and on this hazarded an opinion that probably the distal extremities are really the origin of these structures. Both these statements are of deep interest; the former from its bearing on the late researches of Prof. Matteucci, the latter from its curious connection with some views of Dr. M. Hall, regarding the centripetal origin of incident nerves.

It may now be asked, what proof do we possess that the action on muscular fibre to which I have alluded, is really produced by electric currents? It is true that this is generally taken for granted, but still it is important to review our proofs. One great evidence in favour of this opinion is at once found in the fact, that contractions produced in frogs can only be excited when connection is made between a nerve and muscle by a conductor of electricity, all other bodies interfering with the production of this phenomenon. The only thing amounting to positive proof before the researches of Matteucci is an experiment of Valli, in which he formed a sort of bottle of fourteen prepared frogs, and by the electricity thus accumulated succeeded in producing the phenomena of divergence in a delicate electrometer. It is to be regretted that no accurate account of this experiment has been left on record; for if true, it must be regarded as most satisfactory in proving the identity of the electricity of the frog with that obtained from other sources.

The recent researches of Prof. Matteucci, of Pisa, have, however, completely set this matter at rest. He has incontestably proved that currents of electricity are always circulating in the animal frame, and not limited merely to cold-blooded reptiles, but are common to fishes, birds, and mammalia. From the researches of this philosopher it appears that a current of positive electricity is always circulating from the interior to the exterior of a muscle; and that although the quantity developed is exceedingly small, yet that by arranging a series of muscles having their exterior and interior surfaces alternately connected, he developed sufficient electricity to produce energetic effects. By thus arranging a series of half thighs of frogs, he succeeded in decomposing iodide of potassium, in directing the needles of a galvanometer to 90°, and by aid of a condenser caused the gold leaves of an electrometer to diverge. When more delicate tests of the electric current were made use of, their existence was demonstrated in the muscles of all animals, and even of man himself. Mr. Wilkinson, in his Elements of Galvanism, published in 1804, calculated that the irritable muscles of a frog's leg were no less than 56,000 times more delicate as a test of electricity than that of the most sensitive condensing electrometer. Mr. Wilkinson found that two pieces of zinc and silver, each presenting a superficial surface of $\frac{1}{100}$ inch, produced violent contractions in the leg of a prepared frog; whilst two circular plates of zinc and copper required to be brought twenty times in contact with the condenser, before any sensible divergence of the gold leaves of an electrometer was produced. By comparing the area of these plates, multiplied by the number of contacts, with the superficial surface of the minute pieces of zinc and silver employed to affect the frog's leg, he arrived at the conclusion I have just related.

Prof. Matteucci availed himself of this circumstance in his contrivance of the frog galvanoscope. This is made by skinning the hind leg of a frog, and separating it from the trunk, taking care to leave as long a piece of sciatic nerve projecting as possible. The leg is then placed in a glass tube, the nerve hanging over. In using this contrivance all that is necessary is to let the piece of nerve touch simultaneously in two places, the part where electric condition is to be examined. If a current exists, the muscles of the leg will become convulsed at the moment of contact.

In this way the Professor detected a current in man, by making a clean incision into the muscles of a recently amputated limb, and bringing the nerve of the frog galvanoscope in contact at once with the two lips of the wound, contraction instantly occurred.

In pigeons and fowls, as well as in eels and frogs, currents were readily demonstrable; indeed, by alternating a series of the former by approximating their sides, the raw surface of the muscles of which had been exposed by a quickly made cut, Matteucci formed a sort of battery resembling that made of the thighs of frogs. The result of this experiment thus proved that energetic currents existed in hot as well as cold-blooded animals. Indeed more intensely, but very soon disappearing on the death of the animal. These researches completely corroborate the statements and experiments of Aldini made many years earlier, especially that very remarkable one before alluded to, in which he produced contractions of the legs of a frog by bringing them in contact with the tongue of an ox.

By means of the frog galvanoscope, not only the existence, but the direction of a current can be discovered; for if the leg be kept for a short time before using it, so as to a little diminish its sensibility, the muscles will contract on *making* contact with the body under examination, if the electricity passes from the nerve to the leg, whilst it will contract on *breaking* contact if the electricity is moving in the opposite direction. Using this delicate test for an electric current, Matteucci discovered that the intensity of such currents rises in proportion to the rank occupied by the animal in the scale of being, their duration after death being in the inverse ratio. The Professor discovered that when a mass of muscle belonging to a living animal, or one recently dead, was placed in contact with a piece of wire so that one end of it touched the tendon, and the other the body of the muscle, a current could always be detected circulating in the mass in the direction from the tendon to the external surface of the structure. He further demonstrated the very important fact, that everything which decreases the *vis vitæ* of the animal diminishes the evidence of electricity immediately after death. Thus, when frogs were killed by asphyxia, either by immersion in sulphuretted hydrogen, or water freed from air, the electricity detected in their femoral muscles sunk to a minimum; whilst the thighs of frogs, whose hearts had been previously removed, gave less evidence of the existence of this important agent than those which had not been thus injured.

It is well known that certain fishes possess a peculiar apparatus by which they are enabled to accumulate the electricity developed by the vital processes going on in their structures, and thus produce the ordinarily recognised effects of tension, as shewn in the benumbing shock felt on grasping a torpedo or silurius. This endowment is, however, peculiar to very few creatures, and all the electricity developed in the frames of other organisms is only to be detected by comparatively delicate tests. It is, however, very remarkable that in the batrachians generally, especially the frog, an electric current, denominated by Matteucci the "proper current," possessing some approach to tension, and capable of deviating the needle of a galvanometer to 5°, can readily be detected; its direction is always definite from the feet towards the head. This curious and remarkable fact was I believe first pointed out by Nobili, but accurately studied by the Pisan philosopher to whose researches I have so often referred. —*Ibid.*

(To be Continued.)

Professor SIMPSON *on the employment of ether in the practice of Midwifery.*

A careful collection of cautious and accurate observations will no doubt be required before the inhalation of sulphuric ether is adopted to any great extent in the practice of midwifery. It will be necessary to ascertain its precise effects, both upon the action of the uterus, and of the assistant abdominal muscles; its influence, if any, upon the child; whether it gives a tendency to hæmorrhage or other complications; the contraindications peculiar to its use; the most certain modes of exhibiting it; the length of time it may be employed, &c.* In no case have I observed any harm whatever to either mother or infant follow upon its employment. And, on the other hand, I have the strongest assurance and conviction that I have already seen no small amount of maternal suffering and agony saved by its application. The cases I have detailed sufficiently show its value and safety in cases of operative midwifery. And here, as in surgery, its utility is certainly not confined to the mere suspension

* I have, during labour, kept patients under its influence for upwards of half an hour. In exhibiting it, the first or exhilarating stage of its effects should be passed through as rapidly as possible, and the patient never allowed to be excited or irritated by the nurse or others. I have heard its use strenuously denounced on the ground that its effects, though good and evanescent, are still of an intoxicating character. But on the same ground, the use of opium, &c. &c. in medicine, to relieve pain and produce sleep, should be equally reprobated and discarded.

and abrogation of conscious pain, great as, by itself, such a boon would doubtless be. But in modifying and obliterating the state of conscious pain, the nervous shock otherwise liable to be produced by such pain,—particularly whenever it is extreme, and intensely waited for and endured,—is saved to the constitution, and thus an escape gained from many evil consequences that are too apt to follow in its train. Granting that experience will yet be able to prove its safety and efficacy in modifying and annulling the pains of labour, will (I have repeatedly heard the question asked) the state of etherization ever come to be generally employed with the simple object of assuaging the pains of *natural* parturition? Or (as the problem has not unfrequently been put to me) would we be "justified" in using it for such a purpose?

If experience betimes goes fully to prove to us the safety with which ether may, under proper precautions and management, be employed in the course of parturition, then, looking to the facts of the case, and considering the actual amount of pain usually endured (as shewn in the descriptions of Merriman, Naegele, and others,) I believe that the question will require to be quite changed in its character. For, instead of determining in relation to it whether we shall be "justified" in using this agent under the circumstances named, it will become, on the other hand, necessary to determine whether on any grounds, moral or medical, a professional man could deem himself "justified" in withholding, and *not* using any such safe means (as we at present pre-suppose this to be,) provided he had the power by it of assuaging the pangs and anguish of the last stage of natural labour, and thus counteracting what Velpeau describes as "those piercing cries, that agitation so lively, those excessive efforts, those inexpressible agonies, and those pains apparently intolerable," which accompany the termination of natural parturition in the human mother.—*Ibid.*

Elements of Chemistry; including the actual state and prevalent Doctrines of the Profession. By the late Edward Turner, M.D., F.R.S., L. *and* E. *Eighth edition. Edited by* Baron Liebig, *Prof. of Chemistry in the University of Giessen, and* William Gregory, M.D., F.R.S.E., *Prof. of Chemistry in the University of Edinburgh.*

The fact that this excellent work has reached an *eighth* edition, renders it scarcely necessary for us to do more than announce its appearance. We lately noticed a re-publication of Professor Graham's Elements; and a new edition of Professor Brande's Manual of Chemistry is about to appear. Nothing, perhaps, shews more strikingly the extensive diffusion of a taste for chemical pursuits among the public and the profession, than this simultaneous demand for new editions of the three standard English treatises on the science.

The additions made to the subject of Inorganic Chemistry in the volume before us do not appear to be very numerous. It is chiefly in the department of Organic Chemistry that the progress of the science is indicated in the present day; and in their advertisement the editors announce that many of the sections which are to appear in the second volume have been entirely re-written.

We are glad to perceive from the preface that the Continental chemists are beginning to adopt the British system of equivalents or atomic weights: *i. e.* by taking hydrogen as a standard of unity. This fact appears to us to convey a warning to those English writers on the science who have shewn a strong disposition to import the Continental system into England rather for the sake of novelty, than of effecting any important or useful change. We question the propriety of the editors' doubling the equivalents of phosphorus, arsenic, and antimony, in this edition: it will, we fear, have the effect of producing great confusion in the minds of chemical students respecting the atomic constitution of the compounds of these substances, and will throw the work out of uniformity, not only with former editions, but with other treatises on the science which have deservedly acquired authority. Nevertheless, if the editors perform their task of revision as satisfactorily in the Organic as in the Inorganic branch of chemistry, there will be no reason to complain of these slight innovations, and their labours will tend to maintain the character of a work which, since it first issued from the hands of the late Dr. Turner, has always enjoyed a high reputation.—*Ibid.*

"*Hortus Suburbanus Calcuttensis. A Catalogue of the Plants which have been cultivated in the Honorable East India Company's Botanical Garden, Calcutta, and in the Serampore Botanical Garden. By the late* J. O. VOIGT, *Surgeon to the Danish Government, Serampore: Printed under the Superintendence of* W. GRIFFITH, F.L.S., *&c. &c.*"

If the work, the title of which we have placed at the head of this article, needs any recommendation, it can have none more flattering than the fact that the printing of it was superintended by Dr. Griffith, the most accomplished Botanist that India ever saw. Any one who, like the writer, has met Dr. Griffith in the deep jungles, and is at all acquainted with his indefatigable efforts to bring to light the flora of India, will readily believe, that he valued his time too highly to waste it in reading the proof sheets of a book on Botany that was not worth purchasing, had he been wholly silent in respect to its character. He speaks, however, of both the work and its author in the highest terms. He says, referring to the manuscripts, "it would be a *mortal* sin not to publish them. The work will do Voigt very great credit. It must have cost him great labour, and I can answer for it, that it will perpetuate his name as an Indian Botanist. The Catalogue would certainly command an European sale, as it would be essential to all real Botanists. Indeed I know of none, which would contain so much interesting information. I should like to see a handsome monument erected to Voigt, if possible, in these gardens, where, as his memory would then be associated with that of Roxburgh, Jack, and I hope Buchanan, it would be in good company. It will be on the ground of its being a genera of plants of Lower Bengal, and its great practical utility that I shall be delighted to recommend it as the systematic hand-book of the botanical class, as such, it will constitute era the second in Bengal Botany."

It cannot be misunderstood then, that the work is "*essential* to all real botanists; but it is not so well known, that it is an exceedingly useful book to every one that admires flowers; and who does not in India?" A friend of ours on applying for a copy of the work to a person who acts as an agent for its sale, was told, "the book is fit only for botanists, it will be of no use to you."

Here is a great mistake. Persons who are fond of flowers, but unacquainted with botany, need a work that will afford them some general information concerning the plants in their gardens, and it ought to be known, that this book of Voigt's supplies this want to a much greater extent than any other book that has ever been published on Indian Botany. For the information of such readers, we may say, that the work treats on nearly every plant which has found its way into the gardens of India, besides a large body of wild flowers and fruits, and many rare exotics. There are 5,515 different species enumerated in the work, and these are distributed, not in an artificial manner, not into classes according to the number of their stamens, but according to their natural resemblances: resemblances which are often as manifest to the uninitiated as to the greatest adept in Botany. Thus plants that bear pods form one natural family: those bearing heads of compound flowers, like the daisy and sunflower another: those that have their flowers disposed in umbels a third, and so on to the number of 278 families; each one deriving its name from one of its most distinguished genera. Each of these families is introduced in the work before us, with much general information concerning it; as whether it consists of trees, or shrubs, or herbs; the number of its genera and species, and their distribution in different parts of the world. If the family have any general properties, those properties are mentioned; but if its properties be varied they are described under each species. Under each species is given the different names by which the same plant has been described by different authors, with references to the volume and page where the description may be found; and if a figure of the plant has been published, a similar reference accompanies it. The places where the plant is indigenous are also enumerated, so that the reader knows, how little soever he may know of Botany, what plants are common in his neighbourhood. In this way the book furnishes, to a considerable extent, materials for local floras for a great number of places in India; and preserves the observer from the common error of supposing a plant that has been naturalized to be a native. The reader is also furnished with the properties of each species, and the uses to which it is applied, or capable of being applied; the time of flowering and bearing fruit; and, whenever of value to enable a tyro in Botany to distinguish the species, the colour of the flower is also added. When the plant has an established English or Bengalee name, that is also inserted, and an alphabetical Bengalee index enables the reader to turn to all such plants at once, whenever the vernacular name is known. Most persons who are fond of flowers waste much money and more time in endeavouring to cultivate exotic plants which the climate will not permit to grow, but all this waste may be avoided by a reference to the book before us, for at the end of each tribe or order, is a copious list of exotic plants belonging to it, which might be introduced with a rational prospect of success.

The book will be illustrated best by a specimen of its contents. We select, almost at random, one of the small orders, the wood-oil tree tribe, and transcribe the whole ; so that it will be apparent at a glance, what proportion is useful to botanists only, and what proportion is available to general readers.

"DIPTEROCARPACEÆ, (DIPTERACEÆ, *Lindl. Nat. Syst. p.* 98.)

THE CHAMPHOR TREE TRIBE.

Generally large trees, arranged in 5 genera, comprising 32 species: 2 for Sierra Leone, *(Lophira ;)* and the rest E. India, viz. 11 of *Dipterocarpus ;* 10 of *Hopea ;* 5 of *Vatica,* and 4 of *Vateria.* Besides these, Blume has three species for Java, probably belonging to Dipterocarpus. Roxburgh's Hopea eglandulosa constitutes a new genus, to be referred probably to Euphorbiaceæ or its neighbourhood. More than two-thirds of the species inhabit mountainous hilly parts of the two Indian Peninsulas.

Almost every species of this order abounds in a balsamic resinous juice, well-known under the common English names of *Dammer* and *Wood-oil,* according to its hardening or continuing liquid, when exposed to the air. That drawn from the Vaticas and Vaterias hardens and forms Dammer and Piney ; that from the Dipterocarpi retains its fluidity, and is the Wood-oil of the bazars. Some of the species produce a fragrant resin, which is burnt in the temples as incense. Dammer is used in India for most of the purposes to which pitch and rosin are applied in Europe. Wood-oil either alone, or thickened with Dammer, supplies a useful varnish for wood, possessing the valuable property of repelling, for a long time, the attacks of white-ants, as well as of resisting the influence of the climate. *(Wight.)*

VATERIA, L. (*W. and A. pr.* 1, *p.* 83.)

1. *indica*, L. (*W. and A. l. c.*;—*Wight ill.* 1, *t.* 36;—*Roxb. Corom.* 3, *t.* 288; *fl. ind.* 2, *p.* 602;—*J. Grah. Cat. B. pl. p.* 22. Elæocarpus copalliferus, *Retz.*;—*Rheed.* 4, *t.* 15.) *Piney Varnish tree.* L. ♄ Malabar. Fl. middle-sized, white. In H. C. G. fl. H. S.; fr. Aug. *(Roxb.)*

Vateria indica produces the resin called in India, Copal, (in England known by the name of *Gum Anime)* as very nearly approaching the true resin of that name. *(Lindl.)* When recent, it is found from pale green to a deeper amber colour, with all the intermediate shades. In some parts of India, beads are made of such pieces as most resemble Amber beads, even to being electrical, when excited by rubbing. *(Roxb.)* The resin is procured by cutting a notch in the tree, sloping inwards and downwards. This is soon filled with the juice, which, in a short time, hardens by exposure to the air. When used as a varnish *(Piney Varnish)*, the usual practice is to apply the balsam, before it has become hard; but when this cannot be procured, the resin melted by a slow fire and mixed with boiling Linseed-oil forms a varnish, which answers equally well for most purposes. The resin is on the Malabar-coast also made into candles. While burning, these diffuse an agreeable fragrance, give a fine clear light with little smoke, and consume the wick so as not to require snuffing. *(Wight.)*

2. *lanceæfolia*, Roxb. (*fl. ind.* 2, *p.* 601;—*Wight ill.* 1, *p.* 88.) ♄ Assam, Khassya Mountains. Fl. largish, white, fragrant. In H. C. G. fl. April and May; fr. July and Aug. *(Roxb.)* This tree yields a resin like that of *No.* 1, from which the Indians prepare one of the materials of their religious oblations. *(As. Res.* 12, *p.* 539.*)*

VATICA, L. (*W. and A. pr.* 1, *p.* 84.—Shorea, *Roxb.*)

1. *robusta*, W. and A. (Shorea robusta, *Roxb. fl. ind.* 2, *p.* 615;—*Corom.* 3, *t.* 212.) সাল *Sal.* L. ♄ Morung, Nepal. Extends more northerly than any other of the order, being found all along the Himalaya, to the neighbourhood of the Jumna, forming vast forests, frequently unmixed with any other tree, but generally confined in the most northern parts within the first range of the hills, *(Royle)*. Fl. middle-sized, yellowish-white,

fragrant, April and May; fr. R. S. It affords the best and most extensively used timber in India; the goodness of which must depend in a great measure on the resin, (called *ral* in the northern, and *dhoona* in the southern provinces) which it contains. *(Royle.)*

2. *Tumbuggaia,* W. and A. *(pr.* 1, *p.* 84;—*Wight icon.* 1, *t.* 27. Shorea Tumbuggaia, *Roxb. H. B. p.* 42;—*fl. ind.* 2, *p.* 617.) ♄ Paulghat Mountains. Fl. middle-sized. Introduced into H. C. G. before 1814. Fl.?

DIPTEROCARPUS, Gärtn. *(W. and A. pr.* 1, *p.* 84.)

1. *lævis,* Buch. *(W. and A. o. c. p.* 85.—Dipterocarpus turbinatus, *Roxb. Corom.* 3, *t.* 213;—*fl. ind.* 2, *p.* 612.) L. ♄ Tippera, Ava. Fl. large, white, tinged with red. In H. C. G. fl. March; fr. May and June. Yields an abundance of *Wood-oil.* A large notch is cut into the trunk of the tree, near the ground, where a fire is kept up, till the wound is charred, soon after which the balsam begins to ooze out: the average produce of the best trees during the season, is said to be sometimes 40 gallons. It is found necessary, every three or four weeks, to cut off the old charred places and burn them again. In large healthy trees, abounding in balsam, they even cut a second notch in some other part of the tree and char it as the first. These operations are performed during the months of November, December, January and February. Should any of the trees appear sickly the following season, one or several years' respite is given them. *(Roxb.)*
2. *angustifolius,* W. and A. *(pr.* 1, *p.* 84. *annot.*—Dipterocarpus costatus, *Roxb. fl. ind p.* 613, not Gärtn.) L. ♄ Chittagong. In H. C. G. fl. C. S.; fr. April and May. *(Roxb.)* Next to the following species, it furnishes the largest quantity of *Wood-oil.*
3. *incanus,* Roxb. *(fl. ind.* 2, *p.* 614.) L. ♄ Chittagong. In H. C. G. fl. Nov. and Dec.; fr. April. *(Roxb.)*
4. *alatus,* Roxb. *(fl. ind.* 2, *p.* 614.) L. ♄ Pegu, Mascal Islands. Introduced into H. C. G. in 1809. Here the tree has not fl., though cultivated for more than fourteen years.

HOPEA, Roxb. *(W. and A. pr.* 1, *p.* 85.)

1. *odorata,* Roxb. *(fl. ind.* 2, *p.* 609.) ♄ Chittagong, Pegu. Fl. small, pale-yellow, fragrant. In H. C. G. fl. April and May; fr. R. S. *(Roxb.)*
2. *faginea* Wall. Cat. Penang. Introduced in 1840."

We can recommend the work before us, with Wight's invaluable plates, to persons who have little leisure for the study of Botany, as affording, above all other books on Indian Botany, the greatest possible knowledge of flowers at the least possible expense of time and money.

Spicilegium Neilgherrense, or a Selection of Neilgherry Plants. By Robert Wight, M.D., F.L.S.

The foregoing notice of an excellent and useful work, suggests a similar one of another work, the object of which is also of a practical nature as regards the plants of this country. If we have been slow in noticing the work now alluded, it was from delicacy to the author whose connection with this Journal renders it difficult to allude to his unceasing labours, even in its pages, without terms of praise.

The works of Dr. Wight are so closely identified with the Botany of India, that it would be inexcusable in a Calcutta Journal of Natural History, under any circumstances, to allow a new one to appear, for any length of time, without at least introducing it with a few remarks. We may therefore briefly state, that the only objection to be made to the *Spicilegium Neilgherrense*, is its title, which although professing to give a selection merely from Neilgherry plants, yet the work in reality affords examples, beautifully coloured, of the principal families of plants commonly met with in every part of India.

The principal families thus illustrated in the two parts now before us, are *Flacourtiaceæ, Malvaceæ, Aurantiaceæ, Guttiferæ, Balsamineæ, Celastrineæ, Leguminoseæ, Rosaceæ, Myrtaceæ, Passifloreæ,* and *Rubiaceæ*, with the several intermediate families.

Indeed, all that can be considered to give the work a local character as regards Neilgherry Plants, are a few additions of new species of *Ranunculaceæ, Umbelliferæ,* and a few other families which may be said to belong more particularly to the hills, rather than the plains of India.

In this point of view, we can strongly recommend "Wight's Neilgherry Plants" to all those who in India would wish to acquire a general knowledge of Botany, without diving at once into the depths of the science.

But we will allow the author himself to explain the object of the publication in the following extract, and content ourselves with once more recommending this excellent work to all those who would wish to acquire a general knowledge of plants.

"This work was undertaken partly to gratify the taste and wishes of some friends who had an opportunity of examining the original drawings, and who, thinking it would be a pity to throw away so much labour and skill of the painter, by publishing them as uncoloured outlines, urged the propriety of at least publishing a few coloured sets, in case any of the purchasers of the Icones should wish to colour their copies. The force of their arguments backed perhaps by the promptings of an anticipated ready sale for the work, induced me so far to depart from my original plan as to have 100 extra copies struck off and coloured: the great expense of colouring preventing my incurring the cost of a larger impression.

Having gone so far, it then became necessary to endeavour to add to their usefulness and interest by combining, in as popular a form as I could, some account of the Botanical families to which they belong, and their connection with Alpine vegetation generally.

This I soon found a more difficult task to execute than I anticipated, and, I greatly fear, the descriptive matter has become more scientific than was consistent with my first intentions, or than is quite suitable to the tastes and previous information of many of my readers. I do not know that this need be a subject for regret, as possibly the perusal of the following pages may prove the means of inclining some persons to desire a deeper knowledge of the mysteries of the vegetable organization and economy than they supply, and induce them to have recourse to some of the more elementary works on Botany, written expressly for the elucidation of such matters.

Should such prove the case, I can, as the result of a good deal of experience, promise them a most enduring "feast of reason and flow of soul" of the purest, and, in the right direction, most elevating kind! For who can study the wonderful and mysterious operations of life and endless adaptations of organization for the preservation, not merely of the individual, but of the species without having his soul elevated and purified, by being led through creation, to the contemplation of the wisdom and attributes of the Almighty Creator of all things, animate and inanimate.

Grand and sublime as are the objects brought within the comprehension of man by the powers of the telescope, not less perfect and wonderful to the reflecting mind are those brought to light by the microscope. In either case all is prefection, with this difference, that in the former we witness his perfections on a scale of grandeur, far too magnificent for the comprehension of our limited faculties, while with the other we are easily enabled to detect organic structure in objects so inconceivably minute as to be almost invisible to the naked eye. With the aid of the former the motions through space of the heavenly bodies, distant many millions of miles, can be measured with such extreme accuracy, as to show that in the course of thousands of years, their rates of progression has not altered even a second of time, while by the latter we are enabled to trace evidences of complex structure and organization in the filmy dust of the moth's wing, or the equally minute particle of matter constituting a grain of pollen. Nay further, we learn from its use, that so infinitely varied and so constant are the forms of these minute objects, that, in many cases, the practised observer can, by marking their differences, detect the families to which they belong, and can even tell, by the shape of the red globules in a drop of blood, whether it was drawn from the veins of a man or a lower animal.

These are no doubt extreme cases, and demand an amount of skill in the use of the instruments not easily attained, but much, very much, that is deeply interesting, can be learned from either by the merest novice, and each renéwal of the attempt to interrogate nature by their means, adds to the skill of the observer. Such then are some of the dishes composing the endless intellectul feast which nature provides for her votaries, and of which she, most bountifully, invites all to become partakers.

The magnified figures in the accompanying plates make no pretensions to such perfection in displaying the minutæ of organization, but even in them are exhibited points of structure which could not be made out by the naked eye, and for the most part show, on a sufficiently large scale, to be easily followed, these more minute and intricate portions of the flower, seed vessel, and seed, employed in tracing among plants their relationships to each other, a knowledge which forms the basis of our present natural system; and which, if ever the true natural system of botanical classification, now so ardently sought for by all philosophical Botanists, is discovered, must still prove equally useful, not to say indispensable, towards its acquisition.

As it is not improbable some of my readers may only know of "Natural Systems" by name, without having any very precise idea of what is meant by the term, I shall here digress a little to endeavour to convey some information regarding what Naturalists understand by it. Imperfect the effort must necessarily be, for, in truth, even the most learned and philosophical among them, seem not to know quite clearly what they are in search of, and of course can scarcely be expected to inform others what they do not well understand themselves. For example, opinion is divided on the question of the existence or non-existence of a natural system, some maintaining that there really is one of nature's own contrivance, and others, that the so-called "Natural System," is neither more nor less than a human contrivance, by which the most nearly related species are brought together and placed, as much as possible, in juxta position. This last doctrine I for one reject as unphilosophical, and utterly at variance with innumerable facts and indications of wise design and contrivance, which every division of nature presents for our consideration and instruction: without, however, going so far as to deny, that those who maintain the doctrine can adduce many strong arguments in its support.

Those who maintain the existence of a natural system, set out by showing the admirable symmetry and just proportion which all Nature's works, from the greatest to the least, present and bear to each other: and by tracing the delicate progression from group to group, family to family, and species to species, thence assume that there is not only a natural system, but further, uphold the doctrine that there can be but ONE, justly observing, that it is impossible to suppose that, ALMIGHTY WISDOM, if he admitted system at all into his works of creation, would execute them so imperfectly, as to admit irregularities, much less a medley of systems. The object then, of the philosophical naturalist is, they maintain, to approach as nearly as our finite faculties will permit towards the realization of this one grand and sublime idea, the discovery of The Natural System of organized beings.

Two methods are now in use for the attainment of this end, or rather, limiting the statement to the vegetable kingdom, for the solution of the problem, what is the natural system of plants? These may be respectively called the *Linear* and *Circular* methods.

The first, it is admitted on all hands, is essentially artificial, and can never succeed in placing the most nearly related objects of creation in juxta position, thus, to some extent, virtually admitting the existence of a circular one and its superiority as being the more natural of the two. Necessity, therefore, not choice, constrains its continued employment, rather as providing a convenient kind of cabinet or store-room, in which to store our daily accumulating facts, in an easily accessible form, to have them in readiness for use so soon as a more natural arrangement is discovered, than as affording such an arrangement itself.

The supporters of the circular method claim for it a higher degree of perfection, that of really furnishing a clue to THE Natural System, and apparently with much reason on their side. This method assumes that, nature has systematically arranged all her creations in a series of circular groups, each intimately united to others by a complex but beautifully simple network of affinities interwoven, if I may so speak, with a similar network of more remote analogies, all of which are found to exist in every perfect circle, and that these circles progressively diminish in magnitude from the highest to the lowest, until we arrive at the last link of the chain, *Species*. The primary circles are three—*Animals*, *Vegetables* and *Inorganic matter*. Animals being the Typical circle, Vegetables the sub-Typical, and Inanimate matter the Aberrant; which last is made up of three minor ones, the endless modifications of Earth, Water and Air; each equally perfect, thus making together a series of five.

Animals again divide themselves into three lesser groups, viz. *Vertebrate Animals*—having an internal bony skeleton—*Annulose* animals (insects, crabs, &c.) having a hard crust, or, as it were, an external skeleton—and *Acreta* or soft molluscous animals, having neither proper bone nor crust.

Vegetables in like manner divide themselves into three primary groups, viz. *Dicotyledons* or *Exogens*,—plants increasing in size by the addition of layers of new wood to the surface, or from without. *Monocotyledons* or *Endogens*, plants increasing in size by additions from within, the arborious forms of which have at first a hard crust, increasing in thickness towards the centre by additions of woody fibre to its interior. And lastly, *Acotyledons* or *Acrogens*, flowerless cellular plants. The third or Aberrant group of each of these kingdoms is again divisible into three perfect circles. The ACRETOUS circle of animals contains the *Acreta* proper—the *Mollusca* or slugs, snails, shell-fish, &c.: and the *Radiata* or starfish. The ACROGENOUS circle of vegetables in like manner naturally divides itself into *Fungi* or Mushrooms: *Protophyta* or sea-weeds and lichens: and *Acrobryous* or *Psendocotyledonous* plants including ferns, mosses, Hepaticæ, &c. The progressive blending between these circles, in their own kingdoms, is affinity. The more remote similarities or blending, as it were, of habits and properties often easily traceable between analogous circles of the two kingdoms is, the analogy mentioned as existing in every perfect circle.

Thus far the two kingdoms advance side by side and step by step together, presenting analogous groups in each. The Vertebrata represented by the Exogens—the Annulosa by the Endogens—the Acreta by the Protophta—the Radiata by the Fungi—and lastly, the Mollusca by the Acrobrya or Psendocotyledonia.

But when we advance beyond this point, and attempt to compare the Vertebrata and Exogens, we are arrested at the first step. The former is clearly divided by the hand of nature into three self-evident groups; the typical, *Mammals*—sub-typical, *Birds*—and the aberrant, *cold-blooded Vertebrata,* including *Reptiles, Fishes,* and *Amphibia,* each of which form a perfect circle: thus again completing the quinary series of circles. Wherein the exogenous or corresponding circle of plants do we find analogous groups? I am unable satisfactorily to answer the question, but still I cannot help thinking, as I shall by and by show, that parallel circles or groups may yet be found, and probably, when once traced, will prove as self-evident, even to the most casual observer, as the animal ones now are. The same remark is applicable to the Annulosæ and Exogens, where the parallel circles have not, so far as I am aware, been traced in the two kingdoms, but probably may readily be so, when the attempt is made by a competent observer who has made himself acquainted with the Zoological system, which, in first principles at least, seems to have gone far ahead of the Botanical.

Dr. Lindley in his elements of Botany has presented us with sketches of two circular arrangements of plants; each perhaps superior to those of any of his cotemporaries, but in which, so far as my comparatively limited acquaintance with the subject of circular arrangements, and indeed with the relationships of the vegetable kingdom generally, enables me to follow him, he does not appear to have succeeded in bringing out the affinities and analogies of his vegetable circle so clearly as Zoologists have their animal ones. In this opinion, I may perhaps be greatly in error, and in venturing to express it, may only be exposing my own ignorance of the subject, but still, such is the impression conveyed to my mind by their examination. The first series of analogies between the two kingdoms is however known, and when botanists have succeeded in tracing the second, it seems probable the subsequent ones will prove less difficult, as the mass of knowledge of vegetable structure and function already acquired, but hitherto only sparingly applied to such purposes, will supply many new elements, well adapted for forwarding the work of systematic arrangement. Jussieu founded his secondary divisions, in the Exogens, on the absence or presence of petals, and on their being one or more: hence his *apetalous*, *monopetalous*, and *polypetalous* groups: and his tertiary ones on the relative position of the ovary to the flower, that is, whether the stamens have an *inferior* (hypogynous), *superior* (epigynous), or *middle* (perigynous) attachment. DeCandolle has adopted this method with considerable modifications, but I do not think improvements as a natural arrangement, though well calculated to facilitate its use in practice.

Professors Lindley and Endlicher have each constructed arrangements of the natural orders, or natural systems of Botany, both very different from each other, and from their apparently more simple, though less natural predecessors. This improvement they seem to have accomplished by the avoidance of what may be called linear characters, which must inevitably, in some part of their course, become constrained and artificial; causing, like the Adjutant's measuring rod, the widest separation of brothers, simply because the one happens to be the tallest, the other the shortest man in his regiment. By allowing greater scope or circularity to their divisional characters, they have been enabled to bring together, under the name of alliances or classes, groups of allied orders, which are occasionally widely separated by the procrustive operation of linear characters. But though much has, by these and other similar attempts been effected to improve our arrangements, I still think we are far behind Zoology, through our not having yet discovered in our Exogenous and Endogenous groups, those almost self-evident secondary divisions or circles so clearly marked out by nature in the animal kingdom, and so ably taken advantage of by Zoologists, in working out their animal system.

To discover these, if they actually exist in nature, appears in the present state of the enquiry, to be the first and grand desideratum towards the discovery of the true natural system of plants. In the meantime however, our established orders and genera being for the most part pretty nearly natural, aided by the convenient practical grouping now in use, serves all the purposes of a more strictly correct and philosophical arrangement, leaving us for the time, very independent of a better, and allowing us to proceed at our own pace, leisurely feeling our way, while searching for the long and ardently desired natural one. And it is in the hope that some of the readers of this exposition of what is wanted, towards the construction of the basement of the natural system of plants, may be induced to turn their attention to the subject, and perhaps that some one luckier than the rest, may stumble on a clue which will lead himself or others to the desiderated point, and enable him, by the formation of truly natural secondary groups or circles, to complete at least the lower tier of the edifice.

It only now remains for me to offer a few remarks on vegetable organization, with reference to its employment in the construction of a natural system of Botany. These must unavoidably be brief and imperfect, and probably, so far as they go, little to the point, the ideas of botanists on this obscure subject being far from precise or settled on a firm basis, especially in what relates to the comparative value which should be assigned to each part, engaged in the complex organization of an Exogenous plant.

The organ principally regarded as the basis of all our attempts to obtain a natural arrangement is the embryo, when present, taken in connection with the plant which springs from it, whether, in short, it is mono-or di-cotyledonous, giving origin to an Endogenous or Exogenous plant, or is altogether absent as in Acrogens; plants still further distinguished from those of the two higher groups by their cellular texture, and the nearly total absence of vascular tissue.

Dicotyledonous or Exogenous plants have a woody stem, varying in solidity with their age from the tender herbaceous annual up to the almost stony hardness of the iron-wood tree; increasing, with some exceptions, in thickness by the annual addition to the surface, layer upon layer, of new wood, forming rings or zones round the axis: these zones are intersected transversely by medullary rays radiating from the central pith. Occasionally, as above hinted, increase of thickness does not take place by means of annual zones, the wood, at whatever age, appearing to consist of a single homogeneous zone. Dr. Lindley has taken advantage of this circumstance, and brought together most of the families in which it occurs to form his group of *Homogens*, distinguished by the Endogenous structure of their wood. Descending still lower in the scale we come to two groups of cellular plants, the *Rhyzanths*, mushroom-like plants, and the *Podostemons*, sea-weed-like plants, agreeing with Algæ in almost every thing except their fructification.

The leaves of Dicotyledons are usually attached to, and separate from, the stem by an articulation, and are reticulated, that is, their veins anastomose and form a network; but this is not quite absolute, as it is wanting in the leaves of most of the Gymnosperms.

The flowers are for the most part quinary in the number of their parts, and are generally furnished with both clayx and corolla; but departures from both these rules are frequent: most of the Homogens have ternary, and many families quaternary flowers, while numbers have no corolla.

The seed is usually enclosed in a pericarp, but here also a striking exception occurs, the whole of the coniferus family, forming Lindley's *Gymnosperms*, having naked ovules and seed, a privation combined with some interesting peculiarities of the anatomical structure of the whole plant. The seed itself is either perfect or imperfect, that is, is furnished with an embryo having two or more opposite cotyledons, or is sporulose: imperfectly developed as in Rhyzanths. The embryo also is perfect or imperfect, with or without albumen. The albuminous ones are *intra* or *extra* albuminous, enclosed within the albumen like the yoke within the white of an egg, or placed on the outside of it, as in the case of the curvembryate orders.

From this description, brief and imperfect as it is, we find there are five modifications of structure, as regards vegetation, forming so many distinct groups. 1st Exogens, as generally understood with the wood in zones or concentric circles: 2d Homogens, first associated as a distinct group by Dr. Lindley: 3d Gymnogens or Coniferæ: 4th Rhyzanths, having more the structure of Fungi than perfect plants; and 5th Podostemons, which seem to have an anatomical structure, nearly allied to Algæ, but which Mr. Griffith has determined, from actual dissection of the seed, to be dicotyledonous. Then as regards the structure of the seed there are exalbuminous and two modifications of albuminous embryos; and a fourth where it is imperfect. The albumen, moreover, greatly varies in quantity, being sometimes very abundant with a minute embryo, varying thence to a large embryo and very sparing albumen.

All these variations are available for the purposes of classification, and doubtless when thoroughly investigated, with special reference to this object, will furnish very sufficient secondary circles. The zoned angiosperms, *Zonagens,* may then perhaps be found to represent the typical circle, the parallel or analogy of Mammalia; the *Homogens* the sub-typical, the parallel of Birds; while the *Gymnogens,* the Rhyzanths *(Hysterogens)*, and Podostemons (*Protogens*), would unite to form the aberrant circle. In this case the 1st would represent in the Exogenous circle, and have for its analogies in the general system of plants, the Dicotyledons: the 2nd the Monocotyledons: the 3d the Acrobrya or ferns: the 4th Hysterophyta or Fungi, and the last the Protophyta or sea-weeds. Here we have a series of apparently circular groups, all based on anatomical structure and physiological peculiarities, without reference to the anatomy of the seed, except in so far as regards the embryo. Whether these, when properly analysed, will prove perfect circles, is a point still to be ascertained. It is a difficult enquiry, and the whole subject is far too deeply involved in obscurity for me to offer any opinion in anticipation, beyond the passing remark, that these groups have a circular appearance, and give promise that, though they may not supply all we want, yet that their thorough investigation may put us on the right path, and speedily enable us to reach the long and anxiously sought for goal.

Endogens have a stem increasing in thickness by additions of new matter to the centre, made up of vascular and cellular tissue, without distinction of pith, wood, medullary rays, or bark: the cellular tissue being traversed by bundles of vessels, often, as in all the arboreous forms, palms, the surface first becoming hard and woody or as it were crustaceous. Leaves with parallel veins connected by smaller transverse ones, usually sheathing at the base and not readily separating by articulation. Flowers usually ternary, with both calyx and corolla, but sometimes both series so closely resembling each other in colour, size, texture, and form, as to be undistinguishable; or occasionally they are imperfect or altogether wanting. Seed in a pericarp. Embryo furnished with albumen or rarely exalbuminous, with one cotyledon, or if more, alternate, (not opposite as in dicotyledons) the radicle enclosed within the embryo through which it bursts in germination.

From this general description it would appear there is an uniformity of structure of both the vegetation and seed, little favourable to the formation of well-defined groups. This however on closer inspection is not found to be the case as regards the habit and vegetation of several tribes. We have for example the Lilaceous class, as understood by Redoute, including nearly all the gay, flowering, herbaceous forms. The palms. The Retose families of Lindley, representing the Homogens, generally composed of climbing shrubs with homogenous wood and dicotyledonous foliage, but monocotyledonous seed. The Aroideous families, and lastly, the Glumaceous. How far these five groups are strengthened by variations in the conformation of seed, I am as yet unable to say, not having given that attention to the subject which it requires, but I apprehend, when they also are closely examined, with special reference to this enquiry, that many points in confirmation of their stability will be found, and, with their aid, a series of perfect circles be discovered, presenting striking analogies with others referable to the exogenous circle. Until however this is effected, Lindley's very practical, I think also most natural distribution of these tribes, leaves little to be desired by the practical botanist.

On the last great division of the vegetable kingdom, the *Acrogens*, or Cryptogamic plants, I have nothing to add to what I have already said. This group certainly forms the aberrant circle, and like the analogous circles in the animal kingdom, is made up of three smaller ones, each of which seems complete, though all require verification.

For those wishing to acquire a deeper insight into the science of plants than these pages can possibly supply, I would particularly recommend the study of Dr. Lindley's Elementary Botanical works, which are by far the best in the English language. His recently published Vegetable Kingdom I have not yet seen, but it is very highly spoken of by two of my Correspondents who have. In its arrangement, I learn, he has considerably departed from both those referred to above, as given in his Elements and Natural System, falling back in a great measure on the plan of Jussieu, but greatly improved. To those desirous of becoming acquainted with the first principles, and many of the details of the circular system of classification, Swainson's volumes of Lardner's Cyclopædia are the only easily procurable text-books, and are among the most interesting volumes I ever read on Natural History."

THE

Calcutta Journal

OF

NATURAL HISTORY.

Contributions towards a Flora of Ceylon, being the description of CHRISTISONIA, *a new genus of the tribe* CYRTANDREÆ. *By* GEORGE GARDNER, *F.L.S., Superintendent of the Royal Botanic Gardens, Ceylon, &c. &c. &c.*

CHRISTISONIA, *Genus novum.*

CHAR. GEN.—*Calyx* tubulosus, quinquifidus, 5-angulatus, æqualibus vel sub-bilabiatus. *Corolla* hypogyna, tubo infundibuliformi, fauci ampliata, limbo 5-lobo, sub-bilabiato. *Stamina* corollæ tubo inserta, 4; didynama, fertilia, inclusa, vel raritu exserta: *filamentis* complanatis: *antheris* unilocularibus, apice poro obliquo dehiscentibus, dorso basi calcaratis, coherentibus. *Discus* hypognus nullus. *Ovarium* ovato-oblongum, uniloculare: placentis parietalibus bifidis, lobis utrinque multiovulatis. *Stylus* filiformis, simplex: *stigma* bilabiata: labio superiore abortiente vel nano; *inferiore* sub-orbiculare vel oblongo. *Capsula* calyce inclusa, sub-globosa, unilocularis, bivalvis, valvis medio placentiferis. *Semina* plurima, oblonga, obtusa; *funiculo* brevi crassiusculo; *testa* laxa, membranacea, reticulata. *Embryonis* albuminosi, orthotropi. *Cotyledones* breves obtusæ: *radicula* crassa obtusa.

Herbæ *Ceylanicæ et Indicæ, in aliarum Stirpium radicibus parasiticæ;* caulibus *brevibus, simplicibus vel simpliciter ramosis, aphyllis, squamosis, superne floriferis,* floribus *magnis, roseis vel luteis, pedicellatis, subracemosis.*

Obs.—When my paper on the *Cyrtandreæ* of Ceylon was published in the 6th Vol. of the "Calcutta Journal of Natural History," I was aware of the existence of the present genus, from imperfect drawings of three species in the Garden Library, but, in the absence of all knowledge of their internal structure, referred them provisionally to the genus *Phelipæa.* Since then I have been fortunate enough to meet with three species in a recent state, and from an examination of their characters have discovered, that they belong to an undescribed genus of *Cyrtandreæ,* and clearly referable to the Section *Loxonieæ.* From the five genera which DeCandolle refers to that group, the present is strikingly different in habit, being leafless and parasitical on the roots of other plants; but in the structure of the flower, fruit, and seed, it comes very near indeed to *Rehmannia,* Libosch., differing from it chiefly in having 1-celled anthers, no hypogynous disk, and very unequal lobes of the stigma.

Besides the three species which I have been able to describe from recent specimens, I believe that I can give sufficiently good diagnostic characters of two other Ceylon ones from the figures above referred to; and in my Herbarium I find excellent specimens of a sixth species from the Neilgherry Mountains in the Peninsula of India, which I owe to the kindness of Dr. Wight. To these I add *Phelipæa subacaulis* of Bentham (Scroph. Ind. p. 55.), which, judging from the description, is evidently a congener.

It is with much pleasure that I dedicate this beautiful genus to Dr. R. Christison, Professor of Materia Medica in the University of Edinburgh, an honour which has been long due to him for his labours in connection with the properties of plants. In doing so, it besides affords me an opportunity of publicly expressing my thanks to him for the facilities afforded me in gaining a knowledge of the characters of the Barks of commerce, from specimens in his Museum, previous to my departure for South America.

1. Christisonia grandiflora, *Gardn.*

C. Scapo subramoso squamoso, ramis 1-3-floris, pedicellis ebracteatis, lobis calycis lanceolatis acutis æqualibus, corolla (rosea) calyce triplo longiore, limbo bilabiato, lobis subæqualibus margine undulato-crenulatis, filamentis glabris, antheris oblongis, calcaribus ascendentibus, sitgmate depresso-suborbiculare.

Hab.—Parasitic on the root of a large Acanthaceous shrub, on the ascent of Adam's Peak from Ratnapoora, at an elevation of about 5,000 feet. Flowers in March.

Descr.—*Epirhizal*, herbaceous, leafless, glabrous. *Roots* fibrous, glabrous, brown. *Stem* subramous, round, glabrous, 2-3-inches long, scaley. *Scales* ovate, obtuse or acute, brownish, about 4 lines long. *Flowers* 1-3, at the ends of the branches, pedicellate. *Pedicels* round, glabrous, thickened towards the apex, of a brownish colour, 1 inch long. *Calyx* free, tubular, 5-angled, glabrous, brownish, 9 lines long: *limb* 5-lobed, lobes lanceolate, acute, erect, equal. *Corolla* gamopetalous, hypogynous, infundibuliform, about 3 inches long: *limb* bilabiate; *upper lip* subrotund, 2-lobed, lobes rounded, approximate; *lower lip* 3-lobed, lobes obovate, the two lateral ones emarginate, the whole of a pale rose colour, except the base of the lower lip, which is bright yellow. *Stamens* 4, didynamous, inserted on the lower part of the tube of the corolla: *filaments* complanate, curved: *anthers* oblong, cohering, each opening by a single pore at the apex, and with an erect spur about its own length arising from the back of the connective. *Ovary* free, 1-celled, with two parietal placentæ which stand right and left to the axis of inflorescence. *Ovules* numerous, attached to both surfaces of the diverging plates of the placentæ. *Style* filiform, included, glabrous: *stigma* 2-lipped, the upper lip abortive, the lower flat, roundish, yellow.

OBS.—In habit this comes nearest to the following species, but they are otherwise very distinct. Nothing can exceed the beauty of their flowers when seen growing in clusters of about a dozen together; and it is much to be regretted that they are not susceptible of cultivation.

2. CHRISTISONIA TRICOLOR, *Gardn.*

C. Scapo subramoso squamoso glabro, ramis 1-2-floris, pedicellis ebracteatis, lobis calycis lanceolatis acutis æqualibus, corolla (rosea) calyce triplo longiore, limbo bilabiato, labio superiore bilobo, lobis denticulatis, lobis labii inferioris subæqualibus vix denticulatis, filamentis glabris, antheris oblongis, calcaribus deflexis, stigmate oblique depresso-rotundato.

HAB.—Parasitical on the roots of Acanthaceous shrubs in forests on the Hautane and Rambodde ranges, Ceylon, at an elevation of from 3 to 4000 feet. Flowers in June to August.

DESCR.—*Epirhizal*, herbaceous, leafless, glabrous. *Stem* terete, subramous, about 2 inches long, distantly squamose. *Scales* ovate, acute, 5 lines long. *Flowers* 1-2, at the ends of the branches, pedicellate. *Pedicels* terete, thickened and somewhat angled towards the apex, of a reddish colour, and about 9 lines long. *Calyx* free, persistent, tubular, 5-angled, glabrous, red, 8 lines long: *limb* 5-lobed, lobes lanceolate, acute, erect, equal. *Corolla* hypogynous, gamopetalous, infundibuliform, about 2½ inches long: *limb* bilabiate: *upper lip* 2-lobed, lobes rounded, denticulate, of a blood-red colour: *lower lip* 3-lobed, lobes about equal, scarcely denticulate, together with the outside of the tube of a pale rose colour; the lower part

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...ibus obtusis deflexis, stigmate oblongo-

obtuso curvato.

with the outside of the tube of a pale rose colour; the lower part of the lobes and throat of a bright yellow colour. *Stamens* 4, didynamous, inserted on the lower part of the tube of the corolla : *filaments* flattened, glabrous : *anthers* oblong, cohering, 1-celled, opening by a single pore at the apex, each with a lower deflexed spur at its base. *Hypogynous disk* none. *Ovary* free, 1-celled. *Ovules* numerous, attached to two parietal placentæ. *Style* filiform, glabrous : *stigma* 2-lobed, the upper lobe abortive, the lower round, flat, yellow. *Capsule* ovate-globose, enclosed in the persistent calyx, and crowned with the base of the style, glabrous, about 6 lines in diameter, between coriaceous and fleshy, 1-celled, 2-valved, the valves placentiferous in the middle. *Placentæ* slightly projecting, and then diverging right and left, each branch dilating into a thick fleshy triangular body, which bears seeds on its entire surface. *Seeds* attached by a short orange-coloured funiculus, mostly horizontal, oblong, obtuse, slightly curved, reticulately striated, and of a brownish colour : *testa* membranous, consisting of two coats, the outer lax and separating easily from the inner, which is punctate, of a brownish colour, and firmly adherent to the albumen. *Embryo* orthotropous, in the axis of fleshy albumen, elliptical : *cotyledons* small, fleshy : *radical* conical, obtuse, directed towards the hilum.

Obs.—This, as a species, is distinguished from the last by its smaller corolla, which has besides a three-coloured limb, and the deflexed, not erect, spurs of the anthers. It is by far the most common species, and the three brilliant colours of the limb of the corolla give it a very striking appearance.

3. Christisonia neilgherrica, *Gardn.*

C. Scapo crasso simplici basi densi imbricato-squamoso glabro, floribus racemosis, pedicellis bibracteatis erectis, calyce 5-dentato sub-bilabiato, dentibus obtusissimis, corolla (lutea ?) calyce subduplo longiore, limbo bilabiato, labio superiore erecto bilobo, labiis intigris, lobis labii inferioris patentibus subæqualibus obtusis integris, filamentis glabris, antheris ovatis, calcaribus obtusis deflexis, stigmate oblongo-obtuso curvato.

HAB.—In woods near Pycarrah, on the Neilgherry Mountains, Peninsula of India, *Dr. Wight.*

DESCR.—*Epirhizal*, herbaceous, leafless, glabrous. *Scape* thick, obtusely angular, scaley, 3-4 inches long. *Scales* on the lower part ovate, very obtuse, densely imbricated, about 5 lines long, those on the middle distant. *Flowers* 8-12, densely racemose, yellow? *Pedicels* thick, angular, erect, 6-8 lines long, arising from the axile of an ovate-oblong, obtuse scale, about as long as itself, bibracteate below the middle. *Bracts* oblong-spathulate, acute, veined, denticulate at the apex, about 6 lines long. *Calyx* free, persistent, tubular, 5-angled: *limb* bilabiate, the *upper lip* 2-lobed, the *lower* 3-lobed, all the lobes short, broad, and very obtuse, the whole 9 lines long. *Corolla* hypogynous, gamopetalous, infundibuliform, about 15 lines long: *limb* bilabiate, the *upper lip* erect, 2-lobed, the *lower* 3-lobed, patent, the lobes of both lips rounded and very obtuse. *Stamens* 4, didynamous, inserted on the tube of the corolla: *filaments* complanate, glabrous, included: *anthers* cohering, 1-celled, each opening by a single pore at the apex, and produced into a short, conical, obtuse, deflexed spur at the base. *Ovary* free, ovate, glabrous, 1-celled. *Ovules* numerous, attached to two parietal placentæ. *Style* filiform, persistent, glabrous. *Stigma* 2-lobed, the upper lobe abortive, the lower oblong, flattened, obtuse, curved downward. *Capsule* included in the persistent calyx, globose, about 5 lines in diameter, crowned with the base of the style, 1-celled, 2-valved, with a loculicidal dehiscence, the valves placentiferous in the middle. *Placentæ* projecting nearly into the middle of the cavity of the cell, with two diverging revolute lobes, which are covered on both sides with seeds. *Seeds* horizontal, attached by a short funiculus, oblong obtuse: *testa* loose, brown, reticulated.

OBS.—The specimens from which the above description is made, I owe to the kindness of my learned and excellent friend Dr. Wight. When I was on the Neilgherries with him in the month of February 1845, we visited the only locality which he knows for it, but, as it only flowers in the wet season, not a vestige of it was then to be seen. Although strictly a congener of the Ceylon species, it differs from all of them in having a somewhat bilabiate calyx, and the anterior lip of the stigma oblong, not broadly dilated. Dr. Wight, so far as I now recollect, stated that the corolla was of a yellow colour. It differs from the two preceding species, and agrees with all the following, in having an unbranched scape.

4. Christisonia pallida, *Gardn.*

C. Scapo simplici elongato infra medium verrucoso-hispido cæteris distanter squamoso, floribus racemosis, pedicellis bibracteatis, calyce 5-fido, lobis ovatis acutis æqualibus, corolla (pallide rosea) calyce subduplo longiore, limbo patente, laciniis rotundatis subæqualibus undulatis integris, filamentis glabris, antheris ovato-oblongis, calcaribus ascendentibus acutis, stigmate oblique depresso-rotundato.

Hab.—On the Hunnisgiria range, Central Province, Ceylon. *Mr. Lear*, 1839.

Descr.—*Epirhizal*, herbaceous, leafless. *Scape* simple, the lower portion verrucosely hispid, the upper glabrous and distantly scaley, about 5 inches long. *Scales* obtuse, reddish, 6 lines long. *Flowers* about 4, racemose. *Pedicels* short. *Calyx* tubular, of a pale red colour, about 1 inch long: *limb* 5-toothed, teeth ovate, acute. *Corolla* infundibuliform: *tube* yellowish, a little constricted at the throat, about 2 inches long: *limb* 5-lobed, patent, somewhat bilabiate, *lobes* rounded, entire, undulated, the two upper whitish, the three lower pale rose-coloured. *Stamens* 4, didynamous, inserted on the lower part of the tube of the corolla: *filaments* glabrous: *anthers* ovate-oblong, 1-celled, each opening by a single pore at the apex, and with an erect, conical, acute spur, as long as itself at its base. *Ovary* free, ovate. *Style* filiform, glabrous: *stigma* 2-lobed, the upper lobe abortive, the lower thick, flattened, roundish, obtuse.

Obs.—The above description is taken from a drawing in the Library of the Royal Botanic Garden, which was made from a specimen brought from the Hunnisgiria range, in the year 1839, by Mr. Lear, who was then Officiating Superintendent of the Garden. In habit the plant approaches nearest to the next species, but is well distinguished from it by the much larger size of the corolla, which is besides more distinctly bilabiate, and of a pale rose, not yellow, colour. The filaments are moreover represented as glabrous.

5. Christisonia bicolor, *Gardn.*

C. Scapo simplici elongato verrucoso-hispido ad apicem squamoso, floribus racemosis, pedicellis bibracteatis, calyce 5-fido extus piloso-pubescente, lobis ovatis acutis æqualibus, corolla (lutea) calyce duplo longiore, limbo patente, laciniis rotundatis subæqualibus integris, filamentis glanduloso-pilosis, antheris oblongis, calcaribus erectis acuminatis, stigmate subtriangulare emarginato.

Hab.—On the roots of an Acanthaceous shrub in forests on the Hautane range, in the Central Province, Ceylon, at an elevation of about 3,000 feet. Flowers in August.

Descr.—*Epirhizal*, herbaceous, leafless. *Scape* 3-4 inches long, simple, verrucosely hispid from numerous small root-like protuberances, naked below, scaley above. *Scales* ovate, acute, about 4 lines long, pilose pubescent, red. *Flowers* racemose, few. *Pedicels* about 6 lines long, bibracteate about the middle: *bracts* oblong, acute, pubescent, red. *Calyx* free, tubular, pilose pubescent, of a brick-red colour: *limb* 5-toothed, teeth ovate, acute. *Corolla* hypogynous, gamopetalous, infundibuliform, yellow: *tube* dilated at the throat, about 1½ inch long: *limb* 5-lobed, patent, lobes about equal, rounded, entire. *Stamens* 4, didynamous, inserted on the lower part of the tube of the corolla: *filaments* glandularly pilose: *anthers* oblong, curved, glabrous, 1-celled, each opening by a single pore at the apex, and with an erect acuminate spur, longer than itself. *Ovary* free, ovate, 1-celled, with two projecting parietal placentæ, each terminating in two recurved fleshy laminæ, which are covered with ovules on both sides. *Style* filiform, glabrous: *stigma* 2-lobed, the upper lobe abortive, the lower flattened, somewhat triangular, emarginate.

Obs.—Readily distinguished from all the other species by the brick-red colour of the calyx, the yellow corolla, pilose filaments, and emarginate lower lobe of the stigma.

6. Christisonia unicolor, *Gardn.*

C. Scapo simplici basi verrucoso-hispido ad apicem dense squamoso, floribus terminalibus subracemosis, pedicellis bibracteatis, calyce 5-dentato, dentibus latis obtusissimis æqualibus, corolla (lutea) calyce duplo et ultra longiore, limbo bilabiato, lobis rotundatis integris, staminibus exsertis, antheris coalitis.

Hab.—Hunnisgiria range, Central Province, Ceylon. *Mr. Lear*, 1839.

Descr.—*Epirhizal*, herbaceous, leafless, and the whole plant of a yellow colour. *Scape* simple, about 4 inches long, the lower half warted, the upper densely scaley. *Scales* obtuse, about 6 lines long. *Flowers* terminal, somewhat racemose. *Pedicels* about 7 lines long, bibracteate about the middle. *Calyx* tubular, about 7 lines long, with a very obtuse 5-toothed limb. *Corolla* infundibuliform: *tube* dilated at the throat, slightly curved: *limb* bilabiate, the *upper lip* erect, 2-lobed, the *lower* patent, 3-lobed, all the lobes rounded entire. *Stamens* 4, exserted: *anthers* cohering.

Obs.—This species I describe from a drawing in the Garden Library. In habit it agrees perfectly with the others, but differs from them all in being of an uniformly yellow colour, and in having exserted stamens. The anthers are too imperfectly represented to afford any knowledge as to their structure.

7. Christisonia subacaulis, *Gardn.*

"Caulis brivissimus, crassus, squamatus. Pedunculi in caule 3-4, squamis breviores, uniflori. Calyx 6-7-lin. longus, tubulosus, basi parum inflatus, apice irregulariter 4-5-dentatus. Corolla 2-2½-pollicaris; tubus basi tenuis, e calyce breviter exsertus, dein in faucem amplam dilatatus; limbus breviter et late sub-bilabiatim 5-lobus. Stamina 4, glabra. Antheræ glabræ, loculis calcaratis, stigma capitatum? Capsulam non vidi."—*Bentham.* Phelipæa *subacaulis, Benth. Scroph. Ind. p.* 55. *Walp. Repert. Bot. Syst.* 3, *p.* 463.

Hab.—"In Peninsula? In Herb. Madr. cum *Æginetia abbreviata* miscitur." *Benth. l. c.*

Obs.—The above description, copied from Mr. Bentham, as I possess no specimen, so completely agrees with the essential character of the present genus, that I have no hesitation in considering it an additional species. It is impossible to say how far it differs from some of the Ceylon species, but the much larger size of the corolla would appear to point it out as distinct from the Neilgherry one, independent of the shape of the calyx.

Kandy, Ceylon: 21st August, 1847.

Notes on Indian Botany. By ROBT. WIGHT, M. D., F.L.S., *Member of the Imp. Acad. Nat. Curios. of the Royal Bot. Society of Ratisbon, &c. &c.*

ON VACCINIACEÆ AND THEIR AFFINITIES.

Judging from the summary given at the head of Lindley's 'Vegetable Kingdom,' of the several attempts towards the construction of a natural system of Botany, it may fairly be assumed, that within the last few years, this most interesting but difficult branch of the science has drawn to itself an unusual amount of attention, and that its principles may now be considered in a rapid state of transition from those faintly recognized in the first attempts of Ray and Tournefort, or that more perfect method so distinctly sketched by the illustrious Jussieu, in his admirable genera.

So partial indeed have Botanists, within these few years, become to this mode of exercising their ingenuity, that we scarcely ever meet with a new work on Botany in which the author has not deemed it desirable to try his hand at the improvement of already existing methods.

Of the present long list of living Botanical authors, I doubt whether there is one who has written so much as the author of the 'Vegetable Kingdom,' and few, if any, have written to better purpose than he has: and, as a constructor and amendator of natural methods of Botany, he has no compeer; each of the numerous publications of that accomplished and indefatigable author being almost sure to present some modification of what went before from his own pen, and his last great work, the 'Vegetable Kingdom,' outstrips all its predecessors in that respect.

Numerous however as are the changes introduced, I believe I speak the general sense of Botanists, when I add that most of these are considered improvements, and that even those which are most objected to, still claim our respect on account of the talent and ingenuity with which they are brought forward and supported.

Before entering on the consideration of the affinities of *Vacciniaceæ*, as these are received by Botanists generally, including Dr. Lindley himself, up to the date of his last publication, and as now placed in the 'Vegetable Kingdom,' it is necessary very briefly to advert to the principles of Jussieu's arrangement, whose original views, but with great modification, Dr. Lindley now adopts, justly considering him "beyond all comparison the greatest of Botanical Systematists."

Jussieu founded his primary divisions of Dicotyledonous plants on the assumed degree of perfection of the flowers, as apetalous, monopetalous, polypetalous, diclinous: the secondary divisions or classes on the relative position of the stamens to the ovary as Epigynous, Perigynous, and Hypogynous. According to this arrangement, if rigidly adhered to, Vacciniaceæ must have been referred to his 11th class Monopetalæ Epigynæ, in place of which, viewing them as inseparable from his order Ericeæ, he placed them as an Epigynous suborder of that family, in his 9th class Monopetalæ Perigynæ.

As already remarked, all subsequent Botanists have, until the publication of the 'Vegetable Kingdom,' adopted his arrangement, merely excluding some obviously misplaced genera, with the exception of elevating his suborder to the rank of an independent order, but still placing them side by side, esteeming the difference of the position of the stamens and ovary of less moment than the form of the corolla, the marked peculiarity of the anthers, and similarity of structure of ovary and seed found to exist in the two orders.

Dr. Lindley, by the adoption of a more rigid application of Jussieu's principles of arrangement than the founder deemed advisable, has now, however, been induced to take a different view of their affinities, and by more closely adhering to the technical characters of the system, has, while retaining the Ericaceæ in his Hypogynous sub-class, removed Vacciniaceæ to the Perigynous one, an alteration which has the effect of interposing 300 pages of his work between two families, which other botanists consider nearly inseparable, on the ground that no character can be given for their separation except the free or adherent ovarium; the habit of many of the species being the same in both. In making this change he remarks: "It is usual to station these plants (Vacciniaceæ) with Heathwort's (Ericaceæ,) to which they bear much resemblance, and of which they are no doubt representatives in the Epigynous sub-class. They are however to all appearance closely allied to Cinchonads (Rubiaceæ) in their monopetalous flowers, inferior ovary, and albuminous seed. * * * Upon the whole, Cranberries may be considered as an order standing on the borders of the Epigynous and Hypogynous sub-classes, and of the Cinchonal and Grossal Alliances."

On the principle strongly insisted upon by Zoologists, that each division of the animal kingdom should find representatives in all the other divisions: the station assigned by Dr. Lindley to this order seems at first sight the more correct of the two, as Vacciniaceæ assuredly present in their adherent ovary one rather strong point of relationship with cinchonal alliance. But on the other hand, its affinity with the erical alliance is indicated by several of equal or even greater strength, such as the exact similarity of the flowers, the remarkable structure of the anthers, the alternate exstipulate leaves, and the habit generally. These two families being attached by so many points of relationship that their separation on account of one only, cannot but be viewed as the first step towards breaking down a very natural alliance hitherto preserved intact, by the almost unanimous verdict of Botanists, all of whom appear to esteem the characters by which they are held together as of much greater weight than the solitary one, the adherent ovary, on the strength of which it is proposed to separate them so widely.

After the fullest consideration, I confess I am still disposed to coincide with the majority, because I cannot but esteem strong family likeness an element not to be overlooked in the determination of affinities, however difficult to define: because, in this instance, I attach less value to Hypogynous and Epigynous insertion of the stamens than Dr. Lindley has accorded: and because the proposed alteration deprives us in a twofold way, of the aid in the determination of affinities, derived from family likeness; first, by taking Cranberries from an alliance in which it is strikingly present, and secondly, by placing them in another in which it is to the full as strikingly absent, thereby doing violence to both.

But for the present, leaving habit out of consideration, we find that Vacciniaceæ associate with Ericaceæ in two of the three prominent points adduced by Lindley, as indicating their affinity with the Cinchonads, both have monopetalous flowers, and both have albuminous seed, and both depart from the Cinchonads in their alternate exstipulate leaves and campanulate corolla; anthers opening by pores, and usually furnished with appendages, none of which, but as rare exceptions to the general rule, are met with in the Cinchonal alliance: add to these readily definable characters, the equally, easily appreciable, though not so easily described one of habit, and we have, I think, such a preponderance of characters on one side, as greatly to outweigh those adduced on the other, which indeed is limited to the adherence of the ovary. It cannot be questioned that that is an important character, but not such as to set aside several others standing opposed, each of equal or even greater weight. Then as to their representative relations, they are of about equal force, since it is just as correct to say that Vacciniaceæ are the representatives of the Perigynous sub-class in the Epigynous, as that they are the representatives of the Epigynous in the Perigynous.

Influenced by the great preponderance of evidence adduced in favour of the generally admitted relationship of Vacciniaceæ and Ericaceæ, and perhaps attaching less importance to characters taken from the mere relative extension and cohesion of the calycine tube with the ovary, than the celebrated author of the invaluable work so often referred to, it does not appear to me that the change of station of the former of these orders, from the Erical to the Cinchonal alliance, is an improvement, and I therefore anticipate its retention in its old place by future botanists.

Having premised these general observations on the affinities of the order, I shall now proceed to offer a few remarks on the limits of the genus Vaccinium itself. These I extract from the first part of Vol. 4th of my Icones, which will shortly be published, adding characters of some new species figured in that work, principally derived from the collections of the late Mr. Griffith, also of a new species of Gaultheria, and two of Rhododendron, derived from the same source.

"VACCINIUM.

Dunal, in his monagraph of the Order *Vacciniæ*, retains *Agapetes* and *Thibaudia*. Endlicher, Miesner, and Lindley unite them: Kunth is followed by Miesner in expressing a doubt as to whether *Ceratostema* is distinct from *Thibaudia*, and Hooker states that he "cannot understand what are the essential distinguishing marks between them." Among the following are species which have been referred by different Botanists to *Ceratostema*, *Agapetes*, *Thibaudia*, *Gaylussacia* and *Vaccinium*. To determine among so many genera it became indispensable to examine the characters of all with much care. After the closest scrutiny and careful dissection of the flowers of all the

Indian species in my collection, side by side, with several acknowledged *Vaccinia*, from both America and Europe, I found it utterly impossible, from the characters given, to make out more than one genus among the Asiatic ones, the structure being the same in all. By Roxburgh these would perhaps have been all referred to *Ceratostema*, Wallich refers them to *Thibaudia*, while Don and Dunal form the genus *Agapetes* for their reception. Had long tubular flowers been a constant feature, I might on that account, aided by geographical distribution, have followed these authors, and, assuming that as its essential character, kept up their genus. This however is far from being the case, and therefore, as a generic character, is useless. And on turning to Dunal's character of *Vaccinium*, I find the corolla described as 'campanulata, urceolata vel cylindrica.'

In all the Indian ones it is either urceolate or cylindrical. He describes the stamens as 'limbo calycis inserta,' which is the case in all the Indian ones I have examined, and the fruit 'bacca calyce vestita globosa 4 aut 5-locularis loculis polyspermis, rarissime 10-locularis loculis monospermis,' which, except the last clause, is equally applicable to the fruit of all I have had an opportunity of examining. The ovary, unfortunately, is not referred to in the character of either genus. The concluding clause of the character may perhaps account for Professor Lindley's referring one of the species to *Gaylussacia*, which, while that clause remains as part of the character of *Vaccinium*, seems scarcely a distinct genus, the fruit having 10 cells with one seed in each, being its essentially distinguishing mark. In all other points Dunal's characters of the two genera are nearly word for word the same, and the abortion of all the ovules but 2 in each of the 5 cells converts *Vaccinium* into *Gaylussacia*, and, unless care is bestowed in the examination, even that is not necessary, as a transverse section of a nearly mature fruit almost always presents the appearance of 10 cells with one seed in each, and I feel nearly certain, that an examination of the *ovary* will show that but few of Dunal's 29 species have it 10-celled, with a single ovule in each. *G. dependens*, an authentic specimen of which was most obligingly communicated to me by Mr. Gardner of Ceylon, has a 4-celled ovary, with numerous ovules, and is in fact a quadrimerous species of *Vaccinium* with very short anther tubes.

Whether *Ceratostema* can be kept distinct I am unable to say, but, judging from the really essential points of the character, apart from the numerous non-essential ones introduced by Dunal, I think not. *Thibaudia* has one good distinguishing mark in the union of the filaments between themselves and their attachment to the base of the corolla. But if that is to be taken as the essential character of the genus, then both *Macleanea* and *Anthopterus* should be associated as sub-genera, the collateral marks derived from the calyx and corolla being scarcely of generic value in a family where these organs are so variable.

Influenced by such considerations, I have without hesitation referred all the Indian species to *Vaccinium*, with the sub-generic appellation *Agapetes*, to mark their Asiatic origin. The following I consider the correct characters of the genus, and would view all species in which they meet as genuine species.

Calyx adherent, limb 4-5-lobed. Corolla tubular 4-5-cleft. Stamens 8-10-epigynous, anthers adnate, 2-celled, often furnished with 2 bristles on the back, the cells ending in a tube open at the apex. Ovary 4-5-celled, placentas ascending, usually bearing the ovules on the margin. Berry 4-5-celled, often spuriously 10-celled through the adherence of the walls to the thickened placentas. Seed several in each cell, testa coriaceous or somewhat bony: albumen fleshy: embryo orthotropus, radicle next the hilum.

Trees, shrubs, &c. &c.

According to this character, it is of no moment whether the lobes of the calyx are large or small, whether the corolla is long or short, thick or thin: the anthers may or may not be bristled, but are always expected to have the cells more or less prolonged into tubes, and to have the number of cells of the ovary equal to those of the lobes of the calyx and corolla, with more or less distinctly free ascending placentas and a plurality of ovules. Such is the genus *Vaccinium*, as understood by me when naming the following and several other still unpublished species in my herbarium.

Vaccinium (A.) Wallichianum, (R. W.) Leaves subsessile, lanceolate acuminate, entire glabrous, congested towards the ends of the ramuli: racemes axillary, erect, shorter than the leaves: flowers tubular, drooping, and with the pedicels and calyx sprinkled with longish hairs: pedicels dilated, cup-shaped at the apex: anthers rough, without bristles, ending in two long tubes, cohering nearly half their length: stigma dilated.—*R. W. Icon.* 1180.

Sylhet? I am indebted to Dr. Wallich for the specimen from which this drawing was made, but without station or name, I have therefore dedicated it to him. The leaves are from 2 to 3 inches long, and about 1 broad, the flowers dark-pink, about an inch. In some points it seems to correspond with Roxburgh's *Ceratostema variegata,* but judging from Royle's figures of that species, is certainly distinct, if his is the true plant.

VACCINIUM (A.) VERTICILLATUM, (R. W. *Agapetes verticellata,* Don. *Thibaudia setigera?* Griffith MSS.) Stems shrubby: leaves verticillate, lanceolate, acuminate, minutely denticulate, acute at the base: flowers racemoso-corymbose: peduncles and calyx hispid, corolla glabrous, 'corolla about an inch long, 5-lobed, lobes short: filaments slightly cohering: anthers bifid: stigma simplish (sub-simplex.)'—*D. C. Prod.* 7, 554, *R. W. Icon.* 1181.

Pundua Mountains, Wallich; Khasya, Griffith. I am indebted to Mr. Griffith for my specimens.

It is with considerable diffidence I have adopted the present in preference to Mr. Griffith's name, as the two species seem very nearly allied, if actually distinct. *V. (A.) setigerum* is said to have the leaves elliptic-lanceolate attenuated, obtuse at the base, but in *verticillatam,* acute at the base; that added to verticillation is the principal character, and they associate in the specimen before me. There is another point in which the specimen agrees with the latter, the filaments in it are glabrous while in *setigerum,* they are said to be bearded.

The magnified corolla is represented much too hairy, an error entirely owing to the imperfection of our lithography, for in the original drawing it is shown scarcely even pubescent: some of the young unexpanded flowers have a few scattered hairs near the point the expanded ones, unless when seen under a considerable magnifier, appear quite glabrous.

VACCINIUM (A.) HIRSUTUM, (R. W.) leaves elliptic-lanceolate, entire, glabrous or sub-pubescent, recemes erect, corymbose, many flowered: flowers tubular, long pedicelled: pedicels shorter than the peduncles, slender, and like the calyx and corolla, hairy: filaments short: anthers pubescent, without bristles, ending in two long tubes, cohering nearly half their length.—*R. W. Icon.* 1182.

Sylhet? I received the specimen along with the above, No. 1180, from Dr. Wallich, without station or name. Though rather imperfect, I have ventured to introduce a figure of it, being so very distinct from all I have seen, nor does it correspond with any described species.

Vaccinium (A.) serpens, (R. W.) shrubby, procumbent: branches terete, the young shoots clothed with coarse dark brown hairs: leaves coriaceous, subsessile, distichous, subcordato-ovate, obtuse, mucronate, glabrous on both sides, recurved, and slightly denticulate on the margin: flowers axillary, solitary or rarely paired: pedicels shorter than the leaves, slender, hairy: calyx tube 5-winged, lobes of the limb membranaceous ovate, ciliated, with glandular hairs: corolla tubular: filaments short, pubescent: anthers without bristles, cells short, ending in long filiform tubes.—*R. W. Icon.* 1183.

Bootan, Phullong Woods, Griffith.

This seems quite procumbent, probably growing like ivy on trees. The leaves are from 8 to 10-lines long, and half as broad, ovate, or sometimes slightly cordate at the base when dry, somewhat corrugated on the surface, convex above, each ending in a bristle. The dried calyx is brownish, scariose and translucent when wetted, the lobes decurrent, forming wings to the tube, corolla about 15-lines long, glabrous within.

Vaccinium (A.) serratum, (R. W. *Gaylussacea serrata*, Lindley, Royle, Dunal.) stem fruticose: leaves approximated, narrow, lanceolate, serrated, acute, rigid, coriaceous, shining, shortly petioled: bracts coloured, subulate: racemes, axillary, few flowered: flowers withering, long pedicelled, whitish-green.—*D. C. Prod.* 7, 558. *R. W. Icon.* 1184.

Khasya, Griffith.

A careful comparison of the specimens with Royle's figure, and with the character of the species, satisfies me, that this is really his plant, in which case the analysis shows, that it is a true Vaccinium, and that Dr. Lindley must have been misled by dissecting mature fruit, into the supposition that it had a 10-celled ovary.

VACCINIUM (A.) VENOSUM, (R. W.) shrubby, glabrous: branches terete: leaves and racemes congested on the ends of the ramuli: leaves subsessile, elliptic-oblong, acute at the base, tapering to a point, serrated, rigid, coriaceous; veins above (when dry) prominent with the interspaces somewhat bullate: racemes, axillary, congested on the ends of the branches, about the length of the leaves: flowers numerous, ovate, small, short pedicelled, with a minute subulate caducous bractea and 2 bracteoles: calyx glabrous, lobes triangular, corolla slightly hairy within, filaments about half the length of the anthers: anther cells rough, without bristles, calcarate at the base, stigma obtuse.—*R. W. Icon.* 1185.

Bootan, Griffith.

A very distinct species, easily recognized by its strongly-veined somewhat bullate leaves, and numerous small flowers, leaves 3 to 3½ inches long, and about 1 broad, very rigid, flowers about 2½-lines long, the pedicel about the same. The want of bristles to the anthers places it near V. serratum, the spur to the anthers is peculiar.

VACCINIUM (A.) MALACCENSE, (R. W.) shrubby, glabrous, ramuli slender terete: leaves glabrous, petioled, ovate lanceolate, acute at the base, acuminated, finely serrated: racemes longer than the leaves, many flowered, solitary, from the axils of the upper leaves: flowers drooping, short pedicelled, bracteate: bracts foliacious lanceolate, longer than the pedicels: pedicels hairy, with a bractiole about the middle: corolla ovate villous: filaments hairy, anthers without bristles: style, length of the stamens: stigma simple: fruit globose, about the size of a pea.—*R. W. Icon.* 1186.

Malacca, Griffith.

The largest leaves on my specimens are about 2½ inches long and 1 broad at the broadest point, whence they taper to both ends. The longer racemes rather exceed that length; flowers numerous, about 3-lines long, often shorter than the adjoining bractea. The want of bristles to the anthers associates this with *V. serratum*, but in other respects it is quite distinct.

VACCINIUM (A.) ODONTOCERUM, (R. W.) arboreous, glabrous, branches strongly marked with the prominent scars of fallen leaves: leaves coriaceous, linear-lanceolate, shining, slightly denticulate, short petioled: racemes axillary, rachis about the length of the petioles, pedicels slender, longer than the peduncle: flowers tubular, drooping: corolla 5-cleft, variegated with darker zig-zag, lines: stamens longer than the tube: horns of the anthers furnished near the middle with two retrorse bristles, anther cells and filaments pubescent.—*R. W. Icon.* 1187.

Khasya, Griffith.

Apparently a handsome species. The flowers spring from the wood of the preceding year, covering the branches below the leaves. The most distinctive peculiarity of this species is the position of the antherial bristles, half-way up the tube, in place of on the back of the anther cell. The leaves are about 6 inches long, by about 1 broad.

Vaccinium (A.) neilgherrense, (R. W.) shrubby, glabrous, except the pubescent young shoots and leaves: leaves lanceolate, acute at the base, acuminate at the point, racemes longer than the leaves, axillary, usually confined to the extremities of the branches: flowers whitish or rose-coloured, short pedicelled, usually furnished with a large foliaceous bractea: corolla ovate, slightly pubescent: filaments hairy: anthers bristled: tubes dilated towards the apex.—*R. W. Icon.* 1189.

On the low banks of streams, Neilgherries: abundant along the banks of the Pycarrah river, for a mile or two above and below the Bungalow. Flowering during the dry season, from February till April. It is nearly allied by its technical characters to the former, but is evidently quite distinct. The large foliaceous bracts supplies the best distinguishing mark, but both in habit and locality it differs.

Vaccinium (A.) affine, (R. W.) shrubby, everywhere glabrous: leaves short petioled, from ovate lanceolate acuminate to elliptic lanceolate, pointed at both ends, crenulato-serrated towards the point; racemes axillary, or more frequently from the previous year's wood, about the length of the leaves: flowers secund drooping, pedicels as long as the flowers: bracts foliaceous, lanceolate, caducous, with 2 subulate bracteoles at the base of the pedicels, corolla ovate: filaments slender, subulate, as long as the anthers and tubes, sparingly pubescent at the base: bristles nearly half the length of the tube: anther cells roughish, small in proportion to the size of the tubes.—*R. W. Icon.* 1190.

Khasya, Griffith.

This is very nearly allied to the following, from the same country, the difference being confined to the stamens; in this the filaments are as long as the anthers, and both hairy—in that the filaments are short, covered with matted hair, and the anthers glabrous or nearly so.

VACCINIUM (A.) DONNIANUM, (R. W.) ramuli virgate terete glabrous; leaves short petioled, obovato-lanceolate acuminate coriaceous, crenato-serrated: racemes axillary coriaceous, about the length of the leaves, many flowered: flowers drooping: corolla glabrous, villous within: filaments short, thickly covered with coarse matted hair: anthers glabrous: bristles short, tubes thick: style exceeding the stamens, stigma dilated.—*R. W. Icon.* 1191.

Khasya, Griffith.

This species is nearly allied to both the preceding and following, but I think differs specifically from both.

VACCINIUM (A.) GRIFFITHIANUM, (R. W.) shrubby, ramous: branches terete, glabrous, except the pilose extreme ramuli: leaves elliptic, pointed at both ends, finely serrated, coriaceous, glabrous: racemes axillary foliaceous, many flowered: flowers short pedicelled, ovate, drooping, each furnished with a leaf like bractea and two bractioles: calyx lobes ovate serrated: corolla ovate, filaments hairy, about the length of the anthers: anthers bristled, ending in thick tubes.—*R. W. Icon.* 1192.

This seems much allied to *V. Leschenaultii*, but is, I think, quite distinct.

VACCINIUM (A.) OBOVATUM, (R. W.) shrubby procumbent diffuse glabrous: ramuli slender, very leafy: leaves short petioled, obovate-cuneate, entire, subrevolute on the margin: flowers axillary solitary drooping, pedicels about the length of the leaves; calyx and corolla glabrous, stamens exserted, filaments very short, anther cells united at the base forming a spur, bristled: tubes about twice the length of the anther cells: berry globose, about the size of a small pea.—*R. W. Icon.* 1193.

Cheera Punjee, Griffith.

In habit this seems to approach *Arc. uva-ursi*, but otherwise, is a true Vaccinium, and certainly cannot be mistaken for any other I have seen.

Vaccinium (A.) Dunallianum, (R. W.) arboreous: or shrubby glabrous: leaves elliptico-lanceolate, ending in a long slender acumen, entire coriaceous, changing to a pale sallow-brown in drying: racemes axillary, gemmate at the base, shorter than the leaves: scales of the buds ciliate concave: corolla campanulate: filaments short, broad, pubescent: anthers setigerous, about the length of the corolla: berry orbicular small.—*R. W. Icon.* 1194.

Bootan, Griffith.

This, a curious and very distinct species, most easily recognized by the peculiar acumen of its leaves, and, in dried specimens, by the unusual pale brown colour it acquires during that process.

The scaley buds from which the racemes spring, are also peculiar in this species, and bring it towards Rhododendron. Fig. 5 of the plate represents outside and inside views of one of the scales.

GAULTHERIA.

Gaultheria Leschenaultii, (D.C. *G. ovalifolia, Wall. List No.* 1523. *Andromeda Katagherensis*, Hook. Icon. 246. *Leucothoæ Katagherensis*, D.C. *Prod.* 7, *p.* 606. *Andromeda flexuosa!* Moon,) glabrous, ramuli subtrigonous: leaves petioled ovate or obovate, terminating in a gland, crenulate, punctuate beneath: racemes axillary or lateral pubescent, a little shorter than the leaves, erect: bracts concave acute glabrous, one under the pedicel, two near the flower. D.C. Prod. 7,593.—*R. W. Icon.* 1195.

Neilgherries, abundant; and to be met with in flower at all seasons. It is a considerable-sized ramous shrub, with very thick coriaceous leaves, and pure white flowers. Berries blue.

I have adopted D.C. specific name in preference to Wallich's catalogue name, as having a specific character attached: on the same grounds, Hooker's specific name held priority had he correctly recognized the genus. It seems curious that D.C. should have overlooked the identity of Hooker's plant with his own, as the figure is most characteristic, especially when aided, as it is, by a good character and description. The oldest name is undoubtedly Moon's, but he also referred it to a wrong genus.

Obs.—This well known species is introduced here simply for the purpose of clearing up its already superabundant synonyme.

GAULTHERIA GRIFFITHIANA, (R. W.) shrubby, glabrous: leaves short petioled, elliptico-lanceolate, acutely serrulate, coriaceous: racemes axillary, solitary, erect, much shorter than the leaves, puberulous: bracts acute concave and with the sepals ciliate; bractioles somewhat remote from the flower: filaments short, ventricose in the middle, hairy.—*R. W. Icon.* 1197.

Bootan, Griffith.

This species seems very distinct from all the Indian ones, differing in the form and in the delicate serration of the leaves, the short racemes, ciliate bracts and calyx, but especially in the bellied filaments.

RHODODENDRON.

RHODODENDRON GRANDE, (R. W.) arboreous, everywhere glabrous, except the bracteal scales, the inner series of which are densely tomentose externally: leaves oblong-lanceolate, cuspidately acuminate, somewhat obovate, (the broadest part nearer the apex than the base) petioled, entire, coriaceous, whitish scaley beneath: corymbs terminal capitate: bracteas obovate cuspidate tomentose: corolla subcampanulate, limb 8-cleft, lobes emarginate: stamens 16, the length of the tube: stigma dilated, ovary 16-celled.—*R. W. Icon.* 1202.

Bootan, Griffith.

Mr. Griffith briefly characterises this species in the single word "magnifique," which idea I have attempted to convey in the specific name. In this, the same relative proportion of parts exist as in *R. arboreum*, that is, the number of stamens and cells of the ovary are equal, and double those of the calycine teeth and lobes of the corolla, but in this they are a half more numerous; this mark equally distinguishes it from *R. formosum*, which is 10-androus.

RHODODENDRON GRIFFITHIANUM, (R. W.) arboreous, glabrous, branches terete: leaves coriaceous, crowded on the ends of the branches, oblong-oval, acute at both ends, mucronate: racemes terminal lax, flowers longish pedicelled: calyx entire, scutelliform: corolla campanulate, 5-lobed, spreading: stamens 15 (?) shorter than the corolla: anthers truncated, opening by pores, ovary hairy, 10-celled.—*R. W. Icon.* 1203.

"Bootan, a beautiful species, 1045 of Journal. Griff. MS."

Every flower in my specimen has so suffered from attacks of insects, that I could only find one in a fit state for dissection, and from it we learn, that this species has a 5-lobed corolla, 15 stamens, and a 10-celled ovary. Here is a marked departure from all the other sections of the genus: hence, if further acquaintance with the species establish the correctness of these numbers, this must form either the type of a new section or of a genus."

CONVOLVULACEÆ.

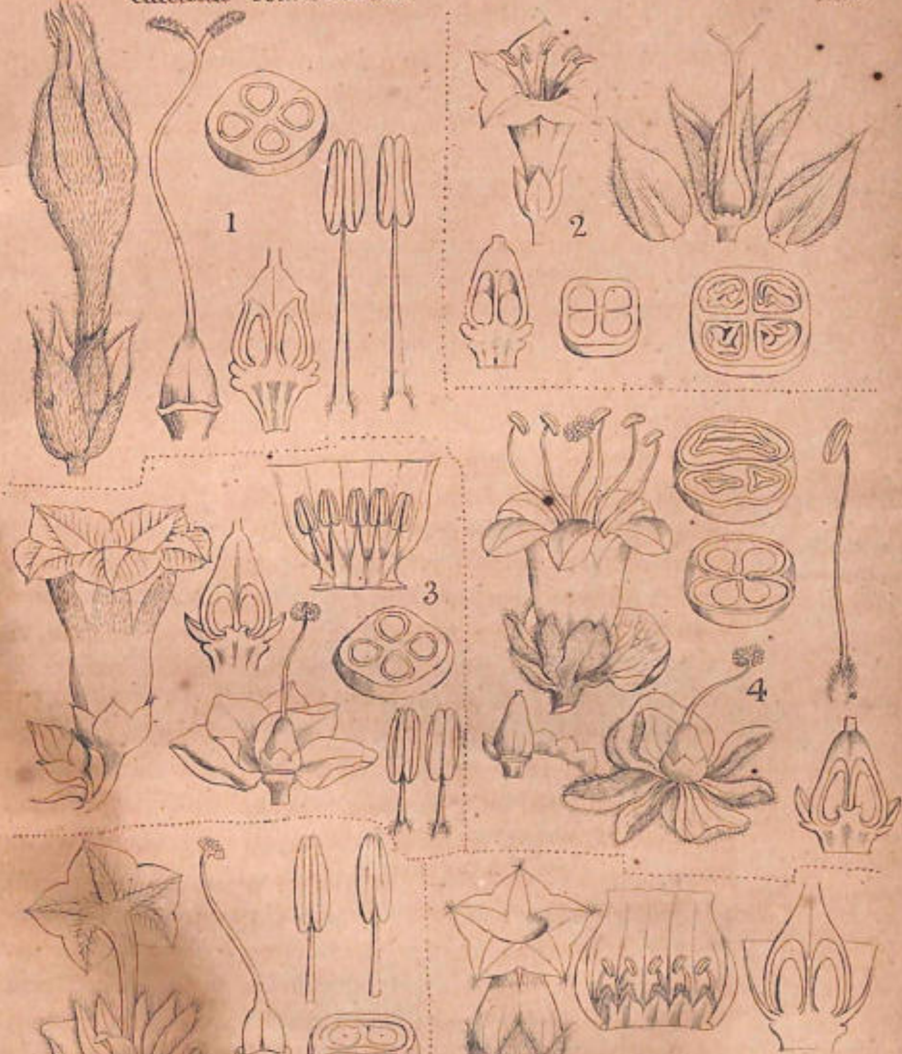
RIVEA ARGYREIA AND LETTSOMIA.

M. Choisy, in his memoir on Indian Convolvulaceæ, in taking up Loureiro's genus ARGYREIA, has changed its character so essentially, that every one of Loureiro's genuine species must now be excluded. I say *genuine*, because if Choisy is correct in referring *Argyreia festiva*, Wall. to *A. acuta*, Lour., which I doubt, then that is not a true species of his genus, which, as defined by himself, has a 4-celled ovary, while *A. festiva* has it 2-celled.

Loureiro's character of the fruit of Argyreia is "bacca subrotunda exsucca 4-*locularis*;" Choisy's "ovarium 2-loculare 4-spermum." If the berries in Loureiro's plants have four cells, it is obvious the ovary must have had at least an equal number: hence, in assigning a 2-celled ovary to Argyreia, Choisy has altogether suppressed the original genus, and set up a most distinct one in its place, while at the same he has added to the confusion by placing in his new genus, numerous species with 4-celled ovaries and fruit. In fact, nearly the whole genus, as it now stands in DeCandolle's Prodromus, will, I apprehend, be found not to come within his generic character.

It is a curious fact, that Roxburgh fell into a similar error in regard to his genus *Lettsomia*, which according to his definition has 2-celled ovaries, while nearly all his species have them 4-celled. When both he and Loureiro wrote, the same importance was not attached to that point of structure that M. Choisy has shown it deserved, and their error is easily traced to too rapid generalization. Loureiro must have examined a species with a 4-celled fruit, and took it for granted all the others had the same structure. Roxburgh on the other hand, when drawing up the character of his genus Lettsomia, seems to have had a species before him with a 2-celled ovary, and assumed that all the other species with baccate fruit had likewise only two cells. He consequently associated under that character many species with 4-celled ovaries, and only two or three having them 2-celled. M. Choisy, in the course of his examinations, met with some species having four cells, others having two cells: of the former he has constituted the genus Rivea, of the latter his genus Argyreia. But falling into the same error as Loureiro and Roxburgh, he has generalized where he should have dissected, and has thereby been induced to bring together, under his essential generic character "ovarium 2-loculare," numerous species having ovarium 4-loculare.

With a view to the correction of these blunders, with the least amount of inconvenience to the science, I propose retaining all the three genera, which can be very well done by merely slightly altering the character of Rivea, and leaving the other two as defined by their original founders. For example, Choisy gives to Rivea a capitate or lamelliform 2-lobed stigma and 4-celled ovary: I propose substituting the word *linear* for *capitate*, and referring all Convolvulaceous plants having indehiscent fruit, a 4-celled ovary and linear, cylindrical, or lamelliform stigmas, to Rivea, those with 4-celled ovaries and capitate 2-lobed stigmas, to Argyreia, and lastly, those having 2-celled ovaries and capitate 2-lobed stigmas, to Lettsomia. With this modification, Rivea stands in exactly the same relationship to Argyreia, that Convolvulus does to Ipomœa, while Lettsomia forms the transition from Argyreia to Ipomœa, having the indehiscent fruit of the one, and the 2-celled ovaries of the other.



1 Rivea Ornata. 2 Convolvulus rufescens. 3 Argyreia fulgens.
4 Lettsomia aggregata. 5 Ipomea pillata. 6 Lepistemon flaviscens.

The characters of these three genera will then stand thus;—

Rivea.—Fruit indehiscent. Ovary 4-celled. Stigmas 2-linear, cylindrical or lamellate.

Argyreia.—Fruit indehiscent. Ovary 4-celled. Stigmas capitately 2-lobed.

Lettsomia.—Fruit indehiscent. Ovary 2-celled. Cells 2-seeded. Stigma capitately 2-lobed.

Thus limited, the genera *Maripa, Legendrea, Marcellia Blinkworthia ? Humbertia*, and *Moorcroftia*, will probably all be absorbed by *Lettsomia*, along with some of the species now referred to Argyreia, such as *A. acuta* (Ch.), *A. aggregata* (Ch.), *A. festiva* (Wall.), *A. setosa* (Ch.), *A. elliptica* (Ch.), thus limited, our genera will possess precision of outline very favourable for the determination of their species: as they now stand, that is wanting, and determination is consequently most difficult, whence we now find species of Argyreia, as here limited, referred to Rivea, Argyreia, and even to Ipomœa.

In the accompanying plate, I have given figures of Rivea and Convolvulus, of Argyreia and Lettsomia, and of Ipomœa, to compare with each other; and lastly, as being a new and little known genus, I have introduced the analysis of Lepistemon, a genus principally separated from Ipomœa by its curious appendage to the stamens.

Explanation of Plate V.

1. Rivea ornata.
2. Convolvulus rufescens.
3. Argyreia fulgens.
4. Lettsomia aggregata.
5. Ipomœa pileata.
6. Lepistemon flavescens.

Notes by the late W. Griffith, *Esq.*, F.L.S., *&c. &c.*

1*st.—On those parts of Lyell's Principles of Geology relating to change of Climate.**

Dr. Fleming's objection† to the former high temperature of northern latitudes (Lyell, p. 148, Vol. I, Ed. 1840) is of some weight, but not so great perhaps as Mr. Lyell seems to think it, because, as the Reindeer is only one of a large family that is fitted for such food as Lichens, it follows that analogy would be strong in favour of the extinct species feeding on the ordinary form of vegetables, that is, that the chances in the favour of this would be the amount of the excess in number of the ordinarily feeding species. Nor is there perhaps any instance in which the temperate zone presents any circumstances at all analogous to those countries in which the Elephant and Rhinoceros are now found; no place in the temperate zone presents the abundance of food, necessary to such vast quantities of Elephants, as once existed in what we now call Siberia.

The Mammoth being known to have existed in modern times in association with freshwater shells which are now found living in the adjoining country, at once suggests the question—did it occur as a solitary or a gregarious animal? Are its remains rare or abundant?

The instance of the Panther may be of no account: in the first place it is a new species; in the second, what is the range of the American Panthers?

The range of the Tiger in India, is so peculiar and so limited with respect to certain circumstances, such as abundance of cover, game, and dampness, that its identity with the one noticed must be doubtful. However, the specimens killed may have been stragglers from India, although their absence

* The references are to Book I, Chap. vi., edit. 1840.

† See Edin. New Ph. Jour. No. XII. April, 1829.

in the intermediate countries is against this idea. Why could not they come from the countries bordering on China, of which we know nothing?

None of the arguments adduced either from Cycadeæ, Equisetaceæ, tree ferns, and arborescent Lycopodiaceæ, p. 153 to p. 155, appear to me to warrant the idea of an extremely hot climate. Of Cycadeæ we want the forms given, for this family is now abundant at the Cape of Good Hope, and *Cycas revoluta* grows in Japan. So far as I have had occasions of judging, tropical Equisetaceæ are not larger than those of cold climates, and what is curious, are never so abundant in the tropics as in cold climates. Tree ferns in India are extra-tropical, and the species that equals the fossil size is found in latitude 25°, at an elevation of 4,000 feet, which, if the calculations of Humboldt can be applied to these parts of Asia, would make the latitude of its site 35° N.; and, what is still more to the purpose, in the southern hemisphere they reach to 45°. As for Lycopodiaceæ, nothing approaching to arborescent species are now found, and in India, even in the most favourable places, the stature is but little greater than that of European species.

The explanation given of the Melville fossils p. 155, may be received, provided no objections are found to the adoption of the idea that tropical forms could not have existed under the circumstances described. But although the fossils, are of distinct species, they do not present any singularities in structure, which we should expect in plants submitted yearly to a night of three months. And it must be remembered, that there is no instance of an unbranched monocotyledonous plant being capable of hybernation, and as to the English coal fields, there is perhaps no absolute reason for insisting on a great degree of heat. The effect of latitude is secondary, inasmuch as it depends upon the proportion between land and sea, and the configuration and elevation of the former.

That there might be a predominance of tree ferns is probable, but why of plants allied to palms and arborescent grasses p. 153? Are palms most common in insular climates? It is curious also, that if arborescent grasses are so, that there is a want of correspondence between circumstances now existing, and those of the coal formation period, in which no glumaceous plant has been discovered. Yet such plants from the silex they contain, from their abundance, and from their frequently gregarious habits, might be supposed to present great facilities to becoming fossilized.*

2nd.—On the Theory of Progressive Development.

If Lamarck's theory be true, we require only one—absolutely only one original type, because of the gradation between animals and plants, and of certain beings not being apparently referable more to one class than to the other.

But as in this case, unless the original formative particle branched off dichotomously into two, of which the one was destined to be the stock of all existing animals, the other of all existing plants, he would have to allow the formation of the most imperfect animal from the most perfect plant, and thus follow a retrograde course, a condition obviously fatal to a theory of progressive development. But similar instances of a retrograde course may be proved to exist in many parts of the series of animated nature. We have some plants with highly developed organs of vegetation, and little developed sexual organs; (Mosses and Ferns,) and others again presenting precisely opposite circumstances, allied nevertheless to the former. Now this obviously includes a retrogression in the vegetative organs of the latter. Again, Lamarck admits several points of formation: he admits even distinct points for the principal families: this is a fatal admission. To a supreme cause, the increase in the number of

* Consult Brongniart's Sur la Nature de la Veget. Annales des Sciences, November, 1828.

formations surely presents no difficulty. Besides, as countless ages are required to the completion of development by progression, it follows that no catastrophe can have been universal. We can trace back more than one-third of the age of our globe, and we know that plants and animals were as perfect then as they are now.

On all questions of this sort, which fundamentally depend on an author's notions of the perfection of a Supreme Being, or cause, the arguments of Mr. Babbage on the perfection of a designer of a machine may be made to bear with advantage. By an All-seeing, Omniscient, Omnipotent Being, every contingency must have been seen and provided against at the creation.

3rd.—On Botanical Geography.

Linnæus' Cosmogony is chiefly noticed because alluded to by Sir W. Hooker in Murray's Geography as ingenious, if not correct. It is quite contrary to all analogy, for in no given island of any given extent could there be found such a discrepancy in forms as exists between the plants of old and new Continents, for in no island could there be an equal amount of effective barrier. The very largest islands known are inhabited by a consonant vegetation. We find in Australia, the fifth Continent, an Australian, not a mixed vegetation.

DeCandolle's divisions of temperature may be omitted, there is no proof of a powerful summer giving the capability of supporting great winter cold, at least in the sense used by D. C. None of his instances are deduced from indigenous plants, and so far as Hooker's version goes, he appears to lose sight of the fact that each plant is adapted to its particular climate.

In Mirbel's remarks on the great power of accommodation to different climates possessed by the vine, no specific data are given; the mean summer heats of the very distant places of culture he adduces, may present similarities to a considerable extent; and as for principal agents, such as humidity, it is easily supplied when deficient. No arguments can be fairly drawn from cultivated plants, because of the influence of acclimation (though this is perhaps denied by the Zoological Kingdom), and of the artificial modes resorted to imitate the contingencies to which the plant is in a state of nature exposed.

The diffusion of light is unequal in actual amount, its rapidity is erroneous. Query, how does Humboldt prove that it is less owing to the absence of heat, than to the want of sufficient solar light that the vine does not ripen its fruit beneath the foggy skies of Normandy? Because the existence of a fog diminishes heat as much as it does light, or perhaps he means abstractly solar light.

As both heat and humidity decrease as we ascend either in elevation or latitude, so that at certain points throughout the world an arctic flora exists, we are led to a comparison of the mutual influence of these agents, i. e. between the arctic regions of mountains, and those towards the poles. The recurrence of an arctic flora at all sufficiently elevated points is a strong argument against the supposed great action of mere density of the air, for we have similar plants appearing on spots where the density is diminished four-fifths! and where it exists at its mean. But there may be a striking similarity between amount of electricity, and other little known agents. The occurrence of arctic points is a striking proof of the value of two causes, viz. elevation or high latitude, and humidity.

What correspondence is there in amount of solar light? Compare the periods during which light exists at the poles and in the tropics? Does the length of the polar summer at all compensate?

Notice the fact that within the tropics of Asia, Africa, and America, the genera are similar, but the species rarely the same.

Both D.C. and Schouw have followed a similar plan, that is, the formation of divisions or Botanical Kingdoms of an arbitrary rank and uncertain number. Yet these kingdoms, 293 in number, only form portions of Continents.

If such and such a proportion of genera and species constitutes a kingdom, a higher amount of grouping would institute a higher division. Several of these divisions, if not the generality, are in my opinion mere provinces, and if viewed in this light, the scale of proportional parts may be considered just enough.

4th.—*Formation of Coal and Distribution of Fossil Floras.*

"Coal is said by Hatchet to be formed chiefly from the resinous principles of plants,—this would account for its appearance when burnt, which is the same as that of burnt bitumen. But resinous principles are, even when they exist, of partial extent only in plants. In good coal the whole of the vegetable substance seems to be transformed, a supposition barely compatible with Hatchet's idea.

To study this, extensive examination of coal in all degrees of formation would be necessary, beginning with the wood so curiously changed by the Brahmapootra, i. e. brown coal occurring in its sand-banks, and which has a very peculiar and disagreeable ódour when burning. It would also be necessary to examine how far the coal-plants exhibit vegetable structure: are they mere impressions or are they the plants themselves changed? To what extent do these agree with coal? What particular plants, and what parts of these appear to have formed coal? Its fibrous structure would hint at formation from the woody system, and it is not incompatible with the *deliquescence* of a thick layer of drift.

The plants of coal fields having been drifted, can only give us an idea of the vegetation along the natural drains of the then former country, which may by no means have had *one universal character*.

The plants of the open surface of modern tropical countries are generally different from those along the beds of streams, in which situations now-a-days Equisetеæ, Lycopods, and Filices, are chiefly found. Coal being drift, it follows that the plants of the coal fields cannot give us exact information on the distribution of vegetables in those days; to gain information on this, the fossils should be in their original situation. And there again an obstacle may exist in our not being able to ascertain the height or level of that situation.

If the plants of coal fields are found to be converted into coal, then the only difference between coal shale, and coal, will consist in the very small proportion of vegetable matter in the former.

The small number of coal-plants, i. e. the small number of species, at once points to the supposition that fossil plants are confined to those of the most indestructible nature: here again is another sign of this in the preponderance of Ferns which Lindley finds to be the most permanent.

Hence the preponderance of Ferns, is by no means explainable by their greatest simplicity of form, and consequent priority of formation."

Note on the Geological formations of Amherst Beach, Tenasserim Provinces. *By* Edward O'Riley, *Esq.*

During the prevalence of the SW. monsoon, I had frequently noticed a dark-coloured deposit at several points on the sands at the beach, which forms the western sea face of Amherst point, at the entrance into the Maulmain river, but supposing it to be the effect of burnt drifts, or casual fires which occur during the NE. monsoon, I took no particular notice of the circumstance until a few months since, when, on observing a larger deposit than usual at a point near the base of the bank, which presented no such appearance the previous tide, I was induced to make a closer inspection of it, and found the mass to consist of magnetic iron sand, about an inch in depth, and of considerable extent, in the direction of the sea, apparently thrown down by the rainwater penetrating through the rock forming the line of coast.

The discovery of the nature of this deposit led me to a further investigation into that of the rock forming its matrix; which, from its general appearance, I had concluded to be a semi-indurated clay, coloured at the surface by oxide of iron, an abundant ingredient throughout the surface rock of these Provinces. Instead of the clay the common magnifying lens exposed the ingredients of a granite rock, in a state of decomposition, with the grains of iron sand disseminated throughout the felspar of the mass.

On a line with the base of the rock, and partially covered by the sand and detritus from the blocks of ferruginous breccia which crop out in all directions, masses of clay-like material appear, which, being formed from the decomposition of the bank, afford a coarse description of "Kaolin," mixed however, with a very large proportion of fine quartzose sand and mica, so as to render it valueless as a porcelain clay.

The section of the coast line at this particular part presents at a distance, an uniform homogeneous mass, without any lines of stratification; but a closer view discloses numerous lines of quartz of various dimensions, striking almost vertically through the rock, and at a point, a short distance to the southward of this site, where the washing of the high spring-tides has caused a recent abrasion of the bank, the harder ingredient being darker in colour than the rest, show a decided line of stratification in the same direction as the quartz veins; which again corresponds with the angle of strike in the schistose rocks, which form the terminating point of the bank to the south.

The rocks at this point consist of greenstone, gneiss, and mica schists. Granite and quartz veins traverse the masses of rock in all directions; the former being generally in the superior strata (greenstone), and the latter of various dimensions through the schistose rocks below.

From the above point to the one at the river's mouth, with the exception of a few granite boulders, all vestige of a primitive formation is lost, the only rocks occurring besides the above granite boulders, being of the conglomerate already noticed, which is highly cellular and indurated on the surface, but soft and more compact beneath. At the point from which a reef extends, the primitive formation again shows itself, but in such confused masses as to obliterate all trace of regularity of form. The principal rock however, appears to be greenstone, unaccompanied on its southern face by any of the schistose forms. Into this quartz veins of various dimensions and highly crystaline structure, have been thrust in all directions; completely enveloping the greenstone in some parts; at others, showing a vertical line for a short distance, and then abruptly terminated, or moved out of its position by intervening lines of quartz veins (quartz and mica). On the northern face of this mass, the clay and mica slate appear, the former being superior: both however having a direct vertical strike, until covered by the rock forming the sea face, which consists of clay slate in a decomposed state, with scarcely any perceptible angle of inclination.

The foregoing remarks are intended more as a rough note of the geological features of the coast at this place, than a systematic classification of the rocks described, as from the almost imperceptible transition of the schistose rocks into each other, it would require a more practical knowledge of them, in various localities, than I possess, to render such a classification perfect; sufficient however will be gained to show how glaringly deficient the published report of a late naturalist is, (who was employed by Government in these Provinces) when he stated that the primitive formation was lost on the coast some distance below this place.

Amherst: 5th September, 1847.

Remarks on the treatment of certain Vascular Diseases. By THOMAS A. WISE, M. D.

In the first volume of the Journal of Medical Science* a number of examples are detailed of a peculiar change produced in the blood, by causes which increase its vitality, beyond that degree in which it is contained in its fluid state. This change in the blood is termed its *consolidation*, in contradistinction to the state of *coagulation*, and affords an explanation of some of those pathological conditions, concerning the nature of which there is still a considerable difference of opinion. As a necessary result of such premises, I supposed the same principle might be applied, with great advantage, in the cure of some varieties of the most fatal class of vascular diseases, and it is the object of the present Essay to relate my experience on that important subject. I propose, as I go on, to intersperse with my observations on this topic, a few remarks on the modifications which it appears to me, the common treatment of erectile, and other vascular tumours and aneurisms, will admit of.

SECTION I.

Erectile and other vascular tumours.

Erectile tumours being principally made up of enlarged veins, by the application of an irritating substance, such as a blister or the like, and by keeping up the irritation, a con-

* Calcutta, 1834. See particularly pages 154, 193, 247, 325, 406, &c.

solidation of blood in the part takes place, and this obstruction forces it to flow in other vessels. The channels in the tumour are thus obstructed by the consolidated blood, which becomes changed and contracted, the morbid swelling is slowly absorbed, and a radical cure of this dangerous disease is thus accomplished. The following are examples of such cures.

Case 1st.—Mrs. S——, while one day dressing her child, two months old, observed a swelling in the lower margin of the pectoral muscle, near the axilla. It was the size of half an orange, and was supposed to have been produced by the bite of a spider. The tumour increasing, the parents became alarmed; and requested me to see it. I found the tumour of the size of a goose's egg, of an oval shape, and it conveyed the characteristic feeling of a large bundle of worms, closely twisted round each other. I recommended an occasional aperient, the most simple food, and pressure with a hollow padded piece of wood, to fit over the tumour. The pad was to be gradually tightened as the swelling diminished. Soon after the family left the district, and on the way up the river, the mother found great difficulty in keeping up the pressure from the continual movements of the child. The bandages often became loose, and the pressure over the tumour was irregular. This produced a redness, and increased sensibility of the swelling. Fearful of inflammation, the mother left off the pressure until she reached her destination. It was again applied, but with less attention than before, in consequence of the mother being attacked with small-pox. In this condition she was entirely separated from her children for two months. The tumour was then found to have entirely disappeared. Two years after I examined the part, and found that there was not a vestige of the disease left.

The tumour in this case appeared to have been dispersed by the inflammation producing a consolidation of the blood, which was followed by the obliteration of the vessels, and the gradual dispersion of the tumour.

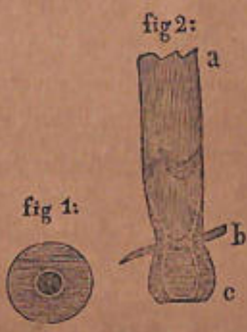
Case 2nd.—In another case the swelling was on the forehead. It was of an irregular shape, and flat in figure. By being vaccinated, and subjected to pressure made with pieces of lead firmly bound over it, it was completely dispersed. The explanation of the manner in which this cure was accomplished, is the same as in the last case.

Case 3rd.—Kudu Khan, aged 27, noticed a small swelling at the upper extremity of the antihelix, which gradually increased, and when I saw the tumour, it had attained the size and form of a pendulous pullet's egg; and the frequent hæmorrhage from its surface weakened his bodily strength, and threatened ultimately to endanger his life. Six small blisters were consecutively applied round the tumour, which stopped the bleeding, hardened the tumour, and reduced it to half its size. As the cure was proceeding slowly, two needles were thrust diagonally through the tumour, and a broad twisted ligature was passed over their extremities, so as to produce a considerable degree of pressure upon its surface. This, it was supposed, would produce such a degree of inflammation as to cause a consolidation of blood, and the eventual absorption of the tumour. A slight degree of inflammation, with an enlargement and hardening of the swelling, followed, but as this was not considered sufficient, a small blister was applied round the tumour. These measures at first increased the size and softness of the tumour, though afterwards there was a great diminution in its bulk. I examined the tumour several weeks afterwards, and found that it had nearly disappeared; indeed, the peculiar nature of the tumour was completely changed, as there only remained a thickened cellular tissue. It was the quantity of this structure that prevented the complete dispersion of the tumour by the consolidation of the blood in the tortuous vessels, the obliteration of which is followed by the gradual absorption of the swelling.

Case 4th.—Bhogbutty, aged 40, noticed a year ago a throbbing pain on the forepart of her right ear, which became more severe and extended, at times to the side of the head. She had an attack of fever, during which she noticed for the first time a small reddish tumour behind the external ear. The fever soon ceased, but the tumour gradually increased, with severe pain in the part extending to the temples and auditory canal. This passage soon became closed up by the same kind of swelling, as had appeared behind the ear, and complete deafness presently followed. From both tumours was secreted a thin ichorous discharge, mixed with blood. The tumour was thin, of an irregular figure, six inches in circumference. Its surface was red and irregular, and the skin was so soft and thin, that on pressure being made upon the tumour it bled. The external ear was red and inflamed. The tumour was principally composed of bloodvessels, and was so intimately connected with the carotid arteries as to preclude all hopes of removing the disease by the knife. In this case, as there was surrounding inflammation, I applied a compress, saturated with strong solution of alum, kept cold, to contract the part, and pressure so as to produce irritation in the tumour. In a few days the tumour was found much reduced in size, with a suppurating cavity in its centre. There is every probability of the ultimate cure of this patient by a continuance of the same treatment, but as she found herself so much better, she discontinued attending the Hospital.

In other erectile tumours the general plan of treatment may be modified with advantage, as in the following case, which affords proof that the cure is accomplished by the formation of consolidated blood in the vessels.

Case 5th.—A man was kicked in the ham by a horse; causing a deep irregular wound, which bled a good deal at the time. The external saphena vein had been divided, and two inches of the vessel was separated from the neighbouring attachments, hung out of the wound, and drop after drop of blood flowed from its cut extremity. As a more considerable hæmorrhage might be expected when the patient had recovered from the faint condition in which he then was, I tied a ligature round the bleeding vessel. Forty-two hours after its application I divided the vein with a pair of scissors (at *c.*), beyond the part to which the ligature had been applied. The cut extremity of the vein, next the limb, formed a round circle filled up with a firm, red, homogeneous portion of consolidated blood, as represented in Fig. 1. On pressing the vessel between the fingers, close to the divided part, no blood flowed; as the solid blood adhered to the internal coat of the vessel. On dividing the part of the vein cut off, its extremity from *a* (Fig. 2) to the ligature *b*, appeared of the natural colour, and possessed the usual properties of venous tissue. The vessel from *b* to *c* produced by the ligature was filled with consolidated blood, which was tough, and adhered intimately to the internal tissue of the vessel; the coats of which were denser and thicker, and the neighbouring parts appeared more vascular than natural.



In this case the ligature caused the irritation, which produced the consolidation of blood, and its adhesion to the thickened coats of the vessel. This constitutes the adhesive inflammation; and not the effusion of coagulable lymph, and the adhesion of the opposite sides of the vessels, as analogy has led pathologists to suppose. It is a like consolidation of blood, in the cells of the erectile tissues, that first stops the circulation, and prevents dangerous consequences; and as the consolidated blood is slowly removed by absorption, the swelling of the part is removed, and the disease cured.

Section II.

Aneurisms.

When an old aneurismal sac is examined, it is found more or less filled with portions of consolidated blood, which had been deposited, at different times, and in concentric layers. When this has occurred in small aneurismal swellings, and the person is young and strong, the swellings may become entirely filled up, and a radical cure be thus accomplished. Such spontaneous cures are, however, very rare. In ordinary circumstances, the force with which the blood is sent into the sac, increases its boundaries; while nature, with a salutary effort at restoration, deposits layer after layer of consolidated blood, which becomes so changed in its structure as sometimes to be reduced to a cartilaginous, and even bony hardness; while its internal surface, next the circulating blood, becomes lined with a smooth membrane, similar to that which lines the internal surface of vessels. It is sufficient at present, after what has been before stated, to add that such changes can only be produced by a higher than ordinary vitality in the blood of the part. I conceive, no other legitimate explanation can be afforded of such changes, on those physiological principles which are generally acknowledged: while the person continues strong, the deposit of consolidated blood is more copious, where it is out of the influence of the current blood; but as the disease advances, and the person becomes weaker, the quantity of blood in the sac increases, and becomes less vital, from being more out of the course of the circulation; while the irritation of the sac consolidates in layers the blood next it. For the same reason, as the sac approaches the surface, the deposits from the blood are less in quantity, and the interstitial absorption diminishes the distance to the surface, the skin over the aneurism becomes soft and discoloured, and on the slough being detached, the patient dies of hæmorrhage. How distressing is it to follow the gradual progress of those fatal cases which involve the large internal trunks, when no hope can be extended to the patient who feels conscious of his approaching, fearful, death; while his senses are unblunted, his mental faculties unclouded, and his yearnings after the pleasures of this world undiminished! In such cases the treatment by depletion, recommended by Valsalva, affords a very inadequate resource, and the principles of treatment proposed by John Hunter, and so ably put in practice by Abernethy, Cooper, Physic, Lawrence, and many others, too often prove unsuccessful, or inapplicable.

If blood be consolidated, by increasing its vitality, we have a plan of treatment which may often be used with advantage, even in the most unpromising cases. This was stated in my former Essays; since which time, I have in vain endeavoured to find opportunities to put it in practice for the cure of aneurisms; these diseases being seldom seen in tropical climates,* from the weakness, and relaxed habit of body of the natives, which render them rarely the subject of such diseases. I presume, however, the following remarks will not be uninteresting to the profession, as explaining a method which may be employed in the case of a class of diseases which are always dangerous, and most commonly fatal.

The modifications which I would propose in the common treatment of aneurisms, may be reduced to the following heads:—

When an aneurism is superficial, recent, soft, and compressible, methodical pressure may be made along the

* We are inclined to think them more common than the author supposes.—Ed.

course of the artery, especially proximid, and upon the tumour itself, the patient remaining in the horizontal position, with the member kept stationary by means of splints or the like. His diet should be easily digested, and nourishing, while he abstains from all heating substances. To these means may be added the exhibition of digitalies, &c. so as to retard the circulation. When these remedies have not had the desired effect, blisters over the aneurismal tumour, or any other stimulus, will be found of use by increasing the irritation, and thus augmenting the tendency of the blood to consolidate in the diseased part. The following are examples of the usual course of favourable cases of aneurism, as cured by the operation now performed, aided by the effect of local irritation. They were published by Mr. Porter, the dexterous Dublin Surgeon.

Case 6th.—Edward Hopkins, aged 63, of a weak and sickly constitution, was admitted into Hospital with an axillary aneurism. It produced the usual distressing symptoms, and amidst many difficulties, the artery was tied with a ligature on the inner border of the scalenus muscle. The operation lasted 25 minutes, and a smart attack of fever followed its performance. The circulation in the smaller vessels of the arm was soon restored, and the patient complained of weakness and oppression about the heart, accompanied with such a train of symptoms, that for some time he was considered in the greatest danger. The wound however continued to go on favourably; the ligature came away on the morning of the 17th day after the operation, without a drop of blood; and the aneurism had diminished in size. On the 31st day after the operation, the aneurismal tumour had diminished nearly one-half in size, and the coagulum (consolidated blood) could be felt firm and defined. No pulse, nor even a thrill was perceptible in any artery in the limb beyond the aneurism, from the weakness of the individual's constitution. Had the tumour been larger, it is probable that supuration would have taken place in the tumour, from the want of vitality in the blood, and increased still more the danger of the operation in so weak an individual.

CASE 7TH.—The second case of Mr. Porter's, which I shall mention, is that of Matthew Collins, aged 47, who had an aneurism of the subclavian artery, above the clavicle. The ligature was attempted to be placed on the innominata; but such were the difficulties met with, that "after the most painful exertions during an hour and a quarter, the accomplishment of the operation was abandoned. On being put to bed, the patient had a long rigor, followed by fever. Next day he only complained of the wound being a little sore, and the strength of pulsation in the aneurismal tumour appeared to have diminished. The patient was kept perfectly quiet; digitalis was given three times a day, and ice applied to the tumour. During the second and third day after the operation, the wound had some slight inflammation round it, and a reddish serous discharge proceeded from it. On the fourth day the pulsation in the tumour was not so distinct as before the operation; on the tenth day the tumour appeared smaller, and was "undoubtedly" harder and firmer. On the 16th day, Mr. Porter supposed the aneurismal tumour was still receiving fluid blood "for since he arose from bed, and discontinued the use of digitalis, the pulsation has become just as plain and as forcible as it was before the operation." "The day following," he continues, "the features of this curious case have still undergone another change. The tumour has gradually diminished, and is now not one-quarter the size it was on his admission, and the pulsation is scarcely perceptible. He is recovering both feeling and power in the arm. His health is excellent."

The explanation of the course of the cure in these cases appears to be sufficient. The cure of the aneurism, from the consolidation of blood in the cavity, was caused by the irritation produced by the long protracted operation, followed by the formation of consolidated blood filling up the aneurismal tumour, and its subsequent dispersion : a similar effect would be produced by artificial local irritants, which it is the design of this Essay to recommend.

A Treatise on the Diseases of the Eye, as they appear in Hindoostan, by Thomas A. Wise, m. d., *Surgeon on the Bengal Establishment. Calcutta : printed at the Baptist Mission Press,* 1847.

This is a sensible little Manual : still it is not the book that was wanted. It is a good enough compendium of our knowledge of ophthalmic diseases, but the remarks on the affections of the eye in India are scanty. We have no detailed information given us, no statistics as to the relative frequency of inflammation of the different textures, but simply a manual for students; thus partaking far too much of the character of Mr. Brett's work, the misnamed "Surgery in India." Dr. Wise seems to consider himself to be the first writer on the diseases of the eye in this country, but he was anticipated some years ago by Mr. Jeaffreson, of Bombay, with whose work however we have not been able to meet ; and we may add, by Mr. Brett, whose Chapters on the Eye equal those of the present volume in bulk. If we had been presented with detailed essays on Amaurosis and Glaucoma, on Nyctalopia, on the Sloughing of the Cornea—so prevalent in the last stage of various diseases, &c. we should have welcomed such a work as an addition to our literature, and no one is more capable of affording such information than Dr. Wise : as it is, his book does not require detailed analysis or criticism. But we shall let him speak for himself, by extracting freely from what he says—on diseases of the eye as occurring in India ;—his remarks are generally extremely judicious, showing the author to be sensible and well informed, and will therefore require but little comment.

Dr. Wise's preliminary remarks on the apathy of natives as to the loss of vision, appear very just and characteristic: (pp. xviii—xx.)

"As so large a proportion of the natives of India depend on their daily labour for subsistence, the loss of sight to them is a serious calamity, exposing them, and often their families too, to the danger of starvation. But though surrounded with privations, the magnanimity with which they meet distress, is remarkable. Even the loss of vision, the greatest of all privations, is often regarded with the utmost indifference. This absence of feeling is the product of their ignorance. They view the calamity as a decree of fate. The gradual deterioration of the faculty of vision, at which stage the means of relief, if sought, promise to be attended with more certain results, is, if possible, regarded with still greater indifference; and if in any case application is made for assistance, it is deferred till a total loss of sight drives the sufferers to any alternative affording a chance of recovery. Frequently, when interrogated respecting the duration of the blindness, their answers have indicated either a time long anterior to the date of the application, or some equally indefinite period. On more particular enquiry, the time which has often been assigned, is that when the individual was first unable to eat his dinner without assistance, though this event may have occurred long prior to the time of application for relief. A similar obtuseness of feeling is evinced when the sight has been restored, as for instance, when a cataract has been removed. The patient indeed seems pleased to find that he can see after the operation, but his carelessness soon prevails over every other feeling, for on the removal of the bandages, perhaps on the very next day, when directed to look up, he rarely expresses a high degree of pleasure at being enabled to see so well, but rather seems disappointed that he sees so indifferently. Even when cataracts have been successfully removed, the difficulty, if not impossibility of inducing patients to supply themselves with spectacles, has afforded proof enough how little they valued the recovery of sight. While acknowledging that they saw much better with the aid of spectacles, they remained content with the degree of vision they possessed, imperfect as it was, and preferred dispensing with glasses, unless they were supplied gratuitously; and for the same reason they would be content to remain in a state of blindness, if the operation was likely to cost them money. This observation is applicable not to the poorer classes only, but to the rich, who possess ample means of payment, though they can seldom be induced to lay out their wealth on any objects but those which administer to their pleasures. They will however, be found to visit the Hospital at some inconvenience in the expectation of obtaining a pair of spectacles as a gift, which they consider necessary for the completion of the good work performed by the Surgeon."

The case of *intermittent symptomatic ophthalmia* is valuable, as being a specimen of cases which are constantly treated as acutely inflammatory, all the symptoms being thereby aggravated: (p. 25.)

"A gentleman who had been many years in this country consulted me for a sudden and very severe pain in the left side of the head and in the globe of the eye, caused by exposure to a cold and damp air. When I saw him, the side of the face and the conjunctiva on the same side were swollen and red; there was great intolerance of light, etc., and he complained of severe intermitting pain in the same side of the head, but particularly in the globe of the eye. In this case warm soothing lotions to the eye, with quinine and aperients speedily removed all the distressing symptoms. This intermittent inflammation, or rather congestion, I have seen affect the eye in a more chronic form when a treatment with tonics and anodynes proved very efficacious, proper attention being at the same time paid to diet, and all irritating causes avoided.

These attacks occur in persons whose general constitution has been weakened by a residence in an unhealthy climate, one charateristic of which is a feeble digestion. In such cases the patient is subject to violent and long continued paroxysms of pain often confined to one spot in the head. The plan of treatment above-mentioned is of great use in relieving the symptoms, but change of air to a better climate is sometimes found necessary."

We can bear testimony to the extreme frequency of œdema of the conjunctiva in common *conjunctivitis*: (p. 27.)

"An *effusion* of serum or blood under the conjunctiva may take place from neglected chronic inflammation. In these cases the redness is usually round the cornea. A much more common cause of the effusion of blood is from violent exertion, as from coughing. Weak native children are often so affected during the prevalence of epidemic hooping cough. In these cases the effusion often nearly covers the whole of the anterior part of the sclerotic coat. In these cases the effused blood is soon absorbed without the application of any remedy."

Dr. Wise alludes with justice to the commonness of *purulent ophthalmia neonatorum* in this country, and to its frequently destructive results; but there is nothing new to be said on the subject, as the ordinary treatment answers as well here as at home.

Epidemic purulent ophthalmia, to which all bodies of men congregated together are liable, is a subject, to which the attention of medical men has long been directed. Dr. Wise discusses it at considerable length, as it used to occur in the Lower Orphan School at Allipore; if he had treated other subjects in equal detail, his work would have been much more valuable than it is. On this subject Dr. Wise arrives at the following conclusions: (p. 55.)

"From a careful consideration of the subject, it appears that the disease may occur epidemically among those pre-disposed to it, during certain states of the atmosphere; that it may be conveyed by inoculation, and under certain circumstances, as a want of proper circulation in houses where numbers are congregated together, when the purulent ophthalmia may even become infectious.

This variety of ophthalmia is characterized by the usual peculiarities of epidemic diseases: such as its fluctuating nature, appearing at certain seasons; at first affecting a few, but in a severe form, and becoming milder in its course as the disease spreads more generally among a number of individuals collected together."

The following extract will show the extent to which this disease prevailed: (pp. 58—61, note.)

"The peculiar circumstances in which the children were placed in the Orphan Institution rendered them so susceptible of purulent ophthalmia, that for nearly half a century it occurred very frequently in the epidemic form, and produced the most distressing effects. In February, 1821, there were 438 pupils more or less affected with ophthalmia, and in September of the same year the following melancholy report was recorded—

22	Children were totally blind.
12	——— —— nearly so.
58	with opacities and slight ulcerations.
47	blind of one eye.
140	affected with purulent ophthalmia.
279	

In 1819 fresh infection was brought into the school by some children who joined from the Upper Provinces, and two years after "the state of the disorder was reported to be as bad now, if not worse, than it ever was at any former period." In the report of that period it is stated "not one of the young children who have joined the school during the last two months has escaped the contagion.

Number in the School, Feb. 1821, Boys 270, Girls 354: Total 624. Seven-tenths of 624—437·8 diseased."

Fortunately the disease has never since then prevailed to such an extent, and has of late years been uncommon. Dr. Wise offers at considerable length some remarks on its prevention for the future.

We shall give the author's remarks on impaired vision, Glaucoma, and Nyctalopia at length, as they are of considerable interest.

Impaired vision: (pp. xiv—xviii.)

"In tropical climates, the less sensitive and dark skin; the black eyebrows and eyelashes of the natives, have the effect of deadening the glare of the powerful sun. The size of the pupil of the eye is diminished, by which means the quantity of light admitted into the retina is proportioned to the intensity of the rays, and to the state of sensibility of that delicate organ, the eye, as well as to the state of the retina on which the image of visible objects is depicted. The degree of sensibility of the retina varies with the age of the person. In infancy and youth it is great, but gradually declines to maturity, from which period the diminution of sensibility proceeds more rapidly. It is probably in consequence of this rapid decrease of sensibility in the retina and other appendages of the organ of vision which have been exposed to the powerful sun, that the eyesight fails so early in tropical climates. In addition to exposure to a strong light, the character of the ordinary food of the natives is not sufficiently nourishing for the youth who is increasing in stature, which weakens the system, and produces a debilitating effect on the retina. Such is the influence of these combined causes, that there are not many natives of Bengal who have reached the age of 30 years, who can read a book by candlelight. The weakness of sight is with them greatly aggravated by writing at night with the aid of a dim lamp. In this way a defect of vision often proves the precursor, and lays the foundation of many other diseases. The progress of the complaint is very gradual, and is unattended with symptoms of particular severity. It commences with occasional pain in the eye-balls and head, and is attended with some degree of dimness of vision. At first these symptoms only occur after exposure to the sun, and during the heat of the day, but the defect of vision slowly increases, and manifests itself particularly on the occurrence of any derangement of the system. At length it becomes so great, as to prove a hindrance to the performance of the patient's customary avocations; or terminates in amaurosis, which, if in his power, necessitates an application to the hospital for relief. This is so very common a complaint, that when officiating as Surgeon of the Eye Infirmary at Calcutta, I prepared the following Table, showing the number of applications for impaired vision and amaurosis, in the year 1841:—

	Total.	Ages.				Total.	Ages.			
	Males.	from 20 to 30	30 to 40	40 to 50	50 to 70	Females.	from 20 to 30	30 to 40	40 to 50	50 to 70
Impaired vision, ...	81	29	25	17	10	17	4	7	4	2
Amaurosis, partial, ...	15	6	6	3	0	3	1	1	1	0
Amaurosis, complete, ...	22	6	7	7	2	7	1	3	3	0
Total, .	118	41	35	27	12	27	6	11	8	2

There are several points in this Table which deserve notice. In the first place it will be seen, that the number of patients of the male sex is upwards of four times that of females; a circumstance to be attributed to their different occupations, and the greater exposure of the former to the rays of the sun. The number of applicants with impaired vision, was greatest between the ages of 20 and 30; probably from the privations to which they were subject, and which at that period often affect them more than when the body is debilitated by age. I have seen a whole boat's crew attacked with impaired vision in consequence of their working much and eating little, and being much exposed to the glare of the sun. This effect of privations gradually increases to old age. The greatest number of female patients afflicted with the same malady were between the ages of 30 and 40, while the paucity of applicants of that, and of every age compared with the males, indicates clearly enough the common cause of the malady; namely, exposure to the sun, which the men in general, from their out-door pursuits, undergo, to a much greater extent than the women, whose avocations lie principally within doors. In both males and females the maximum number of cases of complete amaurosis occurred between the ages of 30 and 50, after which the number of applicants declined. This appears to be owing to the greater rate of mortality amongst persons of advanced age, for a tendency to amaurosis undoubtedly increases with years; or it may be accounted for by supposing that persons near the middle age feel the importance of resorting to the means of repairing decayed vision, while their families are dependent on their individual exertions for support; whereas those whose great age incapacitates them for labour, depend for the most part on others for the necessaries of life.

The frequent occurrence of cases of impaired vision does not seem to be caused by a determination of blood alone; for the patient does not in general complain of seeing flashes of light, or muscæ volitanties, and other symptoms of local determination. The disease in general appears to be more allied to paralysis; and seems to be the effect of the glare to which the natives are so much exposed in the hot and dry atmosphere of most parts of India. The effect, partial at first, and discovering itself by weakness of sight, gradually becomes more marked and intense, and finally terminates in amaurosis or glaucoma. These most distressing effects are doubtless accelerated by other causes besides exposure to the fierce glare of the sun; such as the excessive indulgence of appetite; the unvaried meal of rice; indigestible vegetable diet; and the habitual use of narcotics and other noxious drugs, which increase the predisposition to this distressing malady."

Glaucoma: (p. 105.)—

"This disease is of very frequent occurrence in Bengal, among those who have passed the middle period of life. The unhealthy climate, the bad habit of body, the frequent irregularities in an arthritic diathesis, and dissipated habits, and the exposure to the influence of a burning sun, seem to act in producing the disposition to the attacks of Glaucoma."

Nyctalopia: (p. 113.)—

"The same effect is produced, though more slowly, by the debility caused by the poor and indigestible food of the natives, particularly when combined with other privations. In such cases the person first notices his vision becoming weak until he can only see during the bright light of the sun, and at last he becomes quite blind. As numbers are often exposed to these exciting causes, such an affection of the eyes sometimes takes on an epidemic form. Thus Lascars, or native seamen, who often live on food of a slightly nourishing nature, and are exposed to the weather and great transitions of temperature, in small uncomfortable ships, are not unfrequently affected in this manner. Numerous cases of the same disease appeared among the sepoys in the expedition to Java, in consequence of their being fed on rice alone. The Lascars are so well aware of this, that they complain loudly when their diet is confined to rice, "because it makes them blind." By these causes such a weakness of the retina is produced, that objects become indistinct as soon as the sun disappears, as less of the stimulus of light is present than is necessary in the blunted state of the retina for distinct vision. This forms the disease called Hemeralopia.* The symptoms of the disease are a

* "I use this term to designate "Night Blindness," as generally adopted, although not the correct term. Nyctalopia, "Day Blindness," I consider as merely a symptom, and as such I shall consider it."

gradual indistinctness of vision at sunset, when objects appear covered with an ash-coloured veil. This continues for one or two days to weeks, or months; and after one attack the individual is liable to relapses, during which the sight becomes dimmer as the twilight advances, until vision is completely lost.

When the eyes are examined, the pupils are found dilated and the iris sluggish, and often immovable. There is no pain in the eye. At first the person can see indistinctly in candle or moonlight. If neglected, the sight becomes gradually weaker during the day, and may terminate in amaurosis. The disease is produced by an exhaustion of the retina by its exposure to light under particular circumstances, which can usually be removed by following a proper plan of treatment. The treatment in Europe consists of local bleeding, the repeated application of blisters to the temples and behind the ears, with purgatives. In tropical climates, it consists of improving the tone of the system by the use of tonics, aperients, and nourishing diet; and attention to the cure of any disease which may accompany, and accelerate the disease of the eye.

When the paralysis of the nerves of sight, which produces this disease intermits, quinine during the intervals will be found an excellent remedy, to diminish or check the disease.

The following is an example of the manner in which this disease becomes epidemic in certain situations. In September 1838, three hundred and fifty followers of a person pretending to be the Rajah of Burdwan, were incarcerated in the jail of Hooghly, until the judicial examination of their case was completed. These prisoners consisted of up-country men, often rather selected from their being such, than from their physical powers. Many were old, others very young; and a third class debilitated. These people had been accustomed to live on a full diet of butter, bread, &c. and seemed to have been deluded by having prospects of advancement held out to them. While they were with the pretended Rajah, they were obliged to remain contented with a small portion of their pay, which did not admit of their obtaining their accustomed necessaries of life. In this state they were suddenly seized, and placed in confinement. In jail they were put upon the usual allowance of two pice a day, which was not sufficient to procure them their accustomed food. The depressing circumstances of their incarceration, and the influence of the unhealthy season of the year, quickly showed itself, and three months after became more evident, when they found the chance of liberty and reward more distant and uncertain.

At this time nearly all the above prisoners became more or less affected with Hemeralopia; many of them could not see clearly during the day, and as soon as the sun set and light diminished, they became completely blind until the bright sun of the next morning stimulated sufficiently the retina to action. The light of candles and of the moon, was insufficient to enable them to see. Their pupils were dilated, the retina pallid, and the iris sluggish. In all these cases a generous diet with aperients and tonics quickly restored their vision, and an improved scale of allowance quickly stopped the disease in the jail. Dysentery appeared, with hot skin, quick pulse, and white tongue, followed by œdematous swellings of the extremities, and great debility. Their ears became painful and discharged pus. The conjunctiva next became of a pinkish redness, especially round the cornea; and the eye became very painful, and sensible to light. The cornea was dull and irregular in its surface, followed by ulceration round its edge. (See specific inflammation of the globe of the eye.) These changed to a yellowish and pulpy slough. The complications in some of these cases of hemeralopia were as follows:

	Age.	Complication of Diseases.	
Chundee Churn Ghosaul	58	Dysentery	Hemeralopia.
Goolzar Singh	43	Dysentery	Ditto
Gunput Laul	45	Do. œdema	"
Shawho Dewan Singh	39	Dysentery	"
Reetoo Singh	45	Ditto	"
Ozoodiha Singh	60	"	"
Bhobison	40	"	"
Meer Nur Ali	40	"	"
Deen Dyal	45	"	"
Gobheer Singh	35	"	"
Kooblal Singh	40	"	"
Bhakha	36	Rheumatism	"
Ramessur Chuckerbutty	33	Sores	"
Takeera Rahuman	23	Dysentery	"
Khumdeh Singh	60	Leprosy	"
Sagewan	36	Dysentery	"

On another occasion, during a tedious voyage from Dacca to Calcutta, there were several of the crew that complained of hemeralopia on our return. One was a bearer whose pay did not commence till he reached Dacca, and a second was so lazy that he would not work as the others did, in consequence of which neither were allowed the same quantity of food, and both became weak and affected by hemeralopia. The season was cool, but the sun was very hot, and the glare from the calm surface of the river was considerable, to which they were exposed during the day. Both complained of pain in the head and round the orbit, and one of them at times had a considerable degree of redness of the conjunctiva. In both the pulse was weak; in one of them it was 94, soft, and easily compressed. The iris in both was sluggish during the day, when the pupil was larger than usual, and at night it was fully distended, and immovable. The retina had a lighter or greyish colour. During the day vision was less distinct than usual, and as twilight advanced, although the pupil enlarged considerably, vision was very imperfect. Objects appeared to be enveloped in a haze, and this increased as darkness advanced until vision was entirely lost.

Another class of causes producing this loss of sight is the frequent use of magnifying or telescope glasses, the accumulation of the humours of the eye, or by such causes as exhaust sensibility, as by frequently viewing minute or brilliant objects, exposure to strong light, to the sudden transition from darkness to light, as that of the sun, lightning, &c.

It was by this means that the cruel tyrants of Asia destroyed vision, by placing a red-hot ball before the eyes of their victims; which destroyed vision, by the complete amaurotic state it produced.

The treatment in this variety is sufficiently simple. It should consist in avoiding the exciting causes, in using nourishing food, with tonics, such as the preparations of bark, with stimulants to the eyes, as the Vin. Opii Spt., the vapour of the liquor ammonia; with friction to the eyebrows, stimulating lineaments, blisters, errhines, electricity, &c. These external irritants are particularly useful when the disease is caused by the exposure to a great glare of light. Hydrocyanic acid continued for sometime will sometimes gradually restore the sight.* Creasote in doses of two drops increased to 20,

* "See Dr. Bamfield's Essay on Medical and Chirurgical Transactions, Vol. v."

if necessary, three times a day, will often be of use. In some cases the application of leeches and emetics will be found to afford relief, when the symptoms of congestion, and derangement of the stomach are present. The restoration of the usual discharges, as of the cataminia, by the application of leeches, &c. will be found of great use.

Sometimes persons are found in this country who are unable to judge of colours, although their sight is good in other respects. This appears to be a congenital affection proceeding from a defect of the brain, rather than of any of the parts composing the eye-ball."

There is also some account of that *specific inflammation* of the globe, especially with sudden sloughing of the cornea, which at times destroys the eye in a couple of days, and prevails among jail prisoners and others suffering from extreme debility. We have seen it chiefly in cases of diarrhœa consequent on fever, and never met with a more unmanageable disease: (pp. 141, 76.)

"*Specific inflammation of the globe.*—Under this head I shall describe a disease very common in India, which, from its destructive nature, deserves careful attention, more particularly as it has not been sufficiently attended to, and as it should be treated in a peculiar manner. Like other diseases of the globe, the disease attacks some of the tissues of the eye more than others, and on this account the sloughing ulcer of the cornea has already been described under the head of symptomatic sloughing of the cornea, and I shall here confine myself to the complications produced by a peculiar state of the system which is not unfrequently the cause of the loss of sight.

The inflammation and suppuration terminating in sloughing of the cornea, which was produced by dividing the nerves which supply the eye; and feeding animals on unazotized substances, or keeping them long fasting, has the same effect on animals in producing the diseases of the eyes, as living on food which have imperfect nourishment, and thus lowering the powers of life. The constant use of rice predisposes to these distressing ulcers of the cornea, which sometimes attacks whole ship's companies; and the lascars complain bitterly should rice be at any time substituted for biscuit; and the reason is, that it makes them blind. But it is a curious fact that Bengal rice has not this effect; and is consequently preferred for long voyages, and sells at a higher price than the other kinds. This peculiarity is partly owing to the cheapness of food in Bengal, which enables the natives to use condiments along with it. Weak persons in this country, of the lower class, will be found to live on aliment possessing no diversity of ingredients, to reside in damp impure air, in close heated rooms, and exposed to sudden and great changes in temperature. When such patients are in this state, exposed to fatigue or mental depression, by which they are reduced to great debility and apathy, the tongue becomes pallid and tremulous, they have no appetite, bowels generally relaxed, extremities shrunk, and the surface of the body cold, without much cutaneous perspiration. The pulse is small, soft, and frequent. The sides of the face, lips, and eyelids swell, and the inflammation of the conjunctiva is of a peculiar variety; being of a dark pinkish colour, and thickened. There is considerable pain, with the discharge of warm tears, and great intolerance of light, so that it is with considerable difficulty that the pupil can be seen. When observed, it is of a whitish milky appearance, and the surface is found irregular and dull in appearance. In the acute form a small groove is found near the edge of the cornea, the iris is inflamed, and the anterior chamber filled with a muddy purulent fluid. The ulceration extends, penetrates the different layers of the cornea round its circumference, and the whole cornea sloughs in the form of a yellowish pulpy substance. This being removed, leaves the dark iris bulged out from the dark, pinkish, and thickened conjunctiva, in consequence of the crystalline lens, reduced to an opaque whitish substance, being pressed forwards, and on its being evacuated the eyeball collapses. In some cases the other eye became diseased, followed the same course, and in like manner was quickly destroyed.

This disease of the eye is sometimes complicated with others, and with extreme emaciation when both eyes are more or less affected. In most cases after the loss of one eye the other gets well, and retains a certain degree of vision.

During the collapsed state of insanity, in which diarrhœa is often present, the eyes are often afflicted with this disease. I have already, under the head of amaurosis, given a short account of an epidemic in which the eyes were in many of the cases attacked with this cachectic inflammation. In other patients the disease was produced in the course of other debilitating diseases, of which the following is an example—

Nujooh, æt. 30, was admitted into the hospital with phagidemic ulcers over the body. They appeared as indolent boils which burst, and terminated in ulcers. In this state of disease and great weakness, his bowels became deranged, and the disease terminated in dysentery. His eyes became next very irritable, and the conjunctiva red, especially round the cornea. In examining the cornea it was found of a muddy-white appearance, from the thickening, which was particularly white and opaque near the centre of each cornea. The usual treatment was employed in vain, and the patients sunk, reduced to a skeleton.

I carefully examined both eyes after death. In each there was a thickening and milky whiteness of the conjunctiva covering the cornea, which could be torn, from the clear cornea underneath for two-thirds of the space from the circumference to the centre of the cornea. Near the centre, the milky-like appearance also increased, and in each eye a layer of purulent interlamellar matter had formed, softened, and terminated in an irregular ulcer externally, and at the point it had penetrated through the cornéa. Had the person lived, this inflammation would have been followed by an extension of the ulceration, and eventually, in all probability, by the destruction of both eyes.

The treatment of this form of disease is difficult, and the result very uncertain, for while the system is to be supported by light nourishing food, and attention paid to the abdominal secretions and discharges, the local disease must be carefully attended to. The importance of the organ, which is in such a dangerous state, must be treated without reference to the general state of the system. In many cases the pain, intolerence of light, inflammatory redness and hot tears, indicates the employment of leeches. I have often used with the best effects, blisters—at a distance from the eye, so as not to cause an œdematous swelling round that organ, and a careful attention to the state of the bowels. When this treatment has been followed, and the heat of the tears has been diminished, the spirit opii. is to be dropped into the diseased eye.

The second kind of sloughing ulcers, which is attended with the formation and detachment of the mortified part, occurs in the feeble and cachectic. These ulcers appear on the cornea without much vascular action, and in their progress the layers of whitish or ash-coloured sloughs are thrown off, which for a time leave the cornea underneath more or less clear. In other cases the whole cornea sloughs. This sometimes occurs in this country in cases of dysentery, with extensive organic derangement, from exposure to unhealthy situations, and the great weakness produced by want.

Much care and attention are required in the treatment of this most important variety of ulcer. When produced in the young or in very old persons from weakness, the system is to be supported by quinine and nourishing diet, and the healthy action of the digestive organs improved by aperients, and stimulants applied to increase the action of the ulcer. Of these the sulphate of zinc, the nitrate of silver, and the oxymuriate of mercury in solution are the best.

When the sloughing process is advancing, the cause, as in purulent ophthalmia, is to be diminished by the application of scarifications, leeches, &c., and as soon as the inflammation has been reduced, stimulants are to be applied to the ulcerated surface. In the absence of such symptoms, perseverance in an antiphlogistic treatment, such as the application of leeches, &c. is liable to produce injurious effects. I have known a dose of salts increase the slough considerably in one night, and thus destroy the hope of restoring the eye to a state of useful vision."

We do not think that Dr. Wise has dwelt quite sufficiently on the leading symptom of the complaint—the sloughing of the cornea, and this naturally leads us to the alleged *want of adhesive power in the cornea of natives,* which has long been considered a bar to the use of the operation by extraction: (p. 6.)

"So common is this want of adhesive power, that extraction of the cataracts can very rarely be performed in Bengal; as it is accompanied with great danger to the organ on account of the wound not healing up, and the eye becoming disorganized. Even the small wounds made in performing the operation of artificial pupil, sometimes do not heal until recourse is had to artificial stimuli to the wound."

We should like to know to what extent this want prevails, and how far it is real, for in a few cases where we have had occasion to make partial sections of the cornea, the edges of the wound appeared to unite readily. Mr. Brett seems to think, that in the cities of Upper India it forms no serious obstacle to the operation of extraction, yet Mr. Egerton seems latterly to have given up the operation entirely on this ground. No doubt it saves a great deal of trouble to avoid the operation of extraction, the only one fortunately requiring any great nicety of operation, or involving much risk in its consequences. Still so skilful an operator on the eye as Mr. Egerton would not have abandoned it without reason, and we understand that Mr. O'Shaughnessy coincides with him in opinion. We believe the few remarks on the season for operation to be just: (p. xx.)

"The seasons of the year in Hindoostan are not all equally favourable for the performance of these and other operations; and the difference is so considerable as to merit attention. The extreme hot, cold, or damp months are unfavourable for the purpose, and operations should be deferred till the great heat has been mitigated by the rains, and especially till the genial months of February and March. This is the season recommended by native practitioners; and experience has proved the correctness of their decision. It is, however, proper to avoid the performance of operations even at that season, if diseases, whether in epidemic or other forms, should be found generally to prevail at the time."

Before parting with Dr. Wise, we must express our regret that he has not given us any account of the native practice, or of the native remedies employed in eye diseases. We must also venture to hint, that he would have done wisely in having got a friend to revise the proofs of his little book, as the number of misprints deforms the pages of an otherwise neatly printed work. The fault of the book is, that the author has spoilt it by endeavouring to give some account of every thing: if Dr. Wise had confined himself to a few subjects of interest, his work would have been much more valuable.

We have already alluded to the absence of statistical information on eye diseases in this country; surely this want might be remedied, and a good deal of useful information gleaned by a comparison of the annual reports of the Superintendents of the Eye Infirmary, and an analysis of their returns.

We append some native receipts for eye remedies, which may be of interest to some of our readers, and which we owe to the kindness of Dr. Nicolson.

Eye Ointments from Dr. COCHRANE, *President Medical Board.*

Take of opium, ℈v.

Burnt alum, ℈ij.

Cloves, number two.

Fresh *Neem* leaves four or five.

Reduce the opium, burnt alum and cloves to very fine powder, to which add the *Neem* leaves extremely well bruised, and with a sufficient quantity of lime juice mix intimately the whole into an epithem, of the consistence of thick cream.

With this the outside of the eyelids is to be besmeared once or twice a day, though it is often likewise introduced between them on the inflamed ball of the eye itself with prodigious effect. It should be washed off every morning with a weak solution of opium in water.

Another.—Take of opium, burnt alum and *Rashout,** of each one pice weight, and one clove.

* Amomum Anthorrhizium.

Reduce the above ingredients to a very fine powder, and with equal quantities of the juice of *Tamarind* and *Neem* leaves mix the whole into the consistence of thick cream.

N.B.—Where the leaves of *Tamarind* and *Neem* are not to be had, their juice may be supplied by that of limes.

This is to be used in the same manner as the other. Its efficacy is often incredibly great; operating like a charm.

The natives however do not apply it till after the third or fourth day of the inflammation.

The following receipt for ophthalmia was given to me by Dr. Young, by desire of Capt. Stuart, who procured it from Mr. Ballard.

Burnt alum and opium of each equal parts, rubbed very fine, and mixed with about double the weight of *ghee* into an ointment; this is rubbed or smeared over the closed eye from the eyebrow to the lower part of the socket. Ballard adds, that "combined with leeches or cupping it seldom fails of affording prompt relief in the description of the disease which is common in Hindoostan, and in its nature is either infectious or epidemic."

The following is the Recipe for the eye ointment from General Watson.

No. 1.—*Neem* leaves, *Samur nimuk* (salt), *Kurwa tael* (bitter oil), which is expressed from a small yellowish seed called *Sursun*.

To make the ointment, have a broad, flat, brass vessel, turn it upside down—bruise the leaves, and then rub them with the salt and oil thoroughly together on the bottom of the vessel *with* a new *copper* pice or copper any thing placed under the palm of the hand, collecting the ingredients frequently into the centre, and resuming the rubbing till the whole is of a proper consistence.

Then wash the ointment with water by sprinkling it when spread, (as in rubbing) and gently rub the whole together with the palm of the hand only, shake off the water and collect the ointment which is now ready for use.

No. 2.—The foregoing is the principal ointment. There is a simpler kind (which I have generally sent you), it consists of burnt alum bruised with ghee (ghee, the native butter made of buffaloe milk) in a very shallow small *iron* vessel with a pestle, a very shallow *iron* pestle and mortar. The alum should be well pulverised alone first, and then the two rubbed *together* for a couple of hours. *

The first ointment should continue to be rubbed three or four hours.

The goodness of both will depend on their being *thoroughly* pulverised, &c. as directed.

No. 2. will generally be found sufficient, but should it not, then No. 1. must be had recourse to.

We add the recipe for one other native ointment, which Professor Webb has found to be very efficacious among the children of the Lower Orphan School. From our own experience of its use in the epidemic ophthalmia at present pevailing among the Men of the 18th R. I. in the fort, we are inclined to think its use to be only advantageous in slight cases. We cannot say that the formula is a very pharmaceutical one.

Recipe for Eye Ointment.

Suth-ka-kharoo, or a piece of a bangle worn by the women of Chittagong, equal quantities of the leaves of *Thoolsee*, woodapple, and *Bhungralah*, to be bruised in a mortar, and the juice strained through a muslin rag. Two or three cloves, one grain of opium, about two drachms of *Rasout*, a few grains of lamp-black burnt, a few grains of *metea sandhoor*, two or three yellow cowries, some honey or burnt butter, two drachms of alum.

All these to be ground with the palm of the hand on the back of a bell-metal *chillumchee* or *thallee*. The juice to be added gradually while grinding, and when it becomes thick, to be strained through muslin.

N.B.—Suth-ka-kharoo is a species of shell used by the natives for bangles.

Thoolsee is the *Ocimum sanctum*.

Woodapple is the *Feronia elephantum*.

Bhungralah, a common herb growing in abundance everywhere, *Corchorus olitorius?*

Metea sandhoor, red oxide of lead.

Medical Topography of Upper Scinde. By K. W. Kirk, M.D., *Assistant Surgeon*, 1847.

Who can tell us what malaria is? According to Liebig's view, hydro-sulphuric acid has a great deal to say in the matter. Dr. Gardner is of the same mind, and has written at great length to prove its generation in stagnant water. Professor Daniell, when he found water of the Niger, which had been bottled up for some months, strongly impregnated with it, thought he had stumbled on a great discovery—that of the true cause of fever.

Marchetti thinks he has found out the great secret in the mixture of fresh and salt water, and no doubt they form a noxious enough compound in the Pontine marshes. Simple damp and cold have also of late been represented by some as being the active cause of malaria, and some curious experiments have been made in the way of artificially producing fits of ague by the application of cold and moisture in the hopes of frightening away epilepsy according to one of the favourite theories of the day, the antagonism of diseases. We might easily adduce other opinions, but in this country of fever, it will be more interesting to turn to the latest views of Indian writers.

Dr. Heyne, of Madras, has, from a consideration of the fever which infests many hill forts, come to the conclusion, that it is caused by the geological nature of the formation on which they stand, and this he finds to be primitive granitic ferruginous rock—the impregnation with iron and electrical action being, according to him, the exciting cause of disease. Ingenious enough as are his views, we doubt not that Dr. Heyne will soon be satisfied, that they are founded on too limited a consideration of the subject. But if primary formations are in Madras to bear the blame of the production of fever, we have Dr. Kirk in Bengal, who is as confident that the more recent formations in Scinde, in which a slumbering volcanic action is supposed to go on, are equally prolific sources of disease.

We should not have been at the trouble of exposing the fallacy of any theoretical views thrown out in an ordinary topographical sketch, but as these views form the great bulk of a memoir which has very properly been thought worthy of being printed by Government, we think it right to notice them: the more so, as Dr. Kirk appears to endeavour with most laudable zeal, to adapt to his purposes the more recent chemical views of Europe. His is evidently a mind that cannot rest satisfied without some explanation of the phenomena of disease—explanations, which in its present state, medical science is not far enough advanced to offer.* The views of Liebig, on which our author pins his faith, are, at least in his theories of diseased action, merely conjectural, and find much less favour now than when they were first propounded.

Dr. Kirk seems long ago to have satisfied himself as to the actively deleterious nature of hydro-sulphuric acid. In 1844† he wrote thus: "Physiologists and Chemists are agreed, that it is the principle in malaria on which its poisonous effects depend." "In damp and jungly localities fever is often more or less complicated with head affections and biliary derangement. Exposure to the sun's influence, with that of malaria, is the cause of such accompaniments." He also believed, that "hydro-sulphuric acid generated within the body, does much harm." "The breath of a cachectic person and of a glutton always smells more or less of this gas. It appears to me that this is the poison which, when largely

* We fear, however, that his case is nearly hopeless. When a man gets the length of finding that when he has fever, the eating cruciferous plants, such as cabbage, turnip, &c. hurts him, owing to the sulphur which they contain, he must be indeed wedded to theory.

† See Transactions Med. and Phys. Society of Calcutta, Vol. ix.

generated in low typhoid fevers, causes them to be infectious. It is the immediate cause of death in very many cases of conjestive typhoid fever which terminate in colliquative fluxes in our Indian jails, by its influence as a direct sedative poison on the brain and nervous system; the manner of death being exactly that which sulphuretted hydrogen, when breathed from without, would occasion." These views are laid down without the slightest hesitation; and without the slightest intimation that they are merely theoretical assumptions: but he surely cannot expect his readers at once to adopt them: no one will deny that hydro-sulphuric acid is often deleterious to health, and Dr. Kirk may have had satisfactory reasons for thinking it the cause of fever; but if so, he keeps them to himself: he does not make even an attempt to establish their truth.

With such views and prepossessions he proceeded to Scinde, where he was called on to report on the causes of the unhealthiness of Sukkur—and we cannot be surprised to learn that he found no difficulty in finding that his favourite agent was at work there also, however little this might be obvious to common penetration. But before proceeding further we must remark, that his views seem to have been modified since 1844; as in the commencement of his present memoir he recognises the existence of malaria "as a poisonous emanation from marsh or moist lands," without assuming that it is necessarily hydro-sulphuric acid.

Our author soon satisfied himself, that the higher places in Sukkur were unhealthy, while the plains were comparatively the reverse: as he found it to be highly improbable that ordinary malaria should affect the hills, it immediately struck him that their unhealthiness must be caused by some peculiarity in their geological formation. According to his account they are cretaceous rocks, somewhat like the chalk of Britain, underneath which *unspent volcanic action* and consequent generation of hydro-sulphuric acid are *assumed* to be going on. We are not quite satisfied with his description of these rocks, but on this head we do not quarrel with him.

Dr. Kirk now begins to generalise and asserts—1st, that limestone rocks in volcanic districts produce fever all over the world, and 2ndly, that localities on primitive formations are not unhealthy. With regard to these propositions, it is plain that their truth can only be established by the most ample evidence, and in his attempt to prove those sweeping generalizations our author appears to us most signally to fail: further, granting his propositions—Sukkur does not, by his own account, fulfil the required conditions—he adduces no proof of unspent volcanic agency going on at present, and if we can show this, it appears to us unnecessary to consider the two laws which he has above laid down.

What evidence is adduced of the presence of this volcanic agency? The occasional occurrence of sulphur in the rocks in Scinde is brought forward as a proof. "I have in my possession two specimens of sulphur from different parts of Upper Scinde, and feel confident, that when the river is low *it may yet be found* at Sukkur." Thus we see that where its noxious agency is supposed to be so energetic, it is not known to occur. The next argument is, "the well water at Sukkur is strongly impregnated with sulphates, and the sulphurous vapours arising from it are overpowering." This may be so, but no one will affirm that sulphuretted springs are not common in the oldest formations in which modern volcanic action is unknown—nor will they admit that Harrowgate or Aix-la-Chapelle are nests of fever. In the very last number of this Journal Dr. Murray happened to remark, that in the jungly little valley where his sulphuretted springs are given forth, and where we can state from our own experience that along the course of the stream the air is most strongly impregnated with this gas, for at least a mile, fever is, comparatively speaking, rare.

Our author proceeds to state, that it is "unquestionable that mephitic air is escaping from the rock at Sukkur." This however, he says is not usually admitted, and he remarks that "to such, as trust their own five senses, to the exclusion of their *reasoning power*, argument is in vain." To such Dr. Kirk says, I cannot demonstrate the fact, but we must have sulphuretted hydrogen disengaged, because *my reason* tells me that we have "sulphates formed and forming under ground." His reason has discovered this, but we want proof of the fact. That such operations are going on, on any extensive scale cannot be assumed from the statement admitting it to be quite correct, unaccompanied by any analysis of the water, that wells on being first opened frequently emit a sulphurous smell, and contain sulphates.

Our author next states, that it is on record that dreadful epidemics have been produced during the continuance of volcanic action, and wanders in his notes into some singularly inappropriate quotations from Scripture regarding the countries about the Levant, and here we should expect the analogy of Scinde in these respects to be demonstrated, but no—not a single earthquake, not a convulsion of nature has our author recorded as having ever occurred in Scinde. His *reason* has taught him that unspent volcanic action must be going on. He might however have pitied his weaker brethren, those whose minds cannot so readily jump at a conclusion, and might have thought it just possible that they might not all be able to perceive these things intuitively, especially as, to use a familiar illustration, they never heard of the unhealthiness of Naples, situated close to one of the most persistent points of modern volcanic agency.

Dr. Kirk has been at the trouble to coin a new word for his mephitic air, to which he gives the name of *Sesmaria*, a barbarous compound of Greek and Italian, not of Greek and Latin, as he supposes; but we think he is premature, and it would have been more satisfactory to himself and to others if he had first demonstrated the existence of his agent as a source of disease. There may be abundance of unspent volcanic agency in Scinde, but the author has failed to produce satisfactory proof of its existence. We have purposely avoided all general remarks regarding the nature of malaria, and also all notice of our author's observations regarding other parts of Scinde, besides Sukkur. Our object has been solely to show in a few words the inadequacy of the views, so dogmatically laid down by him, to account for the sickness at Sukkur. For ourselves we have not the materials for forming a satisfactory opinion on so difficult a question, and we believe that the experience of the past year has shown sufficiently that its unhealthiness is not of a permanent character.

We would now venture to caution our author against being run away with by theory, and having done so, we have much pleasure in saying, that Dr. Kirk's topography contains a very considerable amount of useful and interesting information, and many curious facts regarding malaria.

Case of Duplex Monster. *By* J. W. Bedford, Esq. *Assistant Surgeon.*

I received intelligence of the birth of a Monstrosity: on hastening to the house I found the twins as represented. They were six days old, small but healthy. The fleshy band of union stretched from the apex of each sternum. The band was soft, as though containing intestine, which percussion did not verify however. It was two inches from above to below, one inch from before to behind. No pulsation: one common umbilicus in centre of inferior surface. Respiration independent: circulation difficult to be appreciated. Defecation independent, one wakes, whilst the other sleeps. Both females, the aspect of one is more lively than that of the other.

Their mother died: cow's milk was given for food: ulcers formed upon inferior extremities, and they died, one an hour before the other, on April 14th, 1847.

The preparation was sent to the Medical College, and examined by Professor Webb and Dr. Macpherson. On laying open the chest and abdomen it was found, that the fleshy band of union contained in its interior liver and intestines. The intestines were easily withdrawn into the true abdominal cavity, but the liver was fixed to a serous membrane which divided the band of union—the left lobe of the liver of one child, and the right lobe of that of the other, being adherent at this point. From the common umbilicus, umbilical vessels diverged to either side—each child was therefore in all respects individually complete, although their livers were in contact. It is plain that it would have been impossible to separate the children without laying open the abdominal cavities of both, and also cutting through their livers, an operation which most people would not be inclined to attempt.

CHITTAGONG: *May* 8*th*, 1847.

Some general remarks on the Flora of Ceylon.

By GEORGE GARDNER, *F.L.S.*

Although Ceylon is celebrated for the luxuriant vegetation by which it is covered, the plants which compose it are less known to botanists than those perhaps of any other portion of India of equal extent. While the history and uses of the vegetable productions of the possessions of the East India Company and most of the islands of the Indian Archipelago have been given to the world by modern botanists, those of Ceylon are at the present day nearly as little understood in Europe as they were one hundred years ago, when Linnæus published his "Flora Zeylanica," founded on collections which had been made in the Island by Hermann, a Dutch others if he had first demonstrated the existence of his agent as a source of disease. There may be abundance of unspent volcanic agency in Scinde, but the author has failed to produce satisfactory proof of its existence. We have purposely avoided all general remarks regarding the nature of malaria, and also all notice of our author's observations regarding other parts of Scinde, besides Sukkur. Our object has been solely to show in a few words the inadequacy of the views, so dogmatically laid down by him, to account for the sickness at Sukkur. For ourselves we have not the materials for forming a satisfactory opinion on so difficult a question, and we believe that the experience of the past year has shown sufficiently that its unhealthiness is not of a permanent character.

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The vegetation of all countries has its general character determined by two great principal causes—physical aspect and climate. The former having already been detailed in the geological sketch of the Island, I shall here offer a few remarks on the latter. The two monsoons which occupy the greater part of the year, materially influence the climate. That from the south-west lasts generally from April to September, while the north-east prevails from November to February, the intervening periods being subject to variable winds and calms. The western side of the Island, which is exposed to the south-west monsoon, has a humid and temperate climate, similar to that of the Malabar coast, while the eastern, which is open to the north-east monsoon, has a hot and dry climate, similar to that of the Coromandel coast. The seasons and climates of the south-west and north-east portions of the Island are therefore very different. While on one side of the Island the rains are falling in torrents, the other is suffering from drought; and it not unfrequently happens that the opposite sides of a single mountain exhibit at the same time these opposite states of climate.

The great variety of surface and of climate, then, which the Island possesses, are favourable not only to a varied, but to a luxuriant vegetation, especially in its central and southern districts. From the study of plants taken in connexion with these circumstances, and their various other physical conditions, has originated the science of Botanical Geography, one of the most interesting branches of Botany. and one which some day will, no doubt, throw much light on the laws which have regulated the production and dispersion of species. It is only of late years that attention has been given to this subject, for, till the natural productions of different parts of the surface of the globe came to be investigated with the attention and accuracy which are peculiar to the present age, naturalists rested satisfied with the vague idea, that all animals and vegetables had originally radiated from a common centre, and that in the same parallels of latitude the same species would be found. This we now know not to be the case, and it can be as safely asserted that every large tract of country has had its own peculiar creation of both plants and animals, as that two and two make four, the exceptions to this general rule being accounted for by disseminating causes now in operation. In no other way can we account for Europe having a totally different class of plants from that part of North America which lies immediately opposite to it; or for the botany of Southern Africa having little or no resemblance to that of the same parallels in South America, or to that of Australia or for many small Islands, such as that of St. Helena, possessing a vegetation totally different even from that of the nearest continent. Islands, however, in general approach nearest in the nature of their productions to that of the countries to which they most nearly range in a geographical point of view, and this we shall find to be the case with Ceylon.

Both the climate and the soil of the maritime parts of the western side of Ceylon being very similar to that of the Malabar coast, we find that a large proportion of the plants of both places are identical; and the same holds good with reference to the northern and north-east coasts of Ceylon, and that of the opposite Coromandel coast, although each district in both countries is found to possess species which are peculiar to each. A vegetation more or less similar to that of the coast extends inland to the foot of the great mountain chain; but from thence upwards a very great change is found to take place in it, and almost every thousand feet of elevation shows a vegetation which, though merging into those immediately above and beneath it, offers species which do not range beyond it. It is at an elevation of from 2,000 to 8,000 feet that the greater part of the species of plants peculiar to Ceylon are to be found; but most of these belong to forms, that is to natural orders or genera, which form part of the vegetation of neighbouring countries, such as the Neilgherry mountains in the peninsula of India, the Himalaya mountains, the high lands of Malacca and of the eastern islands, but more particularly Java, and I have lately met with a few species which indicate an affinity with the continent of Africa.

I shall now offer a few remarks on the nature of the vegetation which characterizes the different botanical regions of the Island. The truly littoral plants of all countries offer a greater number of identical species in widely separated localities of the same parallels than those of any other, and this, indeed, was to be expected from the fact that the ocean forms a ready medium for their transmission from one country to another by means of tides, winds, and currents, while at the same time their seeds, unlike those of most other plants, are not injured by immersion in salt water. Most of the shrubs which inhabit the muddy shores of the sea and of the salt lagoons which are so numerous towards the north of the Island, and which are known by the name of Mangroves, belong to that natural order of plants which botanists call *Rhizophoreæ*, a tribe which is strictly intertropical. My researches have already yielded me about half a dozen species, all of which I find are common to Ceylon, the shores of the continent of India, and of those of the Eastern islands; and the same I find to be the case with a few other shrubs belonging to other tribes, such as *Ægiceras fragrans*, which extends even to the shores of Australia, *Epithinia Malayana*, *Pemphis acidula*, *Dilivaria ilicifolia*, *Lumnitzera racemosa*, *Thespesia populnea* (the tulip tree of Ceylon), and *Paritium tiliaceum*, the last having a far more extensive geographical range than any of the others, as I possess specimens in my herbarium from the shores of the West Indies, Brazil, and the Sandwich Islands, besides from various parts of India, The cocoanut tree, which gives so marked a feature to the West coast of Ceylon, and which is now so generally cultivated along the shores of all intertropical countries, is essentially a sea-side plant, and has as good claims to be considered indigenous to Ceylon as to any other part of the world. The same observations that apply to the shrubs of our shores, apply also to the herbaceous vegetation.

The great flat tract which extends between the sea-shore and the central mountain range, is possessed of a very extensive Flora, but as its general character is stamped by a few species which are very numerous in individuals, it is to them chiefly that my remarks will extend. In this tract a very great proportion of the species are identical with those of similar ones on the coasts of Coromandel and Malabar. The generally arid nature of its soil, together with its much drier climate than that of the interior, is well shown in the Northern Province, especially by the more wiry and stunted nature of the trees and bushes, their prickly stems and branches, and the smaller size of their leaves, together with a much greater proportion of fleshy shrubs such as Euphorbias, &c. The species which preponderate in individuals in the Northern Province are different kinds of *Acacia*, mostly very thorny, the wood apple *(Feronia Elephantum)*, *Limonia alata, Salvadora Persica* (the true Mustard tree of Scripture, a tree which extends northward and westward to the Holy Land, and which I was the first to point out as a native of Ceylon), *Carissa spinarum, Gmelina asiatica, Pleurostylia Wightii, Eugenia bracteata, Elæodendron Roxburghii, Ochna squarrosa, Cassia fistula, Cassia Roxburghii,* and *Memycelon tinctoria.* These are chiefly shrubs and small trees. The large trees, which are mostly of no great size, are two or three species of *Terminalia, Bassia longifolia,* the Margosa *(Azadirachta indica)*, the satin wood *(Cloroxylon Swietenia)*, the Ceylon Oak *(Schleicheia trijuga)*, the Tamarind *(Tamarindus indica)*, and the Palmyra *(Borassus flabelliformis)*, which is particularly abundant on the peninsula of Jaffna.* The

* Since the above was written, I have made a most important addition to the trees of this region, and, indeed, to the Flora of the Island, in the shape of the far-famed Upas tree of Java and the Moluccas *(Antiaris toxicaria)*; having discovered some fine large trees of it a few miles to the eastward of Kornegalle, early in August of the present year (1847). This discovery, proves how little the investigation of the vegetable productions of Ceylon has hitherto been attended to.—G. G.

mass of the herbaceous vegetations belongs to the natural orders *Scrophularineæ*, *Leguminosæ*, *Rubiaceæ*, and *Compositæ*.

Proceeding southward through this flat country, a considerable difference in the general appearance of the vegetation is observed, arising no doubt from the greater amount of rain which falls during the course of the year. The trees are not only larger, but their foliage is heavier and of a darker hue; and the numerous *Acacias*, which give so striking a feature to the north, almost disappear. Between Colombo and Galle, shrubs belonging to the natural order *Euphorbiaceæ* are very numerous, both in species and individuals, as well as a variety of *Rabiaceæ*, of which the beautiful *Ixora coccinea* is not the least common. It is only in this range that the pitcher plant *(Nepenthes distillatoria)*, which is not, however, peculiar to Ceylon, is met with, growing in moist places, and supporting itself among the bushes. About Galle, and from thence inland to the base of Adam's Peak, one of the most common shrubs is that which has been named in honour of the great Humboldt—*Humboldtia laurifolia*; and on the low hills near Galle a few trees are met with, which farther north do not exist under one thousand feet of elevation, but this is easily accounted for by the greater atmospheric moisture of that district. One of these trees is a new and remarkable species of Durian *(Durio Ceylanicus, Mihi)*. It is in this district that the greater number of the sugar plantations of Ceylon exist.

The east side of the Island being much drier than that of the west, the consequence is that its vegetation has more of the character of that of the northern province than of the opposite coast It must, however, be remarked that, with the exception of the immediate neighbourhood of Trincomalee and of Batticaloa, the eastern side of the Island is a *terra incognita* to the botanist.

Generally speaking, the first two thousand feet of the mountain range is covered with a dense forest of large trees, which are characterized by a foliage of a much larger size than that of the low-country forests, and nearly of an uniform dark green colour, except, indeed, when the large Iron-wood tree *(Mesua Ceylanica)* is putting forth its young leaves, which are of a blood-red colour, and at that season give a remarkable aspect to the forest. To the general observer the trees of the next two thousand feet appear but little different from those of the first, but the eye of the botanist can at once detect many species in both that are peculiar to each. The mass of the herbaceous vegetation of both is made up of *Ferns, Scitamineæ, Urticaceæ, Cyrtandreæ* and *Compositæ*. One of the most marked features of the second two thousand feet is the existence of large open grassy tracts on the sides of the hills to which the natives give the name of Pattanas. Such tracts extend to the highest parts of the island, differing more or less at different elevations in the nature of their vegetation. Scattered through the lower ones, and giving them an orchard-like appearance, are two trees which are almost peculiar to them. These are the *Careya arborea*, and *Emblica officinalis*. The herbaceous vegetation consists of chiefly numerous tall coarse grasses, growing for the most part in tufts, the most common of which is the Lemon-grass *(Andropogon Schœnanthus)*, intermingled with which are several *Compositæ*, principally consisting of several species of *Blumea, Knoxia corymbosa*, the representative of the old and accurate historian of Ceylon, the bloom-like *Atylosia Candollii*, and *Impatiens Balsamina*, the origin of the common garden balsam. It is on the forest land of this tract that the principal coffee estates have been established.

The next two thousand feet, which brings us to an elevation of 6,000 feet above the level of the sea, and into a region which has a much lower temperature than any of the preceding, is still covered with forest having occasional patches of Pattana, but both give support to a very different vegetation. The trees are much smaller, grow closer together, have their stems and branches covered with pendulous masses of lichens and mosses, and many kinds of small *Orchideæ*. Their leaves are mostly small, and their varied tints remind one of the autumnal forests of more temperate climes. The under-vegetation consists of numerous species of beautiful harbaceous and suffruticose Balsams *(Impatiens)*, a great variety of suffruticose *Acanthaceæ* (Nilu), beautiful and delicate Ferns of all sizes, from those scarcely a few inches in height, to tree ones, which throw up their stems surmounted by large masses of verdant fronds to an elevation often of twenty feet, and rivalling in gracefulness the Palms of the low country. It is in this range that the lovely tree, Rhododendron, which is so common in more elevated tracts, first makes its appearance. The Pattanas at this elevation are more spongy in their nature than those below, the grasses which are peculiar to them grow more closely together, and are smaller and more wiry in their texture; while the shrubs which are scattered through them are principally species of *Hedyotis*, and *Osbeckia*, the latter producing beautiful large rose-coloured flowers.

The two thousand feet which succeed to these include the most elevated portions of the island, and embrace chiefly the mountain-tops, and the vallies or plains which divide them from each other. The vegetation of this region has still a more alpine aspect than the preceding one, and of all the others is that which is possessed of the greatest interest to the botanist, from the great number of European forms that are mixed up with those whose range does not extend beyond the tropics. The tree that first claims our attention in this range is the Rhododendron, not only from its great beauty, but from its vast abundance especially in the open plains, which during the months of June and July are clouded with red from the great profusion of its blossoms. I have met with two well-marked varieties, if they are not, indeed, distinct species of this tree. One of them is principally met with in the plains or in their wooded margins, and is easily recognised by the rusty-coloured under side of its leaves. This is the variety which is so common on the open plains of the Neilgherry range of mountains in the peninsula of India. The other variety, so far as I am aware, is peculiar to Ceylon, and is always found in the forest, and at a greater elevation than the other. It is distinguished by its greater size, and the silvery under side of its leaves, which are besides narrow and rounded at the base, not broad and cordate as in the other. Several fine trees of this variety occur on the ascent of Pedrotalagalla from Newera-Ellia, and close to the temple on the summit of Adam's Peak; but the finest I have met with in my excursions among the mountains of the interior, was in crossing over Totapella, where there is a large forest of them, many of which are from fifty to seventy feet in height, and with stems more than three feet in diameter. In these forests are also to be met with some four or five species of *Michelia*, the representatives of the Magnolias of North America, several arboreous *Myrtaceæ*, and not a few *Ternstrœmiaceæ*, the most common of which is the Camellia-like *Gordonia Ceylanica*.

There is much here to remind the European of his native country. Different species of *Rubus* and a Barberry abound along the wooded margins of the plains, as well as two species of *Viburnum* or Guelder Rose, and a shrubby St. John's wort *(Hypericum Mysorense)*, bearing large yellow flowers. The dry open banks are covered with violets and *Lysimachiæ*, while in the open plains are to be found two species of *Potentilla*, an *Anemone*, a *Geranium*, two kinds of *Ranunculus* or butter-cup, a Lady's mantle, not unlike the *Alchemilla vulgaris* of England, a little blue star-blossomed *Gentian*, two species of sun-dew or *Drosera*, a *Campanula*, a *Valeriana*, and in the bogs several kinds of *Juncus* and *Carex*.

At the health station on the plain of Newera-Ellia, which is about 6,200 feet above the level of the sea, there are several gardens in which most of the vegetables of Europe grow freely. European fruit trees have also been tried, but no success has attended the experiment; nor was such a thing to be expected, for although during the cold season the thermometer falls occasionally in the morning to nearly the freezing point—the annual range being from $35\frac{1}{2}°$ to $80°$, with a mean daily variation of $11°$—the cold is not sufficiently intense nor of long enough continuation to give those trees the period of rest which they require. In place of losing their leaves for nearly six months of the year, the peach and the cherry are here evergreens, and are hence kept in such a continued state of excitement as to prevent their bearing. The peach does, indeed, give a poor crop of fruit of a very inferior quality, but although the cherry blossoms annually, its fruit never comes to perfection.

Although the Neilgherry range from its near geographical position, has more species in common with the tracts of a similar elevation in Ceylon than any other part of India, yet these from their small numbers are evidently only stragglers northward, the very great number of species peculiar to the mountains of Ceylon, and to them alone, proves that these mountains form a distinct centre of creation. This I shall illustrate by a few examples from some of the better known natural orders and genera of plants. Beginning with *Ranunculaceæ*, we find three species of *Ranunculus* belonging to the Flora of the Neilgherries, and two to that of the mountains of Ceylon, one species only being common to both countries. Of

Magnoliaceæ Ceylon possesses four or five species of *Michelia*, all of which are different from the solitary one which is found on the Neilgherries. Each country has a violet peculiar to itself, with another that is common to them both. Both places possess about half a dozen species of *Elæocarpeæ* each, but only one is held in common; and the same is the case with the order to which the tea belongs—*Ternstrœmiaceæ*. The genus *Impatiens*, that to which the garden Balsam belongs, affords one of the strongest arguments which can be offered in favour of the fact I am now illustrating, for while each country possesses upwards of twenty species, certainly not more than three are common to both, and none of the other Ceylon species are known to exist elsewhere. Of *Rosaceæ* we find that the Neilgherry range has only three species of *Rubus*, while there are no less than eight found on the mountains of Ceylon, three of which are peculiar to them. Both countries have an *Alchemilla* in common, while the Agrimony of Ceylon does not exist on the Neilgherries, but is found abundantly on the *Himalaya* range; and I have lately described a new species of *Poterium* from Adam's Peak, the only one which has hitherto been met with in India. Two species of *Potentilla* grow in Ceylon, and three on the Neilgherries, one only of which is common to both countries. A comparison of this kind might be run on with to a great length, but enough has already been shown to prove that while the Flora of the central part of the Island has more affinity with that of the Neilgherries than with any other part of the world, yet it must have had a creation of its own, nearly allied indeed to the other in forms, but very distinct in individuals.

Although many of the genera found in the upland regions of Ceylon are such as are common in Europe, yet none of the Ceylon species are identical with European ones. Indeed, there is not to be found growing really wild in the Island, a single species exactly the same as any European one. There are, however, a few which have become more or less naturalized, having been introduced along with garden and other seeds. These are the common Sow-thistle *(Sonchus Oleraceus)*, the common Chick-weed *(Stelleria Media)*, the Mouse-ear Chick-weed *(Serastium vulgatum)*, the Corn Spurry *(Spergula arvensis)*, and the annual Meadow-grass *(Poa Annua)*. All these with the exception of the first, which is much more general, are mostly confined to the plain of Newera-Ellia. In all countries, plants which are introduced from others and find a congenial soil and climate, and which produce their seeds in profusion, and of a nature to be easily blown or carried about from place to place, are sure to naturalize themselves, and often in the course of a few years are not to be distinguished from those which are really original denizens of the clime. Besides those from Europe just enumerated, there are many others, natives of distant tropical countries, which are now rapidly spreading themselves on the Island; and as it is of the utmost importance to distinguish them from those which are truly natives, I shall here enumerate all those species of which I possess sufficient evidence to establish their exotic origin, and mention the countries from which they have been brought.

The two species of prickly Pear *(Opuntia)*, which are now so common in dry sandy localities in the low country, are natives of the tropical parts of the Continent of America, as, indeed, the whole of the *Cactus* tribe is. The beautiful rose-coloured Periwinkle *(Vinca rosea)*, which has so completely overrun the cinnamon gardens at Colombo, and other similar localities, is a native of the island of Madagascar, though it has now perfectly established itself in nearly all tropical countries. The climbing *Alamanda cathartica*, with its dark green leaves, and golden bell-shaped blossoms, is a native of the Guianas, and was no doubt introduced by the Dutch. The *Lantanas* which are to be met with almost everywhere in bushy places and in hedges, are natives of the West Indies; and such also is the case with the yellow-flowered *Turnera ulmifolia* which is common by road-sides about Colombo. The Cape Gooseberry *(Physalis peruviana)*, now so common about Rambodde and Newera-Ellia, is a native of the mountains of Peru. The four o'clock plant *(Mirabilis Jalapa)* common about Kandy, is a native of Mexico and the West Indies; and the *Ipecacuanha* plant, as it is erroneously called, *(Asclepias Curassavica)* with its orange blossoms, and seeds with long silky tails, is a South American. Most of these must have been long established before the English took possession of the country; but the following are well known to have escaped from the Botanical gardens at Colombo or Peradenia during the last five-and-twenty years. The small white-flowered *Passiflora fœtida*, now so common a weed everywhere, is a native of the West Indies and Brazil, and was only introduced to the Island, by Mr. Moon, so short a time ago as 1824. Two species of *Crotalaria*—*C. Brownei*, a native of Jamaica, and *C. incana*, a native of the Cape of Good Hope; the Mexican *Coreopsis*, like *Cosma caudata;* the Peruvian blue-flowered *Nicandra physaloides*, and the South American sensitive plant *(Mimosa pudica)*, are now not only common weeds about Peradenia and Kandy, but are fast extending themselves in all directions, the first mentioned species having now nearly reached as far as Rambodde on the Newera-Ellia road. *Brucea Sumatrana*, a shrubby native of the Eastern islands, and an escape from the Peradenia gardens, now forms part of the low jungle on the neighbouring Hantane range: and *Buddleia Madagascariensis*, a native of Madagascar, and two small kinds of Passion flower *(P. Suberosa* et *glauca*), both natives of the West Indies, are fast following. *Ageratum conyzoides*, everywhere a common weed, and one of the great pests of the coffee planter, is of American origin, though now thoroughly naturalized in all tropical countries.

The above though only a rapid sketch of the more prominent features of the vegetation of the Island of Ceylon, is sufficient to show the great interest and variety of the materials of which it is composed, and the relation which it holds to that of other parts of the globe. Much however, still remains to be done before a detailed exposition of it can be offered to the world.

Electricity and Galvanism, in their Physiological and Therapeutical relations. By Dr. GOLDING BIRD, F. R. S., *Fellow of the College, Assistant Physician to Guy's Hospital.*

[Continued from page 134.]

In my last lecture I pointed out the universal distribution of electricity in brute matter, and exhibited some of its effects when its equilibrium is disturbed by mechanical, chemical, and thermal influences, and then proceeded to demonstrate its existence in living beings, and succeeded in obtaining it in a state of tension from my own body. The great discovery of Galvani, and the more recent researches of Nobili, Matteucci, and others, next engaged our attention; and, having adduced sufficient evidence of the existence of free electricity of varying tension in animal structure, we are now prepared to grapple with the difficult and interesting question which next arises.

Having demonstrated the existence of electricity in the animal frame—what is its origin?—whence is it derived?—if we for a moment animadvert upon the facts already recounted, we find evidence of the existence of electricity under two distinct forms; one in which this agent is in a neutral and static condition, that is, in a state of rest, capable of being resolved into its two component elements by various mechanical and chemical processes. This form of electricity is possessed by the living fabric in accordance apparently with the general laws of the universal diffusion of this agent throughout all matter, whether dead and inert, or quick and animated with the flame of life. It was this that I decomposed by drawing a comb through my hair, and the existence of one of whose elements in a free state I demonstrated with the electrometer. We have no means, in the present state of our knowledge, of explaining the origin of this electricity in the body, save by referring it to the fiat of omniscience.

There is, however, another state in which electricity exists—a dynamic condition, electricity in motion, or in the state of current. This evidently is not anything superadded to the body, but is merely the electricity normally existing in a state of rest and neutral condition, decomposed by some cause or series of causes, by which its positive and negative elements are separated, their attempt at reunion to reconstitute the neutral electricity giving rise to the phenomena we have been investigating. Let us now review some of the processes going on in the body, which, from their nature, appear capable of disturbing the electric equilibrium which would, without their influence, exist alike in the living frame as well as in brute matter.

It is now an incontrovertible fact that no chemical change can possibly occur without a disturbance of electric equilibrium. Let us, then, ask what processes of this character are going on in the body. The first in point of importance that demands our attention is the union of carbon with oxygen to form carbonic acid. We know that in the respiratory process, this acid, in the form of gas, is, with aqueous vapour, evolved from the lungs, in addition to a considerable quantity which exhales with the perspired vapours, from the surface of the skin. It is nearly impossible to determine the quantity of carbon thus evolved in combination with oxygen with any great accuracy; but it seems pretty certain that about thirteen or fourteen ounces are thus got rid of in 24 hours. During this period the greatest proportion is taken in with the ingesta as mere carbon, and undergoes oxidation in some part of the animal frame. By this union with oxygen, carbonic acid is formed and evolved. Now it is demonstrable, that, if we allow a piece of charcoal to undergo combustion in connection with the condensing-plate of a gold-leaf electrometer, the gold leaves will soon diverge with free negative electricity, whilst the stream of carbonic acid escaping from the burning charcoal carries off with it free positive electricity. This observation we owe to M. Pouillet. It is true that the carbon does not, during its union with oxygen in the animal frame, become red-hot and burn with a visible flame; but this does not constitute a serious objection to our regarding the generation of carbonic acid as one source at least of the excitation of free electricity, for the disturbance of electric equilibrium does not depend upon the light and heat evolved, but from the act of union of the carbon with the oxygen. It has, indeed, been suggested by Mr. Wilkinson that the act of respiration is essentially a galvanic operation, and that the cells of the lungs, in which the chemical changes proper to this function occur, are analogous to the prismatic cells or tubes of the torpedo and other electric fishes. This idea is, I need hardly say, not supported by any anatomical resemblance between the organization of the pulmonic cells and the electric tubes of the torpedo, but was evidently simply emitted as an hypothesis necessary to the theory of animal heat promulgated by the very ingenious observer just alluded to. We, however, must not forget that it is by no means proved that any union of carbon with oxygen does occur in the lungs: it is, indeed, more than probable that this combination occurs most extensively in the systemic capillary system, and that the carbonic acid exhaled by the act of expiration is by no means admitted to be exclusively generated in the lungs.

I have here only alluded to the oxidation of carbon; but we must recollect that hydrogen, phosphorus, and sulphur—elements constituting important and essential ingredients of our food—are also thus burnt off and oxidated in the body. These must, like the carbon, become by this very act sources of free electricity. But a more important influence disturbing electric equilibrium is found in the series of decompositions which, in the physiological condition of the body, are always in action. It is impossible that any two elements can be rent asunder without setting free a current of electricity, which, insignificant as it might theoretically appear, is nevertheless competent to the production of many important phenomena. As one among many examples, I would cite the case of common salt, which plays so important a part as an article of food, and for which perhaps alone, of all condiments, an universal appetite exists. In addition to the proportion of this substance which enters the blood unchanged, and becomes an element of all the secretions, a part is decomposed, and one element in union with hydrogen appears as hydrochloric acid in the stomach; another, in union with oxygen, constitutes, as soda, an important constituent of the bile. What, it may be inquired, can be the influence of these apparently infinitesimal evolutions of electric matter, evolved thus from the resolution of a few grains of salt and water into its elements? But it is easy to produce a mass of evidence to show that these small quantities of electricity are more so in appearance than reality. When we gaze on the electric machine, and listen to the loud snapping, and observe the brilliancy of its sparks, we are apt to fancy that we are dealing with an energetic dose of the agent in question; but all the electricity capable of being evolved from a revolution of the plate or cylinder of the most powerful machine, beautiful and brilliant as may be the phenomena it develops, is incalculably less than that set free by the decomposition of a drop of water or a grain of salt, the real difference consisting in the state of tension or elasticity of the evolved electricity. Dr. Faraday has indeed rendered it probable, that, during the decomposition of nine grains of water, an amount of electricity is thus set free far greater than that which is called into terrific action in the production of the vivid lightning-flashes and appalling thunder-sound of the dread-inspiring tempest.

But, to descend to positive proof, it has been shown by Becquerel, and subsequently by myself, in a paper read some years ago before the Royal Society, that the electricity evolved during the decomposition of a few grains of common salt was, when properly managed, capable of producing chemical changes which, in the hands of the illustrious Davy, required for their demonstration the vast voltaic battery of the Royal Institution. The element necessary for the production of these phenomena appears to be simply a weak current with continuity of action.

Let me draw your attention to the glass vessels before you, in which a few grains of common salt have been undergoing decomposition during the last few hours. The current evolved has been made to traverse a solution of hydrochlorate of ammonia. The result of this has been the decomposition of the salt, and the evolution of its curious theoretical base, the compound metal, *ammonium*. It has in the central tube appeared as an amalgam with mercury, a globule of which had been previously entangled in the folds of the platinum conducting wire. The compound here appears as a grey ash-coloured sponge, like spongy platinum, so light as to float in water. And observe another effect of these weak currents: the amalgam remains in the midst of water unchanged, whilst under ordinary circumstances, a moment's immersion in that fluid is sufficient to destroy it; the weak current which produced it is effective in retaining it unchanged. By untwisting a wire I cut off this current; chemistry comes into play, the spongy amalgam vanishes amidst a torrent of bubbles of hydrogen. Once more let me unite the wires, the electricity from the decomposing salt again traverses the solution; again chemical forces are paralysed, and we shall soon see the spongy amalgam of ammonium and mercury reappear.

Fig. 1.

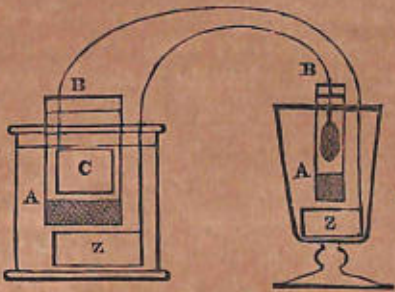


Fig. 2.

Fig. 1, Battery.

A, Vessel containing solution of common salt.

B, Glass cylinder, closed with a plug of plaster of Paris, and containing a solution of sulphate of copper.

C, Copper plate.

Z, Zinc plate.

Fig. 2, Decomposing cell.

A, Vessel containing solution of common salt, having a zinc plate, Z, immersed, and connected by a wire with the copper plate C of the battery.

B, Glass tube, closed with plaster of Paris, containing a solution of hydrochlorate of ammonia, the amalgamated platinum wire immersed in it passing through the cork, and connected with plate Z of the battery.

We have just noticed the fact, that under the influence of a weak current, salts can be resolved into their component elements. In this way a compound can be separated into its constituent acid and base. Now it is a remarkable fact, that if an acid and electric solution be so placed that their union be effected through the parietes of an animal membrane, or indeed any other porous diaphragm, a current of electricity is evolved. This fact was first noticed by Becquerel, and has since been found to be true, not only with nitric acid and potass, during whose combination he observed this disturbance of electric equilibrium, but with all other acids and soluble bases. I am anxious to demonstrate the accuracy of this statement to you, although I fear the test I shall use, the deviations of the needle of an astatic galvanometer, will not be visible to all. I have here a glass tube closed at one end by an animal membrane—a piece of bladder. I fill it with a weak solution of soda, and immerse it in a glass vessel containing some diluted acid. The soda and acid are gradually combining through the walls of the membrane. I now plunge a plate of platinum into the acid, and connect the wire fixed to it to one screw of the galvanometer; fixing the wire of a second plate to the other screw, I plunge it into the alkali; the needles of the galvanometer instantly start into motion, and traverse a considerable arc, pointing out the existence of a current of positive electricity from the acid to the alkali through the conducting wires. Now, with the exception of the stomach and cœcum, the whole extent of the mucous membrane is bathed with an alkaline mucous fluid, and the external covering of the body, the skin, is as constantly exhaling an acid fluid, except in the axillary and perhaps pubic regions. The mass of the animal frame is thus placed between two great envelopes, the one alkaline, and the other acid, meeting only at the mouth, nostrils, and anus. This arrangement has been shown by Donné to be quite competent to the evolution of electricity, and accordingly he found that if a platinum plate connected with the galvanometer be held in the mouth, whilst a second be passed against the moist perspiring surface of the body, the needles will instantly traverse, just as they did in the experiment I have just shown with acid and alkali. The current thus detected by Donné at once explains the cause and confirms the accuracy of the celebrated experiment of Professor Aldini, to which I have already drawn attention. I refer to that in which he excited convulsions in a frog by holding its foot in the moistened hand, and allowing the sciatic nerve to touch the tongue. His curious experiment with the head of an ox admits of a similar explanation.

A remarkably energetic current also can be thus detected when the platinum plates are plunged, one into the acid contents of the stomach of an animal, the other into the alkaline secretion of the liver. This gastro-hepatic current is of so very remarkable a character that it will once more occupy our attention.

Within the last few months, the results of some researches of Liebig have rendered it very probable that a large proportion of the electricity of muscular structures is owing to the mutual reaction of an acid and alkaline fluid. Every one is aware that the blood, in a healthy state, exerts a decided and well-marked alkaline action on test-paper: now it is remarkable that although a piece of muscular flesh contains so large a proportion of alkaline blood, still that when chopped up, and digested in water, the infusion thus obtained is actually acid to litmus paper. This curious circumstance is explained by the fact announced by Liebig, that although the blood in the vessels of the muscle is alkaline from the tribasic phosphate of soda, yet the proper fluids or secretions of the tissues exterior to the capillaries is acid from the presence of free phosphoric and lactic acids. Thus in every mass of muscle we have myriads of electric currents arising from the mutual reaction of an acid fluid exterior to the vessels on their alkaline contents. Whatever may be the ultimate destination of this large quantity of electricity, it is at least remarkable that a muscle should be really an electro-genic apparatus. This view of Liebig on the condition of the fluid of muscles curiously helps in explaining the presence of electricity in them, announced by Matteucci. We have thus two sources of the electricity of muscles—the effects of metamorphosis of effete fibres on the one hand, and on the other the mutual reaction of two fluids in different chemical conditions. It is certainly curious thus to find a muscle, an organ long regarded as the motor apparatus of the bony levers of our frames, invested with new properties. Its agency in generating electricity can no longer be denied, and I hope by and by to render it probable that the seat of the generation of animal heat is also in the muscles. In the course of twenty-four hours, a considerable proportion of watery vapour exhales from the surface of the body. This has been variably estimated, and in all probability is liable to great variation, but from thirty to forty-eight ounces of water may thus be got rid of from the system. The evaporation of this amount of fluid is sufficient to disturb the electric equilibrium of the body, and to evolve electricity of much higher tension than that set free by chemical action. A metallic cup, containing a few drops of water, is placed on the electrometer before me. I now drop in a piece of hot charcoal; a cloud of watery vapour is evolved, and the gold leaves instantly diverge to their utmost extent with free negative electricity. I think this evaporation may probably account for the traces of free electricity generally to be detected in the body by merely insulating a person and placing him in contact with a condensing electrometer. Pfaff and Ahrens generally found the electricity of the body thus examined to be positive, especially when the circulation had been excited by partaking of alcoholic stimulants. Hemmer, another observer, found that in 2422 experiments on himself, his body was positively electric in 1252, negative in 771, and neutral in 399. The causes of the variations in the character of the electric condition of the body admit of ready explanations in the varying composition of the perspired fluid. For if, containing, as it generally does, some free acid, it by its evaporation would leave the body positively electric; whilst it merely contains neutral salt, it would induce an opposite condition. The accuracy of these statements can be easily verified by means of the galvanometer.

It is impossible to quit this part of my subject without calling to mind the fact, that, independently of combustion, chemical action, or evaporation, the mere contact of heterogeneous organic matters is competent to disturb electric equilibrium. Thus a pile of alternate slices of muscular tissue and brain, with pieces of wet leather interposed, has been found by Lagrave to evolve electricity; and Dr. Baconio, of Milan, has shown that a few alternations of slices of beet-root and wood of the walnut-tree were capable of setting free sufficient electricity to excite convulsions in a frog when conveyed to its muscles by means of a conductor formed of a leaf of scurvy grass. Matteucci has thrown out the suggestion, that the organization of a muscle is possibly such as thus by heterogeneity of structure to account for the development of electricity; he considers the analogy between the voltaic arrangements and the constitution of muscle to be complete, if we conceive the zinc, or oxydising plate, to be represented by the true fibre, the platinum, or conducting plate, by the sarcolemma, and the exciting fluid by the blood.

In summing up the foregoing facts, we are, I think, justified in concluding that a mass of evidence has been adduced demonstrative of the actual existence of electricity in three states in the body:—

1st. In a state of equilibrium, common to all forms of ponderable matter.

2ndly. In a state of tension capable of acting on the electrometer, giving to the whole body a generally positive condition, and arising, in all probability, from the disturbance of the normal electric equilibrium by the processes of evaporation and respiration.

3rdly. In a state of current, a dynamic condition, arising from the disturbance of equilibrium by the union of carbon with oxygen in the capillary system, and from other chemical processes going on in the body; such currents, although *suspected* to be everywhere existing, having been actually detected between the skin and mucous membrane, the stomach and liver, and the interior and exterior of muscular structures.

A difficult question now remains for us to grapple with: having proved the existence of electric currents in the animal frame, what is their office, what purpose are they destined to serve in the animal economy? That they must have some function to fulfil is obvious from their presence; that such function, whatever it may be, is important will be at once conceded from their existence in almost every part of the body. We know that nothing in the meanest element of the universe is made in vain; much less, then, can the philosopher admit that the electricity existing in the masterpiece of the Creator has not some great and destined purpose. From the mysterious character of the agent under consideration, from the astounding effects it developes, from its simulating some of the most occult and remarkable phenomena of the external world, the active imagination of the superficial as well as of the more sober observer has always sought in electricity a clue to most, if not all, of the functions of the body. Some, indeed, have gone the dangerous length of regarding electricity as the principle of life itself, and have dared to place it on a level with the divine essence, which, emanating from the Creator, constitutes what, for want of a better name, we call vitality. These pretensions have been given to this agent from its effects when made to traverse the spinal nerves of a recently executed malefactor. This, in the hands of Dr. Ure, in his celebrated experiment upon the murderer Clydesdale, worked on the dead, but yet warm corpse, a horrible caricature of life; by calling into violent contractions the muscles of the face, all the expressions of rage, hatred, despair, and horror, were depicted upon the features, producing so revolting a scene that many spectators fainted at the sight. But this experiment on the recently executed murderer, striking as it was, merely afforded an additional proof of the susceptibility of the muscles to the stimulus of the electric current, and, when divested of the dramatic interest investing it, becomes not more remarkable than the first experiment of Galvani on the leg of a frog.

Secretion and nervous agency have always been the favourite phenomena which electricity has been called in to explain, and with some considerable appearance of probability. Dr. Wollaston, 36 years ago, first suggested from the re-solution of salts into their elements under the influence of feeble currents, that secretion depended essentially upon the electric state of the secreting glands; he thus regarded the kidneys as constituting the positive and the liver the negative electrodes of the electric apparatus of the body. A curious anecdote is related of Napoleon, who is said by Chaptal to have remarked, on seeing the voltaic battery of the French Academy in action, "*Voilà, docteur, l'image de la vie; la colonne vertebral est le pole, la vessie le pole positif, et le foie le pole negatif.*" We must admit that a great *hiatus* exists in every argument which assumes that nervous force and electricity are identical, from the fact that delicate as are our tests for this agent, it has never been actually detected traversing the nerves. It has indeed been stated that on connecting needles plunged in the nerve of a rabbit with the galvanometer, and exciting the muscles of the limb to contract, currents have been detected. Other observers of high repute have stated that a steel needle plunged in a nerve becomes magnetic during the contraction of the muscle it supplies. Both these statements have been rigidly tested, and have been found utterly unsupported by the results of careful experiment. These failures must not, however, be admitted as quite conclusive against the existence of electricity in the nerves, although their structures are by no means such good conductors as some other of the animal tissues, for it has been well remarked by Dr. Todd and Mr. Bowman, in their elegant and elaborate work on physiological anatomy, that the insertion of needles into the nerves is not a sufficiently delicate means for collecting electricity, if such exists, for they can scarcely be expected to pierce the nerve-tubes, but would sink in between them and the central axis, from which they would be separated by the insulating matter of Schwann. I shall, however, have again occasion to return to this question.

I dare not occupy your time by an allusion to all the hypothetical notions which have been promulgated regarding the part played by electricity in the animal economy; still there are two or three which, as well from their ingenuity as from the talent of their authors, well deserve a passing notice. Among these, the supposed action of electricity, as the agent which, by traversing the nerves, induces the contraction of muscle, a theory announced by Prevost and Dumas, stands foremost. It was assumed by these philosophers that the nervous fibrillæ traversed a muscle in a direction perpendicular to the direction of its fibres, forming a series of loops, either by uniting with each other or with a neighbouring nerve. On the influence of the will being directed towards the limb, a current of electricity was supposed to be transmitted along the nervous parallel loops, which consequently attracted each other, and of course on their approximating caused contraction of the muscle: this view is evidently founded on the well known fact of currents moving in the same direction attracting each other, which a single experiment will easily demonstrate.

It is hardly necessary to allude to the objections which may be opposed to this most ingenious theory; among the most serious is the fact that more recent researches of physiologists have shown that the views of its talented authors are not consistent with a correct knowledge of the organization of muscular tissue.

The influence of electricity as an agent in exciting the function of digestion, and, indeed, enabling us to replace the *vis nervosa*, transmitted by the pneumogastric nerves, by a weak current, has been especially insisted upon by Dr. Wilson Philip. This very indefatigable observer made numerous observations on this matter, and he succeeded in proving that when in a rabbit, which had just partaken of a hearty meal, the par vagum was divided on both sides, the food remained in the stomach unaltered, whilst on allowing an electric current to traverse the course of the nerves to the stomach, digestion was effected. This is just what might, from what is now known of the nature of digestion, have been expected, and a very much less energetic current than that employed by Dr. Philip would have been sufficient. For it is now pretty distinctly made out that the function of digestion in the stomach is an action allied to simple solution, of which water,—a temperature of 90°, and a free acid, the hydrochloric, phosphoric, or both, are the active agents. The feeble current from a single pair of zinc and silver plates is powerful enough to furnish, in a short time, a sufficient supply of electricity to decompose some chloride of sodium or common salt, and to evolve enough hydrochloric acid for the purpose of digestion; and I shall have, indeed, occasion to show in a future lecture that such a current, feeble as it is in point of intensity, is capable of producing most remarkable secondary effects on living tissues, actually effecting very important chemical changes in the parts submitted to its influence. It is true that objections have been started to this theory, but my own impression is that they are not sufficient to invalidate the accuracy of Dr. Philip's statements; and although I do not by any means consider we are justified in admitting with him that electricity is capable of performing all the functions of the nervous influence in the animal economy, nor in regarding an electric current as constituting the real digestive agent, we nevertheless possess sufficient evidence to induce us to regard a current of electricity as the means by which the saline constituents of the food are decomposed, and their constituent acids, the real agents in digestion, act free in the stomach; the soda of the decomposed salts being conveyed to the liver to aid the metamorphosis and depuration of the portal blood, and cause the separation of matter, rich in carbon, in the form of a saline combination in the bile.

It is remarkable that although nothing is more frequently praised than the certainty of the evidence of natural truths, and although it would appear a simple thing to describe with fidelity and accuracy the results of experiment and observation, still an observer has scarcely had time to announce his discoveries and array his phalanx of facts in a resistless manner, as he supposes, before some other person repeats his experiments, and perhaps announces that he has obtained exactly opposite results: such has been the case with Dr. Philip's observations. Mr. Broughton, in this country, in particular, obtained nearly directly opposite results; others have again repeated their experiments, and have sufficiently corroborated the results of the doctor's researches on the effects of division of the pneumogastric nerves arresting the digestive process: the effects of the electric current in developing this function after division of the nerves is however variously reported. Now, most certainly, these discrepancies cannot be admitted as furnishing anything valid against Dr. Philip's views, unless, in addition to the use of the battery, the direction of the current was distinctly indicated, for unless the positive current *entered* the stomach it would not cause the separation of free acid; as, if the negative fluid entered, free alkali would alone be developed.

There is, in connection with this hypothesis, a most interesting and important observation of Professor Matteucci, to whose ingenuity and patience we are so largely indebted: this philosopher introduced a plate of platinum into the stomach of a living rabbit, placed another on the liver, and connected both with a galvanometer; the needles instantly traversed an arc of 20°, proving the existence of a powerful current between the liver and stomach. This, it may be observed, shows the existence of a *current*, but does not prove whether it is to be regarded as an effect or a cause of the chemical changes alluded to, for it has been already shown, that when an acid and alkaline fluid are separated by permeable structures, they actually develope a current of electricity; and as the stomach contains an acid, and the liver an alkaline secretion, this might afford an explanation of the current observed by Matteucci; and had the experiment ended here, this plausible objection would have been a fatal one. But the nerves and vessels passing into the abdomen were divided above the diaphragm, and in an instant the needles of the galvanometer deviated to 3° instead of 20°; and on cutting off the head of the rabbit by a sudden blow, even this little deviation nearly completely vanished. Nothing could be more conclusive than this experiment in proving that the electric current was the cause, not the effect, of the chemical metamorphosis of the saline ingesta, whose decomposition furnished acid to the stomach and alkali to the liver. How this current is excited is unknown, although it can hardly be doubted that one of the causes which we have already examined is competent for this purpose; but then there remains the difficulty of pointing out the route taken by the current to reach respectively the liver and stomach, for the pneumogastric nerves, at least in man, cannot, from their anatomical distribution, explain this. Is it improbable, I would venture to suggest, that the ganglionic nerves may be more immediately concerned? Does the positive current pass from the solar plexus to the stomach, and a negative current to the liver; or do the organic nerves alone cause the latter, and the pneumogastric the positive current? All here is doubt and uncertainty, and such must remain, until more careful investigations have cleared up the obscurity. All that is certain is—

1st. That an electric current does exist between the stomach and liver, which nearly ceases on division of the nerves, and completely so with the death of the animal.

2ndly. That this current is competent to the evolution of sufficient free acid in the stomach to enable digestion to go on, an equivalent of soda being determined to the liver.

3rdly. That cutting off the nervous supply equally arrests digestion and stops the electric current.

4thly. That on allowing an artificially excited current to enter the stomach, after division of the nerves, the chemical changes necessary to digestion reappear.

An Italian philosopher of celebrity, Signor Orioli, has hazarded a remarkable theory, which assumes that all the manifestations of life are actually dependent upon a series of galvanic combinations, existing in every organ in the body. He indeed regards every glandular organ especially, as made up of a series of such combinations, and developing different polarities; he thus assumes that the stomach, kidneys, and skin, are by such an arrangement rendered energetically electro-positive, whilst the liver and general expanse of mucous membrane are as powerfully electro-negative. He goes further, and has founded a sort of system of therapeutics on these views; for, believing that disease depends upon an excessive, diminished, or abnormal excitation of the electric polarities of the respective organs, he proposes to treat their several morbid conditions by artificially removing their unnaturally electric conditions. Orioli's views differ from the very remarkable ones promulgated by Meissner, who fancied that during respiration the blood became charged with electricity, which was then distributed by the par vagum and sympathetic nerves to the great nervous centres. Thus becoming charged, the brain is supposed to excite the action of any organ, by giving a spark to the nerve supplying it. The electricity thus transmitted to the muscles forms around their fibres a kind of atmosphere. Becoming similarly electrified, the fibres repel each other, separately in the middle of the muscle, and thus by approximating their ends cause the structure to contract. This very pretty theory has unfortunately no support beyond the fertile imagination of its ingenious author.

Sir John Herschel, in his exquisite Discourse on the Study of Natural Philosophy, has beautifully expressed the possible relation between galvanic electricity and the *vis nervosa*, and hints at the brain being either the organ of secretion, or at least of the application of this agent; adducing in illustration the dry piles, as they are termed, of De Luc and Zamboni, and remarks, that "if the brain be an electric pile constantly in action, it may be conceived to discharge itself at regular intervals, when the tension of the electricity reaches a certain point, along the nerves which communicate with the heart, and thus to excite the pulsation of that organ." By the "dry pile" a ball may be kept in motion for many years, without any obvious waste of power, and some analogous arrangement would constitute the most constant and economic *primum mobile* of a moving organ which the resources of limited human reason can suggest. Dr. Arnott has also hinted at some such cause being the active agent which keeps up the regular pulsations of the heart.

It is indeed remarkable what an enormous quantity of electricity of high tension is developed by the piles here alluded to. I have one before me consisting of 1200 alternations, made by superposing 400 pieces of paper covered on one side with tin foil, and on the other with black oxide of manganese. The upper end of this is always charged with negative and the lower with positive electricity; and this little apparatus will for many years remain a constant source of free electricity.

Founded on the general law that bodies similarly electrified repel each other, an hypothesis has been broached that the circulation in the capillaries was greatly aided by the electric state of the blood. It has been long known that if a vessel containing water, having a very small hole in its base, be connected with the prime conductor of an electric machine, the water will merely escape *guttatim;* but on setting the machine in action, the particles of water becoming similarly electrified repel each other, and the fluid escapes in a continuous stream. In accordance with this fact it was long ago shown, that if a patient have a vein opened in the arm, and the blood happen to escape but sparingly, on placing him on a glass stool and electrifying him, the blood will, like the water in the vessel just alluded to, escape *pleno rivo.* There has always been a difficulty in explaining the capillary circulation. Many have questioned, and with reason, the possibility of the injecting force of the heart being competent to exert its influence through the minute blood-channels of the body. The electric hypothesis, to which I have just alluded, would certainly to a great extent meet the difficulty, but must at present be admitted with caution in the absence of absolute proof, however much probabilities may be in its favour. For it must be recollected that when a body is electrified, *its electricity is collected on its surface, and does not extend into its interior;* thus, if a person on a glass stool be connected with the prime conductor of a machine, evidence of electricity can be obtained from every part of his surface; but none can be obtained from the inside of his mouth for the reason just stated. So the escape of the blood from the vein of an electrified person may indeed be rendered more rapid, without affording the slightest proof that the circulation of the blood in the interior of the body becomes similarly influenced.—*London Medical Gazette for May* 1847.

I propose to-day making a few remarks regarding the forms of apparatus employed in the application of electricity and its modifications, to the treatment of disease. Of these, the common electrical machine, and the electro-magnetic apparatus, are the most important: by aid of the former, we obtain small quantities of electricity in a state of high tension, and by the latter we obtain very large quantities of a lower tension, but still far higher than when elicited from the galvanic trough, which, indeed, is now very seldom employed for medical purposes.

You are all well acquainted with the construction of the common electrical machines; but a few remarks in connection with their mode of action may not be regarded as altogether useless.

The electrical machine consists of a revolving cylinder, or plate of glass, submitted to the friction of cushions, or rubbers. It matters very little what form of machine is employed. As a general rule, a plate machine is, for equal size, of far higher power than the cylinder. The arrangements of the latter are, however, simple, and are, perhaps, more easily managed by the uninitiated. There is also an advantage on the score of economy, as old cylindric machines are readily to be procured at low prices, and, as a general rule, a well-worn cylinder is far preferable to a new one. Plate machines are, on the contrary, less common, and consequently must generally be purchased new. Whichever form is employed, it is useless using a plate with a less diameter than a foot, or a cylinder less than five or six inches.

There is some little tact required to elicit the full power of an electric machine, and, from want of this, you will frequently find some persons quite fail in exciting any amount of electricity even from the best constructed machines. This art is, however, soon acquired. When the machine is required for use, the prime conductor and rubbers should first be removed, and the machine placed sufficiently near a good fire to become completely dry and warm. The surface of the glass should then be slightly rubbed with a piece of tow or flannel soaked in olive-oil, any adhering black spots from old amalgam being scraped off. By means of a dry and warm linen cloth, the oil should then be wiped away, and the polished surface of the glass is thus left clean and free from moisture. The cushions, if covered with amalgam, are then to be rubbed with a piece of brown paper, so as gently to remove the oxydized surface; but if not sufficiently covered, a little amalgam (made by melting together zinc two parts, tin one part, with mercury six parts, made into a paste by triturating it in a mortar with a little lard) must be rubbed into the surface of the cushions with the handle of a knife, or a piece of smooth wood. The silk flaps are to be wiped clean, and the rubbers adjusted to the plate or cylinder. On revolving the latter, a rustling noise will be heard, accompanied, in a darkened room, by vivid flashes of blue light, whilst a strong phosphorus-like odour of *ozone* becomes perceptible. The prime conductor is next to be replaced, taking care that its insulating support is perfectly dry, and even slightly warm: the instrument is then fit for use. You will, however, not unfrequently find, that although you may have taken the precaution to connect the rubber with the table or floor by means of a metallic conductor, still that little or no electricity is obtained on revolving the glass. This will generally be found to depend upon the badly conducting table, or floor, by which a sufficiently ready means is not afforded for the complete restoration of the electric equilibrium of the rubber, when destroyed by the friction of the revolving cylinder or plate against its surface. This difficulty is best overcome, in London and large towns, by connecting the rubber, by means of a long copper wire, with a branch of the leaden pipes through which the house is supplied with water. By this plan a ready communication is afforded by a good conductor with the great reservoir of electricity—the earth.

Having thus got the machine in good action, on revolving the cylinder or plate, and presenting the hand or a piece of metal towards the prime conductor, a series of vivid sparks, attended with a loud snapping noise, will pass between them. In this arena, I felt that any remark connected with the theory of the excitation of electricity by the machine would be quite misplaced, as I feel that all I have the honour of addressing must be most fully acquainted with every thing pertaining to this branch of physics. There is, however, a popular error so generally believed, that I must venture to allude to it; the error consists in regarding the electricity of the prime conductor as derived from the revolving glass, the latter being regarded as pumping electricity from the rubber, and thence from the earth. Now the fact is, that not an atom of positive electric matter leaves the glass to pass to the conductor. The cylinder or plate, rendered positive by friction against the rubber, merely acts upon the electricity naturally present in the prime conductor by *induction* decomposing it into the component elements, attracting the negative fluid, which, accumulating in a state of high tension, or elasticity, dart off towards the cylinder to combine with the positive fluid free on its surface, reconstituting the neutral compound: the prime conductor is thus left powerfully positive, not by acquiring electricity from the cylinder, but by the abstraction of its own negative element. Again, the sparks which appear on approaching the hand to the conductor are often called *positive sparks*, when, in truth, they are nothing of the kind, being, indeed, a series of luminous discharges formed by the union of the negative electricity of the body, which is held near the conductor, with the free positve electricity of the latter.

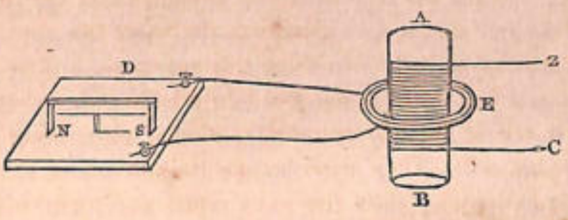
In addition to the electrical machine itself, a pair of directors, or rods of brass, furnished with balls of brass and glass handles, together with a few yards of common copper bell-wire, or brass chain, will be required to connect the patient with the machine, or to convey the discharge of a jar through his body. The jar itself need not have more than a square foot of coated surface, and indeed one much smaller is often sufficient.

There is one piece of apparatus which is very essential, being in almost constant requisition,—I mean the well-known chair with glass legs, on which a patient may sit and be completely isolated from all electrical communication with the earth. This is an expensive, bulky, and fragile contrivance, and hence is the most inconvenient of all the electrical appliances. I advise you, however, not to trouble yourselves with this very clumsy chair, which you will generally find at the instrument makers; as any ordinary chair can be at once rendered most effectual in insulating any person, by merely placing each of its four legs in a thick cup of glass. These may be procured at any of the glass shops by merely asking for four thick, round, glass salt-cellars in the rough state in which they are sent from the glass-house before being engraved or cut. Thus, at the expense of a couple of shillings, any comfortable chair may be converted into an excellent insulating support.

Galvanic electricity, or that excited by chemical action, is sometimes called in requisition. There are, however, many serious inconveniences attending its employment; and not the least of these is the bulky and unmanageable form of apparatus required for its excitation in a state of even moderate tension. On this account this form of electricity is now seldom employed, and in my own practice I confess I never use it; for the electricity of dynamic induction is so much easier excited, and, being the same in essence, has always been, so far as my own experience has extended, substituted for it. Whenever you wish to employ this form of electricity, you will find no apparatus more convenient for its excitation than the well-known Cruikshank trough, which consists of a wooden trough, having double plates of copper and zinc fixed in at short intervals from each other. These plates need not be more than two inches square, and a trough containing three or four dozen pairs will be sufficient for all purposes. The best exciting fluid is very dilute hydrochloric acid, made by mixing one part of the acid with thirty of water. When the acidulated fluid is poured into the trough, you must take care that it does not rise to the top of the plates by about one quarter of an inch. In using this apparatus, a piece of copper wire should be twisted at one end into a loose coil, and plunged in the first cell of the battery, another similar piece being immersed into the last cell. These wires become the conductors, or *electrodes*, or, in other words, their free ends represent doors, out of which currents of the two electricities escape; and, by placing them in contact with the surface of the body, previously moistened, to make it as good a conductor as possible, the union of the two electric elements will take place in the tissues they traverse. Bearing in mind the facts I announced to you in connection with the course traversed by currents, with the development of certain phenomena of nervous irritability and muscular contraction, you will at once see the importance of being able in an instant to ascertain the direction of the two currents when excited by the action of the acid on the zinc and copper plates. This you can at once discover by looking at the trough, and remarking that the positive current escapes from the end towards which all the zinc plates look, and the negative current from the other end.

The great drawback to the utility of this mode of exciting electricity is the trouble of getting the apparatus in proper order, the irregularity of the current in regard of strength, its tension and quantity rapidly sinking from the first moment of adding the acid: and, lastly, the damage inflicted by the latter when ejected from the trough from too violent an effervescence, or from its being accidentally spilled.

The next mode of exciting electricity is of late discovery,—one of the many contributions to physical science for which we are indebted to the talents of our illustrious countryman, Dr. Faraday. It furnishes us with large quantities of electricity of tolerably high tension, and possesses advantages for medical purposes which no other mode of exciting electricity affords. To illustrate the mode of exciting electricity by induction in the simplest manner, I will connect this piece of copper wire wound into a circular coil with the terminal screws of a galvanometer.



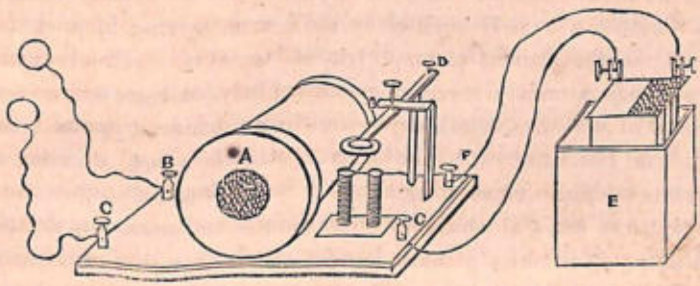
N. S. The magnetic needle of the galvanometer, D.

E. The circular wire coil connected with the wires of the galvanometer.

A. B. The wooden cylinder covered with wire, the ends of which, Z. C. are connected with the terminal plate of a battery.

I have here a wooden cylinder, round which is wound a piece of insulated wire, so as to form thirty or forty convolutions, and will place this in the centre of the coil connected with the galvanometer. The needle of the instrument is now at rest; but observe what occurs the instant I connect the ends of the wire coiled on the wooden cylinder with the zinc and copper plates of a single galvanic battery. In an instant the needle darts off, as if acted upon by some tangential force; and, after several violent oscillations through a considerable arc, it slowly attains a state of rest, several degrees out of the magnetic meridian. Now, as the wire on the cylinder had no connection whatever with that of the coil, it is obvious that the battery merely acted as an exciting agent in disturbing the normal electric equilibrium of the wire, causing the electricity to circulate in the form of current. This current, you will observe, is of momentary duration, and is excited only at the instant that the battery current first traverses the conducting wire. But now, the needle being perfectly quiet, I will suddenly break contact with the battery, and once more the needle rushes out of the meridian line, and traverses a considerable arc, but in a direction opposed to that in which it travelled when connection was in the first instance made with the battery. Like the former current, this is only of momentary duration. From this experiment we learn, that, when a current traverses a wire, it induces or excites another current in any conductor held parallel to it, a second being excited the instant the first current ceases to traverse the wire. These currents are respectively named primary and secondary, and are always opposed in direction, the primary current moving in an opposite direction to the battery or exciting current. If, instead of using a battery current as an exciting agent, I had plunged a magnet into the centre of the coil connected with the galvanometer, the electric equilibrium of the wire would in like manner be disturbed, a primary current being induced on first introducing the magnet, and a secondary one on withdrawing it. It is obvious that if, by any contrivance, contact with the battery could in the first example be rapidly made and broken, as, in the second, the magnet be as quickly immersed and withdrawn, we should procure a rapid series of currents moving alternately in opposite directions; and on this is founded the construction of all the magneto-electric and electro-magnetic machines.

Numerous forms of electro-magnetic machines have been suggested for medical purposes, and it is really not a matter of any importance which you employ, provided care be taken to have the one you have chosen so arranged as to allow of a sufficiently copious development of electricity. As we have seen that in all such contrivances a small voltaic current furnishes the initial force, it is important to have this completely under command, and to be able to make and break contact with the inducing apparatus, with the utmost facility and rapidity. You may break contact with the battery, if you please, by means of a ratchet or cog-wheel; but this is often inconvenient, as it renders the services of an assistant necessary. On this account an automatic apparatus is always to be preferred. I believe I proposed the first of these several years ago in the Annals of Philosophy; but this, as well as all others I have seen, are much inferior to one constructed by an ingenious philosophical instrument-maker, Mr. Neeves, of Broad Street, Holborn, and this is the only one I ever now employ. It possesses the advantage of simplicity, facility of employment, quantity and intensity of the inductive electricity, together with the additional recommendation of low price.



A. The wooden bobbin, on which is wound the double coil of wires.

B. C. The screws connected with the ends of the fine coil, with conductors affixed.

D. The apparatus for breaking battery contact.

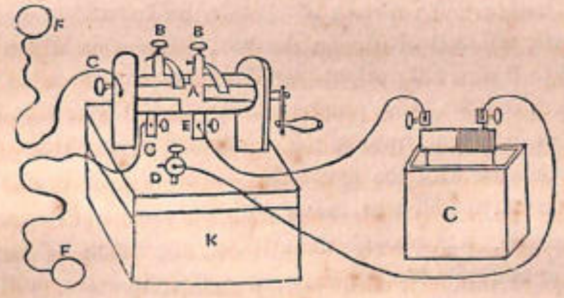
E. Single pair of plates (Smee's arrangement) connected with the screws, F. G.

This consists of a wooden bobbin, with a hollow axis. About thirty feet of thick insulated copper wire are wound on it, and over this about a thousand feet of very fine insulated copper wire, the ends of which are soldered to a couple of binding screws fixed in the base of the instrument: the former is the coil in which the initial or *inducing* current is intended to circulate; the latter is the secondary coil, where electricity is to be disturbed and thrown into motion, to form the *induced* current. One of the ends of the primary thinner coil is connected with the zinc plate of a single battery; the other end of the wire surrounds a small horseshoe of soft iron, and is then soldered to the lower end of a bent rod of brass, whose upper end carries a small screw furnished with a platinum point, which presses on a plate of the same metal fixed to a transverse bar of thin brass, having at the end suspended over the poles of the horseshoe a disk of soft iron. When the fixed end of this bar is connected with the copper or silver plate of the little battery, the disk of iron is rapidly attracted by the ends of the horseshoe, which acquire a powerful magnetic force. In an instant, the contact between the platinum wire and plate being broken, the current is arrested, and, the horseshoe losing its magnetism, the elasticity of the brass bars causes it to fly up and again bring the platinum point and plate in contact, when the same series of alternate attractions and repulsions occur. In this way you see the brass bar rapidly vibrate, and produce a loud humming musical sound, varying in pitch according to the amount of amplitude of the vibrations, and cotemporaneously, a rapidly succeeding series of induced currents traverse the coil of fine wire. If I now grasp in my hands a pair of brass cylinders connected with the ends of the fine coil, a series of currents of high intensity, and rapidly succeeding each other, rush through the arms, producing a most painful and nearly intolerable sensation. You observe that a bundle of iron wires is placed in the hollow axes of the bobbin. The use of this is obvious enough, for these wires becoming a series of powerful temporary magnets add their inducing power to that of the initial current, and greatly increase the tension of the excited electricity. Indeed, by withdrawing the bundle of iron wire, you may diminish most materially the severity of the shocks produced by this instrument, and thus enable you very conveniently to adjust their force according to the case under treatment.

If you reflect for a moment on the principles on which the construction of this very convenient arrangement is founded, you will at once see that you cannot obtain by its aid a series of positive and negative currents in a definite direction; that neither of the connecting wires are capable of being regarded as negative and positive. This you can readily understand from the results of the experiment showed you just now with the galvanometer. Each of the conducting wires of this instrument convey alternately currents of opposite characters. The wires, at the rate the bar is now vibrating, convey about 500 currents per minute, each being alternately negative and positive. To demonstrate the truth of this statement I have here on a glass plate a piece of paper moistened with a mixed solution of starch and iodide of potassium. I place on it the platinum extremities of the conducting wires of the electric-magnetic apparatus; the currents pass, electrolytic action occurs, the iodine is severed from the potassium, and being set free, stains the starched paper. On examining the paper you will find the purple stain of iodide of amidine at both points where the platinum wires touched the surface.

Now as the iodine is invariably liberated at the place where positive electricity enters the body containing it, we have a proof of the accuracy of the statement I made, that positive and negative electricity were alternately evolved at both wires. On this account, however useful this apparatus is when we want the mere stimulant action, the simple shock of the electric agent, yet it is likely to fail in many cases of paralysis, in consequence of our not being able to transmit by its aid the positive current in the direction of the nervous ramifications.

The more elegant and elaborate magneto-electric machine, especially the very effective and powerful one of Mr. Clark's construction, may of course be substituted for the electro-magnetic apparatus I have described. The advantages it presents of being always ready for use, and requiring no initial voltaic current to set it in action, are not, however, I think by any means sufficient to compensate for its expense, and the readiness with which it is disarranged, especially when in the hands of the uninitiated.



A. The revolving cylinder, with slips of brass inlaid, on which the springs B. B. press.

C. The battery, connected by wires with the screws D. E. F. F.; the conductors, connected with the screws G. G., which are in communication with the fine coil in the box K.

To render the electro-magnetic current available where it is required to be transmitted in a definite direction,—where, indeed, we want the currents separated as we get them in the voltaic or galvanic battery, without the serious inconvenience attending the use of these pieces of apparatus,—some modification of the electro-magnetic machine is required. After devoting some attention to the subject I contrived the machine before you, which answers the purpose most completely. It consists of the double coils of wire fixed in a wooden box, on the lid of which is placed a wooden cylinder, capable of revolving between two uprights by means of a proper handle. This cylinder is furnished with two slips of brass fixed in the wood at each end, and connected with the metallic axes, by which the cylinder is supported in the brass collars of the uprights. The slips of brass are placed so as to alternate with each other at either end of the cylinder. Two electric brass springs, supported by pillars of that metal, press on the cylinder at either end. The ends of the thick wire of the coil concealed in the box are connected,—one to the end of one of the supports of the cylinder, the other to a binding screw fixed in the lid. The zinc and silver plates of a single battery are then connected with this screw, and with the supports of one of the brass springs. On revolving the cylinder, contact with the battery is of course made or broken according as the slip of brass or the wooden portion of the cylinder passes under the brass spring. You know that with each of such unions and ruptures of contact, an induced current circulates in the fine coil of wire in the box. The ends of this coil are soldered to the second upright, and the support of the second spring. The pieces of brass being properly arranged, it follows that one kind of current can alone traverse the conducting wires fixed to the supports connected with the fine coil. To prove this, I will let these conductors, terminated as before with platinum ends, rest on the iodized paper. On turning the cylinder, the iodine is, as you see, set free at one end only. I know, therefore, that the positive electricity escapes by this wire, and the negative by the other. Hence by this instrument we have succeeded in detaining separate currents, although we have lost the great convenience of the automatic movement of the other apparatus.

I purpose, next, to direct attention to the results which have followed the employment of the different modifications of electricity in the treatment of disease. In doing this I do not intend to occupy your time by a tedious reference to all that has been previously published on this subject in this country and on the continent. Such records are familiar to every physician, and within the reach of every body who will take the trouble of referring to them. I am more anxious to avail myself of this opportunity of presenting to the members of the College the results which have fallen under my own personal experience.

Electricity has been by no means fairly treated as therapeutical agent, for it has either been exclusively referred to when all other remedies have failed,—in fact, often exclusively, or nearly so, in helpless cases,—or its administration has been carelessly directed, and the mandate, "Let the patient be electrified," merely given, without reference to the manner, form, or mode of the remedy being for an instant taken into consideration.

Conscientiously convinced that the agent in question is a no less energetic than valuable remedy in the treatment of disease, I feel most anxious to press its employment upon the practical physician, and to urge him to have recourse to it as a rational but fallible remedy, and not to regard it as one either expected or capable of effecting impossibilities. I again say, I shall advance nothing but what has been repeatedly tested under my own observation, purposing to lay before you the results of many years' careful clinical experience in this matter in the wards of Guy's Hospital, and hope to make out a strong case in favour of this too much neglected remedy.

In the autumn of 1836, the authorities of the hospital thought fit to set apart a room for the administration of electricity. Clinical clerks were appointed to record the cases, and the whole was placed under my control, and remained in my hands during eight years; and since my other duties compelled me to give up this charge, my successor, Dr. Gull, has watched over it with great zeal and assiduity. In the case-books of this department of our hospital is recorded a large mass of clinical experience on the subject before us,—larger, I presume, than exists anywhere else,—and from these records I propose to cull such matters as appear of the greatest interest and highest practical importance.

Before alluding to the different diseases in which I have employed electricity, I am anxious to allude to one special application of it which has lately occurred to me, and which I think will not be deemed uninteresting and unimportant. We often wish, and indeed require, to produce a persistent discharge from some part of the body, and where an issue or seton, or discharge from the moxa or actual cautery would be desirable. Now the knife for the issue, the needle for the seton, and the ignited tinder or red-hot iron, all have their terrors for timid patients, and there is often the greatest unwillingness to induce patients to use such means. Now I have to offer to the notice of the profession a mode of inducing persistent discharge free from all these objections, in the form of what I beg to call the *electric moxa*. It was long ago observed by Humboldt, and afterwards by Grapengiessier, that when a simple galvanic arc was applied to a blistered surface, the part opposed to the most oxidizable metal was more irritated than that to which the negative plate was applied. In applying such a simple arc to the treatment of paralysis, I was struck with the remarkable effects produced, and such a combination of its results induces me to propose the following ready mode of establishing a discharge from the surface of the body. Order two small blisters, the size of a shilling, to be applied to any part of the body, one a few inches below the other; when the cuticle is thus raised by effused serum, snip it, and apply to the one from whence a permanent discharge is required a piece of zinc foil, and to the other a piece of silver; connect them by a copper wire, and cover them with a common water dressing and oiled silk. If the zinc plate be raised in a few hours, the surface of the skin will look white, as if rubbed over with nitrate of silver. In forty-eight hours a decided eschar will appear, which (still keeping on the plates) will begin to separate at the edges in four or five days. The plates may then be removed, and the surface where the silver was applied will be found to be completely healed. A common poultice may be applied to the part, and a healthy granulating sore, with well-defined edges, freely discharging pus, will be left. During the whole of this process, if the patient complains of pain at all, it will always be referred to the silver plate, where in fact, the blister is rapidly healing, and not the slightest complaint will be made of the zinc plates, where the slough is as rapidly forming. A very interesting physiological phenomenon is observed in making an issue by these means. If the plates be applied to a limb, and on different places, contraction of the subjacent muscles will always be observed most severe when the patient is in the act of falling to sleep; and in a few cases these sensations have been sufficiently annoying to induce the patient to untwist the wires fixed to the plate, when by interrupting the current these feelings ceased. But if the plates were applied to opposite sides of the body, as when on the chest to different sides of the mesial line, no contractions whatever occurred. This admits of explanation by a reference to the fact of the nerves not crossing the middle line of the body.

I have now repeatedly used this mode of exciting a purigenous sore on different parts of the body, both in hospital and private practice, and it has never in any instance failed; I strongly recommend it to your notice, where it is important to avoid the use of means more alarming to the patient. I certainly know of no other plan by which an equally effective discharge can be obtained, except by the use of the moxa or actual cautery.

As scientific and philosophic physicians, we must, however, go a step further, and inquire into the rationale of this process: after some little investigation, I traced it, as indeed was to be expected, to the principles laid down in my second lecture, when endeavouring to show how small an amount of electric force was sufficient to tear asunder the elements of many compounds.

In fact the saline ingredients of the fluid effused on the surfaces of the blisters are decomposed, the sodium of the common salt being set free at the silver surfaces, which by exudation, of course, rapidly become soda: the chlorine is evolved at the zinc surface, forming chloride of zinc. An electric current is then traversing from the zinc through the interposed tissues to the silver, and back again to the zinc, and its actual existence may be demonstrated by separating the wires belonging to the plates and connecting them with a galvanometer. I believe, therefore, the sore is really formed by the escharotic action of the chloride of zinc thus produced, and the reason why the patient feels none of the intense pain so characteristic of the caustic energy of the zinc salt, is found in its acting in infinitely small portions at a time upon the skin,—indeed, in what may be correctly enough termed a nascent state. To prove this is not mere hypothesis, I have placed on the table a vessel containing a weak solution of common salt, having a tube closed at the bottom with an animal membrane, and also containing salt and water immersed therein; a piece of silver was some hours ago, placed in the outer vessel, and a piece of zinc connected with it in the tube. The two pieces of metal are thus placed under conditions nearly parallel, if not identical, to those in which they are when used to form the moxa. If the fluid in the inner tube be tested by adding to one portion of it ferrocyanide of potassium, and to another some ammonia; the occurrence of a white precipitate in either case will at once attest the presence of chloride of zinc in solution.

Conversing on this subject with my friend and colleague Dr. Babington, whose profound erudition and high scientific attainments are familiar to us all, he mentioned to me some analogous experiments, performed by him as far back as 1827, on the action of weak currents on muscular flesh: he also kindly placed in my hands the notes he had preserved of his researches. Of his many ingenious experiments, the following bears most on the subject of my electric moxa:—The doctor took two slices of muscular flesh, placed one between two plates of glass, the other between plates of copper and zinc, binding them together with wire;—in the course of a few days, the weather being warm, the flesh between the glasses began to putrify, and soon afterwards was full of maggots, whilst that between the metallic plates remained free from putrescency. A remarkable change had, however, occurred, for, on taking off the plates, the side opposite to the zinc plate was hard as if it had been artificially dried, whilst that opposed to the copper had become covered with a transparent substance resembling jelly. In fact, the result of the experiment evidently was, that the chloride of sodium existing in the flesh had become decomposed; the zinc had been acted on, and a dry hard compound of chloride of zinc and albumen formed on one side of the piece, whilst the soda set free on the other side had contrived with protein elements to constitute an albuminate of soda in the form of a semi-gelatinous mass. This experiment on dead matter, compared with my own on the living body, affords a beautiful illustration of the wonderful influence of life in modifying chemical action. In the dead flesh mere chemical changes occurred; in the living tissue the principle of life interfered on the one hand in resisting the solvent influences of the soda set free at the silver surface, whilst that same principle from the influence of the irritation of the chloride of zinc formed at the zinc surface, excited inflammation, and by thus setting up a barrier against the further progress of the chemical action, cut off from the system the skin acted on by the acrid salt, and allowed its separation in the form of a slough.—*Ibid, for June,* 1847.

"The Journal of the Indian Archipelago and Eastern Asia."

We ought to have noticed earlier the receipt of several numbers as they appeared monthly, of the above Journal, published at Singapore.

Issuing from a remote quarter in which the cultivation of science is confined to a few scattered Europeans, the appearance of the journal is highly creditable to all concerned, and its pages as diversified as can be expected under such circumstances. In the six numbers now before us, we find excellent details respecting Cochin China, commerce, mineral and vegetable productions, manners and customs of native tribes, Geology and Natural History.

Passing over several interesting papers in the four first numbers, particularly a general view of the Dutch Possessions, being a review of Temmink's work on that subject, and a paper on the Geological Structure of Singapore, we cannot avoid noticing at greater length a very excellent article on Conchology, by Dr. William Traill, in which, after tracing the history of the subject, and discussing the various views entertained with regard to it, Dr. Traill remarks :—

"Without at all assenting to Lamarck's theory of "Transmutation of Species" it must be allowed, that the discrimination between species and varieties among shells is extremely perplexing, the shades of difference between one species and another often appear less than between two varieties of the same species, the marks of distinction are often so modified by various causes, as difference in locality, change of food, &c., that uniformity of colour, size or even shape, when taken separately, are no safe guides, and unfortunately they are not always found combined. Blumenbach wisely observes that, 'no general rule can be laid down for determining the distinctness of species, as there is no particular class of characters which can serve as a criterion.'

"This variable tendency does not prevail in all shells, though some kinds are very liable to it, particularly the genus Nassa, many species of which are common here. In illustration of this property of change, I shall describe a species of Nassa found in the mud of salt swamps: it is in colour a dark-brown or black, about an inch and a half in length, the outer whorl is smooth, those next the apex of the spire are furrowed longitudinally, and it possesses the usual generic mark of a prominent plait at the upper part of the aperture. Out of many specimens examined I have observed none to deviate from the above description. In the same localities may be found another shell quite similar to the other in form and colour, but not more than half its length, possessing however all the marks of a full grown shell; and as no shells of intermediate size are to be met with, there seems good reason to believe them two distinct species. The following instance is however more remarkable in connexion with the above. I lately found at Malacca a small species of Nassa of a pale flesh colour, barred with brown, about a third of an inch in length, and little more than a grain in weight. In the same neighbourhood I met with another specimen, three-quarters of an inch in length, and weighing between four and five grains. As in the former case, the two shells were exactly similar in shape and colour, though very different in size and weight, and as both had the marks of having attained their full size, I was ready to believe that I had obtained two new species; a further search however, put me in possession of fifteen additional specimens, similarly marked, but all of them intermediate to the two first in size and weight; in fact the whole seventeen formed an almost imperceptible scale of gradation, sufficiently proving that they were so many varieties of one and the same species. I have observed several kinds of Nassa particularly abundant in the neighbourhood of the fish markets, where they may be seen in numbers feeding on dead fish and other animal food.

This artificial mode of subsistence is possibly one cause of their variable form and size, as it is well-known that domestic animals, and others that are more or less dependent on man for their support, are very apt to produce a progeny differing more or less from the parent stock. A good example of the propagation of an accidental variety, must be familiar to my readers in the instance of a well-known domestic animal of the feline genus, which in Singapore is rarely seen with a perfect tail. In the neighbourhood of the fish markets may also be seen multitudes of dead shells of all sizes, some so minute as to be microscopic, and all tenanted by Pagurii or hermit crabs, as varied in size as the shells they inhabit, and like the Nassa, busily engaged in devouring fragments of dead fish, which is their principal food. I make mention of them here as a parallel instance of the effect of artificial life upon some of the lower animals, for these crabs are not, as might be supposed, one, or at most two or three, species in different stages of growth. If an examination be made, it will be found that individuals of all sizes are laden with spawn, not excepting such as are so minute that their forms are not to be distinguished by the naked eye: it cannot be imagined that each of these is a different species, they are in fact an evident instance of the alteration of a species into an almost infinite number of varieties.

"Of the various localities in which the Singapore shells are found, one remains to be mentioned, to describe which intelligibly, I must briefly advert to the general form of the island of Singapore. It consists of a cluster of low undulating hills, based on an extensive plain, having an uniform level surface, in some places not varying above two or three feet, in an area of several square miles. The whole of this valley ground is but little raised above the level of the sea, as is shown by the salt-water penetrating for miles into the interior of the island, and, at spring-tides, even overflowing cultivated fields. Over some parts of this low ground there is a layer of decomposed vegetable matter of variable depth, but for the most part the surface is sand, beneath which, at depths varying from 5 to 50 feet, there is a dark-blue plastic clay abounding in shells, and these not of the kinds found in Mangrove swamps, but such as are common in open sandy bays or straits. After a careful examination, I cannot pronounce any to be different from those found in the adjacent seas; the forms of most of them are perfect, and in a few the colour is preserved, but they have for the most part lost their hardness, being readily crushed between the fingers. The kinds most abundant are as follows:—Placenta placuna, Strombus incisus, S. labiosus, several species of Nassa, Columbella, Trochus, Cerithium, Mitra, Turritella, Dentalium Aspergillum, Arca, Venus, Corbula, Tellina and others. I am informed by Mr. Thomson, the Government Surveyor, that wherever he has had occasion to make excavations in the low ground of Singapore, similar appearances present themselves, that in all the brick-pits the clay is of the same description and also contains shells; moreover, that in the Kallang valley, corals similar to existing species are to be found at the depth of six feet; add to this the fact that the growth of coral is yearly diminishing the depth of water in the neighbourhood, a good example of which is seen at the entrance to New Harbour where there is a small-peaked island, between which and Singapore, the coral has grown so rapidly, that it is thought the island will in a very few years form a part of Singapore; taking therefore all these circumstances into consideration, I conceive that the existence of shells in such situations may be rationally accounted for on the supposition, that most of the valley ground of Singapore was originally sea, and has been altered and adapted to the use of man, chiefly if not solely, through the agency of coral."

The remainder of the paper we give in full.

"Most of the shells in the annexed list may be found described in any work of reference on this subject. I shall therefore merely notice individually a few whose exterior forms, or the peculiar habits of their inhabitants, are not, so far as I am aware, very generally known.

"The Magilus antiquus has lately been found north of Penang in the neighbourhood of Junk Ceylon, the natives set some value on them, and occasionally wear them as ornaments; the shell is singular, and apt to be mistaken for a petrifaction, being dense in structure, diaphanous, and much like alabaster. It has been often figured and described by naturalists, but the animal inhabiting it, is, I believe, unknown, unless described in some very recent publication: it is supposed to be a Gasteropod, though this is rather doubtful, as the shell is said to be generally found imbedded in coral or madrepore : it is probable that this point might be satisfactorily settled by a careful examination of the above locality. Among other interesting discoveries lately made on that part of the coast, is a layer or stratum of grey limestone, of considerable extent, composed almost entirely of petrified shells. I have been fortunate enough to obtain a specimen for examination which contains three distinct species, apparently freshwater shells ; two of them I have never seen recent here, but the third closely resembles a small Melania common here in stagnant ditches, their size, number of whorls, and general shape are the same, and they have both deep longitudinal striæ or furrows ; some of the shells were crystaline and amber coloured, though the material uniting them was of an uniform grey colour, both substances however were soluble in hydrochloric acid.

" Of the numerous class of shells inhabiting the interior of madrepores, wood, and stone, there is a species allied to " Pholas" which I cannot find described in any English work, though it seems to answer the description of the Genus Jounannetia of M. Des Moulins in a work entitled 'Manuel des Mollusques par M. Sander Rang,' the shell is white, rather less than a musket ball, and nearly as globular in form, with a slight caudiform appendage at one end, striated obliquely and having accessory pieces, the consistence of the shell more resembles that of the bivalve of the 'Teredo' than a Pholas ; and M. Des Moulins considers it to hold a place between these two genera. The specimens I have met with were in the interior of rolled masses of 'madrepore,' and were evidently old, as none contained the animal alive or dead. The 'Lima' or the 'file shell,' of which several species are found in the Straits, much resembles the Genus 'Pecten' or 'Scallop shell,' which is well-known to possess greater power of locomotion than most bivalves. This power is possessed even in a greater degree by the Lima. When in the water its movements are graceful, the two valves being used as fins, by means of which it swims with considerable rapidity, guiding itself by its numerous tentacula which are frequently of an orange colour, and arranged not unlike the petals of a flower, the shell is less eared than the Scallop, and generally white, the valves do not entirely close.

"The Parmaphora or duck's-bill Limpet is found here, though by no means a common shell, it is like a Patella, flattened and elongated, the anterior edge always widely notched, apex slightly recurved, length from one to two inches, colour white; the body of the animal is much more bulky than the shell, and the mantle is so capacious, that it covers the whole shell except the apex, which enables it in some degree to elude search, as it appears more like a pulpy or spongy mass than a shell; when touched, the mantle stains the hand a dark-purple colour.

"There is a species of Planorbis, or shell allied to Planorbis, found here in pools of freshwater, being the only species of Singapore shell that is found solely in freshwater; the outer whorl is little more than a quarter of an inch in diameter, aperture of the shell more diagonal than is usual in Planorbis; so that when the animal moves on a plain surface, the convex side of the shell is always uppermost: whereas the animal of Planorbis is described as carrying its shell erect, or with the diameter perpendicular; colour of the shell pale-amber, no operculum, animal nearly black, mouth vertically cleft, no perceptible neck, (in the animal of Planorbis, the neck is said to be elongated,) eyes at the base of two blunt tentacula in which also it differs from Planorbis, which is commonly described and figured as having two subulate tentacula: the animal possesses, in a considerable degree, the power of gliding through the water, apparently in search of food, with its shell entirely submerged, and its smooth foot in close apposition with the surface of the water, locomotion being effected, by causing the flat part of the shell to act on the water in the manner of a fin, the head of the animal being at the same time directed forward so as to regulate its movements; the animal does not occupy so much as half the shell, and the remaining space frequently contains air, which the inhabitant has the power of expelling at pleasure.

"The genus 'Natica,' of which there are several elegant species in Singapore, is known from the 'Nerita' or 'hoof shell,' by being umbilicated, more rounded in form, and the interior not toothed, the shell has been also described as having no epidermis, to this rule however, there are marked exceptions, two of the species, native here, having a strongly adherent epidermis.

"In Swainson's Malachology there is a species figured as an extraordinary animal, much larger than the shell it is supposed to inhabit, one of the species found here presents the same appearance in a remarkable degree; and the phenomenon is caused in the following manner; the interior of the foot of the animal is of a loose cellular texture, which it has the power of distending with water so as to be more than three times the bulk of the shell, but on the approach of danger it can instantly reject the water, assume its natural size, and retreat into its shell, closing after it the operculum, which being of stony hardness, secures it from the attack of ordinary foes. This mechanism doubtless assists the progress of the animal through sand, in which it frequently burrows.

"The Cerithium lineolatum of Gray, has been already alluded to: there are two shells of this genus, neither of which I have seen described, though I observed one of them named as above in a collection of the land and freshwater shells of Penang, made by Dr. Cantor, the shell so designated is about an inch and a half in length, thin and fragile, of a brown colour, with obscure transverse bands of a lighter hue, aperture more rounded than is usual in the genus Cerithium, spire always truncated in the full grown shell, head and anterior part of the animal bright-red, like coral: the other species, which I have more particularly observed in Singapore, has rather a larger shell, thinner and more fragile than the other, and of a darker colour, the animal is brown, or nearly black, and like the former, the spire of the full grown shell is always decollated; young specimens of the shell have perfect, sharp-pointed spires, and the convoluted extremity of the animal then entirely fills the spiral part of the shell, but as the animal increases in size, its posterior extremity becomes more blunted and gradually retreats towards the anterior part of the shell, and as it successively abandons each turn of the spire, it throws out a viscid secretion, which forms a hard, shelly, partition between its new situation and the disused extremity of the spire, which, being deprived of its usual nourishment, soon becomes worn into holes and finally drops off: thus the shell, when arrived at maturity, has always the appearance of being imperfect. The habits of the animal are mixed and peculiar; sometimes it may be seen in a half torpid state, the operculum firmly closed, suspended by a glistening thread, from the branch of a tree; when in motion, it leaves behind it a shining track like that of a snail; at the sides of an elongated proboscis are two tentacula, apparently short, blunt, and with eyes *at their extremities:* now as the genus Cerithium is described as having the eyes at the *base of the tentacula*, this would appear a very remarkable deviation, and I was disposed to consider it as such until I had an opportunity of remarking the movements of the animal in water, where it is as often found as on land. When closely observed in that element, it is seen to expand two slender-pointed tentacula of so delicate a structure, that when out of the water they are lax, flaccid, and doubled under the protuberant eye, so as to be almost invisible. The shell has been found in running streams, but more commonly in the brackish water of canals or ditches.

"The very numerous genus of 'Cypræa' or the 'Cowry' shell, is too well-known to require a formal description, the largest species found here is the 'Cypræa tigris,' which is prettily spotted with black, being showy, it is frequently made into snuff boxes in England, the animals of several have been described and figured by authors. The mantle is so large as to cover all the shell, on the back of which there is often a longitudinal line, which marks where its two folds meet: this membrane continually secretes an abundance of viscid fluid which lubricates the shell, and preserves the beautiful polish which has procured for them the name of porcelain shells. I shall only make particular mention of two kinds, the young or spawn, of which I have been fortunate enough to obtain in their earliest stage of existence.

"The 'Cypræa olivacea' is the most abundant of the Singapore cowries, being found on most beaches under flat stones, it is of the size and much the colour of an olive, except that the back is generally mottled with brown, and the mouth somewhat yellow; the specimen which I found with the young attached, was fixed in the usual manner to the lower surface of a stone, on raising it there was found adhering to it, a flat circular membrane, broader than the shell, transparent, and dotted with minute grey spots, like grains of sand, on placing the substance in a glass of sea water, numbers of the grains dropped out of the membranous mass to the bottom of the glass, and immediately assumed rapid and lively movements, some revolving in a rotatory manner, others alternately raising and sinking in the water or sporting over its surface. On a closer examination these grains were seen to be in reality shells, some hundreds in number, nearly transparent, having no perceptible columella, and apparently consisting of a single coil or whorl, aperture round, breadth of the shell greater than the length, so that, when on a plain surface, it rested on either end like a Planorbis or Nautilus: the animal effected these rapid movements by the alternate contraction and expansion of its foot, which was broad and expanded, and much larger than the shell, into which it seemed to have no power of withdrawing it.

"There is another small cowry occasionally found on the coast, resembling in colour the C. adusta, but not more than half the size, and less cylindrical in shape. Captain Congalton, of the H. C. Steamer *Hoogly*, obligingly sent me one that was lately fished up in ten fathoms of water near Sultan's Shoal to the westward of Singapore, the shell was partially imbedded in a species of sponge, on detaching it from which, I found the cavity of the spongy mass lined with the young fry of the Cypræa, differing however in several respects from that of the C. olivacea ;—instead of being contained in one membraneous envelope, there were above two hundred transparent sacs, not larger than grains of mustard seed, and each containing about 30 shells, so minute that they could not be distinguished without the aid of a microscope, at a moderate computation there could not have been less than six thousand young shells : the difference in size is remarkable, as the Cypræa olivacea, which had the largest offspring, is a much smaller shell than the one at present under consideration : in this case I had not an opportunity of studying their habits, &c. as the animals were dead, having been many hours out of the water ; when examined under a microscope, the shape of the shell was found to resemble exactly that of the young C. olivacea above described.

"On various parts of the coast, particularly on coral banks, a considerable number of Echini may be observed, which, (although Naturalists have separated them from the Testaceous Mollusca) it may not be out of place to mention here ; one species in particular, I cannot find to have been hitherto described ; the shell is spheroidal, flattened, not more than two inches in diameter, and of a dark purple colour, the spines are numerous, six or eight inches long, black, very slender, and sharp-pointed, and somewhat elastic; the animal is found along the edges of coral reefs, and moves with tolerable rapidity by means of its spines: when closely pursued it has the faculty of darting itself forward against its opponent, and thereby inflicting considerable injury with its sharp spines, the points of which often break off and remain in the wound.

"The foregoing remarks may, in some measure, suffice to show what a wide field this country presents to those who have leisure or inclination to prosecute this branch of Natural History: should any other remarkable facts connected with the subject come to my notice, I shall be happy to give publicity to them from time to time in future numbers of the Journal."

CATALOGUE OF THE SHELLS OF SINGAPORE AND ITS VICINITY.

The Genera arranged as nearly as possible in conformity with Lamarck's System.

I. *Class.*—Annelides.

Genus Arenicola, ..	1	Species.
do. Siliquaria, ..	1	"
S. anguina.		
Genus Dentalium, ..	3	"
D. elephantinum.		
D. entale and another.		
Genus Sabellaria, ..	1	"
do. Terebella, ..	1	"
T. conchilega.		
Genus Spirorbis, ..	4	"
S. nautiloides.		
S. Carinata.		
S. spirillum.		
S. lamellosa.		
Genus Serpula, ..	1	"
S. decussata.		
Genus Vermilia, ..	1	"
V. tricostalis.		
Genus Magilus, ..	1	"
M. antiquus.		

II. *Class.*—Cirrhipedes.

Genus Balanus, ..	3	Species.
B. tintinnabulum, and two others.		
Genus Creusia, ..	1	"
do. Anatifera, ..	1	"
A. lævis.		
Genus Otion, ..	1	"

III. *Class.*—Conchifera.

Genus Aspergillum, ..	1	Species.
A. javanum.		
Genus Fistulana, ..	1	"
F. clava.		
Genus Teredo, ..	2	"
T. navalis and another.		
Genus Pholas, ..	4	"
P. orientalis.		
P. striatus and two others.		
Genus Jouannetia, ..	1	"
do. Gastrochæna, ..	1	"
do. Solen, ..	8	"
S. vagina.		
S. cultellus and six others.		
Genus Mya, ..	3	"
M. truncata and two others.		
Genus Anatina, ..	1	"
A. hispidula.		
Genus Lutraria, ..	1	"
do. Mactra, ..	3	"
M. spengleri and two others.		
Genus Crassatella, ..	2	"
do. Amphidesma,	1	"
do. Corbula, ..	3	"
do. Saxicava, ..	3	"
do. Petricola, ..	3	"
do. Psammobia, ..	2	"
do. Tellina, ..	19	"
T. radiata.		

T. virgata.
T. spengleri.
T. rostrata.
T. lanceolata.
T. lingua-felix.
T. rugosa.
T. gargadia and eleven others.
Genus Lucina, .. 3 Species.
do. Donax, .. 2 „
do. Crassina, .. 3 „
do. Corbicula, .. 1 „
C. regia.
Genus Cytherea, .. 8 „
C. scripta.
C. picta and six others.
Genus Venus, .. 12 „
V. squamosa.
V. casina.
V. decussata and nine others.
Genus Cardium, .. 9 „
C. cardissa.
C. hemicardium.
C. papyraceum.
C. unedo.
C. flavum.
C. exiguum.
C. humanum.
C. ciliare and another.
Genus Cardita, .. 2 „
C. caliculata and another.
Genus Cypricardia, .. 2 „
do. Arca, .. 13 „
A. tortuosa.
A. semitorta.
A. tetragona.
A. navicularis.
A. barbata.
A. cancellaria.
A. antiquata.
A. granosa and five others.
Genus Nucula, .. 1 „
do. Hyria, 1 „
do. Chama, .. 3 „
C. lazarus and two others.
Genus Tridacna, 3 „
T. gigas.
T. crocea.
T. squamosa.
Genus Hippopus, .. 2 „
H. maculatus and another.
Genus Mytilus, .. 6 „
M. bilocularis.
M. perna and four others.
Genus Modiola, .. 3 „
do. Pinna, .. 4 „
P. pectinata.
P. flabellum.
P. squamosa and another.
Genus Perna, .. 3 „
P. vulsella.
P. ephippium.
P. femoralis.
Genus Malleus, .. 4 Species.
M. vulgaris.
M. albus.
M. vulsellatus.
M. normalis.
Genus Avicula, .. 2 „
do. Meleagrina, .. 2 „
do. Lima, .. 4 „
L. squamosa.
L. inflata.
L. fragilis.
L. linguatula.
Genus Pecten, .. 7 „
P. pleuronectes.
P. sinuosus.
P. rastellum.
P. flavidulus.
P. varius and two others.
Genus Plicatula, .. 2 „
P. depressa.
P. ramosa.
Genus Spondylus, .. 3 „
S. gædaropus and two others.
Genus Ostrea, .. 9 „
O. edulis.
O. imbricata.
O. folium.
O. crista galli and five others.
Genus Vulsella, .. 1 „
V. lingulata.
Genus Placuna, .. 3 „
P. placenta and another.
Genus Anomia, .. 3 „
A. ephippium and two others.

IV. *Class.*—Mollusca.

Genus Hyalæa, .. 1 Species.
do. Chiton, .. 2 „
do. Patella, .. 4 „
do. Parmophora, 1 „
do. Emarginula, .. 1 „
do. Fissurella, .. 1 „
do. Calyptræa, .. 2 „
do. Bulla, 6 „
B. naucum.
B. ampulla and four others.
Genus Onchidium, .. 1 „
do. Helix, .. 7 „
H. tectiformis and six others.
Genus Pupa, .. 1 „
do. Bulimus, .. 2 „
B. citrinus and another.
Genus Auricula, .. 11 „
A. midæ.
A. judæ.
A. myosotis.
A. minima.

A. scarabæus and six others.
Genus Cyclostoma, .. 2 Species.
C. involvulus and another.
Genus Planorbis, .. 1 „
do. Lymnæa, .. 1 „
do. Melania, .. 2 „
do. Valvata, .. 2 „
do. Paludina, .. 7 „
do. Ampullaria, .. 1 „
do. Neritina, .. 2 „
do. Navicella, .. 1 „
do. Nerita, .. 7 „
N. peloronta.
N. polita.
N. versicolor.
N. albicilla.
N. chlorostoma.
N. atrata and another.
Genus Natica, .. 15 „
N. mamilla and fourteen others.
Genus Sigaretus, .. 1 „
do. Stomatia, .. 1 „
S. phymotis.
Genus Haliotis, .. 1 „
do. Tornatella, .. 4 „
T. flammea.
T. solidula and two others.
Genus Truncatella, .. 1 „
do. Pyramidella,.. 5 „
P. terebellum and four others.
Genus Scalaria, .. 4 „
S. lamellosa.
S. varicosa.
S. coronata and another.
Genus Delphinula, ... 3 „
D. laciniata.
D. turbinopsis and another.
Genus Solarium, .. 1 „
S. perspectivum.
Genus Trochus, .. 13 „
T. rotularius.
T. viridis.
T. granulatus.
T. niloticus and nine others.
Genus Monodonta, .. 5 „
M. labio and four others.
Genus Turbo, .. 7 „
T. cochlus and six others.
Genus Planaxis, .. 1 „
P. sulcata.
Genus Turritalla, .. 1 „
do. Cerithium, .. 29 „
C. petrosum.
C. asperum.
C. zonale.
C. aluco.
C. vertagus.
C. telescopium.
C. palustre.
C. obtusum.
C. nodulosum and twenty others.
Genus Triphora, .. 1 Species.
do. Pleurotoma, .. 11 „
P. nodifera.
P. pleurotoma and nine others.
Genus Turbinella, .. 1 „
do. Cancellaria, ... 1 „
do. Pyrula, .. 7 „
P. rapa.
P. ficus.
P. elongata and four others.
Genus Ranella, .. 3 „
R. spinosa and two others.
Genus Murex, .. 6 „
M. saxatilis.
M. crassispina.
M. adustus and three others.
Genus Pterocéras, ... 3 „
P. chiragra.
P. lambis and another.
Genus Strombus, ... 7 „
S. cancellatus.
S. auris dianæ.
S. luhuanus.
S. labiosus.
S. incisus and two others.
Genus Cassidaria, .. 1 „
do. Cassis, .. 1 „
C. glauca.
Genus Purpura, .. 9 „
P. armigera and 8 others.
Genus Dolium, .. 1 „
D. maculatum.
Genus Buccinum, .. 6 „
do. Nassa, .. 24 „
do. Terebra, .. 3 „
T. maculata.
T. strigillata and another.
Genus Columbella, .. 7 „
C. rustica.
C. fulgurans.
C. mercatoria.
C. hebræa and three others.
Genus Mitra, .. 14 „
do. Voluta, .. 2 „
V. undulata.
V. melo.
Genus Marginella, .. 5 „
do. Ovula, .. 4 „
O. verrucosa.
O. triticea and two others.
Genus Cypræa, .. 20 „
C. cicerula.
C. quadrimaculata.
C. moneta.
C. urcellus.
C. annulus.
C. erosus.

C. rigzag.
C. caput-serpentis.
C. poraria.
C. olivacea.
C. adusta.
C. arabica.
C. tigris and seven others.
Genus Trivia, .. 1 Species.
do. Oliva, .. 2 „
do. Conus. 6 „
C. prælatus.
C. marmoreus and 4 others.
Genus Nautilus, .. 1 Species.
N. pompilius.
Genus Argonanta, .. 1 „
A. argo.

N. B. In addition to the Shells above enumerated, there are ten or twelve kinds, for which I cannot find a place among Lamarck's Genera.

Coal at the Foot of the Booteah Hills.

We are indebted to Major Jenkins for the following communication relative to the existence of Coal at the foot of the Booteah Hills. The specimens are not very promising, although it is hardly consistent with the nature of things to expect good specimens of coal to be picked up accidentally on the surface. The specimens, although like canal coal in appearance, are more of the nature of Anthracite with the fibrous character of tignite or brown coal.

"I send you a few specimens of coal from a bed discovered by Mr. C. K. Hudson, directly north of Burpetah, under the Booteah Hills. It is apparently canal coal, it does not answer well for steamers; but for a stove of mine, it burns freely enough, and may be useful for many purposes: it however probably overlies a more useful coal."

POSTSCRIPT TO THE THIRTIETH NUMBER OF THE CALCUTTA JOURNAL OF NATURAL HISTORY.

However well a Journal may be supported as to the number and talent of its editorial staff, yet it is necessary, that some one resident at the place where it is published, should take the trouble of superintending the details of printing and publication.

Some uncertainty having existed during the past few months as to how far the present managing Editor might be enabled to continue the personal superintendence of the work, it has consequently been allowed to fall slightly into arrears. Under these circumstances it is thought necessary to bring the series to a close with the present number. Should circumstances allow of the renewal of another series, nothing would afford the managing Editor more pleasure than again lending his aid to the undertaking, and once more co-operating with his colleagues, to whom the credit and usefulness of the Journal has, of late, been entirely due.

Calcutta : 7th February, 1848.

General Index.

Supplementary Index

TO THE

29TH AND 30TH NUMBERS.