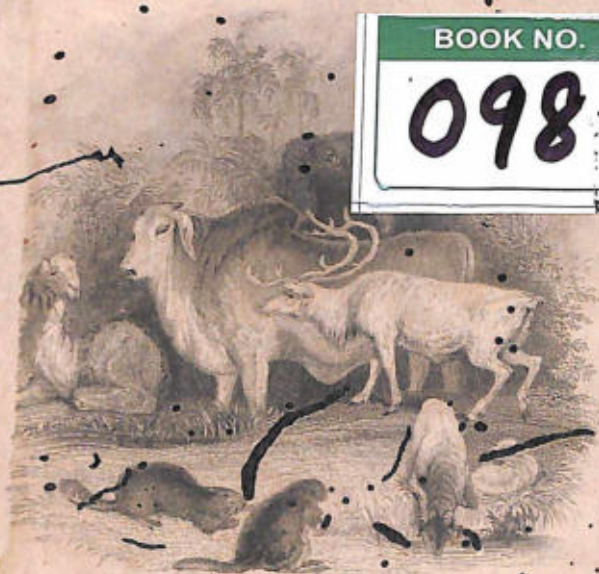


ON
THE NATURAL HISTORY
AND
CLASSIFICATION
OF QUADRUPEDS.

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PART I.

ON THE GREAT DIVISIONS OF ORGANISED MATTER,
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CHAPTER I.

PRIMARY DEFINITIONS. — ON MATTER, TIME, AND SPACE. — THE
STATION OF MAN IN THE CREATION.

(1.) BEFORE commencing a survey of the animal kingdom, it may not be improper that its definitions should be preceded by others of a more general character; and that the mind should be first awakened to some perception — indistinct though it be — of those primary laws, which seem to embrace and pervade all creation. The animal kingdom, however vast, is but a part of organised matter; and this again is connected with higher and lower created natures by various relations. The chain of nature, in short, is infinite; and although man can never analyse more than a few links, sufficient light has been given him to discern their connection with those that stretch into the realms of the immaterial world.

The truths to which we now allude have long since been discussed by some of the most celebrated philosophers ; but they have not, as we conceive, been stated in that precise form which appears best calculated to show the harmony they preserve in their component parts.

(2.) Every thing which the mind of man can conceive, according to Locke, is either *cogitative* or *incogitative* ; or, in other words, is either *intelligent* or *unintelligent*.*

(3.) 1. Of intelligent beings, there is but One universal, primary, and continuous cause, — God, in whose hands is the life and being of every thing. 2. From the will of this great Omnipotent has emanated other intelligent orders, created, indeed, and therefore incontinuous ; but whose entire nature, being spiritual, is incorruptible, and who have been destined by their Creator to live in that state for ever. 3. Following these purely spiritual beings, is MAN, whose essence, or soul, is immortal, but whose substance, or body, is material and corruptible. These, for a season, are united ; but the Creator of the human soul has declared, in language the most unequivocal, that it will continue to exist through the countless ages of eternity ; and finally, that, by obedience to the conditions He has revealed, it will be united, so to speak, with the purity and holiness of Him from whom it proceeded.

(4.) Neither revelation nor reason can suggest to the mind any other order of created intelligences than these, although each contains its own internal or com-

* Although I have here adopted the primary distinctions insisted upon by this celebrated metaphysician, I am not quite satisfied that they are philosophically correct. My reasons for venturing to entertain this doubt are drawn from the apparent impropriety of considering motion and velocity, not as beings, but merely certain relations which particles of matter may bear to space or time. (Hor. Ent., p. 181.) Mobility is that power, by which a material substance is made to exchange one portion of space for another ; it seems, therefore, to be a power quite independent of any form of matter, whether ponderable or imponderable. It may, I think, be fairly questioned whether this plan of dividing all things simply into *cogitative* and *incogitative* is not equally objectionable to that of first arranging all animals under the divisions of vertebrate and invertebrate. Both, indeed, as matters of fact, are true ; but we know that at least the latter division is artificial, because it destroys the uniformity and destroys the analogies of nature in the subsequent details.

ponent qualities; one of these, for instance, is the Godhead itself. Of incorruptible beings, we are likewise taught that some are holy, some unholy, and that both these contain different ranks and degrees of spirits, — principalities, powers, and rulers.* We merely glance at these plains, although indefinite intimations, given in scripture, of the different natures and inequalities existing in the spiritual world, to show that all these diversities fall under one or other of the primary definitions already stated.

(5.) Of unintelligent beings, we can conceive, in like manner, but of three sorts; namely, Matter, Time, and Space. Matter is incon tinuous, but time and space are not so; for there never was a time in which there was no time, or a thing which did not occupy space. Both, however, although continuous, differ from intelligent beings, in that they are capable of mensuration.

(6.) Time and space are eternal, for it is impossible to conceive them otherwise than as coexistent with the Deity. All time is his duration†, and all space is filled by his presence: they are evidently not causes; yet we cannot understand how they can be effects. Thus, as it has been well observed, we come to the inconceivable conclusion, that they are neither causes nor effects. Their definition, in fact, is so difficult, not to say impossible, that, inconsistent as it may appear, those philosophers who have relinquished the effort in despair are those who have the greatest knowledge on the subject.

(7.) Looking collectively to the three great divisions of unintelligent beings, — time, space, and matter, — we shall find that the latter is equally incapable of strict definition. Each, in fact, can be judged of only by its properties. Time and space may be divided, yet they are continuous; for it is impossible that one of these divisions can exist without being connected to others; but every mass or particle of matter may be isolated,

* Coll. i. 16.

† Time, in its most extended sense, is but another name for Eternity, although, in common language, it is used to denote parts of Eternity.

and so exist without other parts. Time and space are capable of mensuration ; but to space is added the property of figure. Matter is the same, but is at once distinguished from time and space by being incontinuous.

(8.) Of time, we know but of three primary divisions, which we distinguish as the past, the present, and the future. The first and the last are incalculable, for they are eternal ; while *the present* is but as a connecting filament to each. Space, in like manner, may be broken into infinite portions ; but of its first great divisions we know nothing more than can be dimly gathered from certain passages in revelation.

(9.) We have said that matter is distinguished from time and space by its incontinuity,—we may also add by its finiteness. One of the most original and philosophic writers of the age justly observes, that “ a metaphysical necessity compels us, indeed, to deny absolute infinity to matter ; and, for the saving of the first principles of theology, we affirm that creation has its limits. But who shall say when, and where, the abstract necessity begins to take effect ? A problem like this we must leave untouched ; meanwhile, the whole evidence of sight and of science tends to render it a probable supposition that that sphere of the universe which light brings within our knowledge is but a small portion of the whole, and that the verge of this visible sphere is the verge of another beyond it, or embracing it, and that again of another. Nothing in such suppositions, let them be extended as they may, can be deemed incredible or extravagant, while the inconceivable truth stands before us of the distances and numbers of the worlds that are actually visible : the demonstrated wonders of astronomy deprive us of the right to affirm that any supposition concerning the greatness of the works of God is too vast to be admitted.”*

* Saturday Evening, third edition, p. 195. I have seen no book of modern times in which the Christian philosopher will find more depth of reasoning, more sublime conceptions, or more vigour and originality of thought, than in this remarkable volume. It demands both the attention of the Christian, the philosopher, and the moralist.

(10.) The true nature of matter, in its most general sense, has never yet been, and probably never will be, clearly understood. It is usual to consider matter as divisible into ponderable and imponderable.

(11.) Ponderosity is obviously the chief or typical distinction of matter; it is that quality by which it is most widely separated from the other divisions last intimated, no less than from time and space. Hence it follows, that, whatever may be our speculations or theories on the aberrant, or imponderable, forms of matter, we can have no doubt as to the nature of bodies which unite form and substance.

(12.) No two particles of ponderable matter can occupy the same place at the same time; and no one can be in different places at the same time: by the first we demonstrate its solidity, and by the latter its identity.

(13.) Ponderable matter, when its particles are collected together and united in a compact mass, which possesses a definite form, is termed a body; and of such bodies we know only of three sorts, — animals, vegetables, and minerals: the two first of these are termed *organic*; that is, they possess an internal organisation for their growth or increase. Minerals, on the other hand, are *inorganic*, without life, and increase by external depositions alone.

(14.) The general sense of mankind, from the earliest ages, is in favour of this mode of dividing MATTER, properly so called; since all the substances, or bodies, composing our globe belong to one or other of these three kingdoms of nature. Matter, indeed, may be simply divided into organic and inorganic; but, having already pointed out the impropriety of adopting such a division in science, and the inconsistency to which it has led*, the arguments need not be here repeated. Before, however, we proceed further, let us pause and contemplate some of the inferences which may be gathered from the foregoing definitions.

(15.) MAN, the only being upon earth who is endowed

* North. Zool., Vol. II., Preface liii.

with improveable reason, and who knows himself to be vastly superior to every other living creature, must ever feel an intense anxiety to understand the station he holds in the scale of creation. He knows but too well that, like the beasts of the field, he also is subject to the law of death; but, revelation apart, he knows no more. It is idle to assert, that unassisted reason can give him a firm conviction of an after-existence; for, had this been true, the most enlightened nations of the heathen world would never have doubted the immortality of the soul: yet reason, when illuminated by a brighter lamp, is of the highest value. It will not unfrequently dispel those doubts and misgivings, which, more or less, will at times impede the full force of faith. It will sometimes bring conviction to those who desire to see in what manner the truths revealed by inspiration accord with the facts of physical science. Of the former, we know, from personal knowledge, nothing; but the collateral evidences furnished by the latter come within our own observation; they either regard simple facts, or furnish inferences drawn from them, to which the reflecting mind, schooled in logical deduction, is accustomed to attach as great a degree of importance as to the facts themselves. Let us, then, inquire how far these aids will assist us in solving the important question,—Does man form a part of the *animal* creation; or is he a being detached therefrom, belonging to a higher order of intelligences, and only placed here as a governor over the governed? One would have imagined that to discuss this question with Christians, were a needless task, seeing that revelation every where places *man* in absolute contrast and contradiction with the “beasts that perish.” “The inspired writers, while they deal faithfully with man in regard to his actual corruption, magnify, without scruple, his character as related to God, and to futurity. The *style* of the Bible, in this point, prepares us to receive whatever it may affirm concerning human destinies; and leave is given at once to entertain the greatest conceptions, when, in the first page of

the sacred canon it is said, and said with emphasis, that 'God created man in his own image, in the image of God created he him.' And that this dignity, whatever it might include, was not forfeited by the transgression of Adam, is made certain when the same principle is anew affirmed, as an abstract or universal truth, 'Man is the image of God;' or, less universally, that, by the gospel, all that believe are made partakers of the divine nature." * With such assurances, it is much to be lamented that those philosophers who are yet believers virtually deny to man the prerogative of his high descent, and of his *natural affinities*. They class him simply as an animal, forming part of the brute creation, as a genus allied to the monkey †, as an order of quadrupeds ‡, or an essential part of a zoological circle §, surrounded by apes and baboons. The great fathers of science in the heathen world, enlightened only by natural reason, seem to have had much more exalted, and much more correct notions of the affinities of man than those of modern times. The immortal Aristotle, in his system of the animal world, excludes man from his scheme; and his example has been followed by Willoughby and Ray. It has been argued, indeed, that the natural pride of these philosophers withheld them from classing themselves with brutes; but we are more disposed to think they were influenced by higher and more worthy considerations. Be this, however, as it may, there is not merely an innate repugnance, but a disgust and abhorrence in every human being, ignorant or enlightened, savage or civilised, against the admission of this relationship. All this, indeed, may be granted; yet still

* Saturday Evening, p. 456. Again, the learned and pious bishop Sumner justly observes, "There is nothing philosophical in the comparison of a being possessed of improveable reason with one that is governed by natural instinct, because there is no just affinity between the talents which are compared."—(*Records of Creation*, i. p. 13.) Are we, then, to place such a being in a zoological circle, connected by affinity with apes and baboons? or are material and immaterial natures so closely allied, that they may be classed together?

† Order Primates. Genus 1. Homo. 2. Simia. *Linnaeus*.

‡ Class Mammalia. Order Bimanae. *Cuvier*.

§ Circle of the Primates. *Macleay*, *Linn.* *Tr.*, xvi. p. 22.

the advocates of these systems may urge that such feelings possess no influence whatever in cancelling the deductions of science; for, if the natural characters of man show that he is, essentially, an animal, he must be classed as part of the animal system, however humiliating to our pride, or repugnant to our feelings such a station may be. There is such a semblance of truth in this argument, that, before we notice others, we shall give it all due consideration.

(16.) Let us, then, for a moment, put aside these innate feelings just adverted to, and consider the question before us simply as one of pure science. Now, the very first law, if there is any one law more imperative than another upon those who undertake to discriminate and to characterise an object, is this, that the object is to be designated and classified by that property or quality which is its most distinguishing or peculiar character. No one, for instance, would think of placing the tiger and the zebra in the same group of animals, because they are the only two quadrupeds in existence which are striped in the same manner. This law, indeed, is well understood, and has only been violated by systematists when they designate man as an animal. Instead of classing him according to his highest and most distinguishing property — REASON, they have selected his very lowest qualities whereby to decide upon the station he holds in the scale of creation. Because, as an infant, he suckled at the breast of his mother, he is to enter into the class of animals called Mammalia; and, because he has nails upon his fingers and toes, he is to be placed "among the unguiculated animals*;" and because some of the apes have a hyoid bone, man is to be classed with them in the same group. What are all these but secondary characters, totally unfit to designate his true peculiarities? Upon this principle we should class the bat among birds, because both fly, and both have a crest to their sternum. But it may be urged, man is placed

* Grise. Cuvier, i. 79.

among animals merely on account of his physical structure, and as agreeing with them in some remarkable peculiarities. But who will venture to assert that this resemblance is an affinity, and not an analogy? What can be a greater violation of nature — all other considerations apart — than to place a solitary species of creature walking erect, upon two limbs, among others which walk upon four? But for the sanction of authoritative names, every naturalist would be shocked at such a forced union of beings into the same class, by those who profess to show us the harmonious gradations by which nature passes from one form to another.

(17.) There is yet another argument against forcing MAN to enter within the zoological circle, furnished by the very theory upon which that hypothesis is built. We know that every being in creation has at least two, if not three, relations of affinity*, and that these are independent of innumerable relations of *analogy*. We know, also, that relations of affinity can only be determined where the object under consideration forms a link in an almost uninterrupted chain of beings, which gradually approach to it on one side, and as gradually recede from it on the other. Now, to prove that man forms a part of the animal circle, it is necessary to show either that he is linked to them by these two series of affinities, or that there is at least no great hiatus between him and animals. Yet neither of these conditions for establishing an affinity, strictly so termed, have been complied with; on the contrary, the writers in question are obliged to admit the "greatness of the gulf between man and the ourang-outang," the nearest relation (erroneously termed an affinity) which they can discover to man. But where is the class to which we are related on the other side of the circle? Where is our double affinity? If this cannot be made out, if man alone, of all the created beings on this earth, stands thus isolated, his relation to the ourang outang proves to be one of mere analogy. Were it otherwise, and we admitted this resemblance to be

* See Classification of Animals, p. 233.

an absolute affinity, the presumed type of the animal kingdom would contradict the first great law of natural classification: man would then possess 'but a single affinity,' while the whole of organised matter presented a double one.

(18.) It thus appears that man, even when viewed simply as a zoological form, exhibits not one of those requisites which are essentially necessary, in all other departments of nature, to constitute an affinity with those beings with which he has been so injudiciously and hastily associated. Between him and the animals that have been placed next to him there is admitted to be "a vast gulf;" and yet this gulf is to be passed over, in order that some place may be found for him in the circle of unguiculated animals, or that some confirmation may be given to the idea of a simple graduating scale, from man down to an animalcule.

(19.) It might have been imagined that, when once the circularity of natural groups had been fully established, naturalists would have given their first and earliest attention to this most interesting subject, and that they would have been, not only anxious, but impatient, to have solved this important question:—Does MAN form a type in a zoological circle? The investigation, indeed, involves the analysis of a large portion of the mammalia,—a task of no ordinary difficulty; and it is to this necessity, in all probability, that we must attribute the neglect of so important and interesting an inquiry. The idea, therefore, expressed by a well known naturalist, — when sketching out the primary groups of quadrupeds, — that man enters into the Linnæan order of *Primates*, after all, is entirely unsupported by any thing like proof; it remains as a mere matter of opinion, expressive of a common belief, and sanctioned only by modern usage. Impressed with a deep conviction that this question involves considerations far more important than the determination of a purely scientific problem, we shall submit to the philosophic naturalist, in a subsequent part of this volume, the results that have

attended an investigation of the order *Quadrumanæ* of Cuvier, which corresponds, with little variation, to that named *Primates* by Linnæus. If man really forms part of the animal world, this is the only group wherein he can possibly be made to enter, we think it will appear, on this investigation, that the assumption of those who advocate the opinions we are now opposing, is erroneous; — that the typical circles of the *Quadrumanæ* are complete, without the introduction of the “human form divine;” and that no place, in fact, can be found for man either in that group, or in the vast circle of organised matter.

(20.) We have now shown that, whether we regard man in his higher or his lower qualities, — whether as an immortal or as a material being, — the station that has been hitherto assigned to him in the scale of creation is inconsistent both with innate feeling, and with that logical induction upon which all true science reposes: nor is this the only inference to be drawn from the arguments here employed. Had the essential distinction, or, in technical language, the *specific character*, of man not consisted in the immortality of his noblest part, there would have been an immeasurable hiatus between the circles of intelligent and unintelligent beings, which nothing that we can conceive would lessen, even by supplying the slenderest filament which might intimate their connection; nay, more, the higher orders of intelligences would appear to want that link which was to connect spirit with matter, — corruption with incorruption. If man holds a station in the series of unintelligent beings, he cannot enter into the circle of those that are intelligent, because *no being can occupy a station in two distinct circles*.

(21.) In MAN, therefore, we behold that creature which connects these two primary orders of beings, the intelligent and the unintelligent. He is by far the lowest in the scale of the first; yet to that circle of spirits he unquestionably belongs. He is one of them, not as a proscribed and degraded race, to be cut off from all

fellowship with the heavenly hosts, and with the bare claim of immortality to sanction his admission into their order; but he is offered the means of *restoration* to what he was in that golden age, when he conversed even with the Highest Intelligence, and was the companion of angels. This restoration will place him again in direct communion with those beings to whom, by his immortality, he is legitimately connected. He will be, on the one hand, "like unto the angels;" and, on the other, his spirit will be united to the holiness and purity of the Omnipotent. Here, then, are the true affinities of renovated man. He is the most aberrant of intelligent beings, because he is the lowest; while, by those *secondary* characteristics which unite him to the material world, the circle of *matter* is brought to touch that of *spirit*. In him we see the highest exemplification of that three-fold affinity which has elsewhere been explained*, and which can be traced in all aberrant forms in the animal world. His third affinity, in fact, *lies out of his own proper circle*, and merely serves to connect him, for a season, with matter. Do we want a more familiar illustration of these views? let us but look to the life of the butterfly, and then ask what naturalist would think of classing it among apterous insects, because, *in its first and lowest stage of existence*, it is a wingless grub?

(22.) We now return to the primary divisions of ponderable matter, which the rudest understanding can comprehend by looking to an animal, a plant, and a mineral.

* Treatise on the Geography and Classification of Animals, p. 233.

CHAP. II.

ON THE DISTINCTION OF AN ANIMAL FROM A VEGETABLE. — THE PRIMARY DIVISIONS OF THE ANIMAL KINGDOM. — VARIOUS THEORIES OF LINNÆUS, VIREY, CUVIER, AND MAC LEAY. — NAMES AND DEFINITIONS OF THOSE HERE ADOPTED. — RELATION OF THESE GROUPS TO VEGETABLES.

(23.) It is apparent to the most ordinary observer that organised matter is of two kinds, *animal* and *vegetable*; and it might be supposed that the difference between them was so great, that not the slightest difficulty would arise in giving to each its proper definition. The case, however, is far otherwise. Not only the ancients, but many of those naturalists who have succeeded them, have frequently mistaken the one for the other: even in our own times, notwithstanding the subtle definitions that have been proposed, no positive or absolute set of characters has yet been detected. Such is more or less the conclusion which the greatest naturalists of the present day have arrived at; yet there are not wanting others, who, with a confidence which argues any thing but a knowledge of the subject, have boldly declared that there is not the least difficulty in the matter. Upon so interesting a subject, we shall first lay before the reader the opinions of others, nearly in their own words; and then, by comparing their relative merits, endeavour to arrive at a just conclusion as to their value.

(24.) M. Cuvier contends, with great ingenuity, that animals are known from vegetables by four leading distinctions: firstly, in deriving nourishment from without, and being, consequently, provided with an intestinal canal. Secondly, by their circulating system; thirdly, by the presence of azote in their chemical composition; and, fourthly, by their power of respiration.

(25.) I. As to *nutrition*, M. Cuvier remarks, that “the spontaneous motion essential to animals, requires

peculiar modifications, even in such of their organs as are purely vegetative. Unprovided with roots to penetrate the soil, and constantly to absorb nutrition, other means are necessary for procuring aliment from without, and a peculiar reservoir for containing it within ; hence are derived the first leading characters of animals in general ; that is, their intestinal cavity, from which, passing through the pores and vessels (which may be considered a kind of internal roots), the nutritive fluid penetrates every part of their system, and sustains the whole. 2. As, to the *circulating system*. The organisation of the intestinal cavity, and its appurtenances, must, of necessity, vary or correspond with the kind of aliment on which each species subsists, and the changes such animals must undergo to convert the food into juices fit for the purpose of absorption. Plants, on the other hand, are supplied by the soil and the surrounding atmosphere with juices, already prepared for absorption. The animal, whose functions are so much more numerous and varied than those of the plant, must, consequently, possess an organisation so much the more complicated ; and as, from the nature of its constitution, its parts could not preserve one fixed position relatively to one other, it is obvious that the motion of their fluids could not be produced by external causes, but must be, in a great measure, independent of atmospheric influence. Here we trace the second leading distinction, or important character, of the animal world ; namely, the circulating system, which is less essential than the digestive, and is unnecessary in animals of more simple conformation. As the animal functions require certain organic systems not requisite in plants,—the muscular system, for instance, for the purpose of voluntary motion, and the nerves for sensibility,—and as these systems, like all the rest, act through the medium of the fluids, it must necessarily follow that the fluids should be more abundant, and the chemical composition of the animal body more complicated. 3. As to their *chemical distinction*. In conformity with the last pro-

position, M. Cuvier goes on to state that, accordingly, azote, an additional substance, enters into the animal composition, as one of its essential elements; while in the plant it is only found accidentally united with other general elements of organisation; namely, oxygen, hydrogen, and carbon: this peculiarity forms the third of the animal characters. 4. As to *respiration*. Vegetables derive their nutriment from the sun, and from the circumfluent atmosphere, in the form of water, which is a combination of oxygen and hydrogen; of air containing oxygen and azote; and of carbonic acid, composed of oxygen and carbon. The peculiar composition of plants requires that the hydrogen and carbon should be retained, the superfluous oxygen exhaled, and a very small quantity, if any, of the azote absorbed. Such, accordingly, is the process of the vital action in vegetables, where we perceive the most essential functions to be the exhalation of oxygen, which is performed by the assistance of the light. The vegetable composition (of which hydrogen and carbon form the principal parts) is also a source of animal nutriment. With regard to animals, "they must," says M. Cuvier, "for the preservation of their own peculiar chemical constitution, get rid of a great portion of the hydrogen and carbon, and absorb and retain more of the azote. This is done through the medium of the atmosphere; the oxygen of which, combining with the hydrogen and carbon of the blood, is exhaled with them in the form of water and carbonic acid: as for the azote, into whatever part of the animal body it may penetrate, it always appears to remain there. The relations, then, of the animal and of the plant with the surrounding atmosphere are precisely in an inverse ratio to each other. Water and carbonic acid are rejected by the one, and produced by the other. The function of respiration is essential to the constitution of the animal body: it is that, indeed, if we may use the phrase, in which its *animality* consists; and animals are found to exercise all their functions, with more or less efficiency, in proportion as their

respiration is more or less perfect. Respiration is, therefore, the fourth of the animal characters, founded on the differences of relations above insisted on." * It will be evident to the experienced naturalist, that, however correct the celebrated author of the above passage may be in the above statement, he has obviously, and justly, drawn his distinctions from the characters which constitute the *typical* perfection of the two kingdoms, cautiously avoiding the attempt of defining those limits where the least organised animals unite with the least organised vegetables.

(26.) M. Mirbel considers that plants alone have a power of deriving nourishment (though not, indeed, exclusively) from inorganic matter, mere earths, salts, or airs; substances certainly incapable of serving as food for any animals, the latter only feeding on what is, or what has been, organised matter, either of a vegetable or animal nature. So that it should seem to be the office of vegetable life alone to transform dead matter into organised living bodies.† The distinction, however ingenious, is liable to this objection, that it overlooks the fact of all earths being more or less impregnated with decomposed vegetables, which has been organised matter, and that this latter is likewise the food of thousands of insects.

(27.) We shall, upon this occasion, notice the opinions of one of the writers before alluded to, as characterised by that confidence which argtles any thing but an acquaintance with the subject under consideration. He considers that the difficulty hitherto experienced by philosophers in marking the limits which separate animals from vegetables, to have originated in two causes.‡ First, from the employment of ambiguous phrases, and to inattention to the number and character of those pro-

* Griff. Cur. i. p. 28. - As it might be thought objectionable, in a popular work of this nature, to quote foreign authors in their own language, we have, upon this and other occasions, cited Mr. Griffiths' Translation of the *Règne Animal*, rather than the original.

† *Traité d'Anat.* i. p. 19.

‡ *Philosophy of Zoology*, i. p. 40.

perties which are common equally to plants and animals. Secondly, to the practice of examining the doubtful objects, without attending to all their relations, by comparing the less perfect animals with some of the qualities of the most perfect plants, and by allowing our opinions to be influenced by circumstances connected with mere size and form. The characters belonging to those animals and plants which occupy the higher stations in their respective kingdoms, are easily defined; but when we descend to those which occupy the lowest stations, and perceive that they are less complicated in their structure, exercise fewer functions, and, consequently, present only obscure points of difference, "we may be led into the supposition that, at a certain link of the chain, the two kingdoms coalesce." Such a belief, however, in the opinion of this writer, is completely erroneous. For he says "when we examine all the characters which the imperfect plants and animals exhibit, we shall be able to trace the relations which connect these minute and obscure species with those in which the characteristics of the kingdom to which they belong are more fully developed. In order to illustrate this subject further, and attempting to guard against the errors into which others have been betrayed, we propose now to consider the marks by which animals may be distinguished from plants." This author then proceeds to contend that, 1. Animals differ from plants in composition; 2. In structure; 3. In action; and, 4. In nutrition. Under the third head are the following remarks:—"The preceding observations on the composition and structure of organised beings establish the existence of characters sufficiently marked to warrant the conclusion, that animals and vegetables belong to different systems; that there is a model peculiar to each, and that by attending to the appearances they exhibit, even after death, it is practicable to ascertain the kingdom to which any individual belongs. When we attend to the display of the living principle in the species of each division, we likewise perceive differences so very remarkable, as to dispel all

the doubt and obscurity in which the subject at first appears to be involved. These differences, however, can only be distinctly traced by a comparison of the most perfect animals with the most perfect plants, and by continuing the contrast until we approach the lowest station of each kingdom." We deem it quite unnecessary to refute the singular opinions here advanced, since every naturalist, who has but ordinary experience, knows that they are denied by facts. To be told that it is perfectly easy to discriminate an animal substance from a vegetable, is an assertion altogether unprecedented in natural history.

(28.) Let us now turn, however, to another writer, from whom we may expect more just conclusions. Mr. MacLeay's opinions on this difficult subject deserve great attention, inasmuch as he anticipates and answers those objections that may be urged against the distinctions he has adopted. He admits that there may be great truth in the remark, that anatomists have not sufficiently investigated the modifications of animal life, with a view to elucidate this important question; "but," he continues, "the fact is, that a very great difficulty indubitably exists in the subject itself, which, independently of the manner in which it is treated, opposes almost invincible obstacles to the clear distinction of the two species of organised matter. It is not assuredly in the circulation of the fluids in animals, that this distinction can be safely said to exist; for while we are as yet ignorant of the true nature of that great motion in the more perfect plants called the flowing of the sap, there are many animals, and those not of the most simple structure, in which nothing like circulation has as yet been detected. The distinction does not consist, as some authors will have it, in the nutrition of animals taking place by digestion, and that of plants by suction; for it is difficult to conceive how the simplest form of animals is nourished at all, unless it be by absorption of fluids by their external surfaces. It is not in respiration; for air is the universal nutriment of organised

matter, the penetration of which into an organised body is so necessary to its vitality, that whether it takes place by peculiar organs for the purpose, or by the whole of the surface, death appears to be the inevitable consequence of its exclusion. It is not in motion, because some animals are as completely destitute of the power of locomotion as plants; unless by motion is meant irritability; in which case, motion and sensation are resolvable into one and the same faculty; the former depending on the contraction of the muscular fibre, which again depends on the influence of the nerves. Neither is it in the presence of azote, as a chemical constituent of animal bodies, for this is allowed also to exist, though in a much smaller degree, in vegetables. There remain, however," continues Mr. MacLeay, "three characters of distinction, which appear more capable of support, and I shall accordingly adopt them, in stating, that vegetables are to be distinguished from animals,—1. By the elaboration of their nourishment of fluid matter received by an absorbent external surface; whereas in animals it is received by an absorbent internal surface, this last being called the intestinal cavity, and its inner surface being furnished with innumerable pores or vessels, which Boerhaave considered as real internal roots; 2. By the exhalation of oxygen and absorption of carbonic acid, whereas animals exhale this last, and absorb oxygen; 3. By the want of a nervous system, and consequently of sensation, whereas animals possess both."

(29.) The objections to these definitions Mr. MacLeay thus states and answers:—"To the first it has been objected, that an intestinal cavity has not yet been perceived in the *Infusoria*, and that in the *Polypes* this cavity may be turned inside out, like a glove, without the ordinary functions being disturbed. But it is possible that the excessive minuteness of the *Infusoria* may account for our not having yet observed an intestinal cavity to them; and with respect to the *Polypes*, the pretended objection is in reality none; as, though the

intestine of these animals may be turned inside out, yet the food is constantly received into it, and the nourishment consequently absorbed by that surface which may happen to be internal. The second character seems much more exceptionable; for M. Biot is said to have discovered that several species of coleopterous insects may exist in a vacuum without inconvenience, and it would, above all, be difficult to apply the rule of the absorption of oxygen to the intestinal worms. To the third character it may be objected, that a nervous system has not yet been detected in all animals; and also that several vegetables, such as the sensitive plants, possess irritable properties: finally, that all plants appear to direct their organs to what is natural and beneficial to them in such a manner, as to render it at least very questionable, whether they be not endowed with sensation. To these objections it may be answered, in the first place, that in all animals where a nervous system has been detected, their sensation has been discovered to depend on it: we are hence led to assume that all animals, in which sensation is observable, have it depending on a nervous system. On the whole," concludes Mr. MacLeay, "it appears that animals are to be distinguished by the existence of an absorbent intestinal cavity, and of a nervous system," and that both these marks became indistinct in the *Infusoria* and *Polypes*. It follows, therefore, that these last, which are the most simple of all animals in structure, approach nearest to the vegetable nature." *

(30.) Other writers pretend to establish distinctions from various sources; as, 1. Digestion. This they assert is the first process which distinguishes the animal from the vegetable, and that it is observable even in the lowest degrees of animal life; 2. The power which an animal possesses of changing the whole of its parts; 3. In nutrition; the animal being stated to derive positive nourishment only from organised matter, or rather from that which has been previously alive; while the vegetable draws the supply from earth, and other un-

* Hor. Ent., 191—193.

organised substances. Of these, and other speculative theories, it has justly been said, "that they have been advanced with a degree of confidence in their accuracy that argues any thing but acquaintance with this obscure subject."

(31.) On impartially reviewing these conflicting opinions, it appears to us that they embrace two very distinct questions; which, from not having been clearly separated, have caused some confusion in the argument. These are, — 1. Whether the animal kingdom is, or is not, distinctly separated from the vegetable by known qualities in their least organised forms; and, 2. What are the most important distinctions between an animal and a vegetable.

(32.) In regard to the definite separation of the two kingdoms, it will be observed that M. Cuvier, in stating what he considers to be the primary distinctions between an animal and a vegetable, nowhere commits himself by expressing his belief that those or any other distinctions are absolute; which, had he entertained a belief in the clear separation of these two kingdoms, they unquestionably would be. His brother professor, M. Lamarck, distinctly says, that hitherto it has been found impossible to define their limits, without interfering with truths already established; and without contesting principles which are universally considered as axioms. This, in fact, is a full confirmation of an opinion which was long ago entertained by a countryman of our own, — Mr. Tupper, who, in a short but highly philosophic "Essay on the Probability of Sensation in Vegetables †," thus expresses himself: — "From man down to the most humble plant the distance is immense: but yet the whole of it is occupied by an innumerable diversity of beings, every species of which progressively descends below another, in regard to the excellence of its attributes, and the extent of its powers. And so gradual is this descent, throughout the whole system of living beings, that the most inferior of a

* Hor. Ent., p. 482.

London. 8vo. 1811.

species resembles, in many respects, the most perfect of that which is next below it. Hence the transition from the animal to the plant is effected by shades so imperceptible, that it is difficult, and perhaps impossible, to determine what are those beings which actually form the last link in the scale of animal existence, and the first in that of vegetables." * Mr. Kirby expresses a similar opinion. "The animal and the vegetable kingdoms," observes this celebrated entomologist, "like England and Scotland of old, have their '*Land Debatable*;' occupied by those *productions moyennes* (to use a term of Bonnets) which are, as it were, partly animal and partly vegetable. From this territory, common to both, the two kingdoms are extended in a nearly parallel direction, till they reach their extreme limits, without any incursion from either side upon their mutual boundaries." † Lastly, let us hear Mr. MacLeay's sentiments upon this union. "It is worthy of attention, that those vegetables, which are generally supposed to make the nearest approach to the other kingdom, possess a degree of irritability, the cause of which has long excited the curiosity of philosophers, but as constantly baffled their efforts to detect it. The chemical analysis, also, of the lower tribes of plants indicates the presence of azote; and though it has been asserted that the irritability of the genus *Linckia* or *Nostrachus*, is entirely owing to the elasticity of the plant, and by no means to any nervous action; yet, allowing this to be the case, we can only admire the beautiful regularity of nature, which, in order to mark the affinity between the lower tribes of plants and animals, has thus impressed a gelatinous vegetable with a degree of elasticity which is so similar to the nervous system among the lowest animals. Nay, many of the *Conserveæ* have the same sort of generation with the *Polypes*;* for, independently of the herbaceous and seminiferous matter contained in the interior of the articulations, as observed by Vaucher, there are also gelatinous tubercles, which give rise to

* P. 45.

† Kirby and Spence, *Int. to Ent.*, iv. 361.

XIII. V. 8.

THE
CABINET CYCLOPÆDIA.

CONDUCTED BY THE
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EMINENT LITERARY AND SCIENTIFIC MEN.

Natural History.

ON
THE NATURAL HISTORY AND CLASSIFICATION
OF
QUADRUPEDS.

BY
WILLIAM SWAINSON, ESQ.
HONORARY MEMBER OF THE CAMBRIDGE PHILOSOPHICAL SOCIETY,
FELLOW OF THE ROYAL AND LINNEAN SOCIETIES, ETC.

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AND GOD CREATED MAN IN HIS OWN IMAGE, IN THE IMAGE
OF GOD CREATED HE HIM.

GENESIS, I. 27.

— WE MEN, WHICH ARE MADE AFTER THE SIMILITUDE OF GOD.
JAMES, III. 9.

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SWA

animals

new plants. We need not therefore be surprised, that several of the Linnæan *Algae* should be still hovering in a state of uncertainty between the two kingdoms; but on the contrary be prepared to expect additional proofs of the analogy (affinity?) which the two great divisions of organised matter bear to each other.*

(33.) To contend, therefore, that a line of demarcation can be drawn with such clearness and precision between the animal and the vegetable kingdom, as that all doubt and obscurity on the subject will be dispelled, is to assert that as true, which is denied by absolute facts, known to all those who have investigated the subject, and upon which the most celebrated naturalists of the age have formed but one opinion. Such a theory would, in fact, go to prove the existence of abrupt divisions in the great groups of nature, — a speculative dogma which, as being totally inconsistent with known facts, has long been exploded. To enter further into this inquiry is therefore unnecessary, the authorities we have quoted having long since set the scientific world at rest on this matter. If any further evidence were wanting, it would be the opinion of some distinguished naturalist, whose studies had been more immediately directed to those beings, the minuteness and simplicity of whose structure would place them at the confines of the two kingdoms; and such testimony is not wanting. Professor Agardh concludes his highly interesting observations on the red snow with the following remarkable passage: — “Hence it follows, that this substance must be either an *Alga* or an *Animalcula*, between which I know of no limits. There are forms among them which may, with equal propriety, be ranked with either or both. There are *Algae* which become *Animalculæ*, and *vice versâ*. Lastly, there are *Infusoria*, which at one period of their existence are endowed with the power of movement; while, at another, they exist only in the character of a vegetable.”†

* Hor. Ent. p. 210.

† Dr. Hooker, in Brewst. Journ., No. 7.

(34.) The union of the animal and vegetable worlds having been thus proved, it follows, that all attempt rigorously to define either, becomes not only futile, but absolutely impossible. The solution of this inquiry becomes, in fact, an answer to the next, viz. What are the *typical* differences between an animal and a vegetable? On this head we can add nothing to the definitions given by Linnæus, Cuvier, &c., or to the acute reasonings of Mr. MacLeay; premising only, that the value of every character that can possibly be devised, will progressively be deteriorated, and finally lost, as we recede from the circle of vertebrated animals, and approach the confines of the vegetable kingdom.

(35.) Having now terminated the investigation of this abstruse yet necessary inquiry, we enter at once upon the animal kingdom, — that countless multitude of animated beings which live and move upon the face of the globe. Of these, myriads swarm upon the land; others, still more incalculable, give animation to vast oceans, while unnumbered hosts “take their pastime” in the ambient air. We limit our attention to these creatures, but, in truth, what limits can be assigned to them, save that they inhabit the same globe as ourselves? We can form an abstract idea of an animal, as different from man, but the imagination is soon bewildered in the effort to form adequate conceptions of their numbers. To say that they are as numerous as the grains of sand upon the sea-shore, is no hyperbole, when the inconceivable fact stands before us, that of those minute atomic beings, made known by the microscope, 500,000,000 may be contained in a drop of water.* The modern discoveries in astronomy, on the other hand, place the assertion almost beyond doubt, that those worlds and systems of worlds which are visible, even with the aid of the telescope, are vastly inferior to those which are beyond the reach of that in-

* According to the recent observations of professor Ehrenberg, quoted by Dr. Roget, each of these *monads* is not more than the 24,000th part of an inch.

strument; so that the mind equally falters in the attempt to imagine the numerical amount of living beings upon this earth, or of the planets rolling around it: to us, indeed, both are as if they were infinite.*

(36.) When, however, we descend to those differences of form which constitute *species*, and include only such beings as are visible to the naked eye, we limit our mental vision to objects which come within its legitimate range. The love of science, and the more noble desire of making known the "wisdom of God in the creation," have prompted man, in these latter ages, to collect and register the diversified beings of the animal world. We shall now employ the extensive knowledge thus accumulated of existing animals, to the construction of a general survey of the numerical amount of species, which, either from actual discovery, or well grounded conjecture, we may suppose to exist in the world.

(37.) Commencing with quadrupeds, we find that the various descriptive catalogues given in modern works contain nearly 900 species. To these we may add about 100 others, made known by Major Hamilton Smith, M. Ruppel, and other naturalists. Considering the small proportion which these more bulky creatures in every region bear to the other animals with which they are associated, we cannot expect that any very considerable number remain undiscovered; and these, in all probability, will chiefly belong to the *Vespertilionidæ* or bats, the *Glires*, or mouse tribe, and others of a small size. We cannot therefore estimate the total number of probably existing species beyond 1200. The feathered creation, being smaller in size, is more numerous. It has been announced that the Royal Museum of Berlin, the most extensive probably in Europe, con-

* "The invisible material creation, therefore, it is probable vastly outnumbered the visible; and it may justly be thought that the worlds made known to us by their inherent splendour, are to the unseen only in the proportion of the chiefs of an army to the thousands that fill rank and file: it is as if from the summit of a tower we were looking by night upon a boundless plain filled with the array of war, and could discern nothing but the gemmed crests of the captains, gleaming amid the countless multitudes they are leading on." — *Saturday Evening*, p. 195.

tains no less than 6000 species of birds. When, therefore, we add to this number another 800, to comprise those few that are exclusively to be seen in other collections, and those unknown species which may exist in Borneo, New Guinea, the interior of Asia and of Australia, and a few other unexplored regions, the total number, at the lowest, may be taken at 6800. There is much more difficulty in forming a just conception in regard to the reptiles and the frogs, for their distribution is more concentrated within the tropics, and they are most numerous in those regions which have been least explored: the number of their species, however, may be fairly estimated at 1500. It is almost equally difficult to fix upon a definite number for estimating the species of fish. We know, however, that those found upon the coasts of Europe do not greatly exceed those of the birds, although there are doubtless many species which live only in the deep recesses of the ocean. Fish, however, are abundant in all latitudes, whether arctic or tropical; and although a greater variety of species are found in the latter, it may fairly be supposed that they preserve the same proportion, in those regions, with the tropical birds, as these two classes are found to do in temperate climates. M. Cuvier was understood to have collected, previously to his death, materials for the description of 6000 species. But, when we consider the difficulty of preserving these perishable creatures, and the little attention that has been bestowed upon them by travellers, or even, until lately, by professed naturalists, we may safely double this number, and still be far short of what analogy would lead us to conclude. We therefore calculate that there may be about 8000 species in existence, not more than two thirds of which are as yet known to science.

(38.) Passing from the vertebrated to the annulose or insect class, we shall find an amazing augmentation to the forms of animal life. Of insects, properly so called (*Aptera* L. et *Ptilota* Artist.), Mr. Mac Leay calculated that, in 1821, more than 100,000 species

actually existed in collections. I am disposed, however, to think that at present we may add 20,000 more, and still fall short of the actual number. Mr. Kirby forms his estimate on the proportion which our native insects bear to the indigenous flowering plants: he states the latter at 1500, and the former at 10,000, which gives more than *six* insects to *one* plant. The basis of this estimate, however, is not quite correct, as it seems to have been forgotten that, in temperate countries at least, there are thousands of purely carnivorous species (as the *Cicindelidæ*, *Carabidæ*, *Sphingidæ*), which never touch vegetable food, and thousands also that live only upon vegetable matter in a decayed state, and both these tribes would appear to be excluded. On an attentive consideration of these and other circumstances, I am disposed to estimate the gross number of apterous and winged insects in round numbers at 550,000 species, of which probably not more than 120,000 exist in all the collections of Europe. The remaining classes of the annulose circle, including part of the *Vermes* of Linnæus and the *Annelides* or red-blooded worms, are far less numerous, and probably do not exceed 2500.

(39.) In the different classes of the molluscous animals, an equal disparity prevails. The *Testacea*, or shellfish, may be calculated at 4500*, while those without shells, including the cuttle-fish, cannot be put down at more than 600, although it must be confessed that we know very little of these last animals. The radiated class, which includes the *Echini* or sea-eggs, the Star fish, *Medusæ*, &c. may be estimated at 1000; while the visible *Polypes*, including the corals and corallines, may possibly amount to 1500 species. Here, however, commences an unseen world of living wonders, the extent of which, even in regard to the species contained in these countless myriads, baffles human calculation. Collecting these several estimates into

* The collection formed by the author, and now in possession of the Manchester Natural History Society, contained 2480 species, nearly all of which were exotic.

a tabular form, we may gain some idea of the amazing variety of visible species living upon our globe.

I. Vertebrated animals.	{	Quadrupeds	-	-	1,200
		Birds	-	-	6,800
		Reptiles and Amphibia	-	-	1,500
		Fishes	-	-	8,000
II. Annulose animals.	{	Insects, apterous and			550,000
		winged	-	-	
		Worms, and other classes	-	-	2,500
III. Molluscous, or soft animals.	{	<i>Radiata</i> , Starfish, &c.	-	-	1,000
		Polypes, Corals, &c.	-	-	1,500
		Naked Testacea	-	-	600
		<i>Testacea</i> , or shell fish	-	-	4,500
					577,600

This estimate, which has certainly been framed with a view rather to *keep below*, than to pass beyond, the probable limits of truth, leads us to conclude that considerably more than half a million of different races of animals, each distinct in themselves, and marked by some peculiarity, are existing in the world; while this number, great as it is, must be multiplied by thousands — who can say how often? — to convey any idea, were that possible, of the enormous amount of the individuals therein comprised.

(40.) It is, then, with such vast hosts of diversified beings that the naturalist has to treat. These are his materials of study and contemplation, and these he is to examine, and, in some measure, to understand, before he can obtain a glimpse of the plan upon which they have been created. But, however overwhelming to the mind this number, viewed abstractedly, may appear, it loses much of its formidable character, when we perceive that nature herself has divided and subdivided it into larger and smaller assemblages; and that through all, and between all, there is a degree of order and of harmony which enables the mind to contemplate and investigate one portion, without the absolute necessity of grasping at the universal knowledge of all. This order and consistency in the creation is productive of another advan-

tage: it not only enables us to form correct notions on the leading peculiarities of large groups, without venturing upon the Herculean, or rather endless, task of analysing the properties of every species, but it likewise gives us the power of forming just comparisons, by contrasting any one of these groups with others. Had the order of nature been so irregular, that we had found she created some birds with four feet, others with two, and some with none; or that, like the fabulous griffin, there were creatures half quadruped, half bird; or, if insects had been found with the feet of quadrupeds, and the toes of birds; in short, had such compounds in the animal world existed, the foundations of natural history, as a science, could never have been laid, until all known animals had been brought to light, and all the anomalies of nature understood. Such heterogeneous combinations, however, have no existence; and our experience of the regularity of her operations justly entitles us to term such suppositions, to be found only in the fables of antiquity, monstrous and unnatural. The truth seems to be, that the primary types of nature are very few, but that the variation of these types sometimes appears to be all but infinite. Thus, no one can mistake a bird for a quadruped, or this again for a fish: one individual from each of these classes is quite sufficient to give us a correct and definite idea of the rest; and yet we have reason to believe that the form of a bird can be varied, without the least essential departure from its characteristic structure, in more than six thousand different ways! The typical form of a fish admits probably of eight thousand variations. But these are nothing when we come to annulose animals. The most ordinary observer, if he sees a "creeping thing," walking upon legs, pronounces it, and justly, to be an insect; and yet, such is the wonderful and almost inconceivable variety that nature has lavished upon this class, that it is highly probable the aspect of an insect admits of half a million of variations, without such a departure from the great outlines of the original type, as would prevent any one

variation from being confounded with a bird, a fish, or a quadruped.

(41.) Such are the reflections which arise when the mind first receives an adequate conception of the inexhaustible variety of existing beings. But when, upon farther inquiry, we can trace the most exquisite *design*, not merely in their individual structure, but in their various internal and external relations to the other parts of the creation, — when we find that these inconceivable diversities of forms are all varied, not merely for the simple object of creating variety, but that each being may perform separate and peculiar functions, necessary to uphold the material universe, — and lastly, when we discover evident indications of a definite plan, upon which all these modifications have been regulated by a few simple and universal laws, our wonder is as much excited at the inconceivable wisdom and goodness of that SUPREME by whom these myriads of beings have been created and are now preserved, as at the mental blindness and perverted understanding of those philosophers, falsely so called, who would persuade us, that even MAN, the last and best of created things, is too insignificant for the special care of OMNIPOTENCE.

(42.) We have said that nature herself has arranged her innumerable productions into large groups, the leading peculiarities of which, for the most part, are at once recognised by ordinary observers. No one, for instance, would mistake a bird for a quadruped, or a beetle for a fish; and the understanding, at once informed by the eye, needs not the technical language of science to establish distinctions which are perceived at a glance: but it is obvious that if all fish, for instance, possessed the same essential set of characters, and all quadrupeds had four legs and lived upon dry land, there would be no gradation of structure: each of these two classes would be isolated; and although each in itself might possess harmonious relations, one of the most obvious facts in nature, that is, her order of progression, would be violated; and that variety, which is obviously

one of the most remarkable peculiarities of the visible creation, would be inconceivably lessened. Now, that this law of gradation in structure, this harmonious blending of two structures so completely different as that of a quadruped and a fish, should not be violated, nature has created the whales, as the actual passage from one to the other; they are beings whose structure and habits partake of both, and which have accordingly been alternately arranged under one class or the other. It is, then, in such instances as this, that a true knowledge of nature depends upon more observation than that which is afforded by the eye; and scientific investigation must be called in to assist our decisions. Hence the origin of systems, in which the greatest excellence consists in making them accord, as much as possible, not only with the facts of nature, but with those impressions which an unscientific but reflecting observer would receive on affinities and differences.

(43.) We have, upon another occasion, briefly notice some of the most popular systems of the animal kingdom.* Previous, however, to laying before the reader the arrangement which will be pursued in this work, it will be necessary to give a more detailed explanation of the primary divisions respectively proposed by MM. Cuvier, Lamarck, and Virey.

(44.) "If," argues M. Cuvier, "we divest ourselves of preconceived opinions, we shall find that there are four principal forms, after which all living beings appear to have been modelled. The basis of these distinctions is laid on the nature and organisation of the several creatures themselves. The ulterior divisions of them, by whatever names they have been called, are but slight modifications of the primary. 1. *Vertebrated Animals* present the first of these general forms. In these the brain and the chief trunk of the nervous system are inclosed in bony coverings: the former called the cranium, and the latter the vertebræ. To the sides of the vertebræ, as to a central column, are attached the ribs, and also the bones of those limbs which form, as

* Classification of Animals, p. 170

it were, the framework of the body. These animals have all red blood, a muscular heart, and a mouth with two horizontal jaws, with distinct organs of vision, smell, hearing, and taste. The limbs are never more than four; sexes are invariably separated, and a similar distribution prevails among them of the medullary masses, and the principal branches of the nervous system. 2. The *Mollusca* form the second grand division, distinguished at once by having no skeleton. The muscles are simply attached to the skin, which forms a soft and contractile covering, from which proceeds, in some instances, a substance called shell, the position and production of which are analogous to those of the mucous body. Within this general envelope are the viscera and nervous system, which last is composed of many scattered masses, attached together by nervous threads. Of the senses, the organs of taste and vision are alone perceptible; and even these are sometimes wanting. In other respects, this division is characterised by a complete circulating system, and peculiar organs of respiration, digestion, and secretion, the two latter being very complicated. 3. *Articulated Animals* (*Annulosa* Auct.) constitute the third division. Their nervous system consists of two cords extending along the belly, and swelled out at regular intervals into knots or ganglia; the first of these, placed on the œsophagus, though called the brain, is not much larger than the rest. The covering of their body is divided by transverse folds into rings, to the interior surface of which the muscles invariably adhere. Articulated limbs are often, but not invariably, attached to the body or trunk. It is among these animals that we can observe the transition from the circulating system in closed vessels, to a nutritive process performed by simple imbibition; as also a transition from the pulmonary to the tracheal system of respiration. The organs of taste and sight in these animals are much developed; and the jaws, when they exist, are invariably lateral. 4. The fourth division contains the *Radiated Animals* (*Radiata* Auct.).

In the former groups, the organs of motion and sensation are systematically disposed, as it were, on the two respective sides of an axis: but in this they have a circular arrangement round a common centre. The *Zoophytes*, in truth, approach nearly to the homogeneous character of plants. They possess neither a distinct nervous system, nor particular organs of sensation. In some few may be discovered, but with difficulty, some vestiges of circulation. Their respiratory organs are generally upon the surface of the body. The intestines of the great majority consist of a sort of bag, through which there is no passage; and those which are lowest in the animated series exhibit nothing but a kind of homogeneous pulp, possessed of motion and sensibility. As we shall shortly have to advert to this arrangement, we may here pass on at once to another, proposed by a naturalist no less learned, although far less popular.

(45.) M. Lamarck divides the animal Kingdom into two great groups, or sub-kingdoms: 1. The vertebrated, having their skeleton internal, as already described; and, 2. The invertebrated, wherein the skeleton is external. This method has gained much popularity, both in this country and on the Continent, from its apparent simplicity. It has even been asserted, "that any other basis of division hitherto employed is faulty, in not including a number of common properties, in affecting unnatural separation among kindred tribes, or in being founded on characters which are merely modifications of some positive quality." A little more attention, however, to the application of this system, will lead to a very opposite conclusion. It has been well observed, that by these rules the tortoises, having their skeleton external, are no longer to be classed as vertebrated animals; while the cuttle-fish (*Cephalopoda*), showing the rudiments of an internal vertebra, will find a place among quadrupeds. It has been forcibly and justly objected to this system, not that it is contrary to truth, but that it does not state enough; and that it leads to the erroneous

belief that animals, like organised matter, have been formed on only two different plans. Had the animal kingdom been divided into radiated and not radiated, or into annulose and not annulose, both these methods would have been equally good, and equally consistent with what is seen in nature. But, whatever opinions may be entertained on this point, the system itself must possess something radically wrong, when we find the author himself, in some measure, to have subsequently abandoned it. M. Lamarck, in fact, soon after proposed another method, founded on degrees of intelligence. In this, vertebrated animals are termed *Intelligens*; insects and *Mollusca* are called *Animaux sensibles*; and the *Radiata* and *Polypes*, *Animaux apathiques*. It will be sufficient to call the reader's attention to the arbitrary, if not fanciful, nature of this second theory, to show its great inferiority even to the first. "Animals may, no doubt, be classed according to the degree of intelligence which each may display; but it is absurd to imagine that intelligence is divisible into three sorts, more than into any other number. This hypothesis seems perfectly arbitrary, since every person, whether naturalist or not, knows that the intelligence of man is one degree, and that of a horse another degree: in short, that we can judge of intelligence only by its effects; and these effects differ not only with the species, but also with the individual. It may be said of the *Vertebrata*, at least, that there are as many sorts of intelligence displayed as there are individual beings; while of insects there are probably as many degrees of instinct as there are species. It is also obvious that we cannot, without confusion, compare with each other in degree the different sorts of intelligence displayed by animals whose general structure is not only different, but also their nervous system, on the disposition of which their intelligence in so great a measure depends. Where, indeed, the intelligence is of the same sort, we may estimate its degree: but this can only be where all the beings under consideration are referable to the

same type of form ; and, above all, where their nervous matter has been dispersed on the same general plan."*

*(46.) In estimating the value of the systems proposed by MM. Cuvier and Lamarck, we must be entirely guided by two considerations : first, their conformity to the leading facts of nature ; and, secondly, with higher and ulterior truths. Now, in regard to the former, it is well known that facts may be differently arranged, — a greater degree of importance being attached to one than to another, — yet without at all diminishing their inherent veracity. If, then, two different systems, built upon the same facts, are proposed to us, we can only decide upon that which is the most natural, by ascertaining which is in most harmony with others of a more general and comprehensive nature. By the theory of M. Cuvier, the animal kingdom is made into four primary groups ; whereas of ponderable bodies we know only of three, — animals, vegetables, and minerals. Then, again, are the affinities of these four divisions circular ? Not the least intimation is given of their possessing this property. Do they harmonise with any ulterior or higher laws ? Certainly not ; for they lead to nothing but smaller arrangements of animal groups. When, therefore, a theory in one branch of science is so far isolated that it bears no relation or reference to other branches, closely and vitally connected with it, there must, in the nature of things, be some great defect in its construction. When, however, as in the primary divisions of M. Virey, we see the animal world according at once with one of the most obvious facts in nature, — the threefold nature of ponderable bodies, — and yet founded upon anatomical characters which are likewise employed to construct the other, the presumption is that the one is a natural — and therefore correct — division of its leading groups, and that the other is artificial.

(47.) Influenced by these arguments, we may at once decide with M. Virey, that the whole of the

* *Horn Ent.*, p. 209.

animal kingdom belongs to one or other of three primary types: namely — 1. VERTEBRATA, or vertebrated animals; 2. ANNULOSA, or annulose animals; and, 3. MOLLUSCA, or soft animals. The distinguishing characters of each of these will now be stated.

(48.) 1. The VERTEBRATA, or vertebrated animals, as their name implies, are chiefly distinguished by possessing an internal bony column or support, composed of jointed vertebræ, to which, in various ways, all the other internal bones and muscles of the body and limbs are attached; all of which are covered by soft flesh. The more perfect examples of this type of structure undergo no metamorphosis, but assume with respiration the form in which they are always to remain. Of all animals, their structure is the most complicated; and they accordingly feel, with great acuteness, all external injuries. They all possess the power of locomotion, and enjoy the senses of taste, smell, sight, and hearing. In some the blood is warm, in others cold, but in all it is of a red colour. As this type blends into the *Mollusca*, the vertebrated column becomes external, as in the tortoises; and as it approaches the *Annulosa*, the body becomes somewhat worm-shaped, the eyes disappear, and the vertebræ become soft: their anatomical characters, less readily understood than those here selected, have already been mentioned.

(49.) 2. The ANNULOSA are ringed or annulose animals, called by M. Cuvier *Animalia articulata*; both names being expressive of their jointed or articulated structure, the body and limbs being divided into ring-like joints. In their complexity of structure, this division of animals is only inferior to the last. The hardest parts of their body form the external surface, so that it may be truly said that their skeleton is external, while that of the vertebrated type is internal. We have already seen that annulose animals are immensely more numerous than all others put together; and accordingly, we find their structure so amazingly varied, that it seems almost impossible to define them, from their

external characters at least, more comprehensively than by their jointed body and limbs. The more perfectly organised, or the typical *Annulosa*, are called insects, and undergo a metamorphosis. They are provided with *antennæ*, or other organs performing the same functions, and with six or more legs, capable of locomotion. The blood is white, and circulates; and the nervous system, as already intimated, consists of two distinct filaments of medullary matter, extending in a parallel direction through the whole length of the body, and united to each other at short distances, somewhat in the manner of the steps of a ladder, by smaller threads which form knots, or *ganglions*. The muscles, however, are not attached to these, but to the inner surface of the hard rings or joints which envelope the body. In such annulose groups as approach the *Vertebrata*, the blood is red, and no metamorphosis has been discovered; while in those which pass into the *Mollusca*, all locomotion is denied, and the limbs perform the office of feelers or hands. The mouth and eyes, however, are generally discernible.

(50.) 3. The *MOLLUSCA*, or soft animals, are at once distinguished from the two former by having neither an outward nor an inward skeleton. Their bodies, in fact, are almost always soft, having rarely any internal support; and they are altogether destitute of perceptible joints, or distinctly formed limbs. Their nervous system, as before intimated, is disseminated in scattered ganglions united by nervous threads. But as it is among these animals that Nature opens a passage to the vegetable kingdom, so do we find indications of a nervous system gradually becoming less: the more regular ganglions are dispersed, and assume the form of minute granules; the animals themselves put on the appearance of plants, and, like them, can be propagated — as in the *Polypes* — by cuttings. With very few exceptions, the whole of these animals are aquatic.

(51.) It is easy to trace, in these primary circles of the animal kingdom, the three ranks of natural groups, explained in a former volume as the Typical, the Sub-

typical, and the Aberrant; the first being represented by the *Vertebrata*, the second by the *Annulosa*, and the third by the *Mollusca*. Now, as this latter is the aberrant type, its contents are more diversified than any other, and we consequently find that it is composed of three lesser circles, to which we retain the names long ago proposed: 1. The Testaceous *Mollusca*, which lead to the *Vertebrata*; 2. The *Acrita*, or *Polypes*, which approach the nearest to plants; and, 3. The *Radiata*, or Radiated *Mollusca*, which unite to the *Annulosa* by means of the *Cirripecta*, or barnacles. The characters of these subordinate subdivisions of the great circle of *Mollusca* will now be briefly stated, as they have been considered by Mr. MacLeay as of equal rank with the *Vertebrata* and *Annulosa*.

(52.) 1. The testaceous *Mollusca*, as coming nearest to the highly organised vertebrated animals, are much more complicated in their structure than either of the two others. Their chief distinction lies in the body being protected by a calcareous shell, in which they live as in a covered house, and which they can increase according to the growth of their own bodies. They have no real feet, provided with joints; but some, in place of those organs, are provided either with short fleshy tubercles, or long armlike processes, with which, as in the cuttle-fish, they seize their prey, or use both in the manner of fins and of feet. Hence they differ from annulose animals in having no ringed or annular joints. The great majority, moreover, crawl, like the serpents, upon their bellies. These, with their nervous system, already adverted to, are the leading distinctions of these animals; for in almost every other respect they vary in a most surprising manner. Some have a distinct head, mouth, and eyes, while others have none; and there are several families which are affixed, during life, to other substances.

(53.) 2. The *RADIATA*, or radiated *Mollusca*, are easily recognised by having their mouth in the centre, as it were, of the body; around which are arranged, as in a

circle, all those members, either of locomotion or sense, with which the animal is endowed : it thus assumes a radiated, or star-like appearance. There is not the least vestige of head, eyes, feet, or fins, properly so called ; but they are often supplied, like the naked *Tes-
tacea*, with fleshy processes, or tubercles, which perform the office either of feet or fins, or both. The *Radiata* are well exemplified both by the star-fish, the sea-urchins (*Echinus*), and the pulpy medusas, so frequent upon our own coasts.

(54.) 3. The *ACRITA*, or the third division of the *Mollusca*, were first named and characterised by Mr. MacLeay, who considers the group of equal rank in the scale of beings with the two preceding, and with the *Vertebrata* and the *Annulosa*. It consequently forms his fifth primary type of the animal kingdom. But on this occasion it will be preferable to use the precise words of this eminent naturalist. — “ There still remains,” he observes, “ a fifth form of animals to be considered ; beings which cannot, in the present state of knowledge, be better described than as masses of a transparent, homogeneous, mobile, and sensible pulp. There are, however, to be observed in this transparent pulp, innumerable minute granulations, which may be considered as the nervous molecules dispersed over, or, as it were, confounded with, the substance of these animals, so as to impregnate the whole with sensibility.”

(55.) On comparing the primary divisions here advocated, with those of M. Cuvier, it will at once be perceived that the only material difference between them rests in the separation of the *Acrita* (MacL.) from the *Radiata* of M. Cuvier ; beings, in fact, so low in the scale of creation, that they comprise — if we may believe Professor Agardh — forms which in one stage of their existence are plants, and in another animals. Their nervous system — if such it may be called — and their general construction, is very different from the radiated structure, and has aptly been termed granular

Separate these from M. Cuvier's *Radiata*, and we have the quinary division of Mr. MacLeay.

(56.) The discovery of those affinities by which these leading groups of the animal kingdom are connected into a circle, was first announced in the following words:—"On considering the gelatinous composition of the *Acrita*, the dispersion of the nervous molecules through their substance, and the absolute certainty that they are destitute of every sense, except, perhaps, those of taste and touch, we are led to connect them with the *Mollusca*, whose substance is always mucous, and often even gelatinous; whose nervous system, though collected into several ganglions, or centres of sensibility, has nevertheless these ganglions dispersed with little if any arrangement throughout the whole mass of their body; and whose senses—so far, at least, as we are certain of their existence—seem to be confined to those of taste and touch, with the exception of a few animals of the division which possess the organs of sight, and still fewer which possess those of hearing. Nevertheless, on comparing the *Acrita* with the *Mollusca*, we find that the organisation of these last has become much more complicated, and that a distinct system of circulation, and peculiar organs for respiration, digestion, and secretion, are even visible in these animals, which connect them in a remarkable manner with a still more perfectly organised family—the *Vertebrata*. The vertebrated animals are nevertheless sufficiently insulated from the *Mollusca*, as well as from all other material beings, by their red blood, their muscular heart, their jaws acting vertically; their distinct organs of sight, hearing, smell, and taste; their sexes, constantly distinct; their vertebral column, and the extreme concentration of their nervous system. The group is, therefore, perfectly distinct and natural; yet, if we attempt to define it by any one of the above properties, little examination is requisite to convince us that the characteristic thus chosen will disappear in the least perfect of the *Vertebrata*, or pass imperceptibly into the

neighbouring groups. Thus the bony skeleton becomes soft and membranaceous in several fish, whose organs of ærespiration and of manducation, want of sight, and general habits and form, all prove to us that they are connected with the *Annelides*, and that by them nature passes to the structure of the *Annulosa*. On the other hand, on examining some of the *Echinoderma* of Cuvier, we may trace the articulated texture of the *Annulosa* into the division of *Radiata*, many of whose external forms are also exactly imitated by the sessile *Cirrhipedes*. Of the *Radiata* again, the stellate form and gelatinous semitransparent substance are observable among the *Acrita*. So that the chain whose links we have endeavoured to unfold, returns into itself; and we find that all animals form a circle composed of the following great divisions:—*Acrita*, *Mollusca*, *Vertebrata*, *Annulosa*, and *Radiata*.*

(57.) The analogical relations which subsist between the great divisions of the animal kingdom, and those of the vegetable, have been slightly intimated by Mr. MacLeay, from the observations of the continental botanists: we shall only briefly notice them in this place, because the subject has not yet received that attention it deserves; and also because some difference of opinion exists as to the true course of the affinities of the vegetable circle. M. Desfontaines, indeed, many years ago, pointed out the analogy which the Dicotyledon plants have with vertebrated animals; the hard parts in the structure of both being internal, while those of the *Annulosa* and the Monocotyledon vegetables are external. According to M. Fries, the *Protophyta* and the *Fungi* form two primary groups in the vegetable kingdom: in the first of these, fructification is secondary, and the *thallus* essential; whereas in *Fungi* it is quite the reverse. "According to our author, the first-born of Flora may all be accounted as essentially roots, and represent the mode of nutrition; while every fungus is as truly and representatively connected with

* Hof. Ent., p. 202, 203.

fructification and reproduction. Throwing aside other considerations, we may perceive the analogous groups of the animal kingdom to be likewise constructed on a similar plan. Each of the *Acrita*, for example, imbibing nourishment at every pore of their surface, internal or external, is essentially a stomach, while the situation of the singular ovaries of the *Radiata* cannot fail to remind us of the importance of the position of the *sporidia* in *Fungi*. The umbellate *Medusa*, the *Echinus*, the *Asterias*, and the *Priapulus* have all their representatives in mycology, of which the genera *Lycoperdon* and *Phallus* are noted instances: so that the analogy of the radiated animals to *Fungi* is complete; and we thus have in organised matter the following two series of groups, connected by affinity, and analogous to their corresponding points:—

Animals.	Vegetables.
<i>Acrita</i> .	Protophyta.
<i>Radiata</i> .	Hysterophyta.
<i>Annulosa</i> .	Monocotyledonea.
<i>Vertebrata</i> .	Dicotyledonea.
<i>Mollusca</i> .	Pseudo-cotyledonea <i>Agardh</i> .*

Consequently some general idea of the primary distribution of all organised beings may be obtained from the following figure." †



(58.) It must here be observed, that the three

* This division has been named and defined by M. Agardh, in the sixth part of his *Aphorismi Botanici*, which is dated December, 1821. It embraces the *Musci*, *Hepaticæ*, and *Filices* of Linnæus.—*Linn. Trans.*

† *Linn. Trans.* xiv. 64.

aberrant divisions of the vegetable kingdom, viz. *Protophyta*, *Hysterophyta*, and *Pseudo-cotyledonea*, constitute the *ACOTYLEDONES* of the generality of botanists, and form the aberrant group: so that, in fact, the primary divisions of all vegetables, like those of animals, appear to be *three*. We hope that one of the most eminent and philosophic botanists of this country will follow up his investigations on this interesting subject, and that ere long he will favour us with a complete exposition of those analogies between the two kingdoms; which will be the best test of the accuracy of the views he has already published.*

CHAP. III.

ON THE SITUATION OF QUADRUPEDS AMONG VERTEBRATED ANIMALS. — THEIR ESSENTIAL DISTINCTIONS, THEIR PRIMARY DIVISIONS, AND THEIR ANALOGIES TO THE ORDERS OF BIRDS.

(59.) It is obvious that the *MAMMALIA*, or quadrupeds, stand at the head of the vertebrated animals. They are the most complicated in their organisation, and the most perfect in their senses. Before we proceed, however, to regard them in an exclusive light, it becomes necessary to cast a hasty glance at the other classes of animals with which, notwithstanding great dissimilarity, they are intimately allied. Our object is to exhibit zoology in the light of a connected series of demonstrable inductions, — demonstrable so far as this, that the inferences we shall draw from acknowledged facts will be in unison with that harmony which *must* pervade the plan of creation: nor will these inductions be con-

* *Nixus Plantarum*. Auctore Johanni Lindley, Phil. Doct. Professore Londinense. Lond. 1833.

tradicted by any others, equally comprehensive, that have yet been given to the world: further demonstration than this, the nature of the case will not admit of.

(60.) As the physiological and anatomical peculiarities of quadrupeds will be detailed in a separate treatise, we shall here draw their definition from those characters which are more obvious, and more comprehensible to general readers. In the first place, they are immediately and eminently distinguished by the peculiarity of the female giving suck to her young: they are further known by having the body covered with hair or fur, in possessing four legs, warm blood, and living upon the ground. Not one of these characters, however, is probably absolute; for the armadillos and Indian ant-eaters are covered with scales; the whales have fins instead of feet; and the bats fly, and rest suspended. Taken collectively, however, these marks of distinction are sufficient to discriminate a quadruped from all other animals at present in existence. Their young are produced under the form in which they are destined to remain; and hence quadrupeds, more than all other vertebrated animals, are the furthest removed from that tendency towards undergoing some metamorphosis which we shall observe in other classes.

(61.) The class of birds (*Aves*), from the same causes, follows in rank next to quadrupeds. While the latter are constructed for living habitually upon the earth, these are formed for traversing the air. Their organisation is less complicated, and their intelligence comparatively slight. They have but two legs, corresponding to the hind pair in quadrupeds, while the fore or anterior pair of these latter are represented in this class by wings: the body is covered with feathers, the blood is warm, and the young are produced from eggs, hatched by the parent. It is unnecessary to enumerate other characters, since the foregoing are more exclusive than those assigned to quadrupeds. The ostrich family, and some of the swimming genera, indeed cannot fly; still they have wings, although in a

rudimentary state. The feathers of some, as the penguins, have the appearance of scales; and of others, hair; yet they are essentially feathers: while the ornithorhynchus, connecting this class with quadrupeds, produces its young from eggs.

(62.) The third great division of the vertebrated circle contains animals greatly inferior in organisation and intelligence to the two former; from which they are strikingly distinguished by having cold blood; while their body is either entirely naked, or covered with compact scales. Their remaining characters are rather negative than affirmative: they neither suckle their young like quadrupeds, nor fly in the air like birds. Their diversity of structure, however, renders it necessary to assign distinct names and characters to their leading divisions, which comprise the reptiles, the *Amphibia*, and the fish.

I. Reptiles, properly so called, are oviparous, mostly terrestrial, and always scaly; their two chief peculiarities, however, are in the double auricle of their heart, and in the young not undergoing any metamorphosis. It is among these animals that we find the vertebrated structure on the decline: the bones are often gristly, or cartilaginous; and, finally, even the vertebrated column becomes so far external as to be united, in the Chelonian reptiles, or tortoises, to the outer covering of the body.

II. The true AMPHIBIA bear a general resemblance to the last; but from which they have long been separated, not only on account of the heart possessing but one auricle, but because the typical examples undergo a regular metamorphosis—being fish in one stage of their existence, and frogs in another. The French anatomists were the first who detached these creatures from the reptiles, properly so called; and M. Cuvier justly observes, that they only are entitled to the name of amphibious animals. This opinion has been completely verified by the anatomical investigations of Configlianchi and Rusconi; the *Proteus*, according to them, being a reptile in respect to its circulation, and a fish in regard to its mode of respiration.

III. From the AMPHIBIA,

thus related, we pass to the third and last division, namely, the fish (PISCES), upon which there is no need to dilate. All the limbs, properly so called, are supplied by fins, adapted for motion in a fluid almost as heavy as the animal itself. The body is protected either by scales, or bony plates. Breathing is performed by internal and radiated gills, and all intelligence apparently ceases.

(63.) Strong and conclusive evidence has long ago been given, to show that the affinities of the vertebrated animals are circular*; and this fact will be sufficiently apparent by merely looking to the following points of connection. — Commencing with the reptiles, we pass from them to birds, by those extraordinary fossil genera, *Ornithocephalus* and *Pterodactylus*, where the head of a lizard appears as if engrafted on the body and legs of a bird. We quit the class of AVES, and enter that of quadrupeds, by a no less interesting animal, — the ornithorhynchus, or duck's-bill, having the aspect of a mole, with the bill and oviparous structure of a bird. The whales lead from quadrupeds to fishes, combining in themselves the leading characters of both. The passage from fish to amphibious animals is no less obvious, whether we look to the frog in its infancy, when it is disguised as a fish, or to the siren, which might be mistaken either for an eel, or a lizard. Thus returning, in her varied route, to the point of structure from whence she commenced, Nature herself describes the mighty circle, and pronounces it complete.

(64.) That the foregoing series of vertebrated animals represents the primary divisions of the animal kingdom, will be sufficiently manifest when we institute a comparison between their respective points. The most perfect in their respective circles are, the *Mammalia* in one, and the *Vertebrata* in the other. The power of flight is one of those which most obviously separates birds from quadrupeds; and this is precisely the case with the *Annulosa*, or insects, in the circle of the animal

* See Classification of Animals, p. 204.

kingdom. So far for the typical groups. Those which are aberrant are still more striking. Fish are the most aquatic of all the *Vertebrata*; and the *Radiata* are the most aquatic of all animals, *not one species* in either group having yet been discovered upon the land: the types of both swim about in the ocean, either by means of real fins, or by those oar-shaped processes, which are possessed by the whole of the *Medusidæ*, and a great part of the star-fish. The *Acrita* and the *Amphibia*, however dissimilar in other respects, are remarkable for changing their shapes more than any other of the aberrant types in either circle. The *Amphibia* are the least organised of the *Vertebrata*, and the *Acrita* are the least organised of living beings. There now remains but one more point; in each circle, to be compared,—the *Testacea* in one, the reptiles in the other. At the head of the first stands the gastropod shellfish, while the true serpents occupy the same station in the circle of the *Reptilia*. Both these groups, however dissimilar, represent each other by possessing *two* characteristics in common; they are destitute of all true feet, or of any processes analogous thereto, and they both crawl upon their bellies. It might be thought, indeed, that the testaceous *Mollusca* were equally aquatic with the *Radiata*, and that they therefore possessed an equal claim to be considered the representatives of the fishes. But those who may be disposed to use this argument, will see its futility when the fact comes before them, that there are hundreds of shellfish which can only live upon dry land, while not one radiated animal has been found out of the sea. Again, if any further proof was necessary to show the analogy of the *Testacea* to the *Reptilia*, it will be furnished by the length of the tail, and by the excessive prolongation of body,—by which it puts on an analogous appearance,—in the latter. The serpents seem to be all tail, while no vertebrated animals have this member more truly developed than the lizards. In like manner the gastropod and acēphalous shellfish are the only animals among the

Acrata, *Radiata*, or *Mollusca*, which, in their typical examples, have an attenuated, or *tail-like* body. The analogy between the *Polypes* and the *Amphibia* is certainly obscure; yet this is generally the case in all groups so situated; and it is quite obvious that, as the other analogies are satisfactory, these groups cannot be misplaced.

(65.) Let us now limit our attention exclusively to the class of MAMMALIA, or quadrupeds, — animals which are no less remarkable for the complexity of their organisation and their great bulk, than for their importance to mankind. Without them, all the laborious occupations of tilling and preparing the earth must have been performed by manual labour, and the lords of creation would have become beasts of burthen, groaning and sinking under weights which could only be removed by multitudes of human beings. The dominion which was given by the Divinity to man, over every “beast of the field,” is in no part of creation rendered more manifest or more unquestionable than in the instinctive subjection of certain quadrupeds to our domestication. All those which derive their sustenance from vegetables, or from the produce of the earth — uniting at the same time great physical strength, superior sagacity, natural gentleness, and social propensities — nearly all these animals are set apart by our beneficent Creator, more especially for our use. He has endowed them with qualities so admirably adapted to our wants, that we may view them as palliatives to that curse provoked by our first parents: “In the sweat of thy face shalt thou eat bread.” Miserable indeed would be the lot of man, had he only to depend upon his own unaided toil in cultivating the earth, cursed as it has been by bringing forth “thorns and thistles.” Nor are these the only benefits we derive from these docile races: they furnish man, in every part of the world, with those coverings necessary to protect him from the vicissitudes of weather, and support his life by furnishing the most nutritious food: nay, some even perform the office of a friend, guard his

person and protect his property. The history of the ox, the horse, the sheep, and the dog, conspire to verify these remarks.

(66.) But to return : the most obvious distinction, as before observed, of this class of animals, is, that the mother suckles her young. Other characters consist in the body being covered with hair, and provided with four feet : their attitude is consequently horizontal, and not, as in birds, obliquely perpendicular. But these latter characters are not without several remarkable exceptions already alluded to. (60.)

(67.) It might be thought that the possession of teeth would be an unerring distinction between quadrupeds and birds ; but here again we find the harmonious progression of nature, since the order *EDENTATA* of M. Cuvier, as its name implies, contains genera almost destitute of teeth. We must therefore, on this, as well as numberless other occasions, warn the student against a belief in those absolute and exclusive characters, which artificial systems inculcate : a dogma, however, which every detail their inventors are obliged to go into, compels them virtually to deny.

(68.) Quadrupeds, observes M. Cuvier, above all other animals, enjoy the most numerous faculties, the most delicate sensations, and the most varied powers of motion ; and a combination of all their properties appear to produce in them the greatest intelligence. Hence they are more fertile in resources, less subjected, perhaps, to the influence of instinct, and altogether more capable of improvement. As the quantity of respiration in these animals is moderate, so, generally speaking, they are formed for walking on the earth, but at the same time with great force and permanence of exertion. To this end, all the articulations of their frame have strictly defined conformations, which determine all their motions with rigorous precision. Some, indeed, as the bats, by having the limbs considerably lengthened and connected by extensible membranes, are able, not only to raise themselves, but even to fly in the air. Others, again, like the seals, have their limbs so short, that

they can only move with facility in the water; while a few, like the whales, are completely aquatic, and have their feet assuming both the shape and the office of fins. Living, for the most part, on the earth's surface, quadrupeds are less exposed to the alternations of heat and cold, and their clothing is proportionate to the average temperature of the climate they inhabit. In those of tropical latitudes, the hair is always thin, although it may be long, as in the monkeys; or almost wanting, as in the elephant and rhinoceros. While, in the northern quadrupeds, such as the bears, foxes, hares, musk oxen and deer, we perceive a warmth of clothing sufficient to repel the rigours of an Arctic winter.

(69.) The characters by which quadrupeds appear to be naturally arranged in their primary groups, are in accordance with those assigned, in a former volume, to the types of the animal world in general; and all these will be found to have immediate reference to the nature of their food, and to their different powers of locomotion; accompanied, of course, by peculiarities of internal, no less than of external organisation. For reasons already explained*, we shall leave the comparative anatomy of these groups, for the most part, to be detailed by the physiologist, to whose province such investigations more properly belong; rather choosing to select such external characters as may be more readily seen, and generally understood.

(70.) The feet, as the organs of motion, and the teeth, as those by which the nature of the food may be determined, naturally claim our first attention. By the first we can trace every degree of locomotion, from the painful and creeping pace of the sloth to the fiery speed of the horse, and even onward to the aerial volutions of the bat. These different structures are again modified by variations in the form of the toes or fingers. It is obvious that an animal which lives by rapine must have extremities very differently constructed from one which

* Preliminary Discourse.

habitually climbs lofty trees; while another, remarkable for speed, would require a foot differently formed from either. The teeth, again, as the organs of mastication, deserve the greatest attention: and they have accordingly been considered of sufficient importance to constitute, almost exclusively, the basis of a system for the arrangement of this class. That they constitute one of the primary characters which enter into the natural arrangement of quadrupeds, cannot for a moment be doubted, even upon theory; but no attempt has hitherto been made to ascertain the mode of their variation. As these instruments will claim particular attention in the following pages, it seems desirable, in this place, to explain the different forms they assume, and the functions they respectively perform.

(71.) The more perfect quadrupeds have three sorts of teeth, termed *incisors*, *canines*, and *molars*. The incisors are placed in front, and are only employed to cut the food in the first instance, before the tongue conveys it, for further preparation, to the grinders: hence they are called, also, cutting teeth. The canines follow the incisors, and occupy an intermediate station between them and the molars: they are only employed in tearing, or in holding: hence they are chiefly confined to quadrupeds which live upon animal matter, and are wanting in the herbivorous ruminants, to whom, in fact, they are unnecessary. The third sort of teeth are the molars, or grinders, which are peculiarly formed for reducing or masticating the food to such a state that it is fit for being swallowed. It would seem, therefore, to follow, that all quadrupeds, whose food is not taken into the stomach in an entire state, must of necessity possess incisors and molars. Nevertheless, when we come to the aquatic quadrupeds, as the dolphins and porpoises, we find the teeth so modified, that they cannot be referred, with any precision, to any one of these determinate forms. Those few animals, also, which swallow their food entire, are unprovided with any organs of mastication. The modifications which the

different sorts of teeth exhibit, both in their relative size, and even in their structure, are very remarkable, and afford certain indications of the description of food upon which they are exercised. Thus, in the carnivorous tribes, the true incisors are very small; the grinders being employed both for cutting and masticating; while the canines are of a most formidable size, and of great strength. In the herbivorous genera, on the contrary, the grinders are blunt and nearly flat; and this structure, added to the horizontal motion of the jaws possessed by these animals, grinds the food as if it had been prepared between two millstones. Some inequality, however, is of course necessary; and therefore these teeth are composed of parts of unequal hardness, some of which, by wearing away soonest, produce those inequalities essential to trituration. As these variations, however, will be employed in defining the different groups, they need not, in this place, be further noticed.

(72.) The primary types under which all quadrupeds appear to arrange themselves, may be thus concisely defined. In the first, the extremities of all the four limbs perform the office of hands; one of the toes being opposable to the others, and acting as a thumb, capable of a free motion: hence they have been judiciously named by M. Cuvier, *QUADRUMANA*. In the second, this prehensile structure of the foot is not seen — the thumb being upon the same plain with the other toes; the claws, also, are mostly retractile. Like the *Quadrumana*, they possess all the three sorts of teeth well developed; but the canines are particularly large: and from this character, which indicates their carnivorous habits, Linnæus has termed the order *FERÆ*, and M. Cuvier *CARNIVORA*. The third, or aberrant group, is chiefly distinguished by its imperfect and variable dentation: the under jaw is without, generally, canine teeth, properly so called, or they exist merely in an abortive or rudimentary state. Like all other aberrant groups in the animal kingdom, this likewise contains three subordinate divisions, thus named:—1. The

UNGULATA, or hoofed order; 2. The GLIRES, or gnawing order; 3. The CETACEA, or aquatic order: these divisions evince a strong tendency to unite into a separate circle of their own, by the *Hippopotamus*, or river cow, in the first, and the *Manatus*, or sea cow, in the last.

(73.) The general course of the mammiferous circle may be thus stated, although there is strong presumptive evidence to believe, as will be seen hereafter, that the aquatic type of the *Quadruman*a is either extinct or undiscovered. Commencing, then, with the *Feræ*, nature appears to quit them for the lemurs by such animals as the *Arctictis* Tem. and the potto (*Cercoleptes*). The lemurs naturally lead us to the monkeys without cheek-pouches (*Cebidæ*), and these to the genuine *Simiadae*. The hiatus, just alluded to, occurs therefore between the *Quadruman*a and the *Ungulata*, which we enter by means of the *Rhinoceros* and quit by the *Anoplotherium*. Arriving thus among the *Glires*, by means, most probably, of the Kangaroos, the beaver evinces an affinity to the more aquatic animals belonging to the *Cetacea*; which order is again left through the medium of the *manatus*: the intimate connection between this latter animal and the Seals is known to all naturalists; and we thus return again to the *Feræ*, from whence we first commenced tracing the circle.

(74.) The analogies of these orders with the class of birds have been variously stated. As the nature of this treatise is not to lay before the general reader the conflicting opinions of others, but to give the results that have attended their full consideration, we shall at once proceed to state our own views upon this important and interesting question; subsequently adverting to those circumstances which have led to the errors, as we conceive, that have influenced others in forming a different conclusion. That the rapacious quadrupeds represent the rapacious birds, is too obvious a fact to be questioned. The *Quadruman*a, on the same principle, have been rightly compared to the insessorial order of birds; for both, in their respective classes, are the most

highly organised. The *Ungulata* — the type of which is the ruminating tribe, containing the oxen, sheep, and deer — were compared by Linnæus to the *Gallinacea*, or poultry; and the analogy, until very lately, has never been questioned. The *Glires*, like the grallatorial birds, have the muzzle remarkably lengthened, and, for their size, are the swiftest runners in the whole class; witness the hare, the rabbit, cavy, &c. Finally the analogy of the aquatic *Cetacea* to the feathered swimmers has been admitted by every one: we are thus able to construct the following table, leaving the positions it contains to be subsequently made good.

Orders of Quadrupeds.	Typical Characters.	Orders of Birds.
I.		
Typical group. QUADRUMANA.	Pre-eminently organised for grasping.	INSÉSORES.
II.		
Sub-typical group. FERE.	Claws retractile, carnivorous.	RAPTORES.
III.		
Aberrant group.	CETACEA. Pre-eminently aquatic, feet very short.	NATATORES.
	GLIRES. Muzzle lengthened and pointed.	GRALLATORES.
	UNGULATA. Crests or other processes upon the head.	RASORES.

(75.) It is not expedient that a treatise of this nature should be made the channel of controversial argument; and it is at all times a disagreeable task to advert to the mistakes, real or supposed, of others. More than one of our cotemporaries have given to the public the outlines of a circular arrangement of this class of animals, and one of them has even attempted to support his views by comparing his groups with those in the circle of birds. The whole theory, however, reposes upon synthesis; the chief object apparently, of the distinguished writer, having been to find out in what manner he could connect the five orders, without analysing the contents of any one of them, or even determining the tribes or families. We have elsewhere expressed our opinion that circles so predicated, cannot be received as valid evidence. And as the

theory here alluded to, on the circle of the *Mammalia*, has not been verified by our own researches, we may be pardoned for rejecting it. The other sketch * of a circular arrangement of the *Mammalia* we have never seen. These circumstances are merely alluded to, that the zoologist, who feels desirous of prosecuting the analysis of the natural groups of the *Mammalia* may consult the essays here pointed out. Much information will, no doubt, be found therein; but, upon the present occasion, the plan most advisable to be followed, appears to be that of simply laying before the reader the results of our individual investigation, with the reasons, occasionally, upon which our deductions are founded. The different arrangements of quadrupeds in detail, made by Linnæus, Cuvier, and Illiger, have already been given in another volume. We shall now proceed to a more particular survey of the several orders under which we arrange the whole.

* The sketch here alluded to is stated (Linn. Trans. vol. xvi. p. 21.) to be in the Philosophical Magazine for November, 1826. But this must be an error; for on procuring that number from the publishers, it is not there. Both the author and the publisher have been applied to, but neither has given me any precise information where it is to be found.

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PART II.

ON THE NATURAL HISTORY OF QUADRUPEDS.

CHAP. I.

ON THE ORDER QUADRUMANA: ITS GENERAL CHARACTERS, PHYSICAL, MORAL, AND ANALOGICAL; ITS MINOR DIVISIONS, WITH INTIMATIONS OF THE HABITS AND MANNERS OF THE ANIMALS IT CONTAINS.

(76.) THE QUADRUMANA, or four-handed order, derives its name, as before remarked (72.), from the animals it contains having the thumb of each hand and foot opposed to the other fingers, as in man; by which peculiarity they are able to grasp both sides of any substance: hence these animals are remarkable for their facility in climbing, and in performing many actions not observed in others. Their anatomical structure refutes the vulgar idea that some of them, as the orang-outang (*fig. 1.*), can walk in an erect position; on the



contrary, they cannot even assume that attitude without considerable difficulty. The three sorts of teeth are fully developed, and the nails of their toes are never retractile. M. Cuvier merely places under this order, the monkeys and the lemurs. To these we have added the bats; and we shall endeavour to place the whole series in what appears to be their natural subordinate groups, upon considerations taken from their external and internal

anatomy, no less than from their mutual affinities and general analogies. The monkeys have long been divided into two great families; the one inhabiting the Old, the other the New World. We distinguish the first as the *Simiadæ*, and the latter as the *Cebidæ*: these, forming the two typical groups, are followed by the *Lemuridæ*, or lemurs, and the *Vespertilionidæ*, or bats. The third aberrant division, which, by every analogy in nature, should represent the natatorial or aquatic type of the *Quadrumanæ*, is entirely unknown. We shall now proceed to a general survey of the contents of each of these families; difating upon those which have been more or less analysed, with a view to determine their natural series; and slightly touching upon others, where nothing definite upon that important subject can yet be stated. As some degree of novelty will attach to the results obtained by the first of these processes, we shall fortify our opinions by referring to authors of the highest popularity, whose testimony is peculiarly valuable, inasmuch as they could have had no idea of the use to which their observations — often disconnected and casual — would be turned.

(77.) Commencing with the *SIMIADÆ*, we find an assemblage of animals entirely confined to the Old World, and familiarly known under the names of apes, monkeys, and baboons. All these, as first observed by Audebert, have the division of the nostrils extremely slender, and the apertures, consequently, close to each other. The American monkeys (*Cebidæ*), on the contrary, have the apertures wide apart, and the partition very thick. The number of molar teeth in each jaw, in the *Simiadæ*, are only ten; in the other monkeys they are twelve. Separated by these obvious distinctions, the monkeys of the two hemispheres may be readily known to any attentive observer. On looking to the more obvious marks for discriminating the minor groups of the particular family now before us, — the *Simiadæ*, — we find that the apes have no cheek-pouches, scarcely any naked spaces or cal-

osities on their buttocks, and (with but one exception) no tails; the fore feet or arms are also much longer than the hinder. The ape-monkeys (*Cercopithecus*), on the contrary, have all of them cheek-pouches, naked callosities, and long tails: their arms, moreover, are much shorter than their feet; so that, in fact, the characteristics of one group are diametrically opposed to those of the other. Intermediate gradations, however, soften these typical distinctions, and establish a gradual progression from one to the other. Lastly, the baboons, as rightly observed by Cuvier and Geoffroy St Hillaire, follow the genus *Cercopithecus*; and although varying among themselves in the presence or absence of a tail, are yet eminently distinguished by their great prolongation of muzzle, which takes from their profile much of the monkey contour, and assimilates it more to that of the generality of quadrupeds. We shall first notice each of these groups in detail, and then proceed to trace their respective analogies.

(78.) At the head of the quadrumanous order stands the genus *Simia*, in its most restricted and pre-eminent sense; that is, containing only those animals which, like the oran-outang (*fig. 1.*), being destitute of cheek-pouches, callosities, or tail, evince a stronger analogy to the structure of man, than do any other of the monkey tribe. This resemblance, however strong it may have appeared to some writers, is, in reality, rude and superficial; for how wide



is the difference between the aspect even of the oran-outang (*fig. 2.*) and man! Not to dwell upon many highly important differences, pointed out by anatomists, Cuvier has shown that the structure of these apes totally precludes the facility of their walking erect, not-

withstanding they may have partially been taught to do so when under captivity. The two most remarkable animals, which exhibit the typical characters in the greatest perfection are the oran-outang of tropical Asia, the true *Simia Satyrus*, and the chimpanzee of equinoctial Africa, forming the sub-genus *Troglodytes* of Geoffroy St. Hillaire (fig. 3.). Both these satyr-like apes,



when full grown, equal, if not exceed, the ordinary height of man; but the specimens of the oran-outang hitherto brought alive into Europe have all been young, averaging from three to four feet in height. To re-

peat the fabulous or exaggerated accounts of this creature, would be but to propagate error; nor can we, in this place, enter upon its natural history, properly so called, as given by recent and more accurate observers.* Suffice it to say that the oran-outang, in all its dispositions and habits, is mild and gentle, evincing much attachment, but without any greater aptitude for improvement than is to be met with in the dog, and several other quadrupeds. The superciliary ridge or prominence above the eyebrows, which distinguishes the chimpanzee, is entirely wanting in the *Simia Satyrus*, whose ears are also much smaller. This extraordinary creature seems to inhabit the vast forests of Eastern Asia, both on the continent and the islands; and, until lately, was thought by M. Cuvier to be the young of the pongo ape. The history of the chimpanzee, or African oran, is still more imperfectly known. It inhabits similar wild and inaccessible regions, under the same latitudes, in tropical Africa; but chiefly in the forests bordering the great river Gaboon. A widely different distribution, no less than physical structure, thus concurs to show the propriety of viewing these animals as

* This will be done in the volume devoted to menageries.

different types. Following these, come the gibbons, or long-armed apes (*Hylobates Lar.*, fig. 4), where a sensible difference of structure may be remarked in the excessive length of the arms, which are so long as to touch the ground when the animal is in a semi-perpendicular attitude: these apes are likewise exclusively restricted to the forests



of tropical India; and their activity in climbing is said to be excessive. The true typical species was discovered by sir S. Raffles in the forests of Java, and is distinguished by the union of the two forefingers to the length of the first joint, precisely the same as is seen in the toes of all syndactyle birds: the name, therefore, of *Hylobates syndactyla* is particularly appropriate. The gibbons, in general, have no naked callosities; but as nature is now progressing towards another form, we find a slight indication of this character in the *Hylobates Lar.*, and one or two others; a circumstance which renders the transition to the sub-genus *Presbytes* more easy: this singular type, which agrees with all the former in its want of cheek-pouches, and its elevated forehead, has been placed next to the gibbons, although it is the only example in this group, where the tail is developed. Like the gibbons, however, its arms are excessively long; and as some of these latter have small callosities, the only exclusive distinction of *Presbytes* is its tail. There still remains a fifth type of the genus *Simia*, to which, following Geoffroy, we preserve the name of *Pithecus*: this is the remarkable animal called pongo by M. Wurmbe; an ape about whose natural station great diversity of opinion exists. M. Cuvier places it with the orang-outang; and expresses an opinion that the latter is merely the young. Illiger, on the contrary, considers it so closely allied to the baboons, that he calls it a *Cynocephalus*. From these opinions, we may draw the inference that it is intimately connected to both,

while subsequent information has incontestably proved it is distinct from either. It is, in short, an ape, with the aspect of a baboon; and we may thus close the circle of the *Simiade*.

(79). The ape-monkeys, forming the genus *Cercopithecus*, are placed immediately after that of *Simia*: their distinguishing characters have already been intimated, and we have therefore only to notice the sub-genera or types which they contain. They appear to be connected to the gibbons by the genus *Lasiopyga* of Illiger, represented by the Cochin China monkey, which inhabits the same regions, and is almost as remarkable for the length of its arms, as the gibbons. Like all the monkeys, however, which we are now come to, the animal in question has a long tail; and, like some of the long-armed apes, its buttocks are covered with hair. Its size is considerable, and its colours remarkably varied; in both these respects it shows some affinity with the snouted monkeys (*Nasalis*, fig. 5.), next to which it has been generally placed. The sub-genus *Nasalis*, however, has a peculiar character, which distinguishes it at once from all others, — the facial angle is only 40° to 45° : the



head is round, but the nose is lengthened out into a proboscis, at the tip of which, on the under part, are the nostrils: the hands are long; but the whole shape of the animal is short, squat, and heavy, so that its general aspect reminds the observer more of a pig than of the light and slender

creatures to which it is allied. Leaving these two aberrant forms, we shall find the true characteristics of the ape-monkeys in the sub-genera *Semnopithecus* and *Cercopithecus*, both of which are remarkable for their long tails, cheek-pouches, and comparatively short arms; but more so to common observers, for the beauty of their colouring, and their gentleness and activity. The first of these groups (*Semnopithecus*), have the

muzzle somewhat prominent, as in *S. entillus*, (fig. 6.),



it seems restricted to Southern India, and contains six species. The thumb of the arms among these monkeys is so very short as to appear almost rudimentary: they are further distinguished by the comparatively small size of their canine teeth, and by the falling

back of their forehead. The *Cercopithec*i, on the other hand, are separated from the last by the size of their canine teeth: their facial angle is from 60° to 65° *, which gives great elevation to the forehead; and they have no ridge above their eyes. The *Mona*, or varied monkey,



and the *C. ruber*, or red monkey (fig. 7.), are types of this group, and, like the greater portion of the other species, inhabit tropical or Western Africa. Following these is the sub-genus *Cercocebus*, wherein we perceive a lengthening of the muzzle,

as in *Cercocebus fuliginosus* (fig. 8.); the forehead recedes, and the facial angle is only 45° . Now, as this prolongation of the face is one of the great characters of



the baboons; the French naturalists have justly placed this division as the last in their series of the Asiatic monkeys. There is still another group, of which, as we have not been able to examine an example, we can only touch

upon from the accounts of others: it is the genus

* F. Cuvier.

Colobus of Illiger, represented by the full-bottom monkey, so called from the neck being ornamented with long white hairs like a mane, or full-bottomed wig. There seems to be three species, all African; and they have been separated from the apes already mentioned on account of the arms, or fore feet, being without any thumb. It may be conjectured, however, that this very circumstance, in reality, constitutes *Colobus* the typical form of the *Semnopithec*i; for it seems that in all these latter the thumb is particularly small. We are, in fact, prepared for the diminutive size of this member in the Cochin China monkey (*Lasiopya* Ill.), and by its slenderness in the proboscis monkey; so that among all these small-thumbed animals the gradation would not be perfect, if there were not some where this member totally disappeared.

(80.) On the natural history, properly so called, of these ape-monkeys, but few authentic particulars exist; independent of those remarks, published by M. F. Cuvier, upon such species as he had observed in confinement. The genus, as a whole, is immediately distinguished from that of *Simia*, not only by the smaller size, and the great length of the tail, but by several other characters. The chief groups, or sub-genera, are characterised by some slight but well-marked differences of structure, accompanied by very opposite dispositions. The *Semnopithec*i have the canine teeth (as seen in



S. maurus Horsf., fig. 9.) very strong; they are grave, sly, and often revengeful: the *Cercopithec*i on the other hand are much more docile, playful, and elegant, both in their motions, form, and colour. The negro monkey (*Sem. maurus*) has been seen in the forests of Java by Dr. Horsfield, who observes that it is there found in abundance, dwelling in trees, and associating in numerous societies. Troops, consisting of more than fifty individuals, are often found

together; and in meeting them in the forests, it is prudent to observe them at a distance. They emit loud screams on the approach of man; and by the violent bustle and commotion excited by their movements, branches of decayed trees are not unfrequently detached and precipitated on the spectators. In confinement, it remains during many months grave and morose; and as it contributes nothing to the amusement of the natives, it is rarely found, in a state of captivity, in their villages or about their dwellings. During its young state it feeds upon tender leaves, and when adult on the wild fruits so common in its native forests.* The red species (*S. pyrrhus* Horsf.), which differs from the last chiefly in colour, and which is found in the same forests; seems to have a much more cheerful disposition; for "both on account of its variety and comparative beauty, it is a great favourite with the natives: whenever an individual is obtained, care is taken to domesticate it, and it is treated with kindness and attention: the black species, on the contrary, is neglected and despised." Perhaps this difference of temper originates in difference of treatment. The *Cercocebi* are chiefly confined to the woods of Africa, and are so truly arboreal, that some of the species walk upon the ground with great difficulty: this has been particularly observed of the Malbrouk (*Cercocebus cynosurus*, fig. 10.) when in confinement. This



inability is at once accounted for by the shortness of the

* Zool. Researches in Java.

arms, or anterior feet, in comparison to the hind legs. The great prolongation of the muzzle in all these animals, no less than their disposition, clearly show us that we are to pass from them to the baboons, to which we shall now proceed.

(81.) The baboons have been arranged by Cuvier and Geoffroy under three distinct groups. — The first, called magots (*Inuus*), is represented by the Barbary ape: the second, macaques (*Macacus*), comprehends those of small dimensions and long tails: while the last, to which we shall retain the old name of *Papio*, includes those of a large size and great head; the typical species having a very short tail, or none. The whole group—which is obviously the aberrant assemblage of this family—is distinguished by a prominent muzzle, an additional tubercle on the last upper molar tooth, and by the ferocity of the greater number of the species: they have also a large bag, communicating with the larynx, by which they are enabled to utter loud and discordant cries. Like all the preceding, they have cheek-pouches and naked callosities, and chiefly inhabit the forests of Africa.

(82.) The genus *Inuus* is typically represented by the Barbary ape (*I. sybanus* Cuv.); remarkable for being the only one of this family which comes within the geographic range of Europe, great numbers still inhabiting the inaccessible precipices of the rock of Gibraltar. It has a full but not a very long muzzle; and a small tubercle is its only indication of a tail. Mr. Bennett associates with this animal his black ape (*Macacus niger*), from the absence of the tail, although he admits “the physiognomy of the two animals is very different;” the fleshy cheeks, and consequently apparent depression of the nose, in the black ape, indicating a close affinity to the mandrills. In the pig-tailed baboon (*I. Rhesus*) or *Magot rhesus* of the French zoologists, the tail begins to appear; and as this animal has been placed as a *Macacus*, we may at once proceed to that division.

(83.) The ape-baboons (*Macacus*) are distinguished by an elongated muzzle (fig. 11.), as in *M. carbonarius*, much more prominent than in the *Cercocebi*, and by a tail more or less lengthened; and they differ from the *Cyanocephali* Cuv. (or true baboons), because their nostrils "open obliquely on the upper part of the muzzle." The form of these animals, nevertheless, shows a strong resemblance

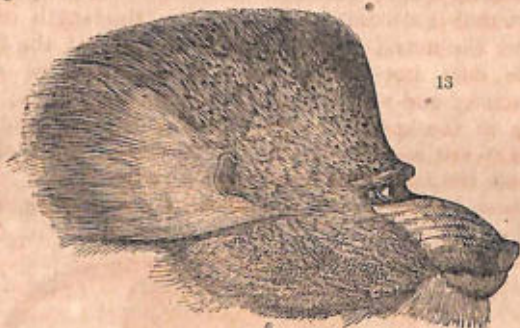
to the *Cercocebi*, which is further increased by their possessing a tail; although this member is generally so short that it seldom equals a third of the length of the body: the muzzle is so much elongated that the facial angle does not exceed 45° , and the canine teeth are strong and very large. It deserves attention, that some of the species (as *M. Silenus*, *Sinicus*, and *radiatus*) are remarkable for having crests, which either assume the form of a mane or of a radiated tuft. The Chinese bonnet monkey, (*Macacus Sinicus*, fig. 12.),



has the hairs of the crown disposed in this manner, while its elongated muzzle is very characteristic of this genus. The form of these animals separates them widely from the monkeys: it is strong and compact, while their disposition is cunning and mistrustful.

The crested species inhabit India; the others are African.

(84.) Of the true baboons (*Papio*), M. Cuvier forms two small sections, the great mandril being placed by itself. Generally speaking, these animals, collectively, may be described as having little or no tail, great dog-shaped heads, and large canine teeth: the muzzle is truncated, or, as it were, abruptly cut off, with the nostrils opening at the end. Of all the monkey tribe, they are the most hideous in their aspect, and the most ferocious, disgusting, and formidable in their manners. A pre-eminence in these odious qualities places the mandril (*Papio Mormon*, fig. 13.) as the



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type. Those species which possess a tail, constitute the division named by Brisson *Cynocephalus*; while the two—the drill and the mandril—wherein there is only a slight stump on the buttocks, are the most typical of the entire genus *Papio*. The little that is known of these disgusting creatures may be comprised in a few words. The greater portion inhabit the wild and impenetrable forests of equinoctial Africa; and when fully grown, they are, next to the orans, the largest of their race; the mandril, for instance, often acquiring the size of an ordinary man. This, as well as some others of the species, are remarkable for having their cheeks pro-

minent, deeply ridged, and beautifully coloured, analogous to what we see, among birds, in most of the hornbills and toucans.

(85.) We must now again advert to that very extraordinary animal, placed by M. Cuvier at the end of the baboons, under the name of the *Pongo*, with the following observations: "The pongo has the long arms and the absence of tail, peculiar to the orang-outangs, with the cheek-pouches



of the guenons (*Cercopithecus*), and baboons (*Papio*), and a form of head and teeth altogether peculiar (*fig. 14.*). The forehead retreats considerably, and the cranium is small and compressed; the face is of a pyramidal form, in consequence of the elevation of the mounting branches of the lower jaw, which indicates in the organs of the voice some disposition analogous to that which has been observed in the howling monkeys of America. — Many traits of its history has, doubtless, been mingled with that of the orang-outang, inasmuch as the length of the arms, that of the spinal apophyses, of the cervical vertebrae, and the tuberosity of its calcaneum, may facilitate its assuming a vertical position." With all these admissions, however, M. Cuvier, and most of the other anatomists of the Garden of Plants, is "strongly inclined to suspect, that the orang-outang, as recognised in Europe, is, in fact, a young pongo;" and they have accordingly been at great pains to establish no less than nine points of similitude in the anatomy of the two animals. But a naturalist no less eminent and equally profound, M. Geoffroy St. Hillaire, stood by himself and opposed this theory, and has clearly pointed out the great anatomical peculiarities of this extraordinary ape. The circumstance most remarkable, he observes, "in the head of the *Sima* of Wurmb, is the excessive elongation of the muzzle; and as this considerable development must be gained at the expense of the adjoining parts, we accordingly find that there is scarcely any apparent forehead; that the cavity which contains the

brain is remarkably small; and that the occipital foramen is placed at the posterior part of the head. The muzzle, the size of which is the distinguishing character, is remarkable, moreover, not only for the enormous thickness of the gums, but also for the extraordinary size of the canine and cutting teeth*: the former exceeding in magnitude those of the lion; and the canines being almost equally large with those of the same animal. Thus, though the teeth (*fig. 14.*) have a general resemblance to those of the other *Simia*, we might be tempted, in consequence of their magnitude, to class this animal among those which are the most decidedly carnivorous. There are other circumstances which would secure support to such a classification: the occiput is elevated at its point, and forms a large and thick quadrilateral protuberance, with three bony crests, not less apparent nor less solid than those of the lion. Two of these crests are considerably elevated, and extend laterally to the auricular foramina; the other extends across the vertex, and then assumes a bifurcal form (as in the lion) above the forehead in two lateral branches, which proceed as far as the external side of the upper edge of the orbits. These little crests are decidedly marked in the *Simia* of Wurmb, and form an equilateral triangle with the upper edge of the orbitary foramina. But these characters, so extraordinary in themselves, astonish us still more by their combination with others equally strange: the head is formed like the half of a pyramid, and the auricular foramina are placed so considerably above the palatine bones, that a line drawn from the former to the internal ridge of the *ossa palatina* would form, with an horizontal line, an angle of 25° ." If any other facts may appear wanting to demonstrate the great error of M. Cuvier regarding the pongo, they will be found in the lucid and masterly paper of professor Harwood.† To illustrate more

* In Fred. Cuvier's plate of the dentation of the Pongo, here copied (*fig. 14.*), the cutting teeth are rather small than large: this must evidently be an error of the draftsman.

† Linn. Trans. xiv. 471.

clearly the gradually marked passage from the *Cercopithecus* to the baboons, we here insert profiles of the genera *Inuus*, *Macacus*, and *Papio* (fig. 15.) — the



three genera which constitute the aberrant circle of the Old World monkeys. In *Inuus sylvanus* (a), the nose is short, and situated little more than half-way between the eyebrow and the mouth; in *Macacus carbonarius* (b), it is much longer, and is in a perpendicular line with the mouth; while in the common baboon (*Papio cynocephalus*, c), the nose considerably advances, and forms the tip of the longest part of the face.

(86.) Having now sketched the leading features of the group formed by the monkeys of the Old World, let us look to the results that attend this view of their natural affinities, which the admirers of M. Cuvier will perceive is strictly and rigidly in accordance with the series given in the *Règne Animal*. First, then, as to the circularity of the group. M. Cuvier passes from the orans, by means of the gibbons (*Hyllobates* Illig.), to the genus *Cercopithecus*, and these two groups he obviously regards as the typical genera. His third genus is composed of the baboons; which he again divides into three smaller sections, the last of which he classes with the pongo, — an animal which is so closely connected to the oran-outang, that he actually considers it to be one and the same species. Those naturalists, therefore, who will be convinced only by the authority of great names, need look no further for an exemplification of a circular series; for a circle of the *Simiadae* has actually been made by M. Cuvier himself, without his possessing the least consciousness of having done so! He distinctly defines

the two typical groups, and he divides the aberrant one into three. But, it may be asked, what authority can be produced for a circular union of the three divisions of the baboons—*Inuus*, *Macacus*, and *Papio*? The reader will recollect that there are species of *Inuus* and of *Papio*, which have no tails, consequently, to unite them there must be a form which is compounded of both; and such a form accordingly exists. Mr. Bennett, who to much critical acumen joins the advantage of having observed many of this family in the menageries of the Zoological Society, thus expresses himself, when describing the black ape (*Inuus niger*):—"The absence of tail would place it in the same division with the Barbary ape, forming M. Cuvier's genus *Inuus*, but the physiology of the two animals is very different; the fleshy cheeks, and consequent apparent depression of the nose, in the present species, indicating a close affinity to the mandrills." Better authority than this cannot be adduced, particularly as Mr. Bennett, quite unaware of the inference we deduct from this declaration, considers the animal as a species of *Macacus*. Between *Inuus* and *Papio*, according to Mr. Bennett, there is, consequently, a close affinity; and thus do the three genera of M. Cuvier's baboons form a distinct circle. Condensing the typical characters of the five genera of the *Simiadae* into a tabular form, M. Cuvier's series will stand thus:—

Fam. SIMIADÆ.

Typical Characters.		
1. Typical group.	} SIMIA.	{ Face flattened, no tail, cheek-pouches or callosities.
2. Sub-typical group.		{ Face flattened, tail long, cheek-pouches and callosities.
Muzzle lengthened.		
3. Aberrant group.	} INUUS. MACACUS. PAPIO.	No tail, { nostrils oblique, superior.
		Tailed, {
		No tail, nostrils terminal.

(87.) So far, therefore, this arrangement verifies the primary divisions of every natural group, insisted upon elsewhere*, the authorities for this having already been given.

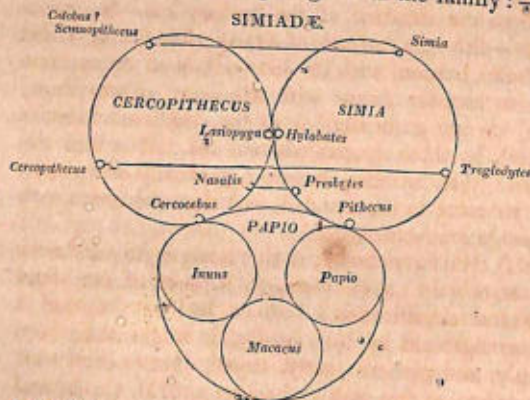
* On the Geography and Classification of Animals, p. 224.

(88.) Next as to the analogies.—If we compare this group with the primary divisions of quadrupeds, we shall find some points in the series sufficiently strong to give an additional confidence in its accuracy.

Typical analogical Characters.

SIMIA.	{ Grave, intelligent, inoffensive: typical }	QUADRUMANA.
CERCOPITHECUS.	{ of the }	FERÆ.
PAPIO.	Mischievous, malicious,	CETACEA.
MACACUS.	Head very large, little or no tail,	GLIRES.
INUS.	Tail comparatively long, hare-lipped*,	UNGULATA.
	Head conspicuously crested†,	

(89.) Having looked only to the genera, we must now turn to what appear to be their types or sub-genera. All these have been instituted or adopted by Cuvier and Geoffroy St. Hillaire; and they follow each other in the *Règne Animal* nearly in the very same order in which they occur in the following diagram of the family:—



(90.) Commencing with the genus *Simia*, we may remember that its three aberrant forms depart from the two typical, in the same degree as they are here exhibited; thus, in *Hylobates*, the callosities begin to appear; *Presbytis*, the most distant from *Simia* and *Troglodytes*, has not only callosities, but a long tail; so that it merely retains the facial angle (60°) and the absence of cheek-pouches of the orans. While *Pithecius*, which again

* The hare-lipped monkey, *Macacus cynomolgus*, is probably the type.

† The *Inuus niger* seems to be the type of this group.

comes back to the type, has, accordingly, more resemblance to it. M. Cuvier, in fact, believed it to be an old oran; but the prolongation of the muzzle, independent of all other considerations, proves it to be a point of connection between the orans and the baboons. Leaving this group, we next enter that of *Cercopithecus*, either by the long-armed Cochin China monkey, or by the genus *Colobus* of Geoffroy; close to which our author places the proboscis monkey (*Nasalis*), which may be considered as representing — conjointly with *Presbytes* — the *Mycaci*, or tailed baboons. *Cercocebus*, according to M. F. Cuvier and others, possesses a greater prolongation of muzzle than any other of the *Cercopithecæ*, and they have consequently regarded it as the connecting link or passage to those animals. Equally high authority sanctions the situation of the Barbary ape — the genus *Inuus* — although destitute of a tail; while the pig-tailed or Rhesus baboon, with its short tail, is an appropriate form to connect *Inuus* with *Macacus*. From these, again, we are gradually led to the dog-faced baboons (*Papio*), by those species wherein the tail is still exhibited: this member, however, gradually diminishes, until we come to the mandril, and close the series with the pongo oran-outang.

(91.) We have chosen, in this instance, to pursue the *argumentum ad verecundiam*, in support of our views of natural classification; because, had we proposed a new arrangement of this family, it might have been strongly, and perhaps justly, urged, that to controvert the opinions of two such authorities as MM. Cuvier and Geoffroy St. Hillaire, who, both as zoologists and anatomists, have directed their greatest attention to the analysis of this family, would have been somewhat presumptuous: the arrangement, therefore, is theirs, not ours; excepting so far as concerns the combination with reference to other natural groups. If, therefore, the foregoing diagram is radically defective, so also must be the arrangement of these two eminent men; for the mere removal of one of the aberrant sub-genera to another station in its own circle would not, in the

slightest degree, invalidate the accuracy of the generic or *primary* divisions. It is quite immaterial, for instance, in this respect, whether *Colobus* constitutes part of the sub-genus *Lasiopyga*, or is the typical form of *Semnopithecus*; for this question (important, indeed, when we come to close analysis), however it may be ultimately decided, leaves the *primary* groups just in the same series as they now stand.

(92.) But we are now to deduct a far more important inference from the above exposition than what involves a purely scientific question. It has been confidently stated, not only by mere systematists, but by those who admit the circularity of all natural series, that MAN stands at the head of the animal creation, not as its lord and governor only, but as "part and parcel" of one of its divisions, — that he represents, in short, either an order by itself, or that he forms part of another order, named by Linnæus *Primates*. Now, this hypothesis may be combated or confirmed by two modes of argument; the one drawn from an enlarged view of his moral and physical qualities, and his relations to other parts of creation; or, secondly, it may be viewed as a purely scientific question, relating only to his form. The first is obviously the most convincing—at least, to those who believe in revelation; but the latter will be the most unanswerable, inasmuch as it comes home not only to the Christian, but to the sceptic. We have hitherto opposed this theory, so degrading and humiliating to our race, in the first instance by general arguments drawn from the assurances of inspiration, and the analogies of nature. We have now pursued the other course, as more demonstrative; and viewing MAN as a reasoning biped animal, we point to this circle of the most perfect of the quadrupeds, and demand in what part of it we are to introduce "the human form divine." We are told, "the genus *Homo*" is followed by that of the orang-outang; but according to the researches of MM. Cuvier and Geoffroy, this is completely denied. Does Man, then, stand as the sole representative of a mammiferous order? — the pre-eminent type of the *Primates*? and

is he followed by the monkeys, the lemurs, and the bats? Analysis now proves this supposition to be equally false with the preceding. The foregoing diagram shows at once that the monkeys constitute *not one family, but two*; the second being composed of the great race peculiar to the New World, and which are entirely excluded from the circle of the *Simiadae*. Now, as the American monkeys are much lower in the scale of organisation than those of the *Simiæ* family, and moreover blend, almost insensibly, into the *Lemuræ*, it would be quite preposterous to think of placing "the genus *Homo*" among them. The structure and affinities of the lemurs, again, prove that they are not a typical, but an aberrant family, connecting the *Quadrungna* to the *Feræ*, by means of *Cercoleptes* and other kindred forms. Where, then, let us ask the admirers of M. Cuvier's system, or the retainers of the Linnæan order *Primates* — where, then, must we insert the "order *Bimana*," or the "genus *Homo*?" Is there any place for him in the quadrumanous circle? Is there any hiatus between the pongo and the oran, the chimpanzee, the gibbon, or the old-woman monkey (*Presbytes*)? Assuredly not, the gradual progression of this series at once falsifies the supposition. The circle of the genus *Simiæ* is complete. If it is said that Man is one of the typical orders, the two really typical groups of the *Quadrumana* stand out from the canvass equally complete in themselves, and we can be consigned to no other station than that of the *aquatic type*, as a companion of the mermaid, the friar-fish, and the *Pisce episcopi habiti* of the credulous Rondeletius*; the one supposition being as little sanctioned by all we know of science as the other.

(93.) It is under this view we see the true value of M. Cuvier's arrangement of the *Simiadae*; since it proves to absolute demonstration, that MAN is entirely excluded from the *Primates* L., and consequently from the entire circle of the animal kingdom. No internal alterations in the diagram of the *Simiadae* would affect this ques-

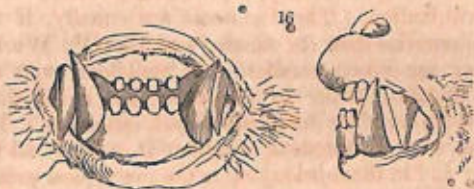
* Prelim. Disc. p. 13.

tion: because the only section of it wherein MAN could be introduced, is absolutely perfect; and even the three aberrant divisions might almost be said to form their own circle. 'Neither does it matter to our present argument, whether the American monkeys (*Cebidæ*) form a perfect or an imperfect circle: they clearly do not enter into that of the *Simiadae*; and it is equally obvious they cannot form a part of the lemurs. Intervening, as they do, between both, they become the sub-typical division of the *Quadrumana*; and thus overthrow the hypothesis, that Man represents, if not a genus, at least an order of this division of quadrupeds.

(94.) The primary distinctions of the American monkeys, forming the family *Cebidæ*, are not so palpable to an ordinary observer, as might be supposed; although the wide space between the nostrils, as before intimated, though a solitary, is yet a strong external mark of discrimination. These animals are equally, if not more, numerous than the monkeys of the Old World; but they are much smaller, less malicious, and are totally destitute either of cheek-pouches or of those naked spots on their haunches called callosities. The tail, also, is a conspicuous member: it exists in all the species; and in those belonging to the two typical groups or genera, *Mycetes* and *Cebus*, is long and prehensile,—that is, capable of being twisted round branches so as to perform the office of a fifth hand. This structure at once points out the two typical forms; as it evinces, in such animals as possess it, a higher degree of organisation than is observed in the others, whose tails, of various lengths, are neither formed nor used in the same way. Thus distinguished, we shall arrange all the divisions that have been named, of the American monkeys, under one or other of the following genera:—*Mycetes*; *Cebus*, *Callithrix*, *Hapales*, and *Pithecia*.

(95.) The *Myceti*, or howlers, are the largest and most remarkable of the American monkeys. They have derived this name from the loud and frightful howlings which they make after sun set, and to which we have

frequently adverted.* This faculty is derived from a peculiar inflation of the hyoid bone, which communicates with the larynx, and which is not found, as it is said, in any other of the American monkeys. Another peculiarity is seen in their long prehensile tail, which is entirely destitute of hair beneath, for almost one third of its length from the top, the skin being marked with those sort of wrinkles seen in the palm of the human hand, — a sure indication of great sensibility in touching. Some species (*G. Lagothrix*,) are said to have this part callous, and the hyoid bone less developed; but it may be questioned whether, upon such grounds, they are entitled to a sub-generic distinction. It is rather singular that M. F. Cuvier should not have specially noticed the remarkable size of the canine teeth in the howlers: they are uncommonly large; and in a specimen now before us, (*fig. 16.*) are nearly six times bigger



than the cutting teeth: a structure which at once separates this group from the genus *Cebus*. Most of these howlers have thick beards, and live in societies: but others, we believe, are solitary; and it is the opinion of the Brazilian hunters, that their tremendous roarings are uttered for the purpose of calling their mates. The only

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decided sub-genus of these monkeys is that of *Ateles* (*A. belzebuth*, *fig. 17.*), differing from the typical examples by having only four fingers on the hands, the thumb being either entirely wanting, or merely rudimentary.

* Murray's Geography, p. 1449. Class. of Animals, p. 78.

The arms and feet are very slender, which, with their superior agility in climbing, and slowness in walking, clearly points them out as representatives of the gibbons (*Hylobates*), the *Cerocebi*, and the sloths.

(96.) To the genus *Cebus* we shall restrict the trivial name of *Sapagew* monkeys (called by the French *Sapajous*); a mode much more preferable than applying the epithet indiscriminately both to them and the howlers.

The *Cebus Apella* (fig. 18.) or the welper monkey of Pennant, is a typical example. The *sapagews* differ from the last genus in having their prehensile tails entirely covered with hair, and from the sub-genus *Ateles* by possessing a perfect thumb on their hands. M. F. Cuvier,

with singular vagueness, has given the dentation of the *Alouate fauve**, as equally illustrating that of *Mycetes*, *Ateles*, *Cebus*, and *Callithrix*. How far he may be correct in regard to the last, we have no means of judging; but by comparing his figures of the teeth of *Cebus flavus* with that already given of *Mycetes*, the reader will immediately perceive the great difference between them, in the relative proportion of the canine and the cutting teeth. If M. F. Cuvier's figure, therefore, of the dentation of *Cebus* be correct, it follows that in this group the canine teeth are much smaller than in *Mycetes*, and are scarcely larger than the grinders.

* No systematic name is added, so that it is very doubtful what species is really intended. I presume, however, it may be *Cebus flavus* of Geoffroy St. Hilaire. The barbarous names given by the French zoologists to these different groups, and which they almost always use in preference to the classic appellations, is exceedingly perplexing, not only to the general reader, but equally to the naturalist. M. Cuvier, for instance, sets out with calling all the monkeys of America *Sapajous*,—a term which he sometimes uses generally, and sometimes particularly. The genus *Ateles* of Geoffroy, he terms *common Sapajous*, but immediately proceeds to call the whole of the species *Coaita*. We then have *Sajou*, *Saki*, *Yarke*, *Oustili*, *Onavapai* (Humb.), and many others equally unintelligible, without even order or method in their use; and yet these unutterable words are copied by our compilers. We shall not be instrumental in perpetuating such barbarisms; for, on this and every other occasion, we shall endeavour to make even our vernacular nomenclature pronounceable, if not expressive.



Now, this structure is in accordance with their manners and disposition: they are gentle and gay, feed mostly upon fruits, and have been correctly thought to represent the genus *Cercopithecus* of the Old World. Whether any of the subordinate types of the genus *Cebus* have yet been discovered is very uncertain, but the horned and the great-headed species would seem to indicate those modifications of the typical form which are found in all large groups.

(97.) The squirrel monkeys form the next genus, *Callithrix* (fig. 19.). It is the first of the three



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aberrant genera, in none of which is the tail prehensile. It is to the illustrious Geoffroy St. Hillaire that science is indebted for a masterly and lucid investigation of the whole of this family; which, for some unexplained reason, has been passed over in a very loose and unsatisfactory manner in the *Règne Animal*. M. Geoffroy was the first who discerned the necessity of separating the squirrel monkeys (*Callithrix*) from the sapigews (*Cebus*): they are, in fact, at once known by their bushy but not prehensile tail, slender body, large ears, and straight but claw-like nails. The squirrel monkey (*C. scireus* Geof.), from which we may gather a good idea of the whole genus, is only ten inches long without the tail; the latter alone being nearly fourteen inches.

(98.) From the genus *Callithrix* to that of *Hapales* the passage is very gradual: these latter we shall designate as the mouse monkeys; because the large cutting teeth in the lower jaw (fig. 20.) strongly indicates a representation of the order *Glires*. The *Hapales* (*Midas*) *leonina*, which all authors place in this group, obviously represents the *Macacus Silenus* in the circle of the



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Simiadae. M. Cuvier well observes, that they depart more from the typical genera of this family than any other; inasmuch as they have only the same number of molar teeth (20.) as the monkeys of the Old World. The nails, by being compressed and pointed, assume the appearance of claws; and even the thumbs, although furnished



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with flat nails, are yet so slightly separated from the other toes, "that it is not without hesitation" they are called four-handed, or quadrumanous animals. This peculiar structure is fully seen in *Midas rufimanus* (fig. 21.).

Of these mouse monkeys (*Hapales*), two divisions have been made, although on somewhat slender grounds. The different dentation, however, of the sub-genus *Midas*, where the lower canines are equal, and cut in a sloping direction, may possibly be accompanied with other more tangible characters. All these little creatures live in troops in the Brazilian forests: where we have



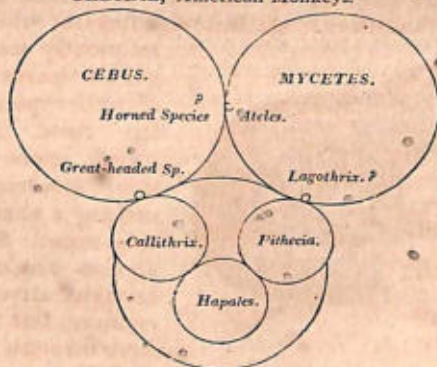
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frequently seen the *Hapales vulgaris* (fig. 22.), and other species, springing from bough to bough, more like birds than quadrupeds, and making a sharp chattering noise. Some of the species are occasionally brought alive into this country, but they rarely survive through the winter.

(99.) The last aberrant genus of the American monkeys (*Cebidae*) is composed of the night apes (*Pithecia*), so called, both on account of their being nocturnal animals, and as evincing a greater affinity to the true baboons

than any of the family to which they belong. In those which, like *P. melanocephala*, make the nearest approach to the apes, the tail is not more than a few inches long; and they have been justly considered as representing, among the *Cebidæ*, the genus *Inuus* (Cuv.) among the baboons. Although the muzzle is not lengthened in any species yet discovered, the canine teeth are very large, and the nails short and bent. The very aspect of the *P. satanus* of Humboldt at once confirms this affinity, and proclaims it to be a baboon of the New World. Another character deserving attention, is the great size of the heads of these night apes; a peculiarity which is almost invariably found in short-tailed animals. Most of the species are strong, stout, and fierce; having a thick beard, a hoarse and hollow voice, and a malicious aspect. In all these circumstances we trace a resemblance on one hand to the howlers (*Mycetes*), and on the other to the apes of the Old World. The circle of the *Cebidæ* is thus closed; and we see that the group, as now arranged, exhibits several remarkable analogies with that of the *Simiadae*, as before detailed.

CEBIDÆ, American Monkeys.



or, the typical characters may be thus stated in a tabular form : —

1. SUB-TYPICAL? Prehensile tails, naked beneath. MYCETES.
 2. TYPICAL? Prehensile tails, entirely hairy. CERUS.
 3. ABERRANT? { Tails not prehensile, nails claw-like.
 { Tails squirrel-like, long, incisors short. CALLITHRIX.
 { Tails squirrel-like, lower incisors large. HAPALES.
 { Tail short, head large, canines long. PITHECIA.

Those "fox-tailed" species of *Pithecia*, where the tail becomes bushy, would seem to indicate the mode in which the aberrant group is closed by the union of *Pithecia* and *Callithrix*.

(100.) The LEMURIDÆ, or lemurs, immediately follow the American monkeys. They have the general aspect of the latter, but their muzzle is lengthened and pointed, particularly in the typical group, to which belongs the ruffled lemur *L. (Macaco, fig. 23.)*. The lemurs, however, are a very distinct race, supplying, in the fauna of Madagascar, the absence of monkeys; yet a few species also occur in Africa

and India. As considerable interest attaches to this group, from its relative situation to this and the following order (*Feræ*), no less than as regards that singular animal, the *Aye-Aye*, we shall endeavour to unravel its internal affinities, and determine its chief types. We



may here notice a peculiarity in the structure of the hind feet of these animals, the first toe of which is the only one armed with a crooked nail (*fig. 24.*).

(101.) It has been observed, that in several of the small American monkeys, of the genera *Callithrix* and *Hapales*, there is a decided tendency to carnivorous habits; these little creatures showing, even in confinement, the greatest eagerness to capture and devour

small birds and insects. Now this is evidently the first indication of the approach which the quadrumanous order makes to that of the ferocious quadrupeds (*Feræ*). We must therefore look for an animal which, to these habits, combines the characters of a monkey and of a lemur. Such an animal, accordingly, has been found. It is the *Aotes trivirgatus* of Humboldt, or three-striped monkey, intimately connected to the squirrel-tailed group (*Callithrix*) by *C. lugens*; but yet having so much the aspect of a monkey, that authors have sometimes placed it in one group, and sometimes in another. Dr. Horsfield and Mr. Vigors justly and forcibly observe that, "in the comprehensive view of the philosophic inquirer into nature, it will equally be a lemur among the monkeys, or a monkey among the lemurs." * Conducted, therefore, by this animal, from the *Cebidæ* to the *Lemuridæ*, we shall now give the result of our analysis of this family. *

(102.) Nearly all the lemurs appear referable to two primary groups: 1. The lemurs proper (*Lemur*), or the genus which more strictly bears that name; and 2. The gallagos, forming the genus *Otolicnus* of Illiger. The true lemurs are of course the most typical, and, with the exception of one species, are conspicuous for their long, bushy, and highly ornamented tail; while in their food they are eminently frugivorous. The other genus — *Otolicnus* — on the contrary, is chiefly carnivorous; preying upon small birds, insects, and reptiles; thus representing, in short, the ferocious order of *Feræ*.

(103.) Commencing with the most typical lemurs, we see in them a larger and more ornamented tail than is to be found in the whole of the quadrumanous order. This is invariably the indication of that particular type which corresponds to the ungulated quadrupeds and the rasorial birds: this member, in the

* Zool. Journ. vol. v. No. 17. p. 140.

ring-tailed lemur (*Lemur catta* L., fig. 25.), is particularly elegant, being bushy,



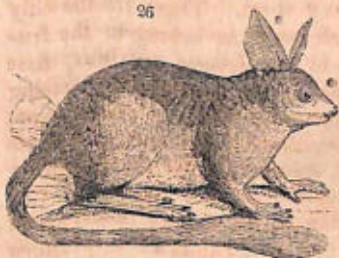
although very soft, and marked throughout with alternate rings of black and white. There is also a white-handed species (*L. albimanus*), as there is a white-handed gibbon (*Hylobates*), as if to mark the analogy of the

two groups. Next we have the *Indrus* of Lacepède, whose tail is also very long, but whose lower cutting teeth are only four, instead of six as in the preceding. *Lichanotus*, which M. Cuvier confounds with the last type, because its cutting teeth are the same, is nevertheless a perfect representation of the aquatic type; as its tail, if any, is very short. These are the only genera, yet defined, which seem to belong to the frugivorous division; yet in the *Lemur murinus*, first described by Miller, there is no difficulty in tracing another, which would appear to be the gliriform type. This supposition is strengthened not merely by its general form, size, and colour, but by the following facts in its history, chiefly supplied by M. F. Cuvier. Buffon, indeed, calls it the *Rat* of Madagascar. M. F. Cuvier, who watched the habits of a specimen in the French menagerie, observes, that during the day it remains in deep sleep, rolled up like a ball, and without the least motion. Towards twilight, however, it began to rouse itself, and continued during the whole night frisking about with the greatest activity: it would traverse its cage with the rapidity of a bird; and such was its power of jumping, that at one spring it could leap vertically from the ground to the height of six or eight feet. Fruit, bread, and biscuits were its usual food. It is, in short, a purely nocturnal animal; and being herbivorous, clearly belongs to this genus. All the above points in its history are so much in accordance with the gliriform and saltatorial types, that

we have but little hesitation in viewing it as such, and of distinguishing it by the sub-generic name of *Scartes*, in allusion to its incessant activity and friskiness when awake. If a further reason for this separation was wanting, it will be found in the peculiarity of the teeth, which, according to Brown, are quite different from those of the other types.* If this view of the frugivorous lemurs is correct, it will follow that one type in which the tail would be remarkably developed, is, at present, unknown.

(104.) The next genus is *Otolicnus* of Illiger: it contains those lemurs whose general habits are carnivorous, and which feed on small birds and insects: they are in general distinguished, as in the Senegal species (*Otolicnus Senegalensis*, fig. 26.), by the great

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size of their hinder feet, or rather of the tarsus and toes; in which respect they offer a beautiful analogy to the genera *Menura*, *Rallus*, and *Crateropus* among birds. Their trivial name of gallagos may be retained; for if

not expressive, it is at least pronounceable. No author has yet paid attention to the natural characters of these two primary groups of the lemurs; and as this cannot be done without a re-examination of the animals themselves, we must, for the present at least, be satisfied with those differences established by the nature of their food. The passage between the lemurs and the gallagos may be traced in the genus *Stenops* of Illiger; where the tail, as in *Lichanotus*, is either very short, or entirely wanting. Mr. Bennett† has judiciously made some remarks on the impropriety of separating

* See Brown's Illustrations of Zoology, pl. 44.

† Zoological Gardens, vol. i. p. 139.

the slow-paced lemur (*Stenops tardigradus*, fig. 27.) from



the slender lemur (*Stenops gracilis*): both belong, in fact, to the scansorial type; and the latter is absolutely necessary to connect the former with the genus *Tarsius*. Much uncertainty hangs over an animal loosely described by Bosman, under the name of *Potto* (*Lemur*

Potto Gm., *Nycticebus Potto* Geof.) which seems to have the form and the slowness of motion seen in the *Stenops tardigradus*, but yet to possess a long tail. Whether such an animal exists or not, certain it is that no other could present a more natural link of connection between *Stenops* and *Otolicnus*. In this latter form, the tail is again remarkably developed; but, although tufted, it does not present that bushy and ornamented character which so much distinguishes the genuine lemurs. The only authentic account we have of the native manners of these gallago-lemurs, is that of Adanson, who frequently met with them in the woods of Senegal. We should have thought, from the great development of their hind legs and feet, that they lived in plains, and sprang like the kangaroos. It seems, however, that "they perch constantly on the branches of trees, where they catch insects with their hands, and devour them rapidly; they appear also to be fond of a particular guñr, and are always to be found on those trees which produce it. The ears, which are large, thin, and naked, are closed when the animal sleeps; but are opened upon their hearing the least noise. It is not improbable that those gallagos which have only two upper cutting teeth,—as the *O. Demidoffi* and *Senegalensis*,—belong to a different type from the others, where the upper cutting teeth are four in number; certain however it is, that the *Tarsius Bancanus* Horsf., or great-headed gallago, is a genuine type of

nature. Dr. Horsfield, with his usual minute accuracy of description and observation, has clearly pointed out how much it differs from others; the most obvious characters being those of a very large round head*, and flattened or obtuse face, and small ears; while the cutting teeth are only two in each jaw. This appears to be a rare animal, and has been only found in Java and Borneo. *Tarsius* is the last sub-genus. It has large ears, a long half-naked or only tufted tail, and remarkably long hind legs: but its chief character is in the lower incisors, which are only two in number; one of which, in each jaw, is so very large as to resemble a strong canine tooth.† The analogy which this structure bears to the gliriform type need hardly be pointed out; while the great length of limb in this animal shows its affinity to the slender lemur (*Stenops gracilis*), with which we first began the circle of the genus *Otolicnus*.

(105.) There are a few other animals, however, placed in this family, but which show so great a departure from the lemurs and the gallagos, that we have viewed them as excluded from those circles, and forming indications of that group which is aberrant. One of these genera — *Aotus* of Humboldt, represented by the three-rayed lemur-monkey — has been already pointed out as the link between the monkeys and the lemurs; the two others, named *Cheirogaleus* and *Galeopithecus*, equally deserve attention.

(106.) Among the unpublished drawings of the celebrated voyager, Commerson, M. Geoffroy St. Hillaire discovered the representations of certain lemur-like animals, which he considers as constituting a distinct group; and which even M. Cuvier thinks “announce a new sub-genus or genus of quadrumanous animals.” To these M. Geoffroy has given the name of *Cheirogaleus*, although the precise characters have not been clearly ascertained. It appears, however, that they have short oval ears; large whiskers; a long, tufted, cylindrical re-

* See the figure in Zoological Researches in Java.

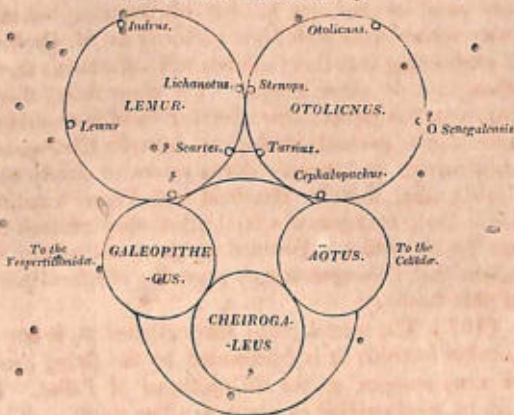
† F. Cuvier, Des Dents des Mammifères, p. 29.

convolute tail; and short hair. Although there is no very peculiar character in this enumeration, we may safely repose upon such high authority as M. Geoffroy in considering that these animals will not arrange themselves with the other lemurs. We place them, therefore, after the genus *Aötus*: because there is an evident resemblance, probably analogical, between *Cheirogaleus* and *Scartes*; and because *Aötus* agrees so closely with *Cheirogaleus*, that M. Horsfield and Vigors candidly admit that, on a partial examination, they mistook the one for the other. Fortified by these authorities, we believe that *Cheirogaleus* may prove the gliriform genus of this family.

(107.) The second genus above alluded to, is one of peculiar interest: it is represented by the flying lemur of some authors, or the *Galeopithecus* of Pallas. To give its most striking character in a few words,—it is a lemur, with the limbs connected by a bat-like membrane; or, in other words, surrounded by a thin skin, which they support, as the framework of an umbrella supports its covering. By this singular structure, the animal is supported in the air; yet, without the power, like the bats, of sustaining a continued flight. Linnæus places this remarkable genus with the lemurs, while every one must perceive its intimate affinity to the bats: like them, also, these bat-lemurs are nocturnal and insectivorous; the mammæ are pectoral; and they sleep, suspended by their hind legs, with their heads downward. M. Geoffroy St. Hillaire, therefore, justly considers them as the form by which the lemurs and bats are connected; while their greater resemblance to the former induces us to consider *Galeopithecus* as one of the aberrant types of the *Lemuridæ*.

(108.) Having now endeavoured to trace the different internal relations of the lemurs among themselves, so far as the imperfect materials we yet possess will permit, and supported by the highest authority for those facts in their organisation upon which these inductions are founded, we shall exhibit the result in the following diagram of the family:—

LEMURIDÆ. — Lemur Family.



(109.) Never having seen an individual of Geoffroy's *Cheirogaleus*, its situation is indicated with a mark of doubt, although, if it is truly an aberrant form, it cannot occupy any other station in the circle than that in which we have placed it. The determination of its affinities involves that, also, of the Madagascar rat (*Scartes*); while one of the typical forms in *Otolicnus* has not yet been determined. These seem to be the only points in the diagram upon which questions can be raised. The valuable results given by Sir A. Carlisle on the anatomy of the *Stenops tardigradus**, establishes its strong analogy to the sloths; and this important conclusion carries with it a demonstration that *Stenops* is the scansorial type of *Otolicnus*, as *Lichanotus* is of *Lemur*; both of which have the tail so short as to appear obsolete. The zoologist who has attentively perused our observations upon the primary types of the animal kingdom†, will be able to trace other proofs of their prevalence in the above diagram.

(110.) Much uncertainty, indeed, hangs on the situation of that remarkable animal, the *Aye-Aye* of Ma-

* General Zoology, vol. 3. p. 91. pl. 30.

† Geography and Classification of Animals, p. 241.

dagascar, or more properly the *Cheiromys psylodactylus*, which has been alternately moved from the *Quadrumania* to the *Rodentia*, according to the views which each writer has taken of its affinities. It would be foreign from the nature of our present treatise to detail the conflicting opinions that have been given on this question. Suffice it to say, that it is merely one of analogy or affinity, and that it by no means involves, as some have supposed, the determination of that order

which naturally succeeds to the *Quadrumania*. When a very ingenious paper on this subject was written*, it was not suspected that every natural or circular group of quadrupeds contained a gliriform type; and that if such analogy was to be taken as an affinity, the orders might be combined in an infinity of ways. No one can doubt that, if the aye-aye is a lemur, it is an aberrant form; and that, consequently, it can fill no other station in the circle than that which we have doubtfully assigned to *Cheirogaleus*; a station, moreover, which must be occupied by a form which is to represent the order of *Glires*. The determination of the true situation of *Cheirogaleus* involves, to a certain degree, that of *Cheiromys*; but demonstration regarding the latter animal will not be obtained until the order of *Glires* has been carefully analysed. The teeth and



skull of *Cheiromys* (fig. 29.) are so decidedly in favour of its belonging to the *Glires*, that we prefer, for the present, to include it in that order.

(111.) The passage to the *VESPERTILIONIDÆ*, or bats, may be considered as established by the flying lemurs; and we thus enter

* Linn. Transactions.

upon the most aberrant family of the quadrumanous order. These remarkable animals are aptly called by the French *Chauve souris*, or flying mice; a name which at once explains their striking analogy to the glirivæ order, which they represent in the circle of the *Quadrumana*.

Like all the foregoing families, the mammæ of the bats are pectoral; and they, with the *Galeopithecæ*, are the only quadrupeds which sleep suspended with their heads downwards (fig. 30.). Now, if we look to the perching order of birds (*Insessores*), which represent the four-handed order of quadrupeds, we find M. Le Vaillant remarking that the birds composing the genus *Colius* sleep precisely in the same attitude, and that this peculiarity is shared by no other birds in creation.

Now, as each group occupies the same station in its own circle, a more striking analogy cannot be brought forward in proof of the correctness of removing the bats from the *Feræ*, and assigning them a station, as the most aberrant family, in the order of *Quadrumana*. The general reader must not form his opinion on the affinity of the bats and the lemurs from those diminutive species of the former, which are found in Europe, where the



muzzle is short, and the features of the head totally unlike those of other quadrupeds. Between these and

the flying lemurs intervenes the genus *Pteropus*, having the wings of a bat, but the prolonged snout of an ordinary quadruped. We have just inspected a new species of this genus from Western Africa; the head of which is here represented of its natural size. (fig. 31.). We propose for it the name of *P. megacephalus*.*

(112.) On the internal arrangement of this extensive group we must be very brief; first, because our space precludes the possibility of treating every family in such detail as the three last; and, secondly, because a circular and quinary arrangement† has already been made of the bats, which—although we have neither had the time nor the opportunity of verifying by those tests elsewhere explained—appears to preserve many important relations, and to be grounded upon those characters which from theory we should have chosen: we cannot, therefore, do better than adopt Mr. Gray's arrangement, as much more natural than that of M. Cuvier. We may possibly investigate this family hereafter more fully; for the present we shall merely glance at a few of the general characters.

(113.) The great family of bats, although strikingly distinguished from all other quadrupeds, both in form and economy, nevertheless present us with numerous modifications of structure, slight, indeed, to the casual observer, but sufficient to occasion a great number of systematic divisions. It will be unnecessary to describe the general structure of an animal so well known. The bat may be truly termed a flying quadruped, moving in the air, and performing all the rapid evolutions of the swallow with as great swiftness and dexterity, although the structure of its flying apparatus is totally different. They afford us one of those innumerable proofs that Nature is constantly exhibiting to our admiration, of the different modes by which she accomplishes the same object. No sooner does the di-

* *P. megacephalus*. Above, deep fawn colour; beneath, paler; a conspicuous white spot at the base of the ear; tail none; total length, 6 in. expanse, 15. tarsus, $1\frac{4}{10}$ in.

† Zoological Journal,

urnal family of swallows retire to rest, and with them those particular tribes of insects upon which they feed, and which fly only during the day, than those twilight wanderers, the goatsuckers and the bats, emerge from their dark retreats; at the same time a host of nocturnal insects, which have also lain dormant during the noontide hours, commence their flight, and are thus destined by nature to supply food to their natural enemies. Now the effect, in both instances, is the same; for the insect world is kept within due limits, while life and enjoyment is given to innumerable living beings, formed and created for particular times and seasons. Bats and swallows catch their prey only upon the wing; and their evolutions are so similar, that, but for the time of day at which they respectively appear, it would be totally impossible to discriminate the one from the other during flight. The general form of the bats, when placed upon the ground alive, may be judged of from that of *Plecotus barbastellus* (fig. 32.): the wings are



closed, and the small nail with which they are furnished acts as a claw, and enables them to crawl, but with slowness and dif-

ficulty. Bats, like insects, are spread over the whole world, with the exception of New Holland, from whence we have hitherto not received any, although they appear to be very common in the island of Timor. The greater number are of a small size; but from India and Madagascar are brought others as large as a kitten, with proportionably long wings: these are the famous Vampire bats (*Pteropus* Bris.), called by the French *Roussettes*. The only species whose habits we are acquainted with, is the *Pteropus Javanicus*, of which Dr. Horsfield has furnished us with a most interesting history. Many of these larger bats, contrary to the

general belief, feed entirely upon fruits. In many parts of India they are the most dreaded of all poachers, attacking, in societies, the choicest fruit trees. Several of the Brazilian bats are likewise frugivorous, and to such a degree, that we remember never having been able to secure a ripe fig from a garden we possessed at Pernambuco, and where many of these trees grew: nets, indeed, were spread over them, but the cunning animals seemed to have the instinct of mice; they crept under the smallest opening, and completely baffled our endeavours to stop their plundering. Others again, in the same regions, verify much of what has been said regarding the Vampire. However incredible it may appear, it is well known to those who have been in tropical America, that the bats are constantly in the habit of attacking animals during the night, and sucking their blood. Our own horses and mules, on many occasions, after having arrived at the end of the day's journey, and been turned out to graze, would be brought in by the guides in the morning with their shoulders and haunches covered with blood: neither is it an uncommon thing for these real Vampires to enter the habitations of the natives, and fasten upon the legs of some incautious sleeper who has not snugly secured his feet beneath the coverlid. Stories, indeed, are told of these unconscious sufferers having been bled so profusely as to have died, but we never could ascertain the fact, nor did we ever suffer from the visits of these midnight phlebotomists.

(114.) The geographic distribution of most of the genera appears to be very regular, certain groups being characteristic of particular continents. Mr. Gray having paid much attention to the natural affinities of these animals, we shall here enumerate the peculiar characters by which he distinguishes the sub-families; referring the reader to the systematic portion of the volume for an enumeration of the genera.

(115.) It may be here mentioned, that a considerable number of bats are provided with a naked leaf-like

appendage to the nose (*Phyllostoma*, fig. 33.), which is apparently for the purpose of adhering more firmly to the animals or fruits they suck. Mr. Gray has rightly estimated the importance of this organ, by considering it as the primary or typical character of the family. Now,

this view is fully supported by what we should have decided upon from theory. The bats, in our arrangement of the *Quadrumana*, occupy that station which we have elsewhere assigned to the suctorial type of the insessorial birds, and all their analogies in the animal kingdom. Mr. Gray, having come to the above conclusion from analysis, gives us an additional and disinterested confirmation of what has already been stated on this type, and we may thus exhibit the primary divisions of our author, condensed into the following table:—

VESPERTILIONIDÆ (Gray) — The Bat Family.

1. Typical.	{ Nasal appendages complicated, membranaceous; index finger of one joint; wings large and broad. }	RHINOLOPHINÆ.
2. Sub-typical.	{ Nasal appendage, simple, fleshy, solitary, or double; the index finger of two joints. }	PHYLLOSTOMINÆ.
	No appendage.	
	{ Grinders bluntly tubercular; index finger 3-jointed, clawed; head long, hairy; tail often wanting. }	PTEROPINÆ.
	{ Grinders acutely tubercular; index finger 2-jointed; wings long, narrow; head short, blunt; lips very large. }	NOCTILIONINÆ.
3. Aberrant.	{ Grinders acutely tubercular; index finger 1-jointed; wings large, broad; tail long; head long, hairy; tongue short; lips simple. }	VESPERTILIONINÆ.

(116.) In this "Sketch" Mr. Gray merely notices the names of the genera which enter into each; and we have only to regret that their internal affinities have not received that full attention which we hope the author will ultimately bestow upon them. The excessive shortness or total absence of the tail in the *Pteropinæ*,—a peculiarity which is universal in one of the aberrant divisions; and the great comparative length of the same member in

the *Vespertilioninæ*,—a structure which almost constantly indicates the rasorial type of birds; are two circumstances strongly indicative of the accuracy of the above arrangement, more especially as they never were considered when it was drawn up, for the theory of variation * was then unknown.

(117.) There is yet another primary type necessary to complete the circle of the quadrumanous animals, and it is that which we have elsewhere distinguished as the natatorial; but of such an animal we have only vague and indefinite accounts. It will be seen that, throughout the whole class of quadrupeds, the aquatic types are remarkably few, and in general scarce; and that they contain fewer forms or examples than any other, and are often, in the smaller groups, entirely wanting. To account for this is altogether impossible; we can only call attention to the fact, as exemplified in the aquatic order of *Cetacea*, in that of the *Feræ*, in the *Pachydermata*, in the circle of the *Glires*, and in all the remaining natatorial types of the different circles of quadrupeds. We do not implicitly believe in the existence of mermaids as described and depicted by the old writers—with a comb in one hand and a mirror in the other; but it is difficult to imagine that the numerous records of singular marine animals, unlike any of those well known, have their origin in fraud or in gross ignorance. Many of these narratives are given by eye-witnesses of the facts they vouch for—men of honesty and probity, having no object to gain by deception, and whose accounts have been confirmed by other witnesses equally trustworthy. Can it be supposed that the unfathomable depths of ocean are without their peculiar inhabitants, whose habits and economy rarely, if ever, bring them to the surface of the watery element? As reasonably might a Swiss mountaineer disbelieve in the existence of an ostrich, because it cannot inhabit his Alpine precipices, as that we should doubt that the rocks and caverns of the ocean are without animals destined to live in

* See Geography and Classif. of An. p. 296.

such situations, and such only. The natatorial type of the *Quadrumana*, however, is most assuredly wanting. Whatever its precise construction may or might have been, it would represent and correspond to the seals in the circle of the *Feræ*, or rapacious quadrupeds; while a resemblance to the *Simiadae*, or monkeys, must be considered an essential character of any marine animal which is to connect and complete the circular series of types in the *Quadrumana*. That some such animal has really been created, we have not the shadow of a doubt; and we have recently been confirmed in this belief by accidentally meeting with the following description in Shaw's *Zoology*, of a strange creature there called, after Pennant, the sea-ape manati. "This species (?) is only known from the description of Steller, who, near the coast of America, saw a singular animal, which he chose to name a *sea ape*. It was about five feet long, with a head like a dog's; the ears sharp and erect, and the eyes large; on both lips it had a kind of beard; the form of the body was thick and round, but tapering to the tail, which was bifurcated, with the upper lobe longest; the body was covered with thick hair, grey on the back, and red on the belly. Steller could not discover any feet or paws. It was full of frolic, and sported in the manner of a monkey, swimming sometimes on one side of the ship and sometimes on the other, and looking at it with much seeming surprise. It would come so near the ship that it might be touched with a pole; but if any one stirred, it would immediately retire. It often raised one third of its body above the water, and stood upright for a considerable time; then suddenly darted under the ship, and appeared in the same attitude on the other side: this it would repeat for thirty times together. It would frequently bring up a sea plant, not unlike a bottle gourd, which it would toss about and catch again in its mouth, playing numberless fantastic tricks with it." Now, upon this statement it may be observed, that Steller, as a traveller and naturalist, is held in good

estimation. He must have been well acquainted with the seal, the only animal that can well be confounded with this sea ape; and was not, therefore, likely to be deceived, even had its appearance been more transitory. The time may yet come, in all probability, when new light may be thrown upon this interesting question. In the mean time, we profess our belief that no perfect circle in nature is without a natatorial type, and that no such type can be assigned to the *Quadrumanæ* from any of the aquatic quadrupeds already defined in our systems.

CHAP. II.

ON THE FERÆ OR RAPACIOUS ORDER OF QUADRUPEDS. — THEIR NATURAL AND SCIENTIFIC CHARACTERS, AND THE PRIMARY GROUPS OR FAMILIES INTO WHICH THEY ARE DIVIDED.

(118.) THE restricted limits of one volume, and the comparatively small extent to which an individual can prosecute analysis, in a field wherein it may be almost said he is the sole labourer, are insurmountable obstacles to that fulness of detail and of illustration with which we should desire to treat the order now before us. The natural arrangement of the different groups of the *Mammalia*, in its details, has never yet been laid before the public; and the slight attempt that has been made to point out the succession of the primary divisions * is, in our opinion at least, unsuccessful and erroneous. We have been particularly interested in the *Quadrumanæ*, as their arrangement involved a question of much higher importance — the station of *Man* in the scale of being. But it will be impossible, for the above reasons, to illustrate the subsequent orders in the same way. We

* Linn. Trans. vol. xvi.

shall, however, give the result of our latest investigations in each group; depending, for such details of structure, as we cannot personally vouch for, to the best modern authorities; pointing out, incidentally, those analogies which have not been worked out, and exhibiting such as are the result of analysis. In the order now before us, one of the most varied and intricate among quadrupeds, we shall venture to designate the families and the genera, leaving the circular series of their succession for the most part undetermined.

(119.) The quadrupeds composing this order are all more or less carnivorous, that is, they live upon the flesh of other animals, either killed by themselves or otherwise. We retain the original name of *Feræ* bestowed upon them by Linnæus, which has been changed, without necessity, to that of *Carnivora* by Cuvier; and we do this the more readily, because the former had much more correct ideas on the true nature of the animals composing it than had the latter. M. Cuvier has burdened this order with the *Vespertilionidæ*, which Linnæus plainly perceived belonged to the *Quadrumana*, a fact now established upon the most solid basis. Rapacious quadrupeds, as just remarked, are those which subsist upon animal food; and the degree of their carnivorous habits is indicated by the grinders being more or less sharp or cutting. On the other hand, such as have their grinders in any degree tuberculated, feed proportionably upon vegetables; while those which have them bristled with conic points, principally subsist upon insects. The articulation of their lower jaw, directed crossways, and clasping like a hinge, precludes a horizontal motion. Their brain, although somewhat furrowed, has no third lobe, nor does it form a second covering for the cerebellum in these animals, any more than in the succeeding families; the skull is narrow, and the zygomatic arches are elevated, while, to give more volume and force to the muscles of the jaws, the orbits of the eye are united to the *fossa temporalis*. In these

animals the predominant sense is that of smelling ; and the pituitary membrane is usually extended over very numerous bony laminæ. Their anterior extremities, or feet, can turn, but with less facility than those of the *Quadrumana* ; from which, moreover, they essentially differ in that claw which represents the thumb not being opposite the others, but directed forwards. As these animals chiefly subsist upon flesh, their intestines are comparatively small, suited to the nutritive nature of their food, and to avoid the putrefaction that flesh would undergo if it remained for any time in an elongated canal. In other particulars, concludes M. Cuvier, "they vary considerably both in their forms and organisation," and produce analogous varieties in their habits to such a degree as to render it impossible to arrange their genera upon a single scale." * This open and unequivocal admission that natural groups, or series, cannot be "represented upon a single scale," is surely enough to set the matter at rest with those who are led by great names, rather than by simple facts, to disbelieve some of the most palpable truths in physical science.

(120.) A general idea of the animals arranged in this order will now be given. It comprehends, then, the whole race of ferocious quadrupeds, as the lions, tigers, panthers, and tiger cats, together with the stoat and weasel families ; the wolf, dog, and fox, among land animals, and the otters among those which frequent the water. The whole family of bats, placed by M. Cuvier in this assemblage, we have removed to the *Quadrumana*, among which they were originally placed by Linnæus. The series terminates with the seals, and wallrus. This intimation of the animals composing the *Ferine* order will be sufficiently comprehensible to the general reader ; but we must now address ourselves to the naturalist.

(121.) Our investigation of the order *Feræ*, as before intimated, has not yet been carried to such an extent as will comprehend the location of all the genera ;

* Griff. Cuv. ii. 2.

and until that has been accomplished, we shall venture only to designate the tribes and families, or, in other words, the primary divisions. The typical section of the whole order, as every one knows, is that which includes the most ferocious of all quadrupeds, and which are generally denominated cats (*Felidæ*): here we have, in the lions, tigers, and leopards — the tyrants of the brute creation — animals of the most sanguinary disposition, uniting great size with enormous muscular strength. Many of these characters are found in the hyænas and the dogs, which by their organisation clearly belong to, and form a part of, the same group. Closely allied to these, yet differing essentially from them in many particulars, are the *Mustellidæ*, or weasels; a small, but, for the most part, an equally destructive race, which live more upon birds and other smaller game, passed over by their more powerful congeners: their body is very long, their snout more lengthened, and their size comparatively diminutive. In the gradual change, however, which takes place from the weasels to the polecats, the gluttons and the badgers, these typical peculiarities become greatly modified, until at length we reach the bears — the last group of strictly rapacious quadrupeds, and where we find a carnivorous and a vegetable diet united. The bears thus stand at the extreme confines of the group we have been indicating, while at the same time they conduct us, by means of two or three very singular genera, to the *Didelphidæ* or carnivorous opossums; where, with much of the shape, and many of the characters, of the weasel, we find a great development of tail, either in regard to its length, form, or use; when to this typical distinction we add that of many possessing a marsupial pouch, and all exhibiting the carnivorous structure in their teeth, there will be no danger in confounding the rapacious marsupial quadrupeds with those which are strictly and entirely herbivorous. The division which next succeeds, we shall name *Soricidæ*, on account of the genus *Sorex*, or shrew mouse, constituting, in our

opinion its pre-eminent type: this group corresponds to the insectivorous division of the *Carnivora* of Cuvier, and comprehends all those small mouse-like animals which possess teeth adapted for devouring flesh, in opposition to their representatives in the order of *Glires*, whose teeth are formed only for gnawing. The last division of the *Feræ*, in accordance with what we have already observed upon natatorial types, includes but few genera and species, all of which are aquatic. It is composed of the seals and wallruses, whose sanguinary habits are carried on in the sea with as much ferocity as those of their congeners upon the land. From the paucity of examples belonging to this type, it naturally appears, and doubtless is, more isolated, than any of those we have enumerated; but all writers have placed them, apparently with justice, in this primary division of the *Mammalia*, and our investigations lead us to believe that such is their true station in the natural system.

(122.) On assembling the above groups into a table, we may briefly state the primary divisions of the order in the following manner:—

Order, FERÆ — Beasts of Prey.

	Typical Characters.	Families.
I. Typical group.	{ Large muzzle, short and round; claws retractile; no small teeth behind the lower molar.	{ FELIDÆ.
II. Sub-typical group.	{ Small, body long, muzzle somewhat lengthened, feet short.	{ MUSTELLIDÆ.
III. Aberrant group.	{ Tail long, bushy, or prehensile; body sometimes with a marsupial pouch. { Small; snout lengthened, pointed; feet very short, tail naked. { Marine, hinder feet fin-shaped.	{ DIDELPHIDÆ. { SORECEIDÆ. { PHOCIDÆ.

(123.) We shall first endeavour to point out the affinities by which this group is connected to the order *Quadrumanæ* on the one hand, and to that of the *Cetacea*, or the aquatic *Mammalia*, on the other. This done, the relations by which they find their representatives in other groups of animals will be a subject of interesting inquiry.

(124.) On looking to the animals placed by modern zoologists in the lemur family, we observe two, which depart so much from the structure of those with which they have been associated, that suspicions are excited as to their real station, and they must either be viewed as indications of the order which next succeeds, or as instances of the strong analogy by which these orders are represented. The animals we here allude to, as having been placed with the *Lemuridæ*, are, the Madagascar squirrel, or *aye-aye* of the French, and the potto, forming the genus *Cercoleptes*. The first of these have alternately been arranged either among the lemurs or with the squirrels, and its relation to both has been considered so strong by Mr. MacLeay, that upon this one circumstance, as it would appear, he rests his theory of the union of the *Quadrumanæ* and the *Glires*. M. Cuvier, however, has expressed a different opinion; and without denying the peculiarities in the structure of the *aye-aye* which likens it to the lemurs, he considers its true affinities to be with the squirrels. After much consideration on the opposite tendency of these opinions, we have, for the present, embraced the latter. We admit that the teeth of a quadruped does not, invariably, point out its station in nature; but when we see such a marked and decided difference between those of the lemurs in general, and those of the *aye-aye*, we must confess that the dissimilarity is too great to admit of being considered an affinity. Upon this, and various other grounds, we follow M. Cuvier in placing this singular animal among the *Glires* (*Rodentia* Cuv.);

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and we have now only to consider the other animal above alluded to, namely, the potto (*Cercoleptes caudivolvulus*, fig. 34.). This singular quadruped is a native of tropical America; and not only in

its aspect, but in its general structure, has so much the appearance of a lemur, that nearly all modern

zoologists have placed it within, or adjoining, the confines of that family. Like them it has a very long hairy tail, which is moreover prehensile; it is a nocturnal animal with large eyes, and seems naturally to feed upon vegetables. It climbs, like a lemur, with agility; and Humboldt affirms it to be a great destroyer of wild bees' nests, which it opens for the sake of feasting upon the honey. On comparing the teeth of this animal with those of the lemur, it will be perceived that there is a much greater resemblance between the two, than there is between those of the lemur and the aye-aye; although, in the former comparison, sufficient difference exists to exclude the potto from the circle of the *Lemuridæ*. Baron Cuvier places the genus *Cercoleptes* close to the badgers, yet implying doubts as to this being its true situation; but his brother Frederic, with more judgment, looks on it as a passage from the lemurs to the *Feræ*, although he thinks that its essential characters are different from either.* In this opinion we perfectly coincide, because it is not only supported by facts of structure, but by other important considerations which bear upon the question. From *Cercoleptes* there is no difficulty in our passage to the *opossums* through *Paradoxurus* and *Dasyurus*; so that the affinities between the orders of *Quadrumanæ* and *Feræ* are uninterrupted by any thing known, and are found to be in union with that law of nature which invariably unites the typical with the sub-typical group. As to the connection of the *Feræ* with the cetaceous or aquatic order, little need be said; for the seals lead us directly to the *Manatus* or sea cow, which thus brings the two groups in immediate contact.

(125.) Let us now see in what manner the groups of the *Ferine* order represent those of the *Quadrumanæ*. Both are circular groups: but the one may be considered perfect, inasmuch as all its primary types are known; while the latter is obviously imperfect. By bringing these

* Des Dents des Mammifères, p. 31.

circles together, we shall be able to refer to their mutual relations with greater facility.



The apes and the lions, as typical of their respective circles; show us the greatest perfection in these two different models of structure, and they are consequently analogous; while the *Cebidæ* and the *Mustellidæ* are placed by all writers immediately after their respective types, as exhibiting a diminished development of the same properties. The *Lemuridæ* constitute the rarsorial group of the *Quadrumanæ*, by their frugivorous food, their gentle manners, small heads, and bushy tails; the same station is held by the *Didelphidæ* in the circle of the *Feræ*, among which they are distinguished by their long tails and semi-frugivorous food: the potto, as already remarked, seems to connect the two. The long hinder legs of *Otolicnus* among the lemurs, is completely analogous to those of the frugivorous marsupials; and *Didelphis* again preserves its analogy to the kangaroos, by having a similar pouch. Further confirmation of these direct relations may be discovered in the ornithological circle, where we have the great-footed genera of *Menura* and *Megapodius*, equally representing *Otolicnus* and *Didelphis*. The relations of the shrew mice to the bats are equally strong; for, setting aside the wings of the latter, both have the same general aspect, and both are the smallest and the most remote from their respective types. Lastly, the situation of the *Phocidæ*, which every systematist places close to the cats, leaves it beyond all reasonable doubt that the aquatic type of the *Quadrumanæ* is either extinct or undiscovered.

(126.) On proceeding to a rapid survey of each of the families into which we have divided this order, we shall make no attempt either to arrange all the genera and sub-genera in their natural series, or to demonstrate the circularity of each family. A task of so much difficulty and labour as the complete analysis of the class of quadrupeds can only be accomplished by the united labours of several experienced naturalists, and after a lapse of years. In venturing to lay before the public for the first time the affinities and analogies of so many groups as will be found in this volume, we trust to have laid a good foundation for a natural arrangement of this primary division of the animal kingdom; the rest must be cautiously elaborated by slow degrees, and can only be completed by different naturalists working simultaneously upon different portions. As the technical characters of the groups or genera will be given in the synopsis at the end of the volume, our present notices will be more of a general than of a barely scientific nature.

(127.) Commencing with the *Didelphidæ*, we perceive that this family serves to unite the very dissimilar orders of *Quadrupedæ* and *Feræ*; and it consequently follows that, before nature could pass from one to the other, with her accustomed harmony, many diversities of form must be exhibited. This is sufficient to account for the somewhat indeterminate character of the



family before us — connecting, as it appears to do, the typical ferine quadrupeds with the shrew mice (*Soricidæ*) and with the lemurs. Of the potto, forming the genus *Cercoleptes*, we have already spoken; and we shall now notice another genus (*Arctictis* Tem.), also possess-

ing a powerfully prehensile tail. Of this there are two species, natives of India: one (*A. albifrons* F. C.) about

the size of a large cat; the other (*I. ater*, fig. 35.) entirely black, and as big as a dog. The head and muzzle of these animals are unusually small; and the latter, although short, is pointed: the whiskers are very long; and the ears, like those of the lynx, terminate in tufts of hair; all these circumstances give to the head a very peculiar character. Sir Stamford Raffles, under the name of *Benturong** has given us some interesting particulars of the *Artictis albifrons*. He expressly says that the tail is bushy and prehensile; the gait of the animal low and couching; the body long and heavy, and the legs low; while the tail, which is thick at the root, gradually diminishes in size to the extremity, where it curls upwards. It climbs trees, assisted by its prehensile tail, in which it has uncommon strength. Major Farquhar kept one alive many years, and it lived both on animal and vegetable food; its movements are slow, and its disposition rather timid; it sleeps much during day, but is more active at night.

(128.) The panda, forming the only example of the genus *Ailurus*, has been discovered only of late years, in the mountains of India. It has been termed the most beautiful of all known quadrupeds, yet this beauty certainly does not consist in its shape, which, from the figure



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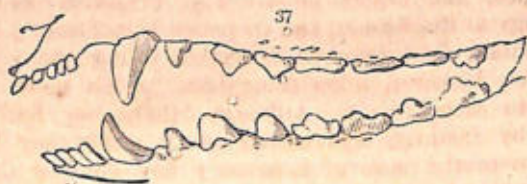
given by F. Cuvier, is remarkably thick and heavy: its size seems to be that of a large cat; the head (fig. 36.), no less than the body and tail, is covered with thick-set fur, soft and shining; but the tail is not prehensile. Whether this animal leads to the *Racoons*, or whether these latter belong more

properly to the bears, are questions which need not here be discussed; Cuvier has placed them together,

* Linn. Trans. 13.

and we may, for the present, follow his example. The racoons, except in their longer tail, and comparatively diminutive size, might be taken for small bears; and as such they were considered by Linnæus. At all events, it is obvious we have now reached one of the aberrant groups of the *Didelphidæ*, and it is time, therefore, that we noticed the more typical genera.

(129.) The carnivorous marsupials, or the opossums properly so called, constituting the genus *Didelphis* as first characterised by Linnæus, are distinguished at once from all the other ferine genera, by possessing an abdominal pouch, wherein the young are contained and secreted in time of danger. The strong canine teeth in both jaws, seen in the *Didelphis cancrivora* (fig. 37.) will



show at once the difference between the carnivorous and the frugivorous opossums. We shall have occasion, hereafter, to describe this very peculiar structure; and, therefore, shall merely remark that it has been given to various animals of very opposite habits and structures; but which, with the exception of the true opossums, are



all inhabitants of the Australian range. Of these American marsupials, which are decidedly carnivorous, there are several species, of which the common or Virginian opossum (fig. 38.) is the best known. In size it is equal to a cat; and, like the rest of its immediate congeners, it appears to be a nocturnal feeder, and to have much of the

habits of the weasels : it frequents barns and farm buildings, for the purpose of killing the poultry, and sucking the eggs; yet the opossums feed also upon fruits: their smell is fetid, and their motions slow. These, with the genus *Chironectes* of Illiger, are characterised as having long canines and small incisors in both jaws and the hinder grinders bristled with points; a denotation, in short, which is intermediate between that of the *Mustelidæ* and the *Soricidæ*: the thumb of the hinder feet is opposite, but it has no nail. In that curious and very rare animal the *Chironectes palmata*, or web-footed opossum, the toes are palmated. There seems, however, to be two distinct groups, even among the opossums of America; for some of them have pouches, and others none. The Virginian opossum belongs to the former, and its pouch is sufficiently large to contain from fourteen to sixteen young ones; they do not, however, upon being born, weigh more than a grain each (Cuv.). Although blind, they find the teat by instinct, and adhere to it until they have grown to the size of a mouse; nor do they desert this natural cave, in the body of their mother, until they are as large as mice. The *Didelphis dorsigera*, on the other hand, is destitute of this receptacle, and carries it young upon its back; all the tails of these little ones, for greater security, being twisted round that of the mother. We thus see the last indication of the prehensile tail in this family consists in its being so used only when the animal is young; for there is no evidence to show that the tail of the mother or of the adult animal possesses this property.

(130.) That the distinctions of the carnivorous marsupials may be better understood, their structure will be here noticed more in detail. The *anatomical characters* of the opossums consist in their having ten incisors above, the middle ones a little longer than the rest, and eight below. Three of the anterior grinders are compressed, while the four posterior ones are bristled with

points, the upper of which are triangular, and the lower oblong: the total number of all is fifty, a number much greater than is possessed by any other genus of true quadrupeds. The tongue is rough and bristly, while the tail is prehensile and partly naked. The thumb of the hinder foot is long, and considerably detached from the other toes. These animals have a very wide gape, which, joined to their large naked ears, gives them a very peculiar aspect; the stomach is small and simple, and the cæcum of moderate size. The habits of the genus *Cheironectes*, further than that it is an aquatic animal, are totally unknown.

(131.) The *Dasyuri*, or brush tailed opossums



(fig. 39.) naturally constitute part of the ferine order: like those just noticed, they are also omnivorous quadrupeds, feeding both upon flesh and fruits: the grinders are consequently cutting and pointed, but the number of these teeth are four less in each jaw than in the American opossums; the upper incisors also are only eight, and the lower ones are but six, leaving two less in each jaw than what are seen in the last genus. In other more general characters, these two groups of animals show an obvious affinity; but the brush-tails are destitute of a true thumb to the hinder feet, the rudiments of which are only seen, like a tubercle; and being without any prehensile power in their tail, they cannot, like the opossums, pursue their prey among the branches of trees. During day, they are said to remain concealed in the dark recesses of rocks or of trees; issuing forth at the approach of twilight in search of smaller and weaker

quadrupeds, birds, and fruits. Some are said to prey habitually upon the dead bodies of seals, and of such cetaceous animals as are thrown and left upon the shore. Authors have generally placed with these Australian species another carnivorous marsupial, the dog-faced *Dasyurus* of authors; but we have no hesitation in excluding it from the family we are now reviewing, more especially as our views are supported by the valuable details on its anatomy published by professor Temminck: whether the ursine brush-tail (*Dasyurus ursinus*); and the sub-genus *Perameles*, really belong to our present group, is somewhat uncertain: the first, as its name implies, reminds us of a bear, by being clothed with long shaggy hair; while the latter is remarkable for having a snout so long as to be called a badger by the colonists: the thumb on its hinder feet is very small; while the tail, unlike all the other *Dasyuri*, is so short as scarcely to exceed five inches in length.

(132.) The only remaining genus which appears to enter within the confines of this family is that of *Cladobates* the *Tupaia* of Sir Stamford Raffles, by whom it was first described.* The two species already made known are small squirrel-looking animals, but with a much more lengthened muzzle; and this latter character is

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greatly developed in the *T. Tan* (fig. 40.)

The whole structure of this curious genus is evidently intermediate between the family of shrews (*Soricidæ*) and that in which we have here placed it; while its analogy to the genus *Tarsius* and *Sciurus* is at once explained by the theory of representation: its station among the *Di-*

* Although the French collectors he employed during his researches in India have taken upon themselves the credit of this and numerous other discoveries of our illustrious countryman.

delphidæ being precisely analogous to that which is respectively held by the lemurs and the squirrels in their own circles. According to these views, *Cladobates* is a squirrel among the opossums, and adds another fact tending to show that the *Didelphidæ* is the rarsorial type of the *Feræ*.

(133.) The shrew mice stand at the head of the *Sorecidæ*, the second aberrant family of this order; and which corresponds, without any variation, to the *Insectivora* of Cuvier. We should have retained this latter name to the group, were it not highly expedient to preserve a uniformity of nomenclature throughout the animal kingdom; and one of the first rules now acted upon is to name every family from the typical genus by which it is represented. We enter, then, among these carnivorous mice by the very singular genus *Gymnura**, which has been correctly stated to possess the closest affinity to *Cladobates*, and also to bear a strong resemblance to *Didelphis*. M. Cuvier is of the same opinion, and adverts to its affinity with the shrews as seen in its pointed snout and scaly tail; there are five toes to each foot; and although the hairs of the body are woolly, they are interspersed with stiff *setæ*, or bristles. He has failed, however, to remark that these bristles point out another and a very important link of connection, namely, to the *hedgehogs*; close to which, indeed, M. Cuvier has arranged this interesting genus.

(134.) But before we proceed further into details, it will be necessary to take a general review of the contents of this family. — The *Sorecidæ*, like the bats, have the grinders furnished with conical points; but they are destitute of wings or lateral membranes, and they possess clavicles: they have no cœcum, and they all press the entire sole of the foot on the ground in walking. In their economy they are nocturnal, leading for the most part a subterranean life, and deriving their prin-

*Zool. Journ. vol. iii. pl. 8. p. 248.

cial support from insects : those that are natives of cold countries pass the winter in a lethargic state : their feet are short, and their motions, when on the surface of the earth, slow and feeble. M. Cuvier divides them into two small families — the shrew mice and the moles — distinguished by the position and the relative proportion of their cutting and canine teeth. The first of these have two long incisors or cutting teeth in front, followed by other cutting and canine teeth, all shorter than the molar. This kind of dentation, observes our author, of which the Tarsier lemurs have already furnished us with an example*, approximates these animals in some degree to the *Glires* of Linnæus. We have quoted these remarks from M. Cuvier, in order to show how essentially they tend to confirm the views already expressed on the analogies of this family. M. Cuvier's opinions are thus seen indirectly to favour the natural analogy between the *Sorecidæ*, *Tarsius*, the *Glires*, and the *Vespertilionidæ*, each of which truly represents the other in their respective circles. In the moles there are four large canine teeth, separated from each other, between which are small incisors ; an arrangement more in unison with the general dentation of the *Quadrumana* and the *Carnivora*.

(135.) The contents of the group, thus generally characterised, will now be more particularly noticed. The hedgehogs are well known by their prickly spines, and by the remarkable property they possess of rolling themselves into a ball when disturbed. The genus *Gymnura* will probably connect them either with *Cladobates*, or this latter animal may come in between the shrews and the hedgehogs : for our present purpose, however, this question is not material. We only know of two species of *Erinaceus*, both inhabitants of Europe and Asia. The shrews (*Sorex*) are more numerous, and, with but two exceptions,—one of which is the *Sorex indica*

* This observation strengthens our belief that *Tarsius* is the gliriform type of the genus *Otolienus*. See page 87.



(fig. 41.)—are likewise peculiar to the European continent. They are remarkable for having on each flank, under the ordinary skin, a little band of stiff and close hairs, from which

an odoriferous humour can be distilled. They dig holes in the earth, which they seldom quit until the evening, when they search for insects and worms. The desmans (*Mygale*) are also European animals, restricted to the mountains of Russia and the Pyrenees. These curious creatures very much resemble the shrews, from which they chiefly differ in their teeth. The muzzle is very small and flexible, and the animal is continually moving it about; a fact in which we trace an interesting point of analogy between this group and the genus *Nasua*. The toes are palmated, as suited to their aquatic habits; for they live in burrows commenced under the water; yet they work upwards in such a manner that the termination of their burrow is always above the level of the water. One species derives its name of musk rat from a secretion, possessing that odour, placed under the tail. The *Scalops* of America seems to represent either these animals, or the moles in the New World. There is but one species, the Canadian scalops, having the slender muzzle of the shrews, and the large, strong-nailed feet of the mole. Lastly, we find in Africa a representation of this little group in the genus *Chrysochlorus*, the only quadruped which presents us, in its glossy fur, with those beautiful metallic shades so common among birds, insects, and fish; in some lights the fur is green, in others golden orange, and this again changes into bronze; its size is rather less than that of the mole, and it has no canine teeth.

(136.) The second division of the family is composed of mole-like animals, apparently connected to the shrews by the American *Scalops* and the African *Chry-*

sochloris. It includes but three genera, composed, like the former, of nocturnal and subterranean species, differing but little from the shrews, except in the arrangement of their teeth. The tendrics (*Centenes* Ill.) are in fact hedgehogs, having the body covered in a similar manner by prickles, but without the faculty of rolling themselves up in a ball. These animals are peculiar to Madagascar, and seem as capable of domestication as their European congeners. Although inhabiting a warm region, they are said to pass three of the warmest months of the year in a state of torpidity: this, it must be owned, is a singular circumstance, and is the only one upon record of an animal hybernating, so to speak, in the height of summer. In other respects they feed like the European hedgehog, and are nocturnal animals. The genus *Talpa*, or genuine moles, follows next; of this there is, in fact, but one species, common in every part of Europe except in Ireland and Greece. The aspect of this curious animal would strike a superficial observer as not only forbidding, but as intimating that Nature had left her work imperfect: it has thick and clumsy feet, and an eye so very minute that its existence was for a long time held in dispute. When, however, we reflect on the peculiar habits of the mole, and then compare its general structure with the functions necessary to be performed, we are filled with admiration. The mole, in fact, is the perfection of subterranean quadrupeds, for it lives almost exclusively beneath the surface of the ground, where it feeds chiefly upon worms and insects. As it burrows with amazing facility, the structure of the fore feet are beautifully adapted for this purpose: they unite the offices of a pickaxe and of a shovel; the long powerful nails breaking the earth, while the broad sole of the foot acts like a spade to push away the loose earth: all the force of the animal is required for this office, and hence the muscles of the forefeet are enormous; while the hinder feet, not being necessary for excavating, are comparatively small and weak. The mole is directed solely to its prey by smell

and sound; we therefore see these organs fully developed: the tympanum of the ear, indeed, is remarkably large; but as the external appendage, so necessary with animals that live on the surface, would, in this, be unnecessary, it is not present: lastly, the organs of vision, as being almost superfluous to an animal which lives in the dark, are therefore merely indicated by two little specks; and these are so well protected by the soft downy hair of the face, that no particle of earth can possibly enter them, and distress their possessor. Take the mole from the ground and place him on the surface, and his motions indicate pain, and almost an incapacity of walking; he is, in fact, placed in an element he was never intended to inhabit; but the moment he can break away the surface, he is all life and activity. The American moles form the genus *Condylura* Ill. Their habits are probably very like ours, but they are distinguished by having the nostrils surrounded by small radii, which are moveable, so that, when viewed in front, the tip resembles a star; hence their name of star-nosed moles. Cuvier doubted the existence of the long-tailed species, but Dr. Richardson subsequently received a skin from North America, and has minutely described it: a beautiful etching by Landseer is also given in the *Fauna Am. Bor.* vol. i. pl. 24.

(137.) The amphibious or aquatic division of the ferine order is the last of the aberrant groups, and is composed only of the seals and walrus. As they live entirely in the sea, their whole structure is consequently adapted for swimming: the feet, in fact, are so short and so much confined, that upon the ground they can be used for no other purpose than to crawl with difficulty; yet, as the intervals between the toes are occupied by connecting membranes, the feet become excellent oars. The seals, accordingly, pass the greatest part of their life in the sea, visiting the land only to rest themselves and bask in the sun, or to nurse their young ones. Their elongated bodies, the great mobility of their spine, and the strength of the flexor muscles, their narrow

pelvis, their hair smooth and tightened, as it were, against the skin, are properties which, combined together, are admirably calculated to make them excellent swimmers. Their internal anatomy confirms this opinion, and points them out as the most aquatic race of four-footed quadrupeds in existence. They may be divided into two leading groups, generally termed *seals* and *morses*.

(138.) The Seals (*Phocidæ*), although smaller in size, are much more varied in form and species than the others. The head, observes M. Cuvier, resembles that of a dog, and they likewise possess the kind and intelligent expression of countenance peculiar to that animal. They are, in fact, easily tamed, and soon become attached to those who feed them. They live entirely upon fish, which they devour in the water: when diving, they can close the nostrils, by means of a particular valve. The common species (*fig. 42.*) is typical of the group.



The zoological characters of the seals are chiefly drawn from their teeth. The incisive or cutting series are from four to six above, and four below; the canine teeth are pointed; and the grinders, to the number of from twenty to twenty-four, are trenchant or conic, without any tubercles, but always furnished with several roots. Each foot has five toes: those on the forefeet decrease gradually from the thumb, or great toe, to the little one; while, on the contrary, the great and little toes on the hinder feet are the longest, the intermediate ones decreasing in size. The forefeet are enveloped in the skin of the body as far as the wrist, and the hinder ones nearly as far as the heel. The tail is short, while

the tongue is smooth ; the stomach simple, the cæcum short, and the canal long. In the liver is 'a large venous sinus, which assists the seals in diving,' by rendering respiration less necessary to the circulation of the blood : this latter fluid is very abundant, and extremely black.

(139.) Seals are found in all parts of the ocean, but more especially in the Southern Pacific, where their great abundance, and the value of the oil extracted from their bodies, have given rise to considerable fisheries, chiefly carried on in ships sent from this country. They are likewise inhabitants of the Frozen Ocean, where both their oil and skins are much prized by the inhabitants. One of the handsomest is the Greenland seal of O. Fabricius, of a greyish white colour, covered by dark blotches : it is also one of the largest, sometimes measuring near nine feet. Several sub-genera have been formed of such as exhibit peculiarities different from the common seal. In that named *Mirounga* by Mr. Grey, one, called the hooded sea lion, has the power of bringing forward a fold of skin, placed on the forehead, in such a way as to cover the eyes ; this is done when the animal is threatened : this singular appendage appears to be filled with blood-vessels, and to contain a vast quantity of blood. Another, very large, was first discovered by lord Anson, and is commonly called the *sea lion* ; the male, when irritated, has the singular power of lengthening out its nose, so that it assumes nearly the shape of the short proboscis of the tapir. At certain seasons these animals are said to be so excessively fat, as to resemble skins of oil. The genus *Otaria* is distinguished from all others of this family by having external and visible ears. To this group belongs the *sea bear*, improperly so called, since this name is much more applicable to the white bear. These animals are stated to live in societies, each male having from eight to fifty females. Though the whole herd may consist of thousands, each family is perfectly distinct ; and they are so jealous of their respective stations, that, if an individual of one party trespasses on the ground of an-

other, not merely a single combat, but a general battle, frequently ensues. The *sea lion* mentioned in Cook's voyage (*Otarix jubata*) is highly remarkable, as presenting a striking analogy between this group and the lions, in the typical division of *Feræ*. The male has the head and the upper parts of the body covered with thick, rough, and stiff hairs, about three inches long, and which, falling over the forehead and cheeks, form a mane, which can be erected when the animal is irritated. Forster tells us that the *sea-lions* live in large societies; that the voice of the male is like the roaring of a lion, or of an irritated bull, while that of the female resembles a calf or lamb. Except in the breeding season, the old males live apart from the females.

(140.) The Morse or wallrus, forms the second division of the *Phocidæ*, and is, in fact, the only species yet discovered. It is the sea cow, sea horse, or sea elephant of navigators, and the *Trichecus Rosmarus* of Linnæus. As this animal fills so important a station in the series, it becomes necessary to give it a more particular notice. Its size is very large, and its general appearance much like that of a seal, which it further resembles in manners and economy. It seems to be gregarious, and is chiefly found in the polar regions of the Pacific and Atlantic oceans. The morses associate with the seals, in troops of eighty to one hundred and fifty, or two hundred, and during the heat of summer frequent the shore; but they soon return to the ocean, probably on account of a deficiency of food: at such times the people of Spitzbergen kill them with lances, for their tusks and fat, both of which are highly esteemed. A middle-sized tusk will weigh three pounds; the interior of these teeth are considered more valuable than ivory, and the substance is harder and more compact than that of the smaller teeth. The carcase of an ordinary morse will yield about half a ton of oil, the quality nearly as good as that produced by the whale.

(141.) The zoological peculiarities of the morse are

thus stated by M. Cuvier. The lower jaw, which is destitute of incisors and canine teeth, takes a compressed form in front, that it may intervene between two enormous canines, or rather tusks, which grow from the upper jaw and are directed towards the lower, being sometimes nearly two feet in length, and of a proportionable thickness. The enormous size of the alveolæ necessary to receive canine teeth so unusually large, elevates the top of the upper jaw in the form of a large inflated muzzle; and the nostrils are nearly directed upwards, and do not terminate the snout. The molars have all the figure of short and obliquely truncated cylinders: four are reckoned on each side, above and below, but at a certain age two of the upper ones fall out. Between the two canines, moreover, are two incisors, like the molars, and which the generality of writers have not yet recognised to be incisors, though they are inserted in the intermaxillary bone: between them are also two small and pointed ones in young individuals. The stomach and intestines of this animal are nearly the same as those of the seals.

(142.) The few forms belonging to the aquatic types of the ferine order, which are at present known, gives to them, in consequence, an isolated character. They appear almost disconnected with the other two aberrant circles, namely, the *Didelphidæ* and the *Soricidæ*, and almost equally so with the typical *Felidæ*; for, although M. Cuvier has arranged the seals and the cats in the same division of this order, their natural connection would be very questionable, but for those laws of variation upon which we have elsewhere enlarged, and by which we are enabled to decide, almost with mathematical certainty, that the seals, which are the aquatic type, must be followed by the *Felidæ*, which is the most carnivorous type of the order, and upon which, as next in succession, we shall now enter.

(143.) The *Felidæ*, or typical cats, constitute the most formidable race of quadrupeds now existing on the earth,

the most bloodthirsty in their habits, and the most dreaded by mankind. Their whole structure is evidently formed to effect destruction of the most fearful description. Enormous muscular strength, surprising activity, great cunning, and an insatiable love for blood, are the prominent characteristics of this race. Among themselves they are unsocial, quarrelsome, and savage; the parent will devour its own offspring, and even the sexes are seldom seen together after the season of courtship. Yet many even of these animals, when they are in confinement, evince some kindness to those from whom they receive their daily food; and we have elsewhere recorded several striking instances of their docility and their gratitude. We shall now proceed to state their zoological characters. The African lion (*Leo Africanus*



Sw., fig. 43.) is generally placed at the head of this order, of which we shall now enumerate the minor groups.

(144.) The most typical characters of the *Felidæ*, as seen in the lions and tigers, are taken from the peculiarity of their teeth and the retractile power of the claws; for by this latter formation the claws can be drawn, as it were, into a sheath, and concealed within the toes, by elastic ligaments, when the animal is at rest, or the claws not in use, and this structure prevents their points from receiving injury. The muzzle is short and round.

The jaws, which are also short (*fig. 44.*)*, are provided, both above and below, with two false molars: the upper carnivorous tooth has three lobes, and a blunt heel



within; but the lower two have pointed and cutting lobes, without any heel. There is, in the upper jaw only, a very small tuberculous tooth, which seems to be that called by major Hamilton Smith, in the following passage, the fourth or flat cheek tooth:—"In the upper jaw of most of the species," observes this excellent naturalist, "is found a flat cheek tooth, altogether different from the rest, and which, from its singular shape, position, and apparent office, we should be inclined to call an auxiliary tooth. It is so situated as not to be seen, except by opening the mouth wide, and looking upwards; it does not protrude from the edge of the jaw, but a little way up the inner inclined surface of it, and takes a direction across the lower part of the last carnivorous tooth: it is flat at the top, and seems to be intended as an anvil, to receive the cutting edge of the large lobe of the last lower carnivorous tooth, so as to render it more available in acting on the food. From its situation in the mouth, it may easily escape observation; whence it is not unfrequently said that the cats have only three cheek teeth in each jaw."† The foregoing characters belong only to the typical genus *Felis*: the aberrant forms are represented by the hyæna. The common and the opossum dogs will be presently noticed.

* *a*, represents the head of the panther, as given by Temminck. The other (*b*) is copied from M.F. Cuvier, who does not state the particular species it represents. In these two skulls there is an obvious difference, if they are correct, sufficient to constitute distinct sub-genera.

† *Griff. Cuv. ii. 422.*

(145.) The natural series of the typical cats, and the distinction of the types, have been subjects full of difficulty and perplexity to all who have hitherto attempted their illustration; we cannot, therefore, be expected to place either of these points upon that solid basis which would result from the analysis of the whole order. It has been customary, since the days of Linnæus, to consider this group in the light of a genus; and such it may possibly be, in the sense we attach to groups bearing that denomination.* It is difficult, however, to subscribe to this belief, seeing that the whole group corresponds with another of a much higher rank, namely, the rapacious birds (*Raptores*), which, we know by demonstration, constitutes, not a genus, but a family.

(146.) On the other hand, there is no great difficulty in throwing the different races of the *Felinæ* into a circle, provided no effort is made to establish its correctness, by comparing it, analogically, with the contents of the entire order, or with the types of the next family, the *Mustelidæ*, to which it is actually united. It is much to be regretted that some of our most respectable naturalists are continually falling into this error; apparently forgetting that no circular disposition of a group, whether large or small, can be in the least depended upon, unless its analogies in neighbouring circles are made out, and these again compared with the primary types of the class itself. In a popular and very useful compilation upon this family, recently published, the Linnæan genus *Felis* is divided into five subgenera, of which the lion, puma, tiger, hunting leopard, and lynx are given as types. This disposition is very good to facilitate the artificial arrangement of the species; but, in the first place, it is not circular, because the lynxes are notoriously united to the tigers, and not to the lions; and, in the second place, the groups, thus

* Preliminary Discourse on Natural History, p. 210. Classification of Animals, p. 210.

disposed, have no uniform analogies with the contents of any other circle in the animal kingdom.

(147.) Before offering any opinions on what^e may be the true arrangement, let us consider how far the obvious analogy between the rapacious birds and the rapacious quadrupeds will hold good in their details; for, if the analogy between them, as a whole, is really natural, it follows that it must be equally true in their component parts. Let us, then, commence with that well known comparison of the lion and the vulture. The two forms correspond in being the largest in their respective groups, and both present us with animals furnished round the neck with a thick and superabundant clothing. In the lion, this is composed of hair, and assumes the form and denomination of a mane; while in the fulvous vulture (clothed in the same colour as the lion), and in several others, it is of feathers, and may be called a muff or tippet: and both animals live entirely and exclusively upon the flesh of others. The tigers follow the lions in all systems; and every ornithologist has placed the hawks or falcons (*Falconidæ*) next to the vultures. Now, between these two groups, also, we find some very remarkable analogies. Both differ from the last in watching for their prey from a fixed station. In regard to the typical falcons, Dr. Richardson* has placed this fact beyond doubt; while, in regard to the tiger, it is well known to spring from its retreat upon its prey much more frequently than seizing it without. Then as to colour: naturalists have hitherto looked upon this peculiarity as so little indicative of natural classification, that they scarcely mention it in their generic definitions; yet it is, nevertheless, one of the most certain and unerring guides we can follow when searching after true analogies. In the present instance it is very striking. The falcons are the only diurnal birds of prey, wherein we find the plumage marked with broad transverse stripes or round spots of black,

* North. Zool. ii. p. 32.

upon a cinnamon or chestnut ground-colour: and this is precisely the pattern which belongs to the tigers, leopards, &c. (*Felis Tigrina*, fig. 45.). The vultures and the lions, on the other hand, are uniformly coloured; and not a single example among the first exhibits the least indication of a striped or spotted plumage. So uni-



versal, indeed, is this fact, that we may pronounce it as the certain indication of a raptorial type. We have now compared the two typical forms of the *Feræ* and the *Raptores*: it remains, therefore, to ascertain which group among these quadrupeds may be likened to the owls (*Strigidae*), the only remaining family of rapacious birds which is universally admitted as natural. The owls are nocturnal animals, with short tails and large heads; and are particularly remarkable for certain appendages, or tufts, which rise above their ears. Now this description is perfectly applicable to a very conspicuous group in the genus *Felis*. The *Lynxes* are eminently nocturnal; their tails are remarkably short, and their heads much larger in proportion than that of their congeners: their ears are long, and from the tip of each arises a tuft of lengthened hairs (*Lynx Caracal*, fig. 46.), perfectly analogous to the tufts of lengthened feathers on the horned owls, the most typical birds of the family of *Strigidae*. In both groups, these tufts are placed immediately above



the orifice, and are, no doubt, intended for purposes nearly similar.

(148.) It seems to follow, as a necessary conse-

quence of the above comparison, that there are at least *three* natural types in the old genus *Felis*, and that they must follow each other in precisely the same order as do their representatives in the raptorial circle of birds : the genus *Lynx* being the fissirostral type ; *Felis*, properly so called, the typical, as representing the falcons ; and the lion the sub-typical, as corresponding to the vulture. It has been customary, indeed, from time immemorial, for all writers to consider the lion as the pre-eminent type of ferine animals,—“the king of beasts;” but this by no means implies that he is strictly and literally so in a scientific sense. Throughout the whole vertebrated circle, the pre-eminent types of rapacious animals are those which are most bloodthirsty and cruel ; and if we imaginê, for a moment, how these propensities to slaughter can be carried to the highest pitch, it would be by the destruction of victims from sheer wantonness, without any intention of using them for food. Now this love of destruction is known to be possessed by many of the tiger group, but is entirely wanting among the lions. On the contrary, many well-known traits in the character of the latter animal have procured for it, and with justice, the epithets of “noble” and “generous.” So that, however strongly we are disposed to believe that popular similitudes and names in natural history are founded on some degree of truth, we must, in this instance, deny to the lion the character of being the most ruthless and sanguinary of beasts ; and, by giving that detestable pre-eminence to the tiger, place him and his congeners as the typical group of the ferine order.

(149.) But, besides the lions, tigers, and lynxes, there yet remain two other animals, which modern naturalists concur in placing within the range of the *Felinæ*, properly so called, and which must therefore be taken into the account, if we desire to get any insight into the circular disposition of the whole group. These are the hunting leopards, forming the genus *Cynailurus*

(fig. 47.), and the weazel cat, or *Prionodon*. The first is a leopard in every thing but its claws, which are not retractile; while the latter has a pointed muzzle and a long body, but its claws are completely retractile. As some further particulars, however, of these two quadrupeds will



be extremely interesting to the zoologist, we shall insert them in this place. The hunting leopards appear to be of two species—one inhabiting Africa, the other India; and it deserves attention, that one of these possesses a sort of mane, of which the other is said to be destitute. Mr. Bennett, who describes one of these from a living specimen in the Tower, furnishes us with the following particulars: “Its size is rather below that of the leopard, but he is more slender in his body, more elevated on his legs, and less flattened on the fore part of his head



(fig. 48.). His tail is completely that of a cat; and his limbs, although more elongated than any other species of the group, seem rather fitted for strong muscular exertion, than for active and long continued speed.

The principal character in which he differs from the cat consists in the slight degree of retractility possessed by the claws. Instead of being withdrawn within sheaths appropriate for the purpose, as in the cats, properly so called, the claws of the hunting leopard are capable only of a very limited retraction within the skin, and are consequently exposed to the action of the ground on which they tread; their points and edges being thus rendered liable to be blunted by

the constant pressure to which they are subjected, almost to the same extent as in dogs. The slightest consideration of the uses to which the claws are applied, will teach us that this modification must of necessity be accompanied by a corresponding change in manners and habits." The species thus noticed was probably that which is destitute of a mane; for Mr. Bennett observes, "the mane, from which he derives his specific name, is not very remarkable; it consists of a series of longer, crisper, and more upright hairs, which extend along the back of the neck and the anterior portions of the spine."

(150.) Of the genus *Prionodon*, at present, but one species has been found in Java, where it is very rare, and is called the *Delundung*; as a familiar appellation, expressive, in all probability, of its analogy to the *Soricidae*, we shall here term it the shrew cat, and shall now enumerate its most distinguishing peculiarities, as given by Dr. Horsfield. In the number of toes on the hind feet, and of the teeth, as well as in the form of the



head (fig. 49.) and body, this animal resembles the gennets (*G. Viverra*); but the character of the claws, and peculiar structure of the teeth, indicate a decided affinity to the *Felineæ*. Both these families, indeed, have the incisive or cutting teeth alike, and those of the shrew

cat are similar: nor does there appear any essential difference in respect to the canine teeth of the three. The cats have three or four cheek teeth above, and three below; the *Viverræ*, on the contrary, have six; while our present animal differs from both in having five above and six below. The pupil of the eye is circular; that of the genus *Felis*, in some instances, is the same, but in others oblong; while in the civets it is transversely elongate. In the ears and form of the body, our animal much more resembles the *Viverræ* than the *Felineæ*;

but in regard to colour it preserves a much closer relation to the genuine cats. The ears are short and round, the body long, and the legs short. From these facts, it appears more natural to associate this singular animal with the present group than with the gennet family; inasmuch as, although it wears the aspect and possesses some of the characters of the latter, it has others, more important to its economy and habits, which belong only to the *Felinæ*. So far we coincide with the views of those who associate *Prionodon* with the true *Felinæ*. But, before this question can be ultimately decided, it is absolutely necessary that the circle of the *Mustelidæ* should be analysed. *Prionodon* may possibly be the type of *Felis* in the circle of *Viverra*; or it may be, as we esteem it at present, an aberrant form of the group now before us. If this latter be its true station, we may regard it as the gliriform type of the true cats, in which case it would, by its pointed muzzle and long body, be no inapt representative of the shrews; and it would therefore stand as the most aberrant form in its own circle; having the raptorial (or canine) type (*Cynailurus*) on one side, and the fissirostral (or aquatic) type (*Lynx*) on the other. That the latter genus is the most aquatic of all the cats is sufficiently established by Dr. Richardson, who, in speaking of the Canadian lynx, observes, "its gait is by bounds, straight forward. It swims well, and can cross the arm of a lake two miles wide; but it is not swift on land." These habits belong to no other feline group yet known. We have considered it necessary to enter upon this inquiry on the circular series of the *Felinæ*, to show that there is, in reality, very strong ground for objecting to those which have already been proposed, and not from any undue impression that the circle we have now marked out is really that of nature. We have elsewhere shown* the difficulty, not to say the impossibility, of determining the contents of a

* Classification of Animals, p. 287.

circle, without also analysing the contents of those which join it; and, in the present case, the question must mainly depend upon a full investigation of the *Mustelidæ*.

(151.) Leaving the more formidable beasts of prey, we pass on to the hyænas, placed by naturalists in close connection with the last group, and constituting the sub-typical division of the whole family. Independent of a considerable difference in the structure of the teeth, their habits and their appearance are altogether peculiar. In the thick shape and stooping gait of these



animals (*H. vulgaris*, fig. 50.), there is nothing to remind us of the elegant form and graceful activity of the genuine cats; their moral character is in unison with their skulking ill-favoured

aspect. They issue forth only from their dens by night, when they prowl about in search of animals, whether living or dead, to satisfy their voracious appetite. In this respect they are the vultures of carnivorous quadrupeds, preying with disgusting eagerness upon dead carcasses, of which they seem to be so fond, that they frequent burying grounds for the purpose of robbing the graves of their dead. Their teeth are enormously strong, and peculiarly adapted for grinding the hardest bones. There are but three species well authenticated—the spotted, the striped, and the Cape hyænas—all natives of the warm latitudes of the Old World, but excluded from Europe. Europe, in former ages, appears to have had one peculiar to itself, but now extinct. Vast quantities of the bones of this species have been discovered in caves both in Britain and on the Continent. The two first-named species have long been kept in the Paris menagerie; and M. Frederick Cuvier has

given us some interesting accounts of their manners.



The spotted species (*fig. 51.*), he observes, showed the greatest confidence and attachment to his keepers; and for one of these men evinced an affec-

tion very unusual in wild animals, and only to be compared with what we daily witness in the common dog. Nor is this a solitary instance. Mr. Barrow affirms that this species, peculiar to Southern Africa, has been tamed in certain inland districts of the Cape of Good Hope, where it is considered more serviceable for the chase than the dog, and fully equal to that animal in intelligence and fidelity. Linnæus, in fact, classed both these animals in the same genus, thus showing how closely he believed them to be united by affinity. In confinement, the hyænas always prefer meat a little tainted; and thus, even in confinement, their appetite for what their congeners would reject, is still preserved.

(152.) The hyænas, in reference to the typical cats, are an isolated group; for no animal yet known opens a passage of easy transition from one to the other. There cannot, however, be a doubt that Cuvier is perfectly correct in bringing them together; for the hiatus between them is the necessary consequence of one group being, as it were, perfect, or at least very full, while the other is imperfect, being indicated only by three typical species. This imperfection, however, is only to be found in one of their affinities, that is, to the group which here precedes them; in that by which they are followed, namely, the dogs, the connection is perfect. This union may, in fact, be established either by the remarkable genus *Proteles*, or by the *Hyæna venatica* of Burchell, placed by some authors in this genus, and by others in the next: nay, so completely does this latter animal unite the characters of both, that M. Temminck

classes it at one time as a *hyæna*, and then, changing his opinion, insists, without assigning any reasons, that it is a dog! * These animals we shall now proceed to describe at length.

(153.) The first of these remarkable quadrupeds is the *Proteles Lalandii*, first made known to us by M. Isidore Geoffroy St. Hillaire as a distinct and remarkable type, but strangely confounded by M. Cuvier under the name of *Viverra Hyenoides*, with the true genets.† This animal demands our especial notice; the *Proteles* is a native of South Africa, and the specimens yet sent home have been not larger than a fox: but its size, when adult, may probably be larger; for the state of the teeth, as it is said, evinces the youth of the specimens in question. The general appearance of the animal is perfectly that of a somewhat slender-shaped hyæna, having a pointed muzzle and long ears, which gives it a physiognomy between that of the dog and the fox. A black mane, like that of the true hyænas, passes down the neck and extends to the back; the tail is nearly as bushy as that of a fox, and, as in that animal, is thickest towards the end. With this form is joined a very agreeable colouring, the ground of which is yellowish grey, relieved on the body by several transverse black bands: six or seven of these cross the body from the back to the flanks, and there are others which band the thighs, while the feet and the toes are almost entirely black: the muzzle also is blackish, but the rest of the head, and outside of the ears, are grey: the tail is grey near the body, and then gradually changes to brownish black. In regard

* Monographies de Mammalogie, Livraison 7. p. xxii.

† At least, so it is stated in Griffiths' Cuvier, ii. p. 390; but, upon referring to the last edition of the *Règne Animal*, and even to the translation by Mr. Griffiths of the original text, no such animal is to be found as "*Viverra Hyenoides* Cuvier." It is much to be regretted that this work, which is avowedly a compilation, and a useful one, is so undigested; and that in hardly any instance is the reader informed where the original authorities are to be found. We mention this as an excuse for our being obliged, in this instance, to do the same; for no doubt, in the original description, some mention is made of the reason why the animal in question has been called a genet. Has it an anal pouch?

to the more minute but most essential parts of its structure, we are first to notice the teeth ; these, in the two specimens yet seen, and which are supposed to be young, are in all thirty. The six incisors, in both jaws, are flat, cutting, and divided by a furrow on the external side ; the canines are very sharp, straight, and form a very elongated cone, while those of the lower jaw are slightly bent : there are four molars or cheek teeth above, very small, and separated from each other, — the three first being false molars, each with a single point, and the fourth a small tuberculous tooth, with two tubercles. Proceeding to the lower jaw, we find three false molars : the first with the point and root single ; the second with two roots, a single point, and a small posterior heel ; the third has a small heel and two little points. The condyles of the lower jaw, as in the cats, are in a line with the teeth. Here, then, is an animal uniting in itself the chief characters of the hyæna, the dog, and the fox ; for even supposing it to have an anal pouch, similar to the gennets, the valuable observations of Dr. Smith upon a new species of hyæna, and which we shall subsequently notice, will show that the anal pouch, or at least a structure analogous thereto, is found in other ferine groups besides those of *Viverra* and *Genetta*.

(154.) The hunting dog is a no less singular animal, discovered and first described by Mr. Burchell under the name of *Hyæna venatica*, yet with some doubt expressed of its belonging to this genus. This specific designation might have been preserved, notwithstanding the effort that has been made by certain nomenclators to substitute other specific names of their own coinage.* According to Mr. Burchell, the first of its describers

* It is in this manner that certain Continental naturalists endeavour to appropriate all the new discoveries, or at least the credit of naming them, to themselves. No one has suffered more from this unworthy spirit than our late illustrious countryman, Sir Stamford Raffles ; but for whose noble and munificent patronage of science, the French Museum would not have possessed one half of the new and beautiful animals of India that now adorn its galleries.

who has seen and studied it in its native country, this animal (*fig. 52.*) is smaller, and of a more slender shape, than either the common or the spotted hyæna; the ground



colour of the body is sandy, shaded with darker hair, varied with irregular blotches of black, intermingled in various parts with spots of white. Its great peculiarity, however, consists in its anatomy. In its teeth it agrees with the dog, except that the little lobe in front of the false molars is rather more developed. In the ribs and lumbar vertebræ it also agrees with *Canis*, but it approaches *Hyæna* in having only four toes on each foot. Mr. Burchell was fortunate in bringing home a living specimen, which he kept chained up for more than a year. At first it was so ferocious that no one attempted to tame it; but at length its manners became softened, and it used to play with a common dog, chained up in the same yard; yet still the man who fed it never dared to venture his hand within its reach. In a wild state, Mr. Burchell informs us, this animal hunts in packs: though in general nocturnal, it frequently pursues its prey by day; and as it is very fleet, none but the swiftest animals can escape it. Sheep and oxen are therefore particularly subject to be attacked: the first openly; the latter only by stealth, surprising them in their sleep; and suddenly biting off their tails, — a mode of attack which the wide gape and great strength of its jaws enables it to do with ease. There can be no doubt but this species is also found

in Northern Africa, and that it is the same as the *Canis pictus*, figured by Rüppell. This type, for such it unquestionably is, in the circle of the *Felidæ*, is highly interesting to our present object. The late excellent anatomist, Josiah Brookes, after an elaborate investigation of its internal structure, considered it as a sub-genus, which he named *Lycaon*; and although there was no absolute occasion to change the original specific name, yet we cannot but agree that it should bear that of *Burchellii*, in honour of the accomplished traveller and naturalist, who first made it known to the scientific world.

(155.) The discovery of the two animals we have now described, places the absolute union of the hyænas and the dogs beyond all doubt, and brings us at once to the genus *Canis*, the rasorial type of the *Felidæ*, corresponding to the order *Ungulata* among quadrupeds. The group we have now entered, as might be expected, has engaged the attention of several naturalists; for popular interest will always be more excited respecting such animals as are daily around us, than such as are only seen occasionally. How much more so, then, in regard to one which has been endowed by the Creator with that peculiar instinct of attaching itself to Man, defending his person, and guarding his property? We can feel no astonishment that sceptical writers should term this wonderful instinct, the *work of man*; but we must confess our surprise at finding this inconsiderate assertion countenanced by translators, who unthinkingly repeat that the subjugation and domestication of the dog, by man, may be called "reason's conquest of nature*," and echo back the opinion, that "this is

* "C'est la conquête la plus complète, la plus singulière, et la plus utile que l'homme a faite." *Règne Animal, nouvelle édition*, ii. 149. See also Griffiths' *Trans.*, i. 149. Again, "Les petits chiens d'appartemens; *Dogues*, *Epagneuls*, *Bichons*, &c., sont les produits les plus dégénérés, et les marques plus fortes de la puissance que l'homme exerce sur la nature." — *R. An.* p. 150. We question whether the scepticism of Buffon, or the infidelity of Lamarck, could have prompted a more objectionable passage than this.

the most complete, singular, and useful conquest man has ever made." What does this mean, but that man has the power of conquering natural instincts or dispositions; and of making an animal, originally created savage or ferocious, domestic and familiar at his own good will and pleasure? Now, in the first place, how is this borne out by fact? If such a power had been given to him, how is it, that, out of hundreds of animals which we are continually attempting to domesticate, our greatest and most persevering efforts are continually foiled? Why has not the zebra, the most elegant and beautiful of all quadrupeds, long since become as familiar to our pastures as the dull-coloured ass; an animal of the same natural genus, the same habits, eating the same food, and naturally inhabiting the same country? Why has the bison ever continued a wild and savage wanderer on the plains of America, while the ox peacefully followed the tents of the primeval patriarchs? Why does the beautiful gazelle, reared from its youth by the fostering hand of man, pine and die, unless it breathe the air of the desert: while the goat, having all the same instincts in regard to food and situation, follows in flocks to the folds of the herdsman; descends, at the sound of his pipe, from the highest crags; and comes at his bidding? Have not much greater efforts been made to reclaim these *naturally untameable* animals, than has been bestowed upon those with which we have compared them? Upon what foundation, then, can we make this boast about "reason's conquest of nature?" If this power really had been given to us, in the sense which the assertion evidently implies, the instinct of animals would be under the control of *man*, instead of having been immutably fixed by the Almighty — that Power to whom man himself is indebted for his faculty of reason; not, indeed, that it might be made, as in this instance, his idle and arrogant boast, but that it should be used to give honour and reverence to his

Maker. The more that the wondrous works of the Creator are studied, the more will this truth become incontestable ; that it is HE only who has given, to certain animals, or to certain tribes, an innate propensity to live by free choice near the haunts of man, or to submit themselves cheerfully and willingly to his domestication. Nor is this law of nature without method or without rule. It pervades every instance among the more perfect animals where the rasorial type has been detected. We would recommend to such believers in the power of man over the works of creation, to peruse the following passage, strikingly contrasted to these sceptical notions, and written by one of the most accomplished travellers our own country has ever produced : — “ The familiarity which subsists between this animal (the dog) and our own race, is so common to almost every country of the globe, that any remark upon it may seem superfluous ; but I cannot help believing that it is the universality of the fact which prevents the greater part of mankind from reflecting duly upon the subject. While almost every other quadruped fears man as its most formidable enemy, here is one which regards him as his companion, and follows him as a friend. *We must not mistake the nature of the case ;* it is not because we train him to our use, and have made choice of him in preference to other animals ; but because this particular species feels a *natural desire* to be useful to man, and from *spontaneous impulse* attaches itself to him : were it not so, we should see in various countries an equal familiarity with various other quadrupeds, according to the habits, the taste, or the caprice of different nations. But, every where, it is the dog only which takes delight in associating with us, in sharing our abode, and is even jealous that our attention should be bestowed on him alone : it is he who knows us personally, watches for us, and warns us of danger. It is impossible for the naturalist, when taking a survey of the whole animal

creation, not to feel a conviction that this friendship between two creatures so different from each other, *must be the result of the laws of nature*; nor can the humane and feeling mind avoid the belief, that kindness to those animals from which he derives continued and essential assistance, is part of his moral duty." *

(156.) This family, zoologically considered, comprises not only the dogs, properly so called, but the wolves and foxes, where the group is evidently aberrant; for, instead of having the dentation of the cats and the hyænas, there are two flat tuberculous teeth behind the upper carnivorous tooth, which itself has a broad protuberance: these animals are described as without much courage in proportion to their strength; as frequently living, like the hyænas, upon carrion; and as having a small cæcum. The family of dogs are technically characterised as having three false molars above, four below, and two tuberculous teeth behind each carnivorous one: the first of these tuberculous teeth in the upper row is very large: the upper carnivorous tooth has but a single small tubercle within, but the lower one has its posterior point altogether tuberculous: the tongue is soft; and there are five toes upon the forefeet, and four upon the hinder. It will not be necessary, in this place, to enlarge on the natural history of the animals belonging to this group. The different varieties of the dog and the wolf render the true distinction of these quadrupeds, as species, still debateable. The foxes, on the other hand, are more strongly marked; they may be distinguished from the dogs and wolves by having a longer and more bushy tail, a muzzle much more pointed, and by the pupils of the eyes being adapted for nocturnal vision: the upper incisive or cutting teeth are also less sloping. They diffuse a fetid smell; live in burrows, which they dig in the ground; and

* Burchell's Travels.

only attack small animals, weaker than themselves: when pursued, they throw their prey, for support, upon the back.

(157.) The *Fennec* of Bruce (*Canis Zerda* Rüppell, fig. 58.), which more than one systematist has made



into a distinct genus, is now ascertained to belong to the dogs, and is remarkable for the enormous size of its ears. The determination of this interesting question has been one of the many valuable results of M. Rüppell's researches in Nubia, and

has thrown light upon another of nearly equal moment. Before the second or re-discovery of the fennec, M. Geoffroy was so much struck with the resemblance it bore to the Senegal lemur, that he has taken considerable pains to prove they were actually the same. The likeness, indeed, between the two animals is so strong, that we can feel no surprise at the above opinion having been entertained, considering that the fennec was then so very imperfectly known, that Buffon simply called it *animal anonyme*. This relation being admitted, the question is by what law of nature can it be explained and illustrated? Now it will be observed that, in speaking of the lemur family, we have considered it as the rasorial type of the quadrumanous order: it should therefore follow, that the same forms would be repeated, under various modifications, in the other groups of the animal circle. And we find these representations accordingly. The dogs are the rasorial division of the *Felidæ*: they correspond, therefore, to the *Lemuridæ*, and, consequently, contain mutual representations of each other in the fennec and the great-eared Senegal lemur (*Otolienus Senegalensis*). If we required a further illustration of this theory in one of the lowest de-

nominations of groups in the animal kingdom, we have only to look to the genus *Equus*, where the ass, proverbial for its large ears and its patient domestication, represents the rasorial type in the series of species of which that small group is composed.

(158.) The wolf, the dog, and the fox, are universally considered the three most prominent types of the genus *Canis*; and it requires no arguments to prove that of these the fox is the most aberrant. According to Cuvier, the race of wolves is distinguished by a straight tail; that of the dogs by the tail being recurved; while in that of the foxes the tail is longer and more tufted: now of these latter there are evidently, in a state of nature, greater modifications of structure than are to be found either among wild wolves, or wild dogs. If, with M. Temminck, we insisted that the hunting hyæna, which has a tufted tail, belonged to the genus *Canis*, then it would be a distinct modification of the foxes. The fennec, again, is so remarkable an animal, that Illiger has given it the generic designation of *Megalotes*. Rüppel, however, describes it as a dog; and Cuvier places it with the foxes. After these come the remaining species of *Vulpes*, intimately connected to the dogs, strictly so termed, no less than to the fennec or zerda by several beautiful links of gradation, as seen in the *Canis anthus* Rüppel, and jackals, on one side; and the *Canis familiaris* (fig. 54.), (with ears nearly as large as the zerda), *C. variegatus*, *pallidus*, and *niloticus*, on the other. These three latter are called by Rüppel foxes, and they obviously connect that race with *Megalotes*. If, then, as we have already premised, the *Hyæna venatica* of Burchell is a distinct type of *Canis*, the three aberrant forms of the genus may be said to be discovered; and there will be no slight ground for supposing that they form, — with



the wolf as the sub-type, and the dog as the primary type, — a circular group, first divisible into three, yet with the aberrant division (*Pulpes*) so diversified as to exhibit three subordinate variations of structure. When we look to the general form, and consider the habits of the *Proteles Lalandii*, it certainly appears more natural to class the hunting hyæna of Mr. Burchell within the circle of the dogs, than to associate it with the genuine hyænas. The hyæna dog will thus be a very appropriate name for the *Lycaon Burchellii*.

(159.) The domestic dog, as is well known, has been multiplied into innumerable varieties, all of which, however, may be traced, according to M. Frederic Cuvier, to three primary types. As this eminent zoologist seems to have paid particular attention to this subject, it may not be uninteresting in this place to give a brief abstract of the arrangement he has proposed. The first of these, called by our author *Matins*, have the head more or less elongated, the parietal bones insensibly approach each other, and the condyles of the lower jaw are placed in a horizontal line with the upper grinders, or cheek teeth; the varieties placed in this division are the dingo, or New Holland dog (*fig. 55.*), the French



matin, the Danish dog, the greyhound, and the Albanian dog. 2. The spaniels, or those varieties which seem to possess the greatest intelligence. Their head and jaws are shorter than those of the first division, but longer than in the third: the parietal bones, consequently, do not approach each other above the temporal *fossæ*, or hollows, but widen, so as to give greater space both to the forehead and the brain. In this section our author brings in the different breeds of spaniels, hounds, shepherds, and wolf-dogs, together with those of Siberia and of the

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Esquimaux race (*fig. 56.*). 3. The last group contains those whose muzzle is more or less shortened;



the frontal sinuses are considerable, and the condyle of the lower jaw extends above the line of the upper cheek teeth. By this construction of the skull, the brain becomes smaller, when compared with the jaws and face, than in the preceding divisions. The breeds here alluded to are those of the bull dog (*fig. 57.*), mastiff pug,



Ice-land dog, little Danish, and several others of a smaller and more mixed race. Without attempting to verify this trinary division of the domesticated races, it will readily be perceived that modifications of all the primary types of nature are to be found among them. The long snout which characterises all the gliriform and grallatorial types is seen in the greyhound: the water dogs remind us of the natatorial structure: the thick tails of the spaniels, and the large size of the Newfoundland dogs, exhibit the rasorial type; while the others either arrange themselves under a ferocious or a highly intelligent group. If, in short, the law of variation, as elsewhere explained, is universal in natural groups of species, it would be no law if it did not also regulate the variation of varieties, however complicated they may be.

(160.) Before we quit the family of *Felidae*, there is one animal unquestionably entering into some part of the circle, and intimately connected to the typical cats;

but to which a very different station, in all our artificial systems, has been assigned, we allude to the dog-faced opossum; recently designated as the type of the genus *Thylacinus* (fig. 58.), by M. Temminck, who has given



a minute and valuable account of its entire structure. Of the habits of this remarkable animal, which is a native of the southern hemisphere, very little, however, is known,

beyond the particulars furnished by its first describer. It inhabits, observes Mr. Harris*, the caverns and rocks in the deep and almost impenetrable glens in the neighbourhood of the highest mountainous parts of Van Diemen's land, where it probably preys on the bush kangaroo and various small animals that abound in those places. The specimen procured by our author was caught in a trap baited with kangaroo flesh. During the few hours it remained alive, it uttered, from time to time, a short guttural cry, and appeared exceedingly inactive and stupid (probably from the mortal injury it had received); having, like the owl, an almost continual motion with the nictitant membrane of the eye. In the stomach was found the partly digested remains of a porcupine ant-eater. In regard to its general external structure the following circumstances deserve especial notice:—"The head is very large, bearing a near resemblance to the wolf or hyæna; mouth very large, extending beyond the eyes; legs short and thick; tail much compressed, and tapering to a point, covered with short smooth hair on the upper part, but not prehensile." So far we learn that the animal is completely carnivorous: the question that remains is, whether its essential characters are more in unison with the *Didelphidæ*, than with the *Felidæ*. Now,

* Linn. Trans. ix. 175.

upon this, let us take the testimony of M. Temminck. The great size of the canine teeth (*fig. 59.*) is one of the



primary characters of the typical cats; and of those of *Thylacinus* M. Temminck observes, that they are absolutely the same as those of the dogs, while “*Les trois arrières molaires ressemblent aux carnassières des chiens et des chats.*” * Now, as the dentation of a quadruped is of the first importance in deciding on its station in nature, it should always turn the scale when the general habits and outer structure of the animal itself *is in unison* with that station which, from its teeth, we should assign it. Upon these grounds, therefore, do we venture to remove this singular type from the other carnivorous opossums, with which, in general appearance, it has no similitude, and place it among those with which its outward structure, and its teeth, more intimately correspond. A glance at its figure (*fig. 59.*) will sanction this latter opinion, for it immediately reminds the naturalist of an animal between the genera *Canis* and *Felis*. The circumstance noted by Mr. Harris, of the tail being much compressed, leads to the supposition that it is an aquatic type—such tails being used to assist in swimming; and this is precisely one of those types in the circle of the *Felidae*, of which, hitherto, we have been in ignorance. We wish, however, that what we have just ventured to surmise, respecting *Thylacinus* being the aquatic type of the *Felidae*, should be received more as a hint than as any determinate opinion.

(161.) The ursine or bear-like opossum of Harris

* Monog. de Mammalogie, liv. 3.

(*Dasyurus ursinus* Tem.*) is unquestionably a purely carnivorous marsupial, as shown by its teeth (fig. 60.),



and by its natural habits ; the only question is, Does this animal form a part of the didelphine family ? or does it enter into that of the *Felidæ* ? in either case, it would obviously represent the bears, rather than belong to them. Now it may be observed, that M. Temminck places this animal immediately after his genus *Thylacinus*, which is the dog-faced opossum ; but he keeps it among the *Dasyuri*, because Harris remarks that its tail is "slightly prehensile." This membrane, however, is so short, and both it and the animal are so unlike the *Dasyuri*, that it seems questionable whether it belongs to that group. If, on the other hand, we place it with *Thylacinus*, all its relations may be explained by viewing it as the representative both of the bears and of the *Dasyuri* among the *Felidæ*. For the present we may consider it in this light, as the only one which appears to explain its different relations. It has strikingly the aspect of a bear, but its structure is much more that of an opossum ; and among these latter it certainly appears to possess, in the teeth, (fig. 60.) greater affinity to *Thylacinus* than to *Dasyurus*. But for its strictly carnivorous habits, we should have been inclined to favour the supposition that this animal connected *Dasyurus* with *Ursus* ; but in one and all of these relations it will yet stand as an ursiform type, corresponding to the *natatorial*, as elsewhere defined.† Harris describes

* Linn. Trans. ix. 176. Monog. de Mamm. 68.

† Classification of Animals, 249.

this curious animal as being covered with long, coarse, black hair, irregularly marked with one or two blotches of white; the heel long and callous (indicating, as in the bears, a plantigrade walk); sharp claws (formed for burrowing); voracious, untameable and savage. They may be caught with a trap baited with raw flesh. "They also, it is probable, prey on dead fish, blubber, &c., as their tracks are frequently found on the sands of the sea-shore." * This latter circumstance in its habits is important; as it favours the supposition of its being a natatorial type, although it may not actually swim, and shows that it has a relation both to *Ursus* and to *Thylacinus*.

(162.) We now come to the last and most extensive division of this order, namely, the *MUSTELIDÆ*, or weasels, which constitute the sub-typical group of the whole. They are, for the most part, eminently carnivorous and ferocious, yet of small size, and slender shape. As they are more numerous than the last family, their forms are more diversified, and we consequently find that some of the aberrant divisions present a striking difference from those which are typical. To the latter, however, we must always direct our first attention, when endeavouring to define the leading characters of a family. The chief groups, therefore, of the *Mustelidæ* are composed of the weasels and the polecats: these, by various intermediate genera, are connected to the racoons, badgers, and gluttons; the series finally terminating in the bears, which stand at the furthest confines of the series. Before, however, we proceed to notice these groups in detail, we may advantageously insert, in this place, some general observations taken from M. Cuvier, who includes all these genera, together with the dogs, in his division named *Carnivora*.

(163.) The most prevalent scientific characters of the animals in question, according to the *Règne Animal*, is the constant presence of four large and long canine teeth separated, and between them six incisors in each

* Linn. Trans. ix. 177.

jaw; the second of which, in the lower row, has always its root more deeply seated than the rest. The molars are always either entirely sharp or cutting, or but partly mingled with blunt tubercles, but they are never bristled with conic points. These animals are more exclusively carnivorous in proportion as their teeth are more or less cutting, and their regimen may be accurately known by comparing the extent of the tuberculous surface of their teeth with the part which is cutting. As an instance of this, the bears, which can subsist entirely on a vegetable diet, have almost all their teeth tuberculous. The anterior molars are the most trenchant; next to these is a molar, larger than the others, and generally provided with a tuberculous heel of different degrees of magnitude; behind this are one or two small teeth entirely flat: these latter, which are at the lower part of the jaw, are used by dogs to chew the grass they occasionally swallow. The above-mentioned large molar, and the corresponding one in the lower jaw, are termed by M. Fred. Cuvier *carnivorous teeth*; the anterior pointed teeth may be called *false molars*, and the posterior blunt ones *tuberculated teeth*. It may readily be supposed that those animals which have the fewest number of molars, and whose jaws are the shortest, can bite with the greatest force. M. Cuvier then proceeds to divide the whole into two primary groups, from a consideration of their different modes of walking, as exemplified by the structure of the hind feet. These are named the *Plantigrades* and the *Digitigrades*. The first stand or walk upon the entire sole of their foot; while the latter, in the same positions, are supported only upon their toes. It is hardly possible to conceive a more indefinite and artificial mode of arranging animals than this, nor does it answer even the humble purpose of abridging investigation; for the bear family is alone plantigrade, while all the rest of the *Carnivora* are digitigrade. The distinction, indeed, is a good one; but, like every other, it may be badly used: the fact being, that the whole of the *Felidae* and the types of

the *Mustelidæ* walk upon their toes, while the aberrant forms of the latter family, which connect it with the *Didelphidæ*, are, like the opossums, plantigrade.

(164.) The first genus which seems to claim our attention is that of *Ryzæna*, which most authors consider as more resembling a dog than any other of this family. Erxleben places it between the genus *Herpestes* and *Nasua*, — an arrangement which, if natural, will cause it to come in conjunction with that of *Canis*, placed in the adjoining family. Be this, however, as it may, the sentiments of M. Fred. Cuvier on the situation of this curious animal, called by him the surigate, are in unison with those of Erxleben. He considers it is intermediate between the genuine *Carnivoræ* (*Felidæ*) and the plantigrades: the teeth (fig. 61.) are



more tuberculous than those of *Herpestes*, and less so than those of *Nasua*. It has the feet —

the number of toes excepted — of the latter genus; but the sole is entirely bare as in *Nasua*, which it further resembles in its prolonged muzzle, while the tongue partakes of the characters of both these genera. In size, this animal is rather less than a rabbit; but its long legs and general form, as represented by M. Fred. Cuvier, reminds us much more of a little sharp-nosed dog than of a weasel: when disconcerted, its voice resembles the barking of a puppy. It must be remarked, however, that the resemblance to the dog, after all, is but slight, for the surigate has only four toes to its feet, and is provided with an anal pouch; that it will stand on its hind legs only, and feed with its paws; and that in walking the entire sole of the foot is placed upon the ground. Like the long-nosed racoons (*Nasua*), it thrusts its mobile nose into every small cavity, and brings out any thing worth eating: lastly, it prefers animal food, although it will occasionally eat fruit, and is very fond of milk, which it laps like a dog. The figure of this animal

already quoted, and those given by Bewick, are so totally different, that it is difficult to believe they are intended to represent the same species. The dentation of the surrigate and of the genus *Canis* may advantageously be compared.

(165.) The gennets (*Viverinæ*), as containing several remarkable types of form, may be considered as a sub-family, and these latter as genera. The celebrated civet (*Viverra civetta*, fig. 62.) is a good example of the



whole group. They are small but purely carnivorous animals, chiefly distinguished from the weasels (*Mustelinæ*) in their external characters, by having an anal pouch, more or less developed,

which serves to secrete an unctuous matter, in some species highly odoriferous: their tongue is rough with sharp papillæ; and they walk upon their toes. We shall assemble, under this group, the genera *Crossarchus*, *Herpestes*, *Genetta*, *Viverra*, and *Paradoxurus*.

(166.) The animal called by the French naturalists Mangue (*C. obscurus*, fig. 63.) forms the only example



of the genus *Crossarchus* yet discovered; it inhabits Sierra Leone, and unites in itself, as M. Cuvier justly observes, the muzzle, teeth, pouch, and walk of

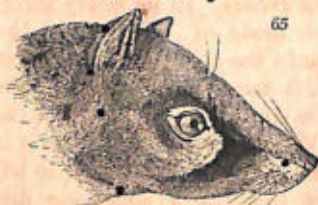
Ryzæna with the toes, size, shape, and genital organs of the ichneumons (*Herpestes*). This is most satisfactory evidence on one of the affinities of *Ryzæna*, while the other is almost equally strong on its relation to *Nasua*. *Crossarchus*, in its general appearance, differs only from *Herpestes* in being stouter made, and having a shorter and more bushy tail. Passing onward to the ichneumons (*Herpestes*), we find the anal pouch very large, yet simple;

the tail remarkably long, bushy towards the base, but gradually tapering to a point. One species, the ichneumon of Egypt (fig. 64.), has long been celebrated, although, as



may be expected, many of the accounts given of it by the ancients are either

exaggerated or fabulous. It is nevertheless a most useful animal in that country, where reptiles abound, and where some check to their increase is absolutely necessary. The third genus (*Genetta*) is composed of the true gennets, distinguished by the claws being completely retractile, like the *Felinæ*; the pouch being very small, and the pupil of the eye vertical: some of these are very beautifully marked animals, reminding us of the cats; and although the species inhabit the warm countries of Africa and India, there is one which has been found in the south of France, and is considered by some as only a variety of the Barbary gennet (fig. 65.); both passing by the name of *Viverra*



Genetta. It is in this group that the French naturalists have placed the sub-genus *Prionodon* already mentioned (150.). The typical civets, to which M. Cuvier restricts the family name

(*Viverra*), are not so slender in their form, and have shorter tails: the anal pouch is very deep; not simple, as in *Herpestes*, but divided into two bags or sacks, while the claws are only semi-retractile.

(16~.) Lastly, we may here insert the genus *Paradoxurus*, so called from the singularity of the tail. Although closely allied to the gennets in the teeth, and in its general characters, it is yet much stouter; and it walks, unlike all the preceding animals, upon its soles; in other words, it is completely plantigrade. As this

form is unquestionably one of those which naturalists will have to study attentively before the natural series of this family can be determined, we shall enter into some detail on its peculiarities. We must confine ourselves to one species, *P. typus*; for of those that have been figured from general Hardwicke's drawings, the descriptions have not yet appeared. M. Lechenault, a naturalist who has seen this Indian animal in its native wilds, terms it the *Palm marten*: he does not appear, however, to have published what would have been highly important, — a description of its habits in a state of nature. For the following account, therefore, we are indebted to M. Fred. Cuvier, who investigated an individual of the common species (*Paradoxurus typus*), which was living for some time in the Paris menagerie. The general appearance of this animal is not unlike that of the civets, in all but the feet and tail; the former being much shorter in proportion, and the latter thicker and twisted. In the formula of its dentation, it also approximates to the preceding genera. In its heavy form, general physiognomy, and mode of walking, it approaches the badgers; while in the sub-prehensile power or spiral form of its tail, it may be compared to the potto. The tail, indeed, is one of the greatest peculiarities in this animal. When it is as straight as it is ever carried, it is nevertheless twisted from right to left towards its extremity; so that, by a particular disposition of the vertebræ, no doubt, the upper part of the tail is turned downwards; whence results the following phenomenon: when the tail is curled by the action of the muscles, this movement is made, at first, from the upper to the under side; and if the muscles cease to act when the curling is only half effected, the tail, in that case, seems organised like the ordinary prehensile tails of other animals; but if the muscles continue their action, the tail returns to its natural state, and the curling goes on, but from below to the upper part, as far as the insertion. The toes, five in number

on each foot, are furnished, at their extremity, with a thick tubercle, which hinders the points of the nails from touching and wearing on the ground; these nails also are nearly as retractile as those of cats, and are slender and sharp, so that they are enabled to use them, like those animals, not merely as offensive weapons, but also as an effective means of ascending and descending trees, &c. The feet are nearly palmate, united by a membrane even to the last joint, and they have four naked fleshy tubercles: the relative length of the toes decreases in the following order; the middle toe, annular, index, little toe, and thumb. The tongue is long, narrow, thin, and aculeated with horny papillæ or tubercles, these tubercles are globular at their base, but terminated in a spiny thread. The head (fig. 66.) is not much unlike that of a gennet. The nostrils are similar to those of the dog. There



is no appearance of a pouch, or even of those folds of the skin, near the vent, so common among the gennets. The ears are rounded, and the internal surface tuberculated. The habits and economy of this singular animal in a state of confinement have been thus detailed by M. Ffied. Cuvier. It passed the

whole of the day in sleep, rolled into a ball, and it was awakened with much difficulty from this lethargic slumber: towards the decline of day it roused itself for a short period; but so soon as it had fed, it returned again to its bed: its motions were slow, and, on being disturbed, it would utter a sort of grunt: the tail, although curled, had not, apparently, any prehensile power; but we may remark that this fact, in a state of confinement, could not be well ascertained: the animal did not appear to send forth any scent, like those of the civet family. According to M. Cuvier, the *Viverra Musanga* of Dr. Horsfield, which we have elsewhere noticed, is

the same animal as the *Paradoxurus typus*; but we doubt the baron's correctness in this particular. Dr. Horsfield is totally silent regarding the convoluted tail of his animal; a circumstance which would never have escaped his notice; and which, if not expressed in the figure he has given (taken by Daniel from a stuffed specimen), would at all events have been alluded to in the text: but should the musang really belong to this genus, Dr. Horsfield's account throws much light on its natural economy. This Javanese species seems to be omnivorous, feeding by night upon ripe and pulpy fruits, but in default of them upon eggs, poultry, and small quadrupeds. Should *Paradoxurus typus*, as M. Cuvier supposes, truly rank with the *Viverinæ*, or gennets, it must be an aberrant genus, obviously of the rasorial type; and in that case will represent the potto by its tail, and the *Ursinæ*, or bears, by its walk — both these groups being analogous. If, on the other hand, it belongs to the *Ursinæ*, it will then be a mere representation of *Viverra*: but the solution of these questions obviously depends upon the analysis of the whole of this division.

(168.) Passing to the next family, we may assemble, under the general name of *Mustelinæ*, the different genera of polecat (*Putorius*), weasel (*Mustela*), skunk (*Mephites*), otter (*Lutra*), glutton (*Gulo*), and teledu (*Mydaus*). Most of these, although destitute of the anal pouch so characteristic of the gennets, emit an odour of the most offensive and infectious description; their muzzle is generally shorter than that of the last group, but they are even more voraciously carnivorous. The skins of several are highly valued as furs, and form an important article of commerce, especially from the colder latitudes of Europe and America, where they may be said to supply the place of the gennets. When viewed in their typical examples, the weasels are immediately known by their long thin body, pointed muzzle, and short legs: though small and rather feeble, they are exceedingly cruel, and insatiable of blood. The technical character belonging to

this group is to have but one tuberculous tooth behind the upper carnivorous one. Here we find all those wild little beasts which, like the stoat, infest poultry-yards, warrens, and preserves: detested alike by the farmer and the gamekeeper: their body, long and very slender, is possessed of peculiar pliability, which enables them to pass through very small apertures and narrow winding holes. We may now proceed to each of these genera.

(169.) The polecats (*Putorius* Cuv.) are proverbial for the nauseous vapour they emit when pursued; it is, in fact, their defence, and it proceeds from a yellow viscid secretion, situated in the glands on each side of the tail. The toes are semi-palmated, which accounts for their power of carrying their depredations into fish-ponds; while the destruction they cause among poultry is well known. The ferret is thought to be a mere variety of the polecat, originally introduced from Africa; and the ermine is but the stoat in its northern winter garb. The *martens* are distinguished by having four carnivorous teeth, instead of three, in the upper jaw, and four below: of these we have two native species, the common and the beech marten, while the pekan (*Martes Canadensis*, fig. 67.) is one of the most numer-



ous fur-bearing animals of Hudson's Bay. The sable (*Martes Zibellina*), another species,

is less common, but more valuable, as its fur has this peculiarity, — that the hairs will lie in any direction in which they may be turned. In our account of living quadrupeds will be found some highly interesting notices of these fur-bearing animals, recently given to the public by Dr. Richardson.*

(170.) The skunks, or mephitic weasels (*Mephites*),

* North, Zool. i. The Quadrupeds.

are among the most singular animals of this tribe. They are restricted to America ; and, as a means of defence, nature has given to them the power of emitting the most powerful and disgusting stench possessed by any animal whatsoever ; it is not only insupportable to man, but to all other creatures, those of their own family alone excepted. They differ greatly from the European weasels, in being much thicker, and they are by no means so active. No dog will venture to seize them ; and if a single drop of this most powerful liquor falls upon a garment, it is rendered perfectly useless ; no washing will eradicate the smell, which will be diffused in every chamber of the house. When they are hunted, the natives are said to irritate them at first with a long cane, in order to make them void this liquor, and thus exhaust their means of defence. The colour of these animals is pleasing, being black and white, disposed in broad and alternate stripes from the head to the tail ; these stripes, however, are so variable in number, that M. Cuvier considers that their variation by no means indicates distinct species.

(171.) The genus *Mydaus* is nearly allied to these American quadrupeds, and is formed of the Javanese skunk (*Mydaus meliceps*, fig. 68.) called by the natives *Teledu* : it possesses, in an equal degree, the same fetid qualities which belong to the American skunks ; for Dr. Horsfield asserts that the entire neighbourhood of a village will be infected by the odour of an irritated *Teledu* : and in the immediate vicinity of the animal it is so violent, as in some persons to produce syncope.

(172.) The otters, although intimately connected to the polecats, clearly form the aquatic type of this sub-family, and as such, represent the seals ; while their head



and short muzzle assimilate them also to the gluttons. At present, however, we shall make no attempt to arrange them in their precise locality. Otters are distinguished, like all aquatic types, by their large flat head, short ears, and palmated feet; by the latter they are enabled both to swim and dive with the greatest facility: their tail probably assists them in the same offices, as it is compressed, something like an oar. They are eminently carnivorous, feeding naturally either solely upon fish, or occasionally on small amphibious quadrupeds. The instinct of destruction appears remarkably developed, both in these animals and the weasels: the latter, as is well known, will destroy for the sole purpose of sucking the blood of their victims; while the otter, after devouring the head of a fish, will leave all the rest of the body untouched. The fur is warm, and so compact as to be impenetrable to water. Like all semi-aquatic quadrupeds, the otters are dispersed, with little variation of structure, over all the temperate regions of the world. One species (*fig. 69.*)



⁶⁹ is found in England: another, formed by some authors into the sub-genus *Enhydra*, is marine, and hence called the sea

otter. Upon the deviation of this animal from the ordinary otters, M. Cuvier observes, that it has only four cutting teeth in the under jaw. He also adds, "the figure of this animal, given by Schreber, seems apparently to have been drawn from a badly preserved specimen, and presents an exaggerated resemblance to the seal. Its whole organisation, however, is that of the otter." As we have never seen a specimen of this marine animal, we can offer no opinion on this question. In its general appearance and physiology the otter is not un-

like the ordinary polecats; and the resemblance is still further strengthened by the latter having semi-palmated or half-webbed toes, and occasionally frequenting the water in search of fish. On the other hand, the grisson (*Gulo vittata*) and the taira (*G. barbara*), now placed among the gluttons, have their feet also semi-palmated, and, observes M. Cuvier, it appears they have sometimes been mistaken for otters.

(173.) We may thus terminate the series of the *Mustelinæ* with the genus *Gulo*, which, although plantigrade, appear to have an affinity to the polecats through *Lutra*, while at the same time it may open a passage to the badgers and bears. Linnæus, indeed, placed the gluttons with the latter; but, observes M. Cuvier, "they approximate much closer to the weasels in their teeth as well as in their habits; the *only* relation they have to the bears consisting in their plantigrade walk. The wolverine, or common glutton, is the best known species, and its history has been recently given with great exactness by Dr. Richardson; it is about the size of the badger, and is entirely a northern animal. Beneath the tail is a fold, indicating the situation of the anal pouch of the gennets, and its whole appearance is very similar to that of the badger. The two species inhabiting warmer countries have just been noticed.

(174.) It will be a question for future investigation whether the gluttons (*Gulo*), the rattels (*Ratelus*), and the badgers (*Meles*) form the aberrant portion of the ursine circle, or whether they merely represent the bears, and enter into the circle of the *Mustelidæ*. For the present, we may consider the two last in the former light, and thus pass onward to the sub-family of *URSINÆ*, typically distinguished from all others of the *Mustelidæ* by their great size, their omnivorous diet, and their short tails. In all these peculiarities we recognise the fissirostral or aquatic type of nature; and the group before us, as a whole, is consequently more aquatic than any one we have yet noticed. It is clear, that whatever may

be the precise locality of the rattels, the badgers, and the racoons, they are obviously aberrant forms, and they will not, therefore, affect our definition of the typical peculiarities of the *Ursinæ*.

(175.) The rattel (*Ratellus mellivorus*), is described both as a native of Southern Africa and of India, and much information has been published upon both. The accounts given by Sparrman, however, of the Cape rattel, and that by general Hardwicke of the Indian, are so widely different, notwithstanding the opinions of modern authors to the contrary*, that strong doubts may be entertained whether they are even of the same genus.† The Indian badger of general Hardwicke (fig. 70.), as

he states, "is a nocturnal animal, living in burrows excavated in the high banks of the Ganges, from which it issues at night: it



prowls about the habitations of the natives, and scratches up the recent and unprotected graves for the purpose of feeding upon the dead bodies. It burrows with such rapidity, using its fore paws, that in ten minutes it will work itself under cover in the hardest ground. It is a bold animal, its hide remarkably thick, and its strength too much for ordinary sized dogs. Its general food is flesh, in any state, but it is remarkably eager after birds; and crows, which were sometimes given to the individual I had domesticated, were devoured with impatient avidity: living rats

* Zool. Gardens, i. 17. As the editor has been at some pains to show that these animals are the same, I have been induced to look further into the question, and the doubts expressed above have been changed to certainty. This is not the place for entering into much detail; but, if the reader will compare the original figures of general Hardwicke of the Indian badger, and that of the Cape rattel, drawn from the life, and upon the spot, by one of the best zoological painters we have ever had, (S. Daniell's Sketches, African Scenery,) he will immediately concur in this opinion. Whether two different animals are known at the Cape by the common name of rattel is another matter; but Mr. Bennett may have been led into this error by not having seen the work of Daniell. Diminished copies of these two figures are here inserted. (fig. 70. 71.)

† Linn. Trans. ix. 116. pl. 9.

seemed almost equally acceptable; and it seldom lost the opportunity of springing upon common fowls. It showed an inclination to climb upon walls, hedges, and trees: this, however, it seemed to execute clumsily; but seldom falls, and it will ramble securely upon every arm of a tree capable of supporting its weight." To this we may add, that the tail is very short, measuring only four inches; and that the soles of the hind, and probably of the fore feet, are entirely naked,—showing the animal to be plantigrade. The general makes no attempt to identify this "Badger" with the Cape animal of the same name. This, which has been described by Sparrman (*fig. 71.*), must at all events be considered



as the true rattel of Linnæus: according to that celebrated traveller, its chief food consists of

bees and their honey, to procure which it has recourse to much art, and exhibits great intelligence. In this search, also, it is assisted by that little bird called the honeyguide, who comes in for a share of the spoil. Sparrman expressly mentions the extraordinary thickness of the rattel's skin; and asserts that a pack of dogs, which would be sufficient to despatch a lion, have sometimes been foiled in attempting to kill this animal. Mr. Barrow, who resided and travelled in South Africa many years, confirms this account of Sparrman's; for he also mentions that "the choice food of the rattel is honey, and nature has endowed it with a hide so very thick, that the sting of a bee is unable to penetrate through it: no animal is perhaps more tenacious of life; a dog with great difficulty succeeds in worrying him to death; and it is a species of amusement for the farmers to run knives through different parts of the body, without being able for a length of time to deprive it of existence."* Precisely

* Barrow's Travels, 4to ed. 355.

analogous to the structure of the rattel is that of the honeyguide, whose skin is so thick that it resembles strong parchment. This fact has not been recorded; but it is a very strange, although an indirect, confirmation of the account given by Sparrman of the rattel feeding upon honey. And there can be no doubt that the quadruped, no less than the bird, represents, in their respective circle, the thick-skinned or pachydermatous family in the order *Ungulata*. So far, therefore, we find that Sparrman's account, setting aside his well-merited reputation, is essentially confirmed; and it therefore follows, that it may not be inconsistent with the account given by general Hardwicke of the Indian badger, seeing that the two animals are distinct.

(176.) The badgers, at present, form the restricted genus *Meles*, and are chiefly distinguished from those aboved noticed by possessing a pouch, placed beneath their short tail, in which is secreted a greasy fetid substance. They are nocturnal, short-tailed, thick-bodied, and low-legged animals, with a pointed muzzle, and strong fore claws, by which they dig burrows with great facility. One species only is found in Europe, and one (*fig. 72.*) in America. Linnæus classed them as bears; from which they only differ, in external appearance, by being smaller, having a sharper muzzle and a longer tail.

(177.) The genuine bears appear to form a zoological genus, containing types of form, or sub-genera, two of which have already been named. When viewed as a whole, they constitute a very remarkable group; not only in regard to their enormous size, but as living both upon animals and vegetables. Their bodies and limbs, (as in the grisly bear *Ursus ferox*, *fig. 73.*), are thick; and the tail so short, that it seems, at first, to be altogether wanting. Their gait is known to be proverbially



awkward, and their shape thick and unsightly. Never-



theless, being gifted with enormous muscular strength, they move comparatively with great facility, and are well known to excavate dens or caves, into which most of the species retire during winter, sleeping and living without food. There was, until lately, two species found wild in Europe; but that which authors call the black European bear has become extinct. Those of America are different, and have been recently described with great accuracy by Dr. Richardson, in his admirable volume upon the quadrupeds of "British America.*" The sea, or Polar bear, entirely white, is distinguished from the others by a longer and more flattened head. M. Cuvier doubted that the grisly bear of America was a distinct species; but Dr. Richardson has since put the question at rest, and living specimens are now in this country. The bears of India have several



peculiarities by which they differ from those of cold countries; they have accordingly been separated into two subgenera: one of these is *Helarctos* Horsf., represented by the Malay bear (fig. 74.), which, besides

* North. Zool. i. The Quadrupeds. ©

possessing anatomical characters, is remarkable for the length of the tongue, and for feeding almost entirely upon vegetables: it has also great powers of smell: in all these characters we trace its analogy to the tenuirostral type among birds, and the *Glires* and ant-eaters among quadrupeds. The sloth bears, again (*Pro-*



chilus Ill., fig. 75.), as their name implies, points out the scansorial type, represented among the quadrupeds by the true sloths; while the aquatic type is seen in the Polar bear: thus we perceive that only one more form is wanting to complete, even in this small group, an il-

lustration of the primary types of nature.

(178.) There is yet a very singular animal so evidently belonging to the ursine family, that we have little scruple in introducing it here, notwithstanding the conflicting relations which it is thought to hold. We allude to the *Arctonyx collaris*, called by the French the



Bali-Saur (fig. 76.). To form a general idea of its appearance, we may suppose it a bear, with the head of a pig, but very small ears, and moderately long thin tail: the strength of the nails evinces its power of digging,

and places it at once as an aberrant form in the circle of the ursine group. It has six small and equal cutting teeth, and its long canines are immediately followed by the molars. In confinement it preferred fruits, bread, and milk, to flesh. M. Geoffroy St. Hillaire* insists upon the affinity of this animal with the bears; yet, from its similarity to the pigs, he seems to think that it is also connected to them, and consequently to the

* Mammif. iii.

omnivorous *Pachydermes*. Now here are two relations pointed out by the greatest zoologists of France, which appear at first sight perfectly irreconcilable; for if both these resemblances were of the same sort, it would follow that the bears, by this animal, passed into the order of *Pachydermes*, a supposition not to be entertained for a moment. But if, on the other hand, we consider these relations as of two different sorts, — the strongest being one of affinity, and the weakest one of analogy, — they are no longer inconsistent with each other. The bears, being a natural group, should have a type representing the *Sorecidae* among the *Ferae*, and the pig among the *Pachydermata*; both these proving to be, upon analysis, the gliriform types of their respective circles; the long snout of *Arctonyx*, therefore, and its thin slender tail, at once show it is analogous to the types above mentioned, namely, the shrew and the pig; and prove, moreover, that in the small circle of the bears, it holds precisely the same station as *Nasua* does in the circle of the *Mustelidae*. A better instance to illustrate the two sorts of resemblances termed analogy and affinity could not possibly be given.

(179.) From the typical bears we pass, with scarcely any break in the series, to the racoons, forming the genus *Procyon*, which nearly all naturalists concur in placing immediately after *Ursus*. Nevertheless the racoons exhibit an aberrant form, possessing the long thick tail and pointed muzzle of the fox, but, as M. Cuvier observes, “the rest of their exterior is that of a bear in miniature.” There are two species; one inhabiting North, the other South America. Of the former, Dr. Richardson observes*, that in a wild state it sleeps by day, comes from its retreat in the evening, and prowls in the night in search of roots, fruit, green corn, birds, and insects. At low water it frequents the shore to feed upon crabs and oysters, and it climbs trees with facility. But the most remarkable trait in its habits is its fondness of dipping its food in water before it is put

* North. Zool. i. 36.

into the mouth, hence Linnæus gave it the specific name of *Lotor*.

(180.) The genus *Nasua* comprises the long-nosed racoons of South America, called by the French, *Coutis*. In their teeth, nocturnal habits, and slow dragging gait, they differ in no wise from the last group; but their tail is more lengthened, and the great prolongation of their muzzle can only be compared with that of the ant-eater. There are two species of this singular genus, the red and the brown (*Nasua fusca*, fig. 77.), and both



possess the sense of smell in a very high degree; the nose, in fact, is in perpetual motion, and it is applied as if it were not only the

organ of smell, but also that of feeling; it is used also for digging and discovering worms, of which these animals are very fond. In feeding, these racoons generally convey their food to the mouth by means of the sharp nails of their fore paws, but sometimes it is seized at once by the mouth. Like the true racoons, they climb trees with agility, and come down head foremost. These animals live in companies, often in large troops, in the thickest forests, and emit a strong and very disagreeable odour. The affinity between this genus and *Ryzæna*, as we have already remarked, has been dwelt upon at much length by M. Frederic Cuvier; we may therefore safely adopt the same views; and as the union of *Ryzæna* with *Herpestes* has been equally insisted upon by the same high authority, we thus find that the principal groups of the *Mustelidæ* form themselves into a circle, while in their typical examples they represent the contents of the whole order.

(181.) It yet remains, however, to show in what manner the *Mustelidæ* are united to the *Didelphidæ*, the family with which our survey was commenced. This union, we believe, is affected by one or other of those singular genera named *Arctictis* and *Ailurus*. The first of these has been already mentioned (127.);

the latter appears, as M. Cuvier observes, to approximate to the racoons by its teeth—excepting that it has but one false molar—and by its tail, which is long and thick; while, in the form of the head and in its plantigrade walk, it reminds us of the bears. The only example yet known of this singular animal—whose form, at least, unites that of *Arctictis* and *Ursus*—is the shining panda (*A. refulgens* F. Cuv.), an inhabitant of the mountains of India: its size is that of a large cat, and its claws are semi-retractile; the fur is soft and thick set. Immediately after this animal M. Cuvier places the genus *Arctictis*, as also related to the racoons by its teeth; while the prehensile nature of the tail of this latter, and its whole organisation, brings the genus in immediate contact with the opossums and the *Dasyuri*. M. Geoffroy St. Hillaire considers the panda related both to the bears and the racoons, as well as to *Arctictis*; so that, whether we place it next to the first, or in conjunction with the second of these genera, there is strong presumptive evidence that the bears stand intermediate between the martens (*Mustelidæ*) and the *Didelphidæ*.

(182.) Before quitting the viverine family, we shall here notice a new quadruped of Madagascar, which has recently been described by Mr. E. T. Bennett in the *Zoological Transactions*, under the name of *Cryptoprocta ferox* (fig. 78.). As this has not yet fallen under our

personal observation, we can only give a condensed statement of its peculiarities from the above work. Its aspect, judging from the published figure, is between that of a gennet and a cat, but more inclining to the latter; and it measures, without the tail, something more than thirteen inches, the tail itself being



about twelve. Mr. Telfer, who sent this animal from the interior, states, "It is the most savage creature of its size I ever met with; its motions and power of activity were those of a tiger, and it had the same appetites for blood and destruction of animal life. Its muscular force was very great, and the muscles of the limbs were remarkably full and thick." Mr. Bennett considers that this animal "belongs to the family of *Viverridæ*; having the prickly tongue, the two tubercular molar teeth in the upper jaw, and the other characters by which the civets are distinguished from the cats on one side, and from the dogs on the other. It approaches more nearly than most of the other forms of this family to the *Felidæ*; having the claws truly retractile, and furnished with retractile ligaments, those of the anterior limbs being also acute both at their points and edges. In these respects it agrees with *Paradoxurus*, as it does also in the nakedness of the soles of its feet, and in the union of the toes almost to their extremities;" but it differs in not having a similar tail; while on the other hand it has an anal pouch covered with hair. The head is narrow and slightly elongated, the eyes rather small, and the ears unusually large. Some of these characters of the head do not appear in the published figure, of which the foregoing (*fig.* 79.) is a faithful copy.

(183.) Having now concluded our arrangement of the chief groups of the ferine order, it may be expedient to advert to those considerations which have induced us to separate the carnivorous marsupials from those which are herbivorous, and thereby to break up the order *Marsupialia* of the *Règne Animal*. Nearly all our leading naturalists have acknowledged the artificial nature of this assemblage, uniting, as it does, animals of the most opposite natures, and of the most dissimilar organisation, merely from the circumstance of their possessing a marsupial pouch. Upon what reasons M. Cuvier, by instituting this order, was induced to violate the very first principles of his own arrangement—which

every one sees is mainly founded upon the structure of the teeth—we know not: but this single circumstance is sufficient to excite the strongest suspicion that his arrangement is not natural. This, at least, was the conclusion at which we arrived, after the most matured investigation we could give the subject, and after endeavouring in vain to discover a circular series among the marsupial animals. It was, therefore, with no small gratification that we found our own impressions confirmed by the opinions of a naturalist eminently versed in this branch of zoology, and whose remarks are so much to the purpose, that we shall borrow his language* to express our own decided convictions on this subject. “The further we advance in our knowledge of marsupial animals,” observes Mr. Bennett, “the more firmly do we become convinced of the impropriety of their separation as a distinct and isolated group. When we see that the single peculiarity that unites them is bestowed upon types of form so widely different from each other, we cannot consider this simple metastasis of function in a certain set of organs alone, however great the importance of that function in the animal economy, as furnishing sufficient ground for the overthrow of every principle of classification, and for setting at nought some of the most strongly marked affinities that the animal kingdom affords. How striking, for instance, is the passage from the insectivorous *Carnivora*, through the opossums and *Dasyuri*, to the civets, and other more purely carnivorous groups! What is there of importance in the structure of the wombat, the *Phascolomys* of M. Geoffroy, except this solitary character of the marsupium, to separate it from the rodent (*Gliris*) order? And what other character can be found to justify, even in appearance, the union of any of the animals just mentioned with the kangaroos? It is obvious that a tribe formed of such discordant materials cannot be natural, and the animals of which it is composed imperatively require to be dis-

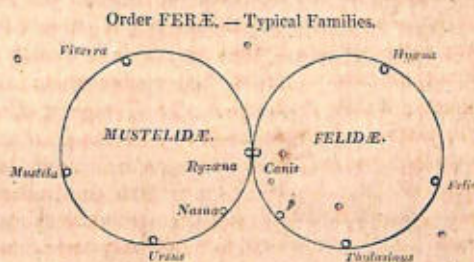
* Zoological Gardens, l. 265.

tributed in more strict conformity with the general laws of their organisation. The anomalous character of many of them undoubtedly presents a formidable obstacle to their classification; but we entertain a confident belief that a more intimate acquaintance with their structure than we yet possess, will, at no very distant period, lead to their complete and homogeneous amalgamation with the general mass, of which they form integral, although at present dislocated, parts. In such an arrangement, the place of the opossums, as we have before intimated, cannot be mistaken. Together with the *Dasyuri*, their representatives in New Holland, they would occupy a station intermediate between the *Insectivora* (*Sorecidæ* Sw.*) and the civets (*Mustelidæ* Sw.), with the latter of which they are no less closely connected in their habits than in their general form and in the character of their dentation." The foregoing opinion on the situation of the opossums and *Dasyuri* is the more valuable, because it has been given not only without any predilection for, but even without the knowledge of, those views of natural arrangement given to the world five years after, and which are not only applicable to this, but to every other group in nature. The details which have here been laid before the reader fully confirm, even to the letter, the belief expressed by Mr. Bennett—from merely looking to the animals themselves—that the *Sorecidæ* passed, by means of the *Didelphidæ*, into the civets. Our intelligent observer seems also to have perceived, upon another occasion, the course of the *other side* of the circle†; for without the intermediate group of ursine animals, and its aberrant forms, as seen in the badger, rattel, and glutton (174.), the weasels and the civets could not be reached. As this is the point, however, which to ordinary naturalists

* These family names, now first used, are not of course in the original paper.

† So completely is the carnivorous character lost in their teeth, that it would be impossible, without the transition afforded by the racoons and the coatis, and carried on through the dogs and the civets, to recognise the lacerators of the cats in the penultimate molars of the bears."—Bennett's *Zool. Gard.* i. 101.

may appear the most objectionable in this circular arrangement of the order, we shall endeavour to prove that it is not only consistent with the authorities we have cited, and with the simple inferences to be drawn from the relations of the animals themselves, but that it can be tried by the double tests of uniform variation and uniform analogy. Let us, then, place the sub-families or chief groups of the *Mustelidæ*, as already disposed, in one circle, and those of the *Felidæ* in another: both are equal in value; and as both are obviously united, so, if natural, their contents must represent the one the other.



(184.) We put aside all considerations of the aberrant types, for it is quite immaterial to our *present* object, whether, for instance, the badgers or gluttons stand at the confines of *Mustela* or of *Ursus*; or whether *Procyon* is in the latter group, or enters into that of *Nasua*: for all these, in fact, are questions which future analysis can alone determine. Looking, then, to *Mustela*, we find M. Cuvier expressly observing that they are the most sanguinary of all their family; and every one knows that this character belongs also to the cats (*Felis*) in the adjoining circle. *Viverra*, in like manner, represents the hyænas, from their diminished passion for blood, and by the remarkable similarity of some of the gennets to the genus *Proteles* already noticed: these facts might be deemed quite sufficient, when the respective affinities of the two genera are considered, to

show their mutual analogies; but this has been placed beyond all doubt by the valuable paper of Dr. Smith upon the *Hyæna crocata*.* The distinguishing character of the gennets, as opposed to the polecats and weasels, is the possession of an anal pouch or gland, secreting an unctuous matter. Now this matter was never suspected to be secreted by the hyænas, until Dr. Smith detected it in the species he described, and in considerable quantity; for although he has not gone into any anatomical details, it is quite evident that, if such an "abundant supply" could be forced out by the animal itself, there must be peculiar glands for its regular and continued secretion; while the use subsequently made of it shows that it is essential to some important part of the economy of the animal. The gennets and the hyænas must, therefore, be characterised as possessing anal pouches, and in this respect differing from all their congeners. Of the affinity between *Ryzæna* and the dogs, little can be said beyond what M. Fred. Cuvier and others have already hinted at; nor can it be expected that, where there is only one species representing a genus, the connection of that genus to another, which happens to be very full, can be very perfect. The gliriform type of *Feræ* is undiscovered; but that such is the denomination of *Nasua* is unquestionable. Let the naturalist only compare its extraordinary snout with that of a mouse, a shrew, a pig, an armadillo among quadrupeds—to the head of a wader among birds—nay, to that of a *Curculio* among insects—and he will be perfectly safe in designating all these as the longest-snouted animals of their respective circles; diversified modifications, in fact, of the suctorial type of nature.† We know of no such animal in the circle of the *Felidæ*, although it may not be improbable that the Cape tiger-cat, figured by S. Daniell‡, should turn out to be the long-nosed or gliriform type of this family. There

* Linn. Trans. ix. 468.

† Classification of Animals, p. 254.

‡ Sketches representing the native Tribes, Animals, and Scenery of Southern Africa, pl. 36. Lond. 4to. 1820.

now remain only the bears in one circle, and the genus *Thylacinus* in another. *Ursus* is well known to be the most aquatic genus of the weasel group; for the otters, according to the sentiments of all authors, appear to be a subordinate division of *Mustela*. On the other hand, we must consider *Thylacinus* as the most aquatic of the *Felidæ*, because, although its manners are little known, it is admitted to be found only near the sea, and to have that peculiar flatness of tail which, in general, is a strong indication of aquatic habits. Future information will decide this point; but in the meantime, when so many strong analogies exist, we may safely conclude that the two typical families in very many respects represent each other, although one appears to be a perfect, and the other an imperfect circle. We may thus assign denominations to each type in the following manner. The union of the aberrant group is of course unknown: —

	<i>Mustelidæ.</i>	<i>Felidæ.</i>	<i>Primary Types.</i>
1. Typical.	<i>Mustela.</i>	<i>Felis.</i>	Typical.
2. Sub-typical.	<i>Viverra.</i>	<i>Hyæna.</i>	Sub-typical.
	<i>Ryzaena.</i>	<i>Canis.</i>	Rasorial or Ungulsted.
3. Aberrant.	<i>Nasua.</i>	?	Grallatorial or Gliriform.
	<i>Ursus.</i>	<i>Thylacinus.</i>	Aquatic or Natatorial.

CHAP. III.

ON THE CETACEA, OR AQUATIC ORDER.

(185.) For the general aspect of the animals we are about to describe, we have been in some measure prepared in the appearance of the seals, by which, in fact, they are represented in the circle of the feline order: common observers, like the early naturalists, would be disposed to class them with fishes, rather than with

quadrupeds, seeing that they are without feet, and swim in the water by means of fins, after the manner of fishes. They are, in truth, fishes in outward form, but quadrupeds in the more important points of structure. The whales, dolphins, and the porpoises compose this assemblage of mammiferous animals; distinguished, indeed, by the absence of feet, but producing and nourishing their young in the same manner as ordinary quadrupeds. Some of these — the whales, for instance — are the largest of all created beings, for even the bulky elephant dwindles by their side into comparative inferiority. They may be described, scientifically, as mammiferous animals, whose fore feet are transformed into fins, the hinder feet being wanting, and the body lengthened into a fish-shaped tail. The head, which is of an enormous size, is united to the trunk by a neck so short and thick, that scarcely any diminution from the width of the body is perceptible. The *Cetacea*, in fact, have so much the external form of fishes, that ordinary observers would not hesitate to consider them as such. It is remarkable, however, that the tail in these animals is always horizontal, while in fishes it is vertical: the present group, moreover, has warm and red blood, ears with small but external openings, and mammae for the purpose of suckling their offspring. These, with many other details of their anatomy, distinctly separate them from the true fishes. By the peculiar form of the tail they are enabled to elevate themselves very considerably on the water, but they never quit it, as do the seals and wallrus. Living in the depths of ocean, where their habits and economy can never be observed, their history possesses few facts of popular interest; while the paucity of the forms yet discovered, prevents that investigation of their affinities which gives so much interest to the scientific naturalist. For these reasons we may be permitted to pass over this order with brevity; merely giving a hasty notice of the leading divisions, and referring the student to the systematic enumeration of the genera for more minute details.

(186.) The natural divisions of the *Cetacea*, for the reasons above assigned, remain undetermined : but they may be artificially arranged under the denomination of, 1. Porpoises or dolphins; 2. Whales; and, 3. Lamantins or sea-cows; the latter obviously connecting this order with the *Feræ* by means of the wallrus and the seals.

(187.) The *DOLPHINS*, like the whales and other typical cetaceous animals, are distinguished by those singular perforations called spiracles. As they swallow, with their prey, an immense quantity of water, some mode was necessary to enable them to get rid of it. The water passes into the nostrils by means of a peculiar disposition of the palate, and is accumulated in a sac placed at the external orifice of the external cavity of the nose, from which it is expelled with violence, by the compression of powerful muscles, through a very narrow aperture situated at the top of the head. Thus it is, that the whales, more especially, produce those artificial waterspouts, observed by navigators, often at a very considerable distance. Their nostrils, thus continually exposed to the influx of salt water, cannot be lined with a membrane of sufficient delicacy to enable them to detect odours with any acuteness. The olfactory nerve is excessively small; and if they do enjoy the sense of smelling, it must be in a very faint degree. The larynx, of a pyramidal form, penetrates to the back part of the nostrils, to receive the air and conduct it to the lungs, without the animal being necessitated to put its head and throat out of the water. There are no projecting laminae in the glottis, and the voice is reduced to simple lowing. They have no vestige of hairs, but the whole body is covered with a glossy skin, under which is a coat of thick fat, from which the oil is produced which renders these animals so useful to man, and so important to commerce. Their anatomical peculiarities are chiefly these. The stomach has from five to even seven distinct pouches, many of which are small and globular. Such as, like the dolphins, are provided with teeth, have them conical and all alike :

and the food is swallowed rapidly without being masticated. There are two small bones suspended in the flesh near the anus, which indicate the position of the hinder feet in more organised quadrupeds: the eyes have a thick and solid sclerotica: several are provided with a ventral fin, but it is of a tendinous substance, and is not supported by bones. The dolphins differ from the true whales in having simple conical teeth in both jaws, and a head of ordinary proportion to the size of the body. * They are the representatives in this order, of the *Ferae* among quadrupeds; being carnivorous, rapacious, and cruel. The genera are chiefly distinguished by those external characters expressed in our synopsis: the common porpoise of the British seas, as likewise the grampus, are among the best examples we can cite. In the narwhals we see a representation of the tusks of the elephant; while, by the absence of all other teeth, a natural transition is made to the next division.

(188.) In the WHALES, we see developed, in the highest degree, the aquatic form; one of the primary types of nature, the chief character of which is to have a head of immense size in proportion to the rest of the body. In the present instance, in fact, the head is so large that, as M. Cuvier observes, it makes up one third, or even one half, of the entire length of the animal: this proportion is occasioned by the enormous developement of the facial bones: its form gives it the appearance of being inflated, for it is excessively obtuse in front, like the muzzle of a *Hippopotamus*, or river horse. The cachalot or spermaceti whales show this developement in the most conspicuous manner. The mouth is enormous: the lower jaw is narrow, and armed on each side with a range of conical teeth, which repose into cavities when the mouth is closed, by meeting the upper jaw in which there are no teeth. The upper part of this enormous head is in some degree hollow, for it consists only of large cavities, covered and separated by cartilages. In these cells or chambers is contained an oil, which fixes when cool, and is familiarly known by

the name of *spermaceti*. These bellows, however, must not be confounded with the true skull, which is rather small, and placed beneath them. Various canals filled with this oil traverse different parts of the body, and communicate to the cavities of the head. It is this animal also which produces the odoriferous substance called ambergris; and which is said to be a concretion formed in the intestines during a morbid state of the system. The true cachalots (*Physeter*) have no fins; but in the genus *Physeter* of Lacepède there is one upon the back. The true whales (*Balæna*), as we before remarked, have no teeth. The peculiar structure of their mouth will not permit these huge monsters to feed upon animals at all proportionable to their size: a wise provision of nature; for were it otherwise, or were their appetite proportionate to their enormous size, even the ocean would be almost depopulated of large inhabitants: very small fish are their most bulky prey, and even these form but a small portion of their food. It is the swarms of minute worms, shrimps, and other marine creatures abounding in the ocean, which are the chief sustenance of the whale; they are taken in with a volume of water, which the animal then strains, as it were, by expelling through the nostrils, almost precisely analogous to the habits of the duck, except that in those birds, the water is expelled from the sides of the bill between the laminae, and not from the roof of the palate. This is one of the innumerable analogies of the natural system; for, on comparing the circle of the *Mammalia* with that of the natatorial or swimming birds, we find the whales and the ducks come parallel to each other; both, in fact, being fissirostral and natatorial types in their respective circles. The common whale is the type of the genus *Balænus*, and it yields an immense quantity of oil, some individuals producing more than 120 tons. The genus *Balenoptera*, or pouched whales, has the typical character of a throat capable of great distention: at other times the skin is folded over the throat and chest in very deep wrinkles:

only one species, however, the *Balenoptera Boops*, exhibits this peculiar formation.

(189.) The third and most interesting group of this order is that of *Manatus*, composed of such *Cetacea* as are *herbivorous*; that is, deriving their nourishment alone from vegetables. From this circumstance, they have been vulgarly called sea cows or sea horses, but they are better known by the name of *Larantins*, or dugongs. So closely do they resemble the seals, and more especially the wallrus (*Trichechus*), that Linnæus classed them in the same genus, and all naturalists admit their affinity. They are large animals, but much inferior to the whales; having the tail lengthened and spread into a broad flat surface, almost precisely similar to that of the beaver, which, in point of fact, they truly represent in the natural series. They inhabit the mouths of rivers in the tropical latitudes of America, India, and Africa, and are gentle and harmless. Unlike all other animals of this family, the fins are provided with vestiges of claws at their extremities, which they use with tolerable dexterity in creeping and carrying their young ones. Like the ruminating animals, to which they are intimately connected by means of the genus *Hippopotamus*, the stomach is divided into several sacs or receptacles. They sometimes grow to the length of fifteen feet, and their flesh is very good. The three genera into which they are distributed, are *Manatus*, *Halicore*, and *Rytina*, the characters of which will be found elsewhere.

(190.) The paucity of types and of species in all the aquatic divisions of the *Mammalia* is no where more conspicuous than in this order; a group equivalent in rank to that which will here follow, but which, so far as our knowledge extends, does not contain one fifth of the number of animals belonging to the *Ungulata*. One of the inevitable consequences of this deficiency, if it may be called one, is the difficulty, or rather the impossibility, of connecting such groups to these which, from other considerations, we feel assured come next in the

order of nature. In regard to the *Cetacea*, this difficulty only regards its union with the *Glires*, for the *Manati* form an immediate passage to the seals by means of the wallrus; but their affinities on the other side cannot be established by synthesis—seeing that there is every solid reason to suppose, from analogy, that several of those connecting links by which the passage to the *Glires* would be rendered easy, are lost or undiscovered. When we reflect on the enormous destruction which fall upon the antediluvian animals, and more especially upon the large races of quadrupeds, there is nothing surprising that their place becomes vacant in the existing series. Were it not so, there would indeed be strong presumptive evidence that our views of the natural system were radically defective, for then we should have no room to insert those fossil animals which of late years have been brought to light. We shall therefore make no attempt to show in what probable manner this imperfect circle of the *Cetacea* is connected to the order *Glires*; but to that we are now entering upon, the affinity has often been remarked. “For although it is difficult to look at a *manatus* or dugong, and call it an elephant, it is impossible to deny that it is a modification of the pachyderm form.”* In this manner are the aberrant orders of the *Mammalia* united into one great circle.

CHAP. IV.

ON THE ORDER UNGULATA, OR HOOFED QUADRUPEDS.

(191.) THE animals we are now to consider are the largest of those inhabiting the land, and are the most important when viewed in their connection with Man; they are generally destitute of canine teeth, and the construction of those they possess are especially adapted to a vegetable

* MacLeay. Linn. Trans. xvi. p. 34.

diet. In some few genera, however, the cutting teeth are entirely wanting, as in the ant-eaters, &c.; and in the *Monotrema* the whole of the teeth almost entirely disappear. The *Ungulata* are at once known by the peculiar construction of their feet, the extremities of which are entirely surrounded or inclosed in a horny covering or sheath; a structure by which they are distinguished from all other land quadrupeds, whose toes are merely tipped with claws or protected outwardly by nails. The animals of this order are technically called *ungulated*, but we may apply to them the more popular term of *hoofed*. This hoof is either entire, as in the horse; or parted, as in the ox: in a few genera a third modification is seen, where the toes are divided, and enveloped in large nails; a structure which is seen in the sloths, armadillos, and ant-eaters. All these minor groups, however, are but modifications of the primary structure first mentioned: a truth which was first perceived by Aristotle, and assented to by Willughby. Linnæus and Cuvier, however, in their artificial systems, thought it expedient to make these differences a ground for higher divisions; and thus, as it has well been observed, they lost sight of the comprehensive group of Aristotle, which was thus broken up into disconnected fragments. Sanctioned by these great examples of antiquity, but still more by the laws of nature, we shall view the whole as contemplated by the Grecian philosopher; and we shall now proceed to determine the characters of the first divisions.

(192.) The most conspicuous group of the hoofed quadrupeds, in reference to that particular structure of foot which distinguishes the order, is, undoubtedly, that represented by the horse, whose hoof is in one undivided piece, and the head unprovided with horns. These constitute the *Solipedes*, and, although few in species, contain some of the most useful of animals, employed in burthen, in war, or in the chase. Following these come the *Ruminantia*, distinguished by their horns and cloven hoofs; feeding, like the last, solely

upon herbage; and containing the remainder of those animals which, in temperate climates, are endowed with peculiar instincts for living in a state of domestication. The third division of these quadrupeds is chiefly known by their fossil remains. In a former age of the world they were very numerous, but their only living representatives are the tapirs and the pigs. They had no horns, and their dentation is altogether peculiar. They inhabit humid tracts, and love the water, in which the living examples delight to wallow. We shall name them, in reference to their type, the *Anoplotheres*. These are succeeded by another group, eminently conspicuous for their enormous size and thick skin, almost entirely destitute of hair; these are the *Pachydermes*, and comprise the elephant, the rhinoceros, and the largest land quadrupeds now existing. Lastly, we include, as the most aberrant division of this order, the *Edentates*, whose toes are sheathed in strong horny claws, and who are unprovided with teeth in the front of their jaws. This group forms a solitary exception to all the preceding, in having distinct toes and very large nails; but these nails are unlike those of all other quadrupeds, and M. Cuvier well observes, "that they approach, more or less, to the nature of hoofs."

(193.) That there are strong grounds for believing that the above divisions form a circular series, will be apparent from the following considerations.—The *Solipedes* pass into the ruminants by the camel, which has nearly the same sort of foot as the horse, but the ruminating structure of the ox. The tapirs show us an intermediate form between the *Ruminantes* and the armadillos, and thus connect the *Anoplotheres* with the *Edentates*. The sloths, placed by Cuvier among these latter, lead immediately to the fossil genus *Megatherium*, in the circle of the *Pachydermes*; and we return again to the *Solipedes*, by means of the river horse, or *Hippopotamus*. The typical characters of these primary groups, and their respective denominations, may thus be expressed:—

Order UNGULATA—The Hoofed Order.

		<i>Families.</i>	<i>Typical Genera.</i>
1. Typical.	} Hoof partially cloven.	RUMINANTES.	Bos.
2. Sub-typical.		SOLIPEDES.	Equus.
3. Aberrant.	} Hoof completely cloven. Feet with large nails. Toes various; skin thick, nearly naked.	ANOPILOTHERES.	Anoplotherium.
		EDENTATES.	Dasyptus.
		PACHYDERMES.	Elephas.

Before proceeding further, we may observe, that there exists precisely the same difficulty in determining which is the pre-eminently typical group of the *Ungulata*, as there is in fixing upon the corresponding group among the *Scansores*. A union of many and varied powers is the usual indication of such types; and if this principle is to decide the question in the present instance, the horse, which stands at the head of the *Solipedes*, will be the most typical of the hoofed order, as it would be even if we only regard its very peculiar construction of foot. But if, on the other hand, we consider the still more valuable properties of the ox, as more coinciding with the general characters of rasorial types, as elsewhere explained*, then the *Ruminantes* becomes the pre-eminent type. This must long remain a debatable question; because there are so few existing forms among the *Solipedes*, that their double affinities cannot be made out so clearly as to set this question at rest: the aquatic type, in short, is wanting: and of the *Anoplotheres* the succession of forms is equally incomplete. Fortunately, however, the camel puts the immediate union of the *Solipedes* and the *Ruminantes* beyond all doubt; but whether the *Anoplotheres* or the *Pachydermes* unite with the *Solipedes* on the other side of the circle is very doubtful: this subject, however, may probably receive further light from what we are now about to state.

(194.) The analogy of this order to that of the *Rasores* among birds is so evident, that it was pointed out by Linnæus, and has never been questioned until very lately. True it is that no reason has hitherto been assigned for this analogy, beyond the fact, that one order includes

* Geog. and Classif. of Animals, p. 257.

the principal part of our domestic birds, and the other of our domestic quadrupeds. As the objections to admitting the truth of this analogy were urged at a time when the nature of primary types were unknown, it would seem unnecessary in this place to show the fallacy of those principles that have led one of our most eminent writers into a maze of perplexities, in endeavouring to show the errors of his predecessors; for it will be quite obvious, that if this important inquiry had been more thoroughly gone into, a very different conclusion would have been formed. We shall therefore entirely leave out of consideration the domesticating instincts of the two groups, and draw our comparison from their structure and general appearance. Great development of the tail, as already remarked, is one of the prime distinctions of rasorial types. No quadruped shows this more than the horse; and no bird more than the peacock, and the whole of its family. In the order *Rasores*, in fact, we have the most beautifully crested birds in creation*; and the order of *Ungulata* alone contains the horned quadrupeds: crests being perfectly analogous in their appearances, and in their uses, to horns.† It has been well observed that the ruminating order is eminently herbivorous; and the *Rasores*, in a state of nature, are the most herbivorous of all birds, although in the farm or poultry yard they eat seeds only.‡ The types of both orders live entirely upon the ground, for some of the *Rasores* only frequent low trees to roost. Both are the most gregarious of their respective classes—not in one or two solitary instances only, but with scarcely a single exception. The *Ungulata* have the fewest toes of any quadrupeds in nature; and this character is precisely applicable to the *Rasores*

* Witness the whole of the *Pavonidae*.

† The only truly horned bird is the *Palamedia*, which has been mistaken for a grallatorial genus. Analysis will show that it is a true *Rasores*. The crowned crane, in like manner, will be found to be a rasorial type, although in the circle of the *Grallatores*.

‡ Those who have never seen the typical rasorial birds alive in their native regions, may yet see this fact in the turkey, the peacock, and the Guinea fowl. If turned out on a common, or in a field, they immediately begin eating herbs. In the goose, a rasorial type, this is proverbial.

among birds, where we have the ostrich, the cassowary, and the emu. Now, it must be remembered that all these are the pre-eminently typical distinctions of the two orders. Let us now look to the two typical groups. In the *Solipedes*, represented by the horse, and in the *Pavonidæ*, we have, as before remarked, a corresponding analogy in the unusual length of tail; while in the *Ruminantes* and in the partridges (*Tetraonidæ*), the shortness of this member is one of their great peculiarities. The *Struthionidæ*, or ostriches, perfectly represent the *Pachydermes*, in the great bulk of the individuals of which each group is composed; while the obtuse horny protuberance of the cassowary is a most exact representation of the short horn of a rhinoceros. The pigeons in one order, and the *Edentates* in the other, follow next; let us therefore see if these groups also are analogous. The *Edentates* are remarkable among the *Ungulata* for having the greatest prolongation of muzzle, and in having the shortest feet. The muzzle of birds is their bill; and the bills of the *Columbidæ* are the longest and the most slender, considering the size of the birds, of any among the *Rasores*, while their feet possess the opposite extreme of remarkable shortness: each, again, are the most aberrant; and by these two characters they represent the typical *Glires*, or mouse-like quadrupeds. There now only remains the *Anoplotheres*, which are to be compared with the *Cracidæ*, or curassow birds. Cuvier, as already observed, is decidedly of opinion that the *Anoplotheres* were semi-aquatic; that is to say, that they lived in marshes, and in the vicinity of water. Now, it is not generally known that these are precisely the haunts of the *Cracidæ*; while their long and somewhat rigid tail preserves their analogy both to the *Anoplotheres* and to the whole of the marsupial genera, each of which in their respective circles represent the *Cracidæ*.

* *Megapodius* is in this family. From its remarkably large toes, it may be called a kangaroo among birds; and the *Cracidæ* being the rasorial division of the order, we see the tail nearly as much developed as in the peacock.

(195.) By condensing the foregoing analogies into a table, we shall at one glance perceive how beautifully and how regularly the families of the rasorial order represent those of the hoofed quadrupeds.

	Families of the <i>Ungulata</i> .	Analogical Characters.	Families of the <i>Rasores</i> .
Typical.	SOLIPEDES.	Tail excessively long.	PAYONIDÆ.
Sub-typical.	RUMINANTES.	Tail very short.	TETRAGNIDÆ.
	ANOPLOTHERES.	Semi-aquatic.	CRACIDÆ.
	EDENTATES.	{ Jaws prolonged, slender ; feet very short }	COLUMBIDÆ.
Aberrant.	PACHYDERMES.	{ Size large ; hair or feathers very thin ; skin thick }	STRUTHIONIDÆ.

(196.) Of all the orders of quadrupeds, the *Ungulata* is that which bears the least analogy to the grallatorial birds, for there is not one of the typical *genera* which habitually frequent the water. The only quadrupeds which have aquatic habits, or which frequent the vicinity of water, are the *Hippopotamus*, or river horse, the fossil *Anoplotheres*, and the stags (*Cervidæ*), each and all of which are not types of the *Ungulata*, but of the *Cetacea*; or, in other words, they are, in their own circle, aquatic types, and therefore have no right to be selected as animals which are to give us the typical characters of the hoofed order. Indeed, it must be obvious, upon a moment's reflection, that as every order has one division which lives in the vicinity of water, we may just as well say that the *Feræ* represent the wading birds, because the seals actually live in the water; so that the *Feræ*, upon such reasoning, might be substituted for the *Ungulata*. Analogous characters, in short, must always be drawn from typical and not from aberrant forms; for if the latter, there is not only a positive contradiction in the terms, but errors innumerable will be committed at every step.

(197.) The tribe of SOLIPEDES, although small in number, is a most natural one; for it comprises the horse, and its allies, the ass and the zebras; to which, as aberrant genera, must be added the camels and the lamas. The typical examples are admirably distinguished by having but one apparent toe upon each foot,

or, in other words, a single and undivided hoof. It is a curious fact, however, as mentioned by M. Cuvier, that, although by this structure they seem to have but a single toe, yet under the integument on each side of their metacarpus and metatarsus, there are two protuberances which represent as many lateral toes. We shall not here dwell upon the history of an animal so well known



as the 'horse (fig. 79.), particularly as, from being one of the most essential of all animals to man, it enters into another portion of our work. All the innumerable varieties and breeds of this noble animal now

domesticated, can be traced but to one species; but in the deserts of Asia is found another, the *Dziggtai*, or the *Equus Hemionus* of Pallas, which, in its proportions and tail, is an intermediate species between the horse and the ass. We shall notice this animal more particularly, and then touch upon two others equally untameable, the zebra and the quagga.

(198.) The *Dziggtai*, or Tartary horse, as we are informed by major Smith, whose account we follow, receives this name from the Mongolian Tartars, on account of its large ears. It is distinguished at once from the horse, by the tail having hairs only at its extremity, and by a black dorsal line which enlarges on the crupper. In winter, the hair is very long; but in summer it becomes smooth and glossy: at both seasons the general colour of the whole body is a uniform bay or fawn colour, but the tint is redder in winter and lighter in summer. The ears, as already intimated, are longer than those of the horse, but straighter and better formed than in the common mule. Its general size is that of an ordinary

horse ; and although the head is strong and heavy, the rest of its proportions are said to exhibit much elegance and lightness, while the limbs possess the most astonishing suppleness and capacity for speed. It runs with wonderful rapidity, carrying its head erect, and snuffing up the wind. It is said, moreover, easily to escape the hunters ; for the fleetest courser that ever scoured the desert would in vain attempt to overtake it. When undisturbed, their character seems peaceable and social ; they live in troops of from twenty to thirty, and often in much larger communities. Each of these has its chief, who watches for its safety, gives the signal of danger, and regulates the general movement. It is said that this leader gives the signal for flight to the rest, by leaping three times in a circle round the object which inspires fear ; if, in this strange freak, he is slain, which will sometimes happen as he approaches very near the hunters, the troop will disperse, and thus afford greater facility for their destruction. The Mongols, the Tunguses, and other nations bordering the Great Desert, hunt these animals for food, the flesh being considered a great delicacy. These people, however, have not yet succeeded in taming it, even when they have captured young individuals for the express purpose. These animals would assuredly make the best ponies in the world, were it possible to subjugate and domesticate them. Their character seems absolutely untameable ; and those individuals with whom the experiment has been tried, have always perished in their violent and unceasing attempts to regain their freedom. There seems, however, no just reason for concluding that the most effectual methods have been tried in vain ; although we must bear in mind that the perfectly untameable nature of the zebra is a convincing argument, and an insurmountable proof, against the theory advocated by some writers, that " there is no animal but what may be tamed to a certain point." Sonnini himself, a traveller no less than a most excellent naturalist, is of the same opinion as ourselves upon this

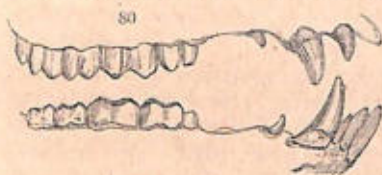
point, when he says that this species of wild horse would be utterly annihilated, before any of its individuals shall be reduced to the service of man. Nature has clearly assigned to some animals the faculty of domestication, and has as clearly withheld it from others: explain it as we please, the fact remains the same.

(199.) Of the remaining hoofed animals, viz. the ass, the zebra, the quagga, &c., little need be said: the first has been domesticated from the earliest record. The zebra is, with scarcely an exception, the most beautifully coloured quadruped in creation. Although less in size, it has much of the graceful symmetry of the horse; but its disposition is widely different; all attempts to render it serviceable to man have completely failed. This love of liberty in our own species is extolled to the skies; but when we find it in the animal world, it is termed obstinacy or viciousness, and brings reproach. The zebra shuns the haunts of man, and lives in the deserts; hence, although specimens are sometimes captured and brought alive to Europe, we are entirely unacquainted with its natural habits. The quagga somewhat resembles the zebra, and likewise inhabits the African deserts; but its size and form is more that of a horse. Its name is said to express its voice, which resembles the barking of a dog. We are told that the quagga is gregarious, living in troops of more than one hundred, in the vast interior deserts of Southern Africa, where also the zebras congregate; but that the two herds never intermix. Unlike that animal, the quagga is known to be easily tamed; and we have been assured that "among the equipages in the gay season in Hyde Park, and other fashionable places of resort, may be occasionally seen a curricule drawn by two quaggas, which seem as subservient to the curb and whip as any well-trained horses."* The mountain zebra (*Equus montanus* Burch.) is a third species, first described by Mr. Burchell, who thus speaks of it: — It is the wilde paarde of the Dutch, and the dauw of the

* Griff. Cuv. iii. 465.

Hottentots, and is a much scarcer species than either the zebra or quagga. The body is somewhat similarly marked, but the dispositions of these markings are nevertheless peculiar. The legs of the zebra are white; but those of the mountain species are striped over every part, even down to the feet. The quagga, again, although with similar-shaped stripes to the zebra, has them confined to the head and fore part of the body. From the structure of its hoofs, Mr. Burchell judiciously infers that the common zebra lives in the plains, and the present species upon the mountains.*

(200.) The next group, the camels (*Camelus*), have been placed by Cuvier, as well as by major Smith, among the *Ruminantia*, not as pre-eminently characteristic of these animals, but as "approximating more than the others to the horses;" an admission which at once con-



firms the view here taken of their true station in nature. They not only possess canine teeth in both jaws (*fig. 80.*), but have likewise

two pointed teeth implanted in the incisive bone. It is unnecessary to describe the appearance of an animal so well known, at least by its delineations, as the camel; and a family likeness pervades all others of the group. The camel (*fig. 81.*) suggests the appearance of a



heavy and somewhat inactive animal; and as being formed by nature for a beast of burthen. It would almost seem that the humps upon its back were intended to facilitate the security of the cargo, serving

the office of a natural packsaddle; and we accordingly find they are used, almost for this very purpose, by the native drivers. Considered scientifically, they have several peculiarities. Instead, says M. Cuvier, of the great hoof, flattened on the internal side, which envelopes the whole lower part of each toe, and determines the figure of the ordinary cleft foot, they have but one small toe, which adheres only to the last phalanx; and this is of a symmetrical form, like the hoofs of the *Pachydermata*. Their swelled and cleft lip, their long neck, prominent orbits, the weakness of their crupper, and the unsightly proportion of their legs and feet, give them, in some degree, an appearance of deformity; but, we may add, among the harmonious structures devised by nature, there is not one so beautifully adapted for the station and purposes for which it was created, than is the camel. As we shall, however, illustrate this subject in another place, we merely cite the words of major Smith, as opposed to the insinuation of a French writer, that the peculiarities above alluded to "make the camels, in some degree, deformed beings." These apparent disproportions are, however, in reality, only manifestations of that Great Will, which has adapted every thing, with wonderful precision, to its destined end: for, in the hands of nature, true disproportion is nowhere to be found; and although we cannot at all times point out the direct object of a particular structure, yet, in the case before us, several may be assigned with confidence.

(201.) The camels of the New World form the genus *Auchenia*, and constitute the most aberrant division of the family; they are much smaller than the genuine camels of the ancient continent, and are usually denominated *lamas*. M. Cuvier observes, there are but two distinct species known; but major Smith, with more justice, is of opinion that five or six are confounded under these names. They appear confined to the lofty table land and Cordilleras, or Andes, of South America; and chiefly, if



not exclusively, to the western side of this mountainous ridge. In external characters they differ from the ordinary camels by being without humps on the back, and as having two distinct toes on their feet: their size, also, is much smaller; the common lama (*Auchenia Glama*, fig. 82.)

being about the height of a stag, while that called the paco or vicugna is not larger than a sheep: the fur or wool of both, but more especially of the latter, is beautifully fine and soft.

(202.) There is such an obvious hiatus or gap between the horse and the camel, that every principle of analogy induces us to think a very important link of connection has either become extinct, or has hitherto remained undiscovered. This form we consider to be possessed by some animal more or less agreeing with the unicorn; but upon this subject we shall here merely repeat those observations already before the public. "Respecting the unicorn, M. Rüppell's researches have furnished us with some very interesting information: his observations on the structure of the horns of the northern giraffe (*C. antiquorum* Sw.) prove at least that the existence of a quadruped, like the supposed unicorn, furnished only with a frontal horn, is at least neither impossible nor contrary to nature. Our traveller obtained much information on this much-debated question at Kordofan, where the unicorn was said to be known, and to bear the name of nillekma. Persons of various conditions agreed in the statement that the nillekma was of a reddish colour; equal in size to a small horse; slender as the gazelle in its shape; and furnished with a long, slender, straight horn in the male, which was wanting in the female. Some added, that its hoofs were divided; while others declared they were entire. According to these statements, this animal in-

habits the deserts to the south of Kordofan, is uncommonly fleet, and only occasionally visits the Kaldagi Slave Mountain, on the borders of this province. Three several Arabs asserted to M. Rüppell, that they had themselves seen the animal in question; and one of his slaves from Kaldagi, on seeing the antelopes brought from the desert of Korti, gave, of his own free will, a description of the nillekma, exactly coinciding with the notices afterwards obtained by M. Rüppell: it appears he had eaten of it in his own country, and described it as a very beautiful animal. Of the veracity of this slave, M. Rüppell had frequent proofs, especially in the description of animals, all of which were found to accord with the respective species which were subsequently procured.* Having been conducted from the *Solipedes*, or entire-footed quadrupeds, to the *Ruminantes*, by means of the camels, we now take the opposite point of the circle, and approach the *Ruminantes* by means of the aberrant tribes of the order; namely, the *Pachydermes*, the *Edentates*, and the *Anoplotheres*.

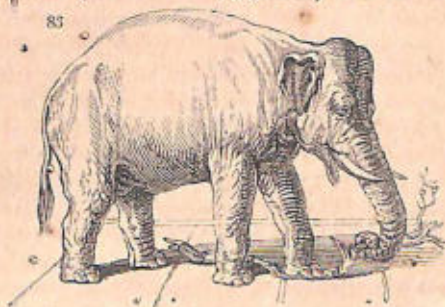
CHAP. V.

CONTINUATION OF THE ORDER UNGULATA — THE ABERRANT TRIBES.

(203.) UNDER the order of *Pachydermata*, or thick-skinned quadrupeds, M. Cuvier assembles all those immense herbivorous animals which do not ruminate their food, as the elephant, the rhinoceros, and the hippopotamus; including also those which have been discovered only in a fossil state. These he has divided into two sections, or families; to the first of which only do we confine the name; the second, with some modifications, compose the tribe here called *Anoplotheres*, or tapirs.

* Murray's Ency. of Geography, p. 1178.

The elephant (*E. Asiaticus*, fig. 83.) will therefore be



the type of the present order. The characters we now assign to the typical *Pachydermes*, as distinguishing them from the *Anoplotheres*, chiefly depend upon the structure of the feet. In speaking of the elephant and the mastodon, M. Cuvier observes that they have five toes on each foot, very perfect in the skeleton, but so incrusted with the callous skin which surrounds the foot, that their only external appearance is in the nails; and he very justly terms this foot a species of hoof. Now, this is precisely an intermediate structure between the solid hoof of the horse and the ordinary foot of quadrupeds in general; or, to bring the illustration more home, it is that sort of hoof which is necessary to connect the *Solipedes* with the *Ungulates*. All the *Pachydermata*, therefore, of M. Cuvier, which partake of this structure, we retain under his denomination; removing such as have the toes more or less externally cleft, to the family now formed of the *Anoplotheres*.

(204.) The most typical of these animals, with united or syndactyle toes, are the elephants and the mastodons; but the "ordinary *Pachydermata*, which have not cloven feet," of M. Cuvier, may be included in the same group: they constitute the genera *Rhinoceros*, *Hyrax*, and *Hippopotamus*; the last, according to our author, having four nearly equal toes terminated

by "little hoofs" to each foot. Whether this genus, however, really belongs to this group, or to the tapirs, is very doubtful.

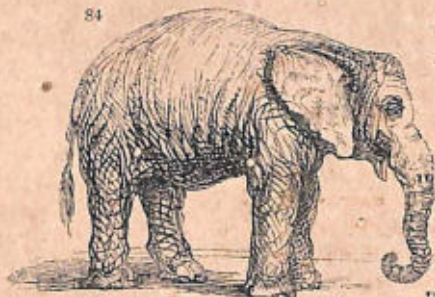
(205.) The elephants and the mammoths constitute the group called *Proboscidiens* by Cuvier; the first of these being the only living representatives of this stupendous race of quadrupeds upon the face of the earth: the latter belonged to a remote age, and have long been exterminated, either by human means, or by some of those mighty changes, which have passed over and altered not only the appearance, but the very inhabitants, of this our globe: yet to such a point of perfection has the study of comparative anatomy been carried of late years, that the fossil remains of these exterminated monsters make known to us, in many instances, very exact information on their general structure, and enable us to judge not only of their relative size, but also of their external form. It is in this field the reputation and the authority of M. Cuvier stands pre-eminent, and on which that monument which consigns his name to immortality will be raised.

(206.) Considered scientifically, the characters of the two genera, *Elephas* and *Mastodon*, may be thus generalised:—They are furnished with a proboscis and with tusks: as to their teeth, they have no canines, or incisors, properly speaking; but two large tusks are implanted in the incisive bone, which spring from the mouth, and frequently attain to an enormous size. The necessary magnitude of the alveoli of these tusks renders the upper jaw so high, and bends back the bone of the nose so far, that the base of the nostrils are found, in the skeleton, towards the top of the face. The most extraordinary part, however, of these animals is the proboscis; which is, in fact, its real nose; this is very greatly elongated into a cylindrical tube composed of many thousand small muscles, so variously interlaced together, that the proboscis is moveable in every direction: it is endowed with exquisite sensibility, and is terminated by a process resembling a little finger.

With this wonderful instrument does the elephant seize every thing which is conveyed to its mouth; he uses it also for drinking — sucking up the water, and bending the trunk round in the form of a cup. Notwithstanding the size and apparent weight of the head, it is rendered much lighter than it appears to be, by having several large vacuities; thus presenting a beautiful analogy to the toucans among the scansorial birds. In the lower jaw there are no incisors. To conclude: the intestines are very voluminous, the stomach simple, and the cæcum enormously large.

(207.) The elephants now existing are but of two species, — one belonging to Asia, the other to Africa, — the peculiarities of which we shall notice more in detail in another place. It will therefore only be necessary to observe, that the Indian species (*Elephas Indicus*) is known at first sight by the small size of its ears, when compared with those of the African elephant (*Elephas Africanus*, fig. 84.). The two species also differ

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greatly in the form of their grinders; which circumstance has induced methodists, who consider variation in the teeth as denoting variation in genera, to class them differently! Formerly, however, there existed a third species of these animals. "For," observes M. Cuvier, "in almost all parts of the two continents are found, underground, the bones of a species of elephant allied

to that of India, but having the ridges of the cheek

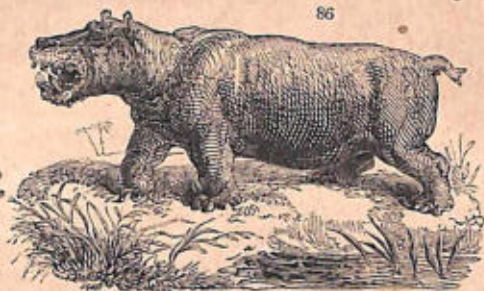


teeth narrower and straighter ; the alveoli of the tusks much larger in proportion, and the lower jaw more obtuse. A specimen, about twenty years ago, was discovered in a mass of ice on the coast of Siberia, and was covered with thick fur of two kinds ; so that it is possible this species may have lived in cold climates. The structure of the teeth in the Indian (fig. 85. a) and the African species (b) are also different.

(208.) The mastodons or mammoths (*Mastodon*), as before intimated, are known only by their enormous fossil remains, discovered of late years, in great abundance, throughout the whole of America, and demonstrating the existence of a tribe of animals in the New World, at some remote period, analogous to that of the elephants in the ancient continent. According to the profound researches of baron Cuvier, they had the feet, tusks, trunk, and many other details of conformation in common with the elephants ; but they differed in the grinders, whose tops, as is seen by the fossil examples, are furnished with thick conic points commencing from the base where they issued from the gum : these points, in their detrition, present disks of a size proportioned to the wearing of the points. This confirmation, which is also observable both in the hippopotamus and the pigs, has given rise to the mistaken idea that the mammoths were carnivorous. M. Cuvier more particularly notices two species of these extinct animals. The remains of one, the great mammoth (*M. giganteum*), are found wonderfully well preserved, in vast abundance throughout the whole of North America, and sometimes, but very rarely, in the old continent. The other (*Mastodon angustidens*) was one

third less in size, and much lower on its legs: its remains are found nearly throughout all Europe, and also in the greater part of America.

(209.) The hippopotamus is one of the most bulky of all quadrupeds; and both from its natural affinities and general structure may be termed the elephant of the waters. Only one species is known (*fig. 86.*)

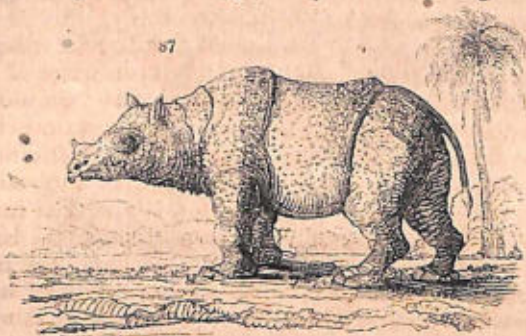


inhabiting the great rivers of Southern Africa, and passing its life almost entirely in the water. But for its short, thick, and very blunt muzzle, it might be compared to a gigantic pig; the body is thick and heavy, and is destitute of fur or any other covering but a few weak and scattered bristles, while the legs are so short that the belly almost touches the ground. The head is enormously large, and the muzzle unusually thick, while the eyes and ears are very small: there are four toes on each foot, terminated by little hoofs: in each jaw there are six grinders; the three first of which are conical; the three next furnished with two pair of points or eminences, which assume, by detrition, a trefoil shape: the cutting teeth, or incisors, are four in each jaw; the upper are short, conical, and bent; the under are long, cylindrical and pointed: each jaw has one canine tooth on each side; the upper pair are straight, but the lower are thick and bent, assuming the indication of tusks, and rubbing against those of the upper jaw. Although ferocious, or rather cou-

rageous, when attacked, these unwieldy animals of the waters are harmless when undisturbed; they are, in their nature shy, and feed entirely on roots and other vegetables. According to M. Cuvier, the hippopotamus formerly came by the Nile into Upper Egypt, but it has long disappeared from that part of Africa. Fossil bones of this genus are found, in some abundance, in different parts of Italy; but it is still uncertain whether they belonged to individuals of the species now in existence, or to another.

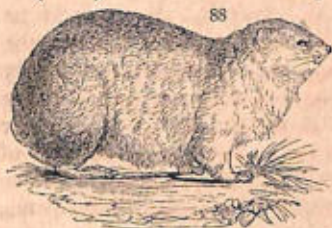
(210.) The genus *Rhinoceros* is one of the most conspicuous of the present tribe. All the species are of so large a size as to yield only to the elephants. Possessed of equal strength, they do not, however, evince the same sagacity or the same capability of domestication. The skin of the body has no covering, yet its substance is of such uncommon thickness, and is withal so hard, as to turn a musket ball. The proportions of the body may be compared to those of the elephant, but that the nose or upper part of the muzzle is armed with a pointed, and curved horn, and the folds of the skin lie over each other, so as to give the animal an appearance of being covered with armour. The species yet known are few, and are confined to the warm latitudes of Africa and India; and they live, like all the animals of this order, upon vegetables. The artificial nature of systems built solely upon the number and form of the teeth is nowhere more apparent than in this group, where, if the dental system is strictly applied, we should have nearly every species of rhinoceros made into a genus, since they decidedly differ in the number of the incisors or cutting teeth: the Indian rhinoceros has, in all, six of these; that of Sumatra only four; and the common one of Africa none. The technical characters of this genus are taken from the feet being divided into three toes; the stomach being simple, the intestines long, and the cœcum very large. It is said that they are stupid and ferocious animals, living, like the tapers and other swine-like quadrupeds, in marshy and humid places. The

structure of the horn is particularly curious; for, although to all appearance solid, it is composed of an infinite number of agglutinated hairs, resembling very delicate fibres. Our friend Mr. Burchell discovered a new species in the interior of Africa but a few years back, which he has named and characterised as the *Rhinoceros Sinusis*, while nearly at the same time sir Stamford Raffles made a similar discovery of another species in Sumatra (*R. Sondaicus*, fig. 87.). These designations,



with the characteristic vanity of his countrymen, a modern systematist has attempted to set aside, and very modestly to substitute names of his own.

(211.) The rock rabbit (*Hyrax Syriacus*, fig. 88.)



is placed by M. Cuvier in the same division with the rhinoceros. It is a small rabbit-like animal both in point of colour and size, but without any tail. "The damans or *Hyrax*," observes M. Cuvier, "has

been for a long time placed among the *Rodentia*, on account of their very small size; but by a close examination of them, it is found that, excepting the horn, these are in some sort rhinoceroses in minia-

ture: at least they have exactly the same molars; but their upper jaw has two strong bent incisors, and during nonage two very small canines; the lower jaw having four incisors without canines. The anterior feet have four toes, and three to those behind, all with a sort of very small hoof, thin and round, except the internal toe behind, which is armed with a bent oblique nail. These animals have the muzzle and the ears very short, are covered with fur, and have only a tubercle in the place of a tail. Their stomach is divided into two pouches, besides a large cœcum, and many dilatations to the colon, towards the middle of which there are two appendages analogous to the two cœca of birds.* "It is obvious," observes the industrious translator, "that the daman is one of those animals which are intermediate between two or more genera, the very plague of naturalists, though they merit, from their singularity, particular attention. Independently of disparity in size from others of the present order, it differs from them in the nails, which, instead of covering the bottom of the toes, scarcely cover the whole of their upper side; its motions are plantigrade, while other *Pachydermata* move on the toes, and have the carpus and the tarsus adapted only to pronation; its fur is thick and soft, and it has labial whiskers; in all which particulars it differs also from others of the order, as it does also from most of them in great agility and activity. If, therefore, its osteological characters are to prevail in its classification, other dissimilarities must be endured." We have given this passage entire, because upon the present occasion we must rest satisfied with M. Cuvier's views. There is an obvious relation, of some sort, between this singular genus, of which three species are now known, and the *Glires*; but whether of analogy or of affinity it is impossible to determine: for the present we place it as the gliriform type of the *Pachydermes*, upon the sole authority of what M. Cuvier has said of the construction of its feet.

* Geoff. Cuv. iii. 358.

(212.) The gigantic *Megalonyx*, an extinct quadruped, whose entire skeleton has been found in North America, will be introduced in this part of our series; for it affords a most beautiful link of connection between the *Pachydermes* and the *Edentates*, without which, indeed, it would have been impossible to conceive in what manner animals of such bulk could be connected with the sloths. The discovery of this animal, in short, sets at rest the scruples of those who have imagined that extinct animals formed no part of the circular plan pursued in the creation of existing races. There seems to be two species of this genus, to which we retain the original name imposed by Mr. Jefferson, the well known American president. Both these species, according to Cuvier, were at least as large as the ox; the limbs remarkably robust, and ending in five thick toes, some of which, only, were provided with an enormous claw curved like those of the sloths and armadillos. The head is small, and the muzzle short, and was terminated probably by a short proboscis; the mouth being furnished only with molars, whose crowns were marked by transverse ridges: the neck was rather short, the body large and heavy, the limbs extremely robust, and the anterior paw provided with powerful clavicles. There is every reason to believe that its skin was entirely covered with ossified polygonous scales, fitting into each other like mosaic work. The form of the molars, no less than the size of the animals themselves, seem to indicate that both species fed on vegetables and roots, and that their walk must have been very slow. It will be only necessary for us to add, that while the structure of the teeth assimilates these remarkable animals to the *Edentates*, the structure and proportions of the limbs remove them from the scansorial sloths of the existing race (all of which live in trees), and places the genus within the limits of the *Pachydermes*.

(213.) The fifth great division of the ungulated order, as already remarked, is the *EDENTATES*, comprising all such as are not provided with cutting teeth. The group

in itself is small, and the individuals, as M. Cuvier well observes, are almost associated by characters merely negative. They have, nevertheless, some mutual relations of a positive nature; such, for instance, as very large nails, which embrace the extremities of the toes, and more or less approach to the nature of hoofs; they possess, also, a certain inertness or want of agility, arising from the peculiar organisation of their limbs. The name given to the order must also be received with some limitation. The incisive teeth, indeed, are wanting in most of these species, but others have canine teeth and grinders, a few have grinders only, and only a small number are really toothless quadrupeds. The toes, in like manner, vary in number, but they are all furnished with nails, generally of a very powerful structure. As the group contains so few modifications of form, we shall follow the arrangement of the *Règne Animal*, and divide it into three tribes: 1. The sloths (*Bradypus*); 2. The armadillos and ant-eaters (*Dasypus*); and 3. The toothless quadrupeds (*Monstrema*). The reader will immediately perceive how widely these groups differ from each other, not only in general appearance, but in those especial characters derived from the teeth, upon which M. Cuvier and other systematists have built their methods. A more convincing proof, indeed, cannot be adduced, to show the utter impossibility of laying down rules, beforehand, for natural groups, or for erecting a system upon any one set of characters, when nature every where tells us that her system is *one of variation*. We must not, therefore, be expected to say any thing on the affinities of these divisions, but shall merely notice their contents in the order in which they stand.

(214.) On the zoological character of the sloths, M. Cuvier makes the following remarks: — “ They have both canine teeth and grinders, — the former much larger than the others, and very sharp; the latter cylindrical: on the breast are two mammæ. The toes are united together by a skin, and terminated by enormous nails, considerably compressed, and much bent towards the inside of the hand and the sole of the foot. The hind

feet are articulated obliquely on the leg, and lean only on the external side; the joints of the toes are articulated by a close ginglymus, and the first become attached at a certain age to the metacarpian or metatarsian bone, which also become in time attached to each other for want of use. To this inconvenience in the organisation of the extremities, is joined another, not less considerable, in their proportions. Their arms and fore-arms are much longer than their thighs, so that when they walk they are obliged to draw themselves along on their elbows. Their thighs are so wide apart, that they cannot bring their knees together: this structure is completely analogous to what is seen in the *Loris*, or slow lemurs, and points out, as before noticed, a very important analogy. The viscera of the sloths is as singular as the rest of their conformation: the stomach is divided into four sacs, analogous to the four stomachs of the *Ruminantia*, but without leaves or other prominent internal parts; while their intestinal canal is short and without a cæcum."

(215.) The sloths are certainly a group of the most extraordinary animals in the class *Mammalia*. They claim, therefore, our particular attention in this place, since their history has been recently illustrated by an eye-witness of their economy, and they have never been brought to Europe alive. Living, indeed, only in the hottest parts of South America, and feeding upon the foliage of certain trees peculiar to those regions, their transportation to this country is naturally attended with difficulties almost insurmountable.

(216.) The sloth in a state of nature is destined to be produced, to live, and to die in the trees. In Demarara he is a scarce and solitary animal, inhabiting only the most remote and gloomy forests. Were we to draw our own conclusions from what all authors have written about this animal, we should suppose that nature had departed from her usual course in the formation of this extraordinary creature, which appears to us so forlorn and miserable, so ill put together, and so totally

unfit to enjoy the blessings which have been so bountifully given to all other quadrupeds: for he has no soles to his feet, and he is evidently ill at ease when he tries to move on the ground; it is then that he looks up in your face with a countenance that says, "Have pity on me, for I am in pain and sorrow." It is, no doubt, from seeing the sloth in this situation, "in which nature never intended that he should be exhibited," that writers who have not contemplated him in his natural element, have been led into the erroneous accounts which it is our present business to rectify. We will first take a near view of him; as, by obtaining a knowledge of his anatomy, we shall be able to account for his movements hereafter, when we see him in his proper haunts. His fore legs, or, more correctly speaking, his arms, are apparently much too long; while his hind legs are very short, and look as if they could be bent almost to the shape of a corkscrew. Both the fore and hind legs, by their form, and by the manner in which they are joined to the body, are quite incapacitated from acting in a perpendicular direction, or in supporting it on the earth, as the bodies of other quadrupeds are supported by their legs. Hence, when you place him on the floor, his belly touches the ground. Now, granting that he supported himself on his legs like other animals, nevertheless he would be in pain, for he has no soles to his feet, and his claws are very sharp, and long, and curved; so that, were his body supported by his feet, it would be by their extremities, just as our bodies would be, were we to throw ourselves on all fours, and try to support ourselves on the ends of the toes and fingers,—a trying position. Were the floor of glass, or of a polished surface, the sloth would actually be quite stationary; but as the ground is generally rough, with little protuberances upon it, this just suits our animal: he moves his fore legs in all directions, in order to find something to lay hold of; and when he has succeeded, he pulls himself forward, and is thus enabled to travel onward; but at the same time in so tardy and awkward a manner, as

to acquire for him the name of sloth. His looks and his gestures evidently betray his uncomfortable situation ; and as a sigh every now and then escapes him, we may be entitled to conclude that he is actually in pain. See him, however, upon a branch, and his aspect is altogether different. In short, the sloth, in its wild state, spends its whole life in trees, and never leaves them but through force or by accident. An all-ruling Providence has ordained man to tread upon the surface of the earth, the eagle to soar in the expanse of the skies, and the monkey and squirrel to inhabit the trees ; still these may change their relative situations without feeling much inconvenience ; but not so with the sloth. He is appointed to spend *his whole life* in the trees ; and, what is more extraordinary, not *upon* the branches like the squirrel and monkey, but *under* them ! he moves suspended from the branch, he rests suspended from it, and he sleeps suspended from it. To do this he must have a structure very different from that of every other known quadruped. This we accordingly perceive : but his seemingly awkward conformation is accounted for by its habits. In lieu, then, of the sloth leading a painful life, and entailing a melancholy and miserable existence on its progeny, it must enjoy that life for which it is so admirably and beautifully adapted, just as much as any other animal ; while its extraordinary formation and singular habits are but further proofs of the wondrous works of Omnipotence. It must be observed, however, that the sloth does not hang head downwards, like the vampire and other bats. When asleep, he supports himself from a branch parallel to the earth : he first seizes the branch with one arm, and then with another ; and after that, brings up both his legs, one by one, to the same branch, so that all four are in a line, and he seems perfectly at rest in this position. Now, had he a tail, he would be at a loss to know what to do with it in this position : were he to draw it up between his legs, it would interfere with them ; and were he to let it hang down, it would become the sport

of the winds, and therefore destroy his balance. Thus his deficiency of tail is a benefit; it is, in fact, so rudimentary, as scarcely to exceed an inch and a half in length. In climbing, the two arms are never together, but first one and then the other, and so on alternately. As the sloth is an inhabitant of forests within the tropics, where the trees touch each other in the greatest profusion, there seems to be no reason why he should confine himself to one tree alone for food, and entirely strip it of its leaves. "Indeed," continues our author, during the many years I have ranged the forests, I have never seen a tree in such a state of nudity; indeed, I would hazard a conjecture, that, by the time the animal had finished the last of the old leaves, there would be a new crop upon the part of the tree he had stripped first, ready for him to begin again, — so quick is the process of vegetation in these countries."

(217.) "On the motion of the sloth, the Indians have the following saying; that when the wind blows, the sloth begins to travel. In calm weather he remains tranquil, probably not liking to cling to the brittle extremity of the branches, lest they should break with him in passing from one tree to another; but as soon as the wind rises, the branches of the neighbouring trees become interwoven, and then the sloth seizes hold of them, and pursues his journey in safety. There is seldom an entire day of calm in these forests: the trade wind generally sets in about ten o'clock in the morning; and thus the sloth may set out after breakfast, and get a considerable way before dinner. He travels at a good round pace; and were you to see him pass from tree to tree, as I have done, you would never think of calling him a sloth." *

(218.) The rapidity of motion of this animal is well illustrated by Mr. Waterton in the following anecdote: — One day, as we were crossing the river Essequibo, I saw a large two-toed sloth on the ground upon the bank: how he had got there nobody could tell; the Indian said he had never surprised a sloth in such a

* See also an excellent paper, by Dr. Buckland, on the subject, in *Linn. Tr.*

situation before : he could hardly have come there to drink, for both above and below the place the branches of the trees touched the water, and afforded him an easy and a safe access to it. Be this as it may, though the trees were not twenty yards from him, he could not make his way through the sand time enough to escape before we landed. As soon as we got up to him he threw himself upon his back, and defended himself in gallant style with his fore legs. "Come, poor fellow," said I to him, "if thou hast got into a hobble to-day, thou shalt not suffer for it; I'll take no advantage of thee in misfortune; the forest is large enough both for thee and me to rove in; go thy ways up above, and enjoy thyself in these endless wilds: it is more than probable thou wilt never have another interview with man. So fare thee well." On saying this, I took a long stiek which was lying there, held it for him to hook on, and then conveyed him to a high and stately Mora tree. He ascended with wonderful rapidity, and in about a minute he was almost at the top of the tree: he now went off in a side direction, and caught hold of the branches of another tree; proceeding in this manner towards the heart of the forest. I stood looking on, lost in amazement at this singular mode of progress. I followed him with my eye till the intervening branches closed in between us; and then I lost sight for ever of the two-toed sloth. I was going to add, that I never saw a sloth take to his heels in such earnest; but the expression would not do, for the sloth has no heels. Upon the ground he is as much at a loss to proceed on his journey upon a smooth and level floor, as a man would be who had to walk a mile on stilts upon a life of featherbeds. The sloth is the only known quadruped which spends its whole life from the branches of trees, suspended by his feet. I have paid uncommon attention to him in his native haunts. The monkey and squirrel will seize a branch with their fore feet, and pull themselves up, and rest or run upon it; but the sloth, after seizing it, still remains suspended, and suspended moves along under the branch, till he can lay

hold of another. Whenever I have seen him in his native woods, whether at rest, or asleep, or on his travels, I have always observed that he was suspended from the branch of a tree; and when his form and anatomy are considered, it will appear evident that he cannot be at ease in any situation where his body is higher, or above his feet.

(219.) In confinement, our traveller thus speaks of a sloth he possessed. "I kept him in my room for several months. I often took him out of the house, and placed him upon the ground, in order to have an opportunity of observing his motions. If the ground were rough, he would pull himself forwards by means of his fore legs, at a pretty good pace; and he invariably immediately shaped his course towards the nearest tree. But if I put him upon a smooth and well trodden part of the road, he appeared to be in trouble and distress. His favourite abode was the back of a chair; and after getting all his legs in a line upon the topmost part of it, he would hang there for hours together, and often, with a low and inward cry, would seem to invite me to take notice of him."* It is really delightful to see the theories and day-dreams of speculative naturalists and compilers fade into thin air before the rays of truth, like that which Mr. Waterton has cast upon the history of these extraordinary animals. For the rest, we can safely say, that the only wild animal we ate in Brazil, whose flesh reminded us of tender boiled mutton, was the sloth; and that its fur, although thick, is so peculiarly soft and cool, that it makes the most delicious pillow imaginable, particularly in a warm country. We must, therefore, attach no great credit to the assertions, that "its flesh and its fur are good for nothing."

(220.) Regarding the different species of sloths there is also much to be learned. The two best known are the three-toed (*Bradypus tridactylus* L.) and the two-toed (*B. didactylus*). Respecting a third, alluded to by the translators of M. Cuvier's *Règne Animal*, some unin-

* Waterton's Wanderings in South America, p. 163.

tentional misrepresentations have been made, which no one can correct but ourselves. In the third volume of the above-named work will be found the plate of a sloth, which is stated to have been engraved from a drawing by Howitt; this latter being taken "from a specimen which appears formerly, if not at present, to have belonged to Mr. Swainson. Major Smith has also a drawing from the same specimen; and from a note of his upon the drawing, it appears that M. Temminck had seen the specimen whence it was taken, and had applied the epithet *cristatus* to it as a specific name." Now we must claim for ourselves not only our own name, but the original discovery of the species. This rests, in fact, upon one and the same specimen, brought home by us with the other zoological collections formed in the interior of Brazil. From this specimen we employed Howitt to make both an original sketch and a finished



drawing (fig. 89.); and having done this, we parted with the skin to M. Temminck, who was then in England, and who carried it back with him to Holland. Howitt, who was proverbially careless in his drawings, made several copies of that which we had commissioned him to execute; but these copies were made without having the skin in his possession: in this way we can

readily account for copies having come into the hands of Mr. Griffith and Major Smith. We must, however, premise that they are eminently defective, and very unlike the animal they profess to represent. The artist has given the animal the lengthened face or muzzle of a sheep, bare of fur, while the long black hair seems as if it sprang from the crown of the head instead of the back. The name of *cristatus* instead of *melanotus* is, therefore, not only unjust, but implies a character which

does not exist. The learned professor has been too often accused of appropriating the names and discoveries of others to himself, to excite in us any surprise at his conduct in this instance; but we feel assured that neither Mr. Griffiths nor major Smith would knowingly sanction this sort of scientific robbery. We not only discovered the *Bradypus melanotus*, but we actually ate him; this being the very specimen alluded to as tasting like boiled mutton. Finally, we must do justice to one or both of the above writers for the success with which, in the case of the sloth, they have combated the atheistical opinions of Buffon. The knowledge furnished us by Burchell and Waterton fully confirms the sound justice of the following remark:—"Still we must regard the sloths as perfect in their kind, and as properly organised for the existence to which they are destined. We must also admit a final and a wise cause for the anomalies they present to our view. We cannot, indeed, agree with Buffon, that species of animals have been created or organised for misery. We suspect, on the contrary, that there is little or no misery in the animal world, or at least among animals in a state of nature. Among us, indeed, there is a sufficiency of evil; but it is, for the most part, the work of our own hands."* We now resume the thread of our discourse.

(221.) The ant-eaters (*Myrmecophagæ*) follow the sloths in a natural series, although they are completely without teeth: they live in the same regions, and, but for their long muzzle, and still longer tail, bear a very close external resemblance to the animals we have just quitted. These are, likewise, some of the most remarkable quadrupeds of the New World, and their manners are very interesting. Their name informs us of their food. Provided with large and powerful curved claws like the sloths, they are employed both as weapons of defence and for tearing open the strong nests of the *Termites*, or white ants: the long snout is then inserted

* Geoff. Cuv. iii. 281.

in the aperture ; and the tongue, of a still greater length, being insinuated into all parts of the nest, draws out crowds of its inhabitants, which are immediately conveyed to the mouth. But let us return to Mr. Waterton, who, in his eccentric but amusing manner, puts truth before us in such an inviting garb. There are but three species of this genus known, all of which are thus spoken of by our author as inhabiting the interior of Demerara. "The smallest is not much larger than a rat, the next is nearly the size of a fox, and the third (the *Myrmecophaga Jubata*, or great ant-eater) is a stout and powerful animal, measuring about six feet from the snout to the end of the tail. He is the most inoffensive of all animals, and never injures the property of man. He is chiefly found in the inmost recesses of the forest, and seems partial to the low and swampy parts near creeks, where the troely tree grows. There he goes up and down in quest of ants, of which there is never the least scarcity ; so that he soon obtains a sufficient supply of food, with very little trouble. He cannot travel fast, for man is superior to him in speed. Without swiftness to enable him to escape from his enemies ; without teeth, the possession of which would assist him in self-defence ; and without the power of burrowing in the ground, by which he might conceal himself from his pursuers ; he still is capable of ranging through these wilds in perfect safety ; nor does he fear the fatal pressure of the serpent's fold, or the teeth of the famished jaguar. Nature has formed his fore legs wonderfully thick, and strong, and muscular, and armed his feet with three tremendous sharp and crooked claws. Whenever he seizes an animal with these formidable weapons, he hugs it close to his body, and keeps it there till it dies through pressure, or through want of food. Nor does the ant bear, in the mean time, suffer much from loss of aliment, for it is a well known fact that he can go longer without food than any other animal, excepting, perhaps, the land tortoise. His skin is of a texture that perfectly resists the bite of a dog ;

his hind parts are protected by thick and shaggy hair, while his immense tail is long enough to cover his whole body. The Indians have a great dread of coming in contact with this animal ; and after disabling him in the chase, never think of approaching him till he is quite dead. It is, perhaps, on account of this caution that naturalists are ignorant of its true mode of walking or standing, which we shall presently detail. He is a very pacific animal, for he is never the first to begin an attack. His motto may be *Noli me tangere*. As his habits and his haunts differ materially from those of every other inhabitant of the forest, their interests never clash ; and thus he might live to a good old age, and die at last in peace, were it not that his flesh is very good food. On this account the Indians wage perpetual war against him ; and as he cannot escape by flight, he falls an easy prey to the poisoned arrow shot from the Indian bow at a distance. If ever he be closely attacked by dogs, he immediately throws himself on his back ; and if he be fortunate enough to catch hold of his enemy with his tremendous claws, the invader is sure to pay for his rashness with the loss of life.

(222.) The tongue of the ant-eater and its mode of walking are both very curious. " He has two very large glands situated below the root of the tongue ; from these is emitted a glutinous liquid, with which his long tongue is lubricated when he puts it into the ant's nests. These glands are of the same substance as those found in the lower jaw of the woodpecker. The secretion from them, when wet, is very clammy and adhesive ; but upon being dried it loses these qualities, and you can pulverise it between your finger and thumb ; so that, in dissection, if any of it has got under the fur of the animal, or the feathers of the bird, allow it to dry there, and then it may be removed without leaving the least stain behind." The position of the toes, in the living animal, is unlike that of any known quadruped, and is thus commented upon by Mr. Waterton :—" If, in taking a drawing from a dead ant bear, you judge

of the position in which he stands from that of all other terrestrial animals, the sloth excepted, you will be in error. Examine the figure of this animal in books, or inspect the stuffed specimens in museums, and you will see that the fore claws are just in the same forward attitude as those of a dog, or a common bear, when he walks or stands. But this is a distorted and unnatural position, and in life would be a painful and intolerable attitude for the ant bear, for the length and curve of his claws cannot admit of such a position. When he walks or stands, his feet have somewhat the appearance of a club-hand. He goes entirely on the outer side of his fore feet, which are quite bent inwards; the claws being collected into a point, and going under the foot. In this position, strange as it is, he is quite at ease; for his long claws are disposed of in a manner to render them harmless to him; and are prevented from becoming dull and worn, like those of a dog, which would inevitably be the case, did their points come in actual contact with the ground; for his claws have not that retractile power which is given to animals of the feline species, by which they are enabled to preserve the sharpness of their claws on the most flinty path. A slight inspection of the fore feet of the ant-bear will immediately convince you of the mistake above alluded to; for you will perceive that the whole outer side of his foot is not only deprived of hair, but is hard and callous,—proof positive of its being in perpetual contact with the ground; while, on the contrary, the inner side of the bottom of his foot is soft and rather hairy.* Azara has also given us much valuable information on this extraordinary quadruped, and confirms many of the foregoing particulars.

(223.) Of the two other species, called the middle and the least ant-eaters, little authentic information has been published. Both these differ essentially in their tails from the former; this member being prehensile,

* Wanderings, p. 177.

and adapted to assist the animals in climbing trees. The middle-sized species, on the authority of Azara, emits a strong scent of musk, particularly when irritated. It is said also to eat honey; which it no doubt procures by scratching into the nests of the tree bees, so common in all parts of tropical America. The tail, although long and thick, is destitute of the flowing hair of the greater species; and the lower part, for one third of its length, is altogether naked. We have strong suspicions, however, that more than one or even two distinct species pass under this common name. All we know of the little ant-eater is, that it lives entirely in trees, feeds like the others upon ants and insects, and has a tail even more prehensile than the middle-sized species.

(224.) The scaly ant-eaters, forming the genus *Manis*, belong to the tropics of the Old World, and occur in the same parallels of latitude to those inhabited by the genuine ant-eaters of America. Their general form is much the same, but the whole of the body and limbs are covered with thick sharp-edged plates disposed one upon another in the manner of scales: by this defensive covering the animal is enveloped, as it were, in a complete suit of impenetrable armour. This coat of mail, which has only been given to the ant-eaters of the Old World, is still more invulnerable when the *Manis* is attacked: he then rolls himself up into a ball, and, by raising his pointed scales at the same time, assumes the appearance of that weapon used in ancient warfare called a spiked ball. The feet, like those of the American ant-eaters, are armed with strong claws: five are upon each foot; and they probably walk in the same manner. They are said to be gentle animals, and totally inoffensive; living, like their hairy brethren in the New World, upon ants and small insects. One species inhabits Africa, the other India.

(225.) Before taking leave of the ant-eaters, we must notice the Cape species, a very curious and somewhat anomalous quadruped found in Southern Africa, and called the African ant-eater (*Orycteropus Capensis*,

fig. 90.) in Europe, and ground-hog by the colonists.



With much of the general habits, and even something of the appearance, of the genuine ant-eaters, this animal is furnished with grinders, whose structure is different, as M. Cuvier remarks,

from those of all other known quadrupeds; they are solid cylinders, traversed like the pores of a cane, according to their length, with an infinite number of little canals: the stomach, also, is simple, muscular towards the *pyloris*, and the *cæcum* is small and obtuse: the claws of the toes are flat, and, instead of being pointed, are constructed for digging. Its size is that of the badger, its legs short, and its body covered with scanty hair: the ears are very large and long. The whole appearance of this creature is thick, heavy, and pig-like: the hind feet are plantigrade, and the nails of all the toes approximate to the character of solid hoofs; the skin is very thick, which, with the harsh and scanty nature of the fur, gives it much of the pachydermatous character; and this approximation is further shown in the bones of the *tarsi* and *metatarsi*. It has the extensible tongue of the genuine ant-eaters, and feeds in the same manner. Mr. Burchell, one of the best authorities we can have, has given us some interesting notices on its manners. Its colonial name is *Hardvark*, signifying earth-hog; and indeed it may, from its appearance and size, be more justly compared to the hog than to any other ant-eaters, although, in its mode of life, it resembles the latter: with its fore feet, which are admirably formed for that use, it digs a deep hole, wherein it lies concealed the whole of the day—never venturing out but at night, when it repairs to feed at the ant-hills. Scratching a hole on one side, it disturbs the little community; on which the insects, running

about in confusion, are easily drawn into the animal's mouth by its long slender tongue. Without tusks, or any efficient teeth, this animal is quite defenceless, and depends for its safety solely on concealment, in which it so completely succeeds, that no animal is less seldom seen; and from its power of burrowing, with incredible rapidity, away from those who endeavour to dig it out of its retreat, few are more difficult to be obtained. The philosophic zoologist will be at no loss to recognise, in these details, many points of the highest interest, elucidating the natural affinities of the ant-eaters generally, to the more typical examples of the natural order of *Ungulata*.

(226.) The armadillos of South America, in the general form and impenetrable covering of their bodies, seem to represent the scaly ant-eaters of tropical Asia; but they are much smaller in size, and feed in a totally different manner. They are also provided with teeth; but the dentation of these animals is so variable as to be different even among the species. The sub-genera, as will be perceived on referring to our systematic arrangement, rest on very refined characters, and need not occupy us at present. The zoological peculiarities of the whole group of armadillos are thus detailed by M. Cuvier:—The entire animal may be said to be cased in armour, the divisions of which may be compared, for their regularity, and admirable fitting into each other, to a mosaic pavement. This substance forms a buckler over the forehead; a second, very large and convex, protects the shoulders; and a third, similar to the preceding, envelops the crupper: between these two last are several parallel and moveable bands, which give the body the faculty of bending. The tail is sometimes furnished with successive rings, and sometimes only with tubercles, which also cover the legs: the ears are very large; the muzzle lengthened and pointed; and the grinders cylindrical, without any enamel on the interior side. The nails are remarkably well adapted for digging; there are always five on the hinder feet, but

those on the fore feet vary from four to five: the tongue is soft, and but little extensible.

(227.) The natural habits of the armadillos have been thus spoken of by Mr. Waterton:—"The armadillo burrows in the sand-hills like a rabbit. As it often takes a considerable time to dig him out of his hole, it would be a long and laborious business to attack each hole indiscriminately, without knowing whether the animal was there or not. To prevent disappointment, the Indians carefully examine the mouth of the hole, and put a short stick down it. Now if, on introducing the stick, a number of musquitos come out, the Indian knows to a certainty that the armadillo is in it; and vice versâ, wherever there are no musquitos in the hole, there is no armadillo. The Indian, having satisfied himself that the armadillo is there, by the musquitos which come out, immediately cuts a long and slender stick, and introduces it into the hole; he carefully observes the line the stick takes, and then sinks a pit in the sand to catch the end of it; this done, he puts it further into the hole, and digs another pit; and so on, until at last he comes up with the armadillo, which had been making itself a passage in the sand till it had exhausted all its strength through pure exertion. I have been sometimes three quarters of a day in digging out one armadillo; and obliged to sink half a dozen pits, seven feet deep, before I got up to it. The Indians and negroes are very fond of the flesh, but I consider it strong and rank. On laying hold of the armadillo, you must be cautious not to come in contact with his feet; they are armed with sharp claws, and will inflict severe wounds: when not molested, he is harmless and innocent. The armadillo swims well in time of need, but does not go into the water by choice. He is very seldom seen abroad during the day; and when surprised, he is sure to be near the mouth of his hole. Every part of him is well protected by his shell, except his ears. In life, this shell is very limber, so that the animal is enabled to go at full stretch, or roll

himself up into a ball, as occasion may require."* The researches of Azara, in the southern provinces of this continent, has made us acquainted with an armadillo of very considerable size (*Dasypus gigantea*), which sometimes measures more than three feet in length, without reckoning its tail. But we must now advert to one of the most interesting of modern discoveries in this department of nature, — an animal uniting many of the characters of the armadillos to those of the sloths, but of whose natural manners little is known of popular interest.

(228.) The *Chlamyphorus truncatus*, or mailed sloth, is a native of Chili; the only specimen yet known having been brought from Mendoza, in the province of Cuyo (fig. 91.). It was, says Dr. Harlam, obtained on the



spot in a living state, but it continued to live in confinement only a few days. Mr. Colesberry, who brought the skin with him to Philadelphia, says that "its habits resemble those of the mole — living for the most part underground: it is called by the native Indians *Pichiciago*, and it is reputed to carry its young beneath the scaly cloak with which it is covered: the tail possesses little or no motion." Its general appearance is not much unlike that of an armadillo without a tail, and with the head of a sloth. Its size is small, measuring only five inches and two lines. (Is there no mistake in this?) The upper part of the body is covered with a coriaceous shell, of a consistence somewhat more dense and inflexible than sole leather of equal thickness. It is composed of plates, either square, rhomboidal, or cubical; each row separated by an epidermal or membranous production, which is reflected above and

* Wanderings, p. 183.

beneath over the plates, of which from fifteen to twenty-two are in each row. The shell is broadest behind, and extends about one half round the body. Except along the spine, and on the crown of the head, this covering is loose throughout; being attached to the back immediately above the spine by a loose cuticle, and by two remarkable bony processes; on the top of the *os frontis* by means of two large plates: but for this attachment, and the tail being firmly curved beneath the belly, the covering would be very easily detached. The external ears are circular and patulous; the eyes very minute; and both are nearly hid by long silky hair: the mouth is wide, and the extremity of the snout is furnished with an enlarged cartilage, as in the hog. The whole surface of the body is covered with fine silk-like hairs, longer and finer than those of the mole, but not so thick set: the fore feet are short, clumsy, and powerful; the joints of the toes united: they are each provided with five powerful nails, rising gradually one above the other; the external shortest and broadest, and the whole so arranged as to form a sharp cutting instrument, admirable for making way underground, but calculated to impede motion on the surface. Hind legs weak and short, the feet long and narrow, the heel well defined and resting flat upon the ground; the toes are separate, and the nails flattened horizontally. The teeth deserve particular attention: there are no incisors; the grinders are eight in each jaw, all approximate, and disposed in separate alveoli; the crowns of the two first only approach to a point, and thus resemble canine teeth; the six remainder are all nearly flat on the crowns: their structure is simple; a cylinder of enamel of equal thickness throughout surrounds a central pillar of bone, there being no division into body and root; the lower half is hollow, the cavity representing an elongated cone: in the lower jaw, the teeth penetrate its whole depth. The sides of all these teeth are somewhat flattened, and very slightly curved externally.

(229.) On the affinities of this extraordinary animal,

Dr. Harlam, after giving many other interesting details, for which we must refer the reader to the original paper, observes, "that the animal before us unites in its external configuration traits peculiar to the genera *Dasypus*, *Talpa*, and *Bradypus*. It will be observed, that, though this singular being is clothed with a coat (or rather cloak) of mail, it differs very materially from that of the armadillo. Its analogy to the mole is observed in the lower portions of our animal, as well as that beneath the scales; but the hair is finer and longer, and at a distance has the appearance of long staple cotton. In both animals the eye is very small; the neck, breast, and shoulders very powerful; the posterior extremities weak; the anterior short, strong, and furnished with large claws; but in the structure of the latter, in the form of the head, and in that of the external ear, our animal differs entirely from the mole. In comparing it with the sloths, we find some analogy in the claws; but then they are articulated to the last phalanx, as in the mole. Yet in the structure of the teeth this animal is unquestionably more nearly allied to the sloths than to any other group: the teeth, as before observed, consist of a simple cylinder of bone, surrounded with enamel, except on the crowns, which has no enamel in the centre; while the roots, or rather that portion buried in the jaw, in both these animals are hollow. In these particulars, together with the short process descending from the zygomatic arch, as well as in the form of the fore claws, there is considerable analogy; but in all other points of organisation these genera are very distinct. We have omitted to notice the tail of the *Chlamyphorus*, which is very remarkable; it is little more than one inch long, and is completely curved beneath the body. The portion which is free consists of fourteen caudal vertebræ, surrounded by as many plates similar to those of the body, the extremity being depressed, so as to form a paddle; the rest of the tail being compressed; and the whole of the free portion is firmly curved beneath the belly." Dr. Harlam, in

concluding his elaborate account, particularly adverts to the form of the lower jaw, as separating the animal, in this respect, from the order *Edentata*, and approximating it to the *Ruminantia* and *Pachydermata* C.*

(230.) The third principal division of the *Edentates* contains but two genera, belonging to the Australian range, and which have long excited the attention of zoologists: these are *Echidna* and *Ornithorhynchus*: the first resembling a hedgehog, with the muzzle of an ant-eater, without the slightest vestige of a tooth; and the latter a mole, with the bill of a duck. M. Cuvier observes of these animals, collectively, that they differ from all others in having but one posterior opening, which serves both for the functions of reproduction and for the ordinary evacuations: this part of their anatomy, indeed, is highly curious, but not well adapted for popular details. Their skeleton is no less remarkable, especially on account of a sort of clavicle to the shoulders, placed before the common clavicle, and analogous to a similar bone in birds. Independent of each foot being provided with five unguated claws, the males have a spur on the hind feet, analogous, as a means of defence, to that of some gallinaceous birds: the eyes are very small; and there are no external ears.

(231.) The *Echidnæ*, or spiny ant-eaters, are of two species. Their mouth, or muzzle, more resembles that of a bird than of a quadruped, unless, indeed, it be compared to that of the American ant-eater; its form is narrow and lengthened, terminating in a very small mouth, hardly more than sufficient to admit the passage of a slender extensible tongue, which the animal uses, like the ant-eaters of America (*Myrmecophaga*) and India (*Manis*), to draw into its mouth the ants upon which it feeds. Although this mouth is destitute of teeth, the palate is furnished with several rows of small spines, directed backwards. Their feet are short, and are each furnished with five very strong and lengthened toes, admirably adapted for digging. The whole of the

* Amer. Journ. of Science, p. 235. &c.

body is covered with short, acute, and rather strong spines, somewhat similar to those of the hedgehog ; but in one species (*Echidna setosa*), these spines are intermixed with a quantity of thick and soft fur, more resembling that of the Brazilian porcupines. In common with these animals, the spiny ant-eaters are said to roll themselves into a ball on the approach of danger. The tail is very short, the stomach large and nearly globular, and the cæcum moderate.

(232.) The *Ornithorhyncus*, or duck-billed platypus, is certainly the most extraordinary quadruped in existence ; presenting the perfect bill of a bird, engrafted, as it were, upon the body of an otter or mole-like animal. Its size is equal to that of a full-grown cat, but its short feet and tail give it the appearance of being smaller. The first specimen which reached England was described by Dr. Shaw, and excited so much attention, that it was only after numerous and careful experiments that he himself could believe, and the naturalists of his time, that no deception had been practiced in preparing the specimen. So accurate, observes the doctor, is the similitude, that, at first view, it naturally excites the idea of some deceptive preparation ; the very epidermis, proportion, sereatous manner of opening, and other particulars in the beak of a shoveler, or other broad-billed species of duck, presenting themselves to the view ; nor is it without the most minute and rigid examination that we can persuade ourselves of its being the real beak, or snout, of a quadruped. Little is known of their natural economy, excepting that they are expert swimmers, seldom quitting the water, and moving slowly and painfully upon dry land. The males are distinguished by a very powerful spur, perfectly resembling, in its general form, those upon the feet of gallinaceous birds, and in like manner merely attached to the skin. This is a much more formidable weapon of defence than might at first be imagined ; for, through a minute perforation at its tip, is discharged a liquor highly poisonous.

(233.) Some further details regarding the structure of these animals deserve to be noticed. The body is depressed; and has some resemblance to that of an otter in miniature: it is covered with a very thick, soft, and beaver-like brown fur, darkest above, but paler beneath; the head is flattened and rather small; the mouth, or muzzle, as before remarked, exactly resembles that of a duck; round its base is a flat, circular membrane, somewhat deeper or wider below than above. The tail is rather short, but very considerably flattened and dilated, the tip being obtuse, and presenting, according to Dr. Shaw's account, an almost biped termination: this, however, must have been the effect of an accidental injury, for it is not apparent in two specimens of the crisp-haired species of Van Diemen's Land now lying before us. The *nostrils* are small, round, and situated much nearer to the tip of the upper jaw, or rather mandible, than to the front of the head; thus resembling those of many ducks. The *ears*, or *auditory openings*, are placed about an inch beyond the eyes, appearing like a pair of oval holes, there being no external ear. On the upper part of the head, on each side, a little beyond the beak, are two smallish oval white spots, in which are imbedded the eyes: these organs, however, as in the mole, are excessively small. In the place of *teeth*, the cartilaginous edges of the beak, towards the lower part, are furnished with vertical fibres, flat at top, not planted in alveoli, but simply attached to the gum: the *tongue* is short, furnished with papillæ, and ending in two aculeated horny points. M. Cuvier observes, that at the bottom of the mouth are two teeth on each side, but they are without roots, the coronals being flattened, and composed, like those of the *Orycteropus*, or Cape ant-eater, of small vertical tubes. The *fore feet* have a membrane which not only unites the toes, but projects considerably beyond the nails; in the hind feet the membrane is much shorter, and terminates at the root of the nails. M. Cuvier further observes, that the tongue in some degree is double; one in the beak, studded

with papillæ; and a second at the base of the first, much thicker, and carrying forward two small fleshy points: this latter assertion is contradictory to the statement made by Dr. Shaw.

(234.) On the various classifications which have been made of the above extraordinary animals, it would be needless to dwell, since they have all been founded upon mere individual opinion, without the least attempt to substantiate such opinions by analogical comparisons. In regard to the *natural* station of the toothless quadrupeds, there can be no doubt as to their belonging to the order *Ungulata*, where they occupy the same situation as do the *Tenuirostres*, or long-billed suctorial birds, among the perchers (*Insectores*), and the *Glires* among the orders of the *Mammalia*. This will be apparent to any one who analyses these groups; and the more varied are the tests applied to this theory, the more incontestably will its truth be manifested. We cannot, however, establish this analogy at present by details, which, to render them satisfactory, would occupy several pages. It is necessary, however, to call the reader's attention to the fact, that the rasorial order of birds is that which touches the circle of the *Mammalia*, or quadrupeds, into which class it blends by means of the *Ungulata*. Now, if this theory is correct, it will follow, as a matter of course, that among the *Rasores* we should find those birds which made the nearest approach to quadrupeds, and that among the *Ungulata* we should see quadrupeds assuming some of the characters of birds. These approximations, also, theoretically speaking, should be so great as to strike every one, and should be much more marked than any other resemblances that can be traced between the two classes. Let us look, then, to the ostrich family, as one of the most anomalous among rasorial birds, and that which contains species having many of the peculiarities both of a quadruped and a bird. The covering of the cassowary is much more like hair than feathers; its wings are perfectly useless, and appear intended only to indicate the class which

nature is about to leave. The ostrich and the emu exhibit the same affinity in different ways and not only lead us to quadrupeds, but to that particular order which makes the nearest approach to birds; namely, the *Ungulata*. If, on the other hand, we inquire what quadrupeds show the greatest affinity to birds, every one replies,—the *Echidna* and the *Ornithorhynchus*. These, as we have already stated, and as they have been considered by others, are truly ungulated animals; so that their extraordinary structure, considered as altogether anomalous in artificial methods, is absolutely essential to the harmony of the natural system; occupying, as they do, that important station in the series, which brings the classes of birds and quadrupeds into immediate union. So strong, indeed, is the affinity between the ornithorhynchus and birds, that more than one author of repute has actually placed these animals in the class *Aves*! The diagram we shall subsequently give of the two circles of *Mammalia* and *Aves* will illustrate the above observations. We can only regret that the nature of our present survey will not admit of those lengthened details by which we could corroborate these affinities.

(235.) The ANOPLOTHERES, for reasons subsequently stated, appear to constitute one of the leading divisions of the hoofed quadrupeds; and as they have already been placed in a distinct section of the *Pachydermata* of Cuvier, we shall merely bestow upon them a distinguishing name. In all that regards their construction, we shall implicitly follow M. Cuvier, even to using his very words. For as no living naturalist, more especially in this country, can pretend to that consummate knowledge of these fossil relics, which so eminently distinguished their first describer; so do we consider it infinitely preferable, on the present occasion, to employ his precise words, rather than to put his ideas into a phraseology of our own; and thus lead the reader to suppose we were giving original remarks, when, in truth, they were borrowed from others, but dressed in a new

garb. Our main object is to prove that the family of the *Anoplotheres* are sufficiently distinct to be detached from the other *Pachydermata* of M. Cuvier. 2. That they have a closer connection to the ruminating tribe than any other group of the aberrant *Ungulata*. And, 3. That they are the most aquatic of this order. We shall first enumerate those genera which we conceive to constitute this family group, and then adduce our reasons in support of the three propositions above stated.

(236.) The genera of the *ANOPLOTHERES* appear to consist of the following, *Anoplotherium* being the type, and consequently bestowing its name upon the family. The recent types probably are, *Sus*, *Tapirus*, *Dicotyles*, and *Phacochærus*; while those which are known only by their fossil remains are *Anoplotherium*, *Paleotherium*, *Lophiodon*, and *Cheropotomus*. These differ from the typical *Pachydermes* by a simple and striking character, — their toes are deeply cleft, while those of the latter are more or less collected or united into a mass. A short account of each of the above genera will now be given.

(237.) The pigs (*Sus*), despisable to some by prejudice, and to others by their filthy habits, nevertheless have been placed with those animals destined by Providence for the domestication and nourishment of man; and, like all others which have propagated under such artificial influences, the original breed has been lost, by branching off into an endless variety of races. It is generally supposed, however, that the wild hog, or boar, is the origin of our domestic swine, but it is by no means clear that the pigs of the Australian range are of the same species. The pigs, or hogs, as it is well known, have on all their feet two large middle toes armed with strong hoofs, and two much shorter, that hardly reach the ground; the cutting teeth are variable in the species, but the inferior always slant forward, while the canines project from the mouth, slant outwards, and curve upwards. Such are the characters of the ordinary pigs; but in the *Babirussa*, the tusks

of the male are developed in a very extraordinary and unusual manner, forming large curves, or volutes, on each side of the mouth. Its general form, in other respects, assimilates to the common pig; but it stands higher, and the neck is rather longer; its colour is reddish brown, the skin being covered with short and rather woolly hair. These animals are said to swim remarkably well, so that when hunted in the vicinity of water they invariably plunge into it; and in this manner, it is affirmed, they have been known to pass from one island to another. Towards Western Africa, and those parts adjoining Ethiopia, is found a third species of pig, which, from having been first observed (we believe by Le Vaillant) at the Cape de Verd Islands, has been termed the Cape de Verd boar: whether or not this is identical with the Ethiopian boar of some authors, is still a question. It forms the modern genus *Phacochoerus*, and is remarkable for several protuberances on the head, which give it a strange and grotesque appearance: "the grinders are composed of cylinders, together with a kind of cortical substance, very similar to the transverse laminæ of the elephant, and, like them, succeeding each other from behind." The pigs we have enumerated belong exclusively to the Old World, but in the tropical latitudes of America we find them represented by the peccaries.

(238.) Of the peccaries (*Dicotyles*), M. Cuvier thus writes:—"The peccaries have the grinders and incisors very similar to those of the domesticated hogs, but their canines are like those of ordinary quadrupeds, and do not project from the mouth; they have also no external toe on their hinder feet. There is no tail; and upon the loins is a glandular opening, containing a fetid humour. The metatarsal and metacarpal bones of their two great toes are soldered together like those of the *Ruminantes*, with which their stomach, divided into several sacs, gives them also a remarkable relation. There are two species, rendered interesting by the pen of Azara. These creatures resemble the common pig in their general

form and mode of living; but on a more attentive survey they are found to differ, in having a shorter and thicker head, the body and limbs more compact, and with no appearance of a tail. Azara, however, assures us, that there are the rudiments of this member, yet so very small that it is with difficulty made out. The peccaries inhabit the vast tropical forests of the New World, feeding upon roots, and such esculent fruits as fall upon the ground. The gregarious nature of one species, the collared peccary (*D. torquatus*), leads it to congregate in vast herds; while the other, or white-lipped species (*D. labiatus*), is generally met with only in pairs. Although the South Americans have not profited by the domestication of these animals, they are represented to be gentle and tractable; equally well flavoured, and easily tamed, as the domestic pig. We shall here depart somewhat from the series of the *Règne Animal*, and notice the tapirs as certainly evincing a greater affinity to the peccaries than does the rhinoceros, which M. Cuvier places immediately after the genus *Dicotyles*. The tapirs are very extraordinary animals, and, judging from their outward form, suggest the idea of small elephants allied to the pigs. For a long time it was supposed that the tapir of America was the only living species, but another has been found in Chili, and a third (*Tapirus Malayanus*, fig. 92.) in Java. The



tapirs are about the size of a small horse, with a short proboscis to the upper jaw. Their fore feet have four toes, but the hinder only three; all of which, however, are deeply cleft, and touch the ground, the outer toes being smallest. They have, in each jaw, six incisors and two canines, separated from the molars by an empty space; the tail is thin and moderate.

"Fossil tapirs are also scattered throughout Europe; and among them is a gigantic species, which in size must have nearly equalled the elephant."

(239.) The tapirs appear to lead us immediately to those extraordinary fossil animals, among which are the *Anoplotheria* and *Paleotheria*, for whose elucidation and discovery we are indebted to the profound researches of M. Cuvier. All these, with many other gigantic forms, have been long swept from the face of the earth, although their bones attest that at some remote period they formed a conspicuous feature in the zoology of Europe. These remains have hitherto, indeed, only been found in the gypsum or plaster quarries in the neighbourhood of Paris, and in some other parts of France. The scientific history of such extinct animals must of necessity be very imperfect. In pursuance of our former declaration, the reader will bear in mind that all the *scientific* information he will here receive of them is derived from the writings of M. Cuvier.

(240.) The extinction of so many animals of one group gives rise to some interesting reflections, which may serve as introductory to what follows.—Geologists are almost universally of opinion that the immense number and variety of these large herbivorous quadrupeds belonging to the *Pachydermes*, as known to us only by their fossil remains, existed at a period when their CREATOR had not called into being his last and best of works — Man. It has been further observed, that however abundantly the surface of the earth is now covered with the ruminating quadrupeds, yet that their fossil bones are of great rarity in those deposits which, nevertheless, abound in the remains of the *Anoplotheria*. A question thus arises, — Is there any, and what, hypothesis, attempting to account for so remarkable a fact? We know of none hitherto proposed; yet there are some curious speculations arising out of this fact, which are certainly deserving of our attention. If, as it is rationally supposed, Man was not created at that remote period when the earth was covered by these

now exterminated animals, it follows that there was no need of a vast race of quadrupeds, adapted, in so many ways, to his wants, like that of the *Ruminantia*. Hence, although some few species existed, their number was very small, and belonged almost entirely to genera which have never been domesticated. But that the green herb of the field should not be created in vain, it served to nourish another race of herbivorous animals, equally bulky in size and numerous in individuals, but whose habits and whose economy, as far as human researches have gone, neither adapted them to live in the haunts of man, nor enabled them, by their structure, to assist in his labours. M. Cuvier, and all who have followed him in the same interesting inquiry, is decidedly of opinion, that the whole of the *Anoplotheria* belonged to the same natural group as the tapir and the rhinoceros; two genera of which a few species only are now in existence, and which have neither been domesticated, nor possess any of those qualities belonging to the horse, the ox, or the sheep. The tapirs, indeed, may be considered a living type of these exterminated quadrupeds; plainly showing us that, even had Man existed in the same era of the world, they would not have been suitable to his wants. This opinion is strengthened by the fact, affirmed by M. Cuvier, that nearly all the *Anoplotheria* were semi-aquatic quadrupeds; that is, living, for the most part, in swamps and morasses, and consequently made only for inhabiting such situations. Now, if we look to all such living animals as are obviously formed for, and intended to lead, a semi-aquatic life, we find that they are more difficult to naturalise and domesticate than any others. The whole order of wading birds (*Grallatores*) is a remarkable instance of this: they are all semi-aquatic, and naturally live in such situations only as were also assigned to the *Anoplotheria*. Out of many hundreds of species, not more than two or three genera of these birds approach the habitations of man, or indeed can exist, for any length of time, on dry and cultivated lands.

We are thus led, by analogy, to conclude that the *Anoplotheria* (like the modern tapirs) had the same haunts and the same instincts. The ploughed field, the sultry plain, or the beaten road, would have been certain death to these water-loving quadrupeds; and this very circumstance, setting aside all others, renders it more than probable that they would have been utterly un-serviceable to the wants of man, even had he, as we have been supposing, then existed on the earth. Where, then, would he have sought for such mute companions and assistants in his toils, as he now has in the horse and the ox? Not among the *Feræ*, where the dog alone is the only domestic animal: not among the *Quadrumana*, where not even one such species exists. In the order of *Glires* we search in vain for any animal larger than a porcupine or a kangaroo; while, among the aquatic quadrupeds there is no animal which can live upon dry land. If, therefore, man had been upon the earth at the same time as it was peopled by the *Anoplotheria*, and all those ancient races, he would have been, to all appearance, without any helps from the animal world. But if, as geologists assert, and as M. Cuvier is fully persuaded, man did not then inhabit the earth, then there was no need of those peculiar races since appropriated to his service; hence we find scarcely any fragments of ruminating animals intermixed with the immense quantities of bones belonging to those races which filled their places. But no sooner do we pass these deposits, and come to such as lie, as it were, upon the surface, than we find fossils of a much more recent formation, obviously belonging to the present creation of beings; and to a period when "God created man," and at the same time consulted his comfort and necessities in the animal creation. The ancient races of the *Anoplotheria* were almost wholly removed, and another order of quadrupeds excessively multiplied, in order to be rendered serviceable to that being whom the all-wise Creator had, for the first time, called into existence. Accordingly we find that almost the only living attest-

ations of the *Anoplotherian* family are two species of tapir; while the *Ruminantes*, or horned tribe, formerly so scarce as to be rarely met with in the relics of that epoch, are now one of the most extensive and diversified races of quadrupeds on the face of the earth. It is a subject worthy of remark, that by far the largest proportion of those stupendous animals which formerly existed on our globe, were more or less aquatic. Such were the huge *Megalosauri*, and all those monstrous beings belonging to the order of the *Enaliosauri* among the reptiles: such were the gigantic salamanders noticed by M. Cuvier, and such were the anoplotherian quadrupeds. It seems, therefore, highly probable, that the idea mentioned by some geologists is well founded, when they conjecture that the earth was then much more intersected by the waters than it is now; for it cannot be questioned that every part of the animal creation was then as much in unison with the general structure of the globe as at present. We pretend not to say that the removal of the anoplotherian races from the face of the earth, and the increase of those of the *Ruminantes*, was intended solely and entirely for the benefit of man: but this is obvious, that had both been continued in existence there would have been an excess of animal population of one peculiar sort; which would not only have been discordant with what we see in other departments of nature, but have filled the earth with races of huge and monstrous animals quite disproportionate to every apparent necessity. Neither must it be inferred, from what has been said, that the remains of oxen are not occasionally found, accompanied by those of the *Anoplotheria*; but the circumstance is rare, and by no means invalidates the theory we maintain, that the *Ruminantes*, in those ages, bore no proportion to the *Anoplotheria*; while, in the present order of things, this proportion is notoriously reversed.

(241.) M. Cuvier remarks that the genus *Palæotherium* seems to have approximated to the tapirs now in existence, in the number and disposition of the teeth,

and more especially in the structure of the nasal bones. The grinders are similar to those of the rhinoceros, that is, with seven on each side of both jaws; those in the upper having square crowns, with several prominent lines; while those in the lower have their crowns in the form of a double crescent, excepting the last, where the crescent is treble. The six incisors and the two canines in each jaw are similar to those of the tapirs. Like those animals, also, the *Palæotheria* were furnished with a short fleshy snout, — a circumstance evinced by the shortness of the bones of the nose, under which there is a strong slope for the reception of the muscles connected with the proboscis. No less than eleven or twelve species have been detected by their skeletons, more or less imperfect, in the gypsum quarries of France. Those of Paris alone have furnished five. the largest of these must have been equal in size to an ordinary horse: two others were as large as the American tapir, and the others no bigger than small sheep. But a stupendous species seems to have existed at the same period, for several bones have been found of it near Orleans, which prove it to have been as large as a rhinoceros. It is singular that the remains of all these animals are found intermixed with shells belonging to freshwater genera only; thus indicating, in the most satisfactory manner, that the quadrupeds lived in the vicinity of marshes and lakes, and possessed much of the structure as well as the economy of the tapirs now existing in America and India. It seems, however, that these fossil animals differed in their toes, of which there were only three upon each foot, whereas the tapirs have four. This, however, may justly be considered only as a generic distinction, and does not appear to us sufficient to separate them by the intervention of the rhinoceros.

(242.) The lophiodons (*Lophiodon* Cuv.) constitute another genus of M. Cuvier's discovery, which, so far as their system of dentation is concerned, he seems to

consider even more allied to the tapirs than are the *Palæotheria*. This opinion is founded on the structure of the lower false grinders, which have transverse necks like those of the tapirs. They differ, however, from these latter, in having the anterior grinders more simple, while all the posterior have three necks: the upper ones also are rhomboidal, and marked with ridges very much resembling those of the rhinoceros. Regarding the rest of the structure of the living animal there is but little known; nor has it yet been determined what was the form of its snout or the number of its toes. M. Cuvier has discovered no less than twelve species of this genus, all imbedded in the same freshwater formations as contain the remains of the *Palæotheria*. The largest *Lophiodon* was nearly as big as the rhinoceros, and the smallest not much exceeded a lamb of three months old.

(243.) The *Anoplotheria* form a genus sufficiently extensive and varied to be divided, according to our author, into three sub-genera. Looking, however, to them collectively, M. Cuvier observes, that their remains have as yet been found only in the vicinity of Paris, and they have two characters which are observed in no other quadruped. First, the feet have only two toes, the metacarpal and metatarsal bones of which are separated in their whole length, and do not unite in a single piece as in the *Ruminantia*; and, secondly, the teeth are placed in a continuous series, without any interruption. It is singular that the latter structure is seen only in Man, where the teeth are placed in mutual contiguity, without any interval. Those of the *Anoplotheria* consist of six incisors in each jaw, and a canine tooth and six grinders on each side, both above and below: the canine teeth are short, and similar to the outer incisors: the three first grinders are compressed; while the four others in the upper jaw are square, with transverse ridges, and a small cone between them: in the lower jaw they are in the form of a double crescent, but without a neck at the base: the

last grinder, as in the genus *Palæotherium*, has a treble crescent. All these animals, however, differ materially from the *Palæotheria*, since the bones of the head do not indicate that the muzzle was terminated either in a proboscis or a snout. This extraordinary genus, which can be compared to nothing in living nature, may be divided into three sub-genera, from the variation in their teeth: 1. *Anoplotherium* proper; 2. *Xiphodon*; and, 3. *Dichobune*. Of these, the most common is the *Anoplotherium commune*, which was as high as a boar, but much more elongated, and furnished with a very long thick tail, so that altogether it had nearly the proportions of the otter. From this construction, it is highly probable that it was well adapted for swimming, and frequented those lakes at the bottom of which its bones are now found, incrustated with gypsum. There is another almost similarly formed, but smaller in size. Of *Xiphodon*, the remains only of one species have been yet discovered. It must have been a remarkable animal, of the size and general shape of the gazelle antelopes. This induces M. Cuvier to suppose that it lived in the manner of our deer, and that it was covered with hair, like the generality of ruminating quadrupeds. The genus *Dichobune*, on the other hand, was not larger than the common hare: independent of the peculiarities observed in the teeth, it differs from the *Anoplotheria* and *Xiphodons*, in having two small and slender toes on each foot, at the side of the two larger ones. Whether these small toes existed in the species of *Dichobune* is uncertain, for two of the species scarcely exceeded the size of the Guinea pig.

(244.) The three other fossil genera of *Anthracotheirium*, *Cheropotamus*, and *Adapis* are all, in different degrees, allied to the foregoing, and complete the list of extinct *Pachydermata* hitherto discovered. The first (*Anthracotheirium*) is considered by M. Cuvier to be, in some degree, intermediate between the *Palæotheria*, *Anoplotheria*, and the ordinary pigs (*Sus*). Of the two species yet discovered, the first was nearly equal in size to the rhino-

ceros ; but the second was much smaller. Both have been found in the lignites of Cadibone, near Savone, (Savona ?) as also in Alsace and in the Vélaz. Their grinders are similar to those of the *Anoplotheria*, but they have projecting canine teeth. The bones of the genus *Cheropotamus* are found in the gypsum deposits of France, but by no means so abundantly as those of the *Palæotheria* and *Anoplotheria*. As yet only one species is known, which was of the same size as the *Babyrussa*, or Siamese hog. *Adapis* also contains but one discovered species, little bigger than a rabbit. It is found in the same quarries, and must, as M. Cuvier thinks, have been nearly allied to the *Anoplotheria*.

(245.) The arguments that may be urged in support of the arrangement here made of these fossil genera will now be briefly stated. — It will be seen that M. Cuvier has already divided his order *Pachydermata* into two groups, founded mainly upon the structure of the feet : upon the same principle, though differently applied, have we detached the *Anoplotheres* from the *Pachydermes* ; placing in the latter group those animals which appear not to have their toes distinctly divided, like the former : whether or not, however, this is the essential character of the two groups, it is utterly impossible to believe that an animal like the *Anoplotherium gracile* (which we shall presently notice) can belong to the same family as the elephant, the mastodon, and the rhinoceros. Looking, therefore, to the *Anoplotherium commune* Cuv., as a distinct family type from the elephant, we have placed around it such animals as, according to M. Cuvier's own admissions, partake more or less of the same structure. Secondly, The group thus formed has a decided affinity to the ruminating family. To establish this, let us take the words of M. Cuvier. Of his *Pachydermata ordinaria* he says, "they approximate to the *Ruminantia* in many respects by the skeleton, and even by the complication of the stomach." Of *Dicotyles*, he observes, "the metatarsal and metacarpal bones of their two great toes are soldered together

like those of the *Ruminantia*: with which their stomach, divided into several compartments, gives them also a remarkable relation." *Anoplotherium* also approximates in some respects to the *Ruminantia*. "Their feet, terminated by two great toes, as in the *Ruminantia*, differ only in being separated." By one of the species of *Xiphodon*, however, named *gracile*, M. Cuvier brings this affinity as close as it is possible. Our author affirms that this most remarkable animal had peculiar elegance in its proportions; that it was slender, and delicately formed "like the prettiest gazelle." Its anatomy was such as induces our author to conjecture that it had the same habits as the deer and antelopes; that its senses were analogous to theirs; and that it was, like them, covered with hair. It was probably, continues M. Cuvier, a timid animal, with large moveable ears like those of the deer, and fed upon aromatic plants and the buds of young trees. Our last object is to show that the tribe of *Anoplotheres*, in its typical examples, was more semi-aquatic than any other group of this order. We know the fondness of pigs for mud and wet, and we have already stated that the *Babyrussa* is an expert swimmer. Of the *Anoplotheria* in general, it is well known that their remains are only to be found in freshwater formations. The *Anop. commune* was an animal with a very long and very thick tail, so that altogether it had nearly the proportion of the other, but larger. It is probable that it was well fitted for swimming, and frequented the lakes, in the bottom of which its bones have been incrustated by the gypsum which was there deposited*, while the *Palæotheria* appear to have frequented the shores of lakes and marshes, for the rocks which contain their bones also contain freshwater shells.

(246.) Having now, upon the highest authority, established the chief facts upon which this arrangement is founded, let us advert to a few of the inferences that follow. — We have seen that the *Ruminantes*, on one

* Theory of the Earth. Jameson's 5th ed. p. 271.

side are connected, in the most unquestionable manner, to the *Solipedes* by the camels; and we may now, upon M. Cuvier's authority, connect them, on the other side, with the *Anoplotheres*; the relative situation, therefore, of these three groups of the order *Ungulata* is no longer a matter of speculation. With regard to the situation of the other two, it is quite obvious that the *Solipedes* show a much greater affinity (by the union of their toes) to the true *Pachydermes* than to the *Edentates*; and although the form by which they are absolutely connected has been lost, yet the discovery of the two fossil genera, *Megalonyx* and *Megatherium*, at once connects the *Pachydermes* with the *Edentates*. Between these last and the *Anoplotheres* there is no great hiatus: so that the *Ungulata* thus appear to constitute, in their great divisions, a circular assemblage, the subordinate groups of which can only be determined by analysis. Nor is this the only important inference resulting from placing the *Anoplotheres* in this situation. For this group, being that which is next to the *Glires*, should of course constitute the connecting passage to that order. Now, the only animal in nature which bears any similarity to the kangaroo in its size, and in its "very long and very thick tail," is the *Anoplotherium commune* of M. Cuvier already adverted to; while in the structure of the feet of the whole of this family we trace a gradation from the equal nails of the *Edentates*, to the unequal toes of the true *Marsupidæ*, and also a tendency to the parted hoof of the ruminants. If the *Pachydermata* of Cuvier really form two distinct families, it matters not to our present purpose whether *Rhinoceros*, *Hyrax*, or any of the subordinate genera, stand in one or in the other. The elephant is the type of one family, the *Anoplotherium commune* of the other; and where the subordinate forms and links, in each, are so imperfectly known, the greatest difficulty must ever impede the researches of those who may wish to define the circular succession of the two series, of which we know, as yet, only the pre-eminent types.

CHAP. VI.

ON THE TRIBE OF RUMINANTES.

GENERAL CHARACTERS, ETC. OF THE TRIBE, AND OF THE TWO TYPICAL GROUPS. — THE CIRCULAR DISPOSITION OF THE FIVE FAMILIES OF THIS TRIBE. — THE ANTILOPIDÆ, OR ANTILOPES.

(247.) THE ruminating or horned quadrupeds form such an extensive and varied group, that they must be termed a tribe rather than a family. They are, above all others, the most important to man; for they supply him with beasts of burthen, with the best animal food, and with the materials for his clothing.

(248.) The station of these animals, in the view here taken of their natural affinities, is immediately following the *Solipedes*, or hoofed family. Their zoological characters, when viewed as a whole, are thus detailed by M. Cuvier: — “The *Ruminantia* are, perhaps, the most natural and best determined of all the classes of quadrupeds, since they appear to be altogether constructed on the same model; the camels alone presenting us with some trifling variations from the common structure.* The first and most striking character is the absence of cutting or incisive teeth in the upper jaw, their place being supplied by hard tubercles; but in the lower jaw there are almost always eight: between these latter and the grinders there is generally an empty space, which, in a few genera only, is occupied by one or two canine teeth. The grinders, of which there are almost always six on each side of both jaws, have their crowns marked with two double crosses, of which the

* The camels, in this work, are viewed as the representatives of the *Ruminantes* in the circle of the *Solipedes*.

convexity is turned inward in the upper teeth, and outward in the lower. The feet are terminated by two toes and by two hoofs, which face each other by a flat side, so that they appear like a single hoof that had been cleft in two: hence the feet of these animals are termed bifurcated: behind the hoof there are sometimes two small spurs, being, in fact, the incipient vestiges of the lateral toes. But the most extraordinary circumstance which belongs to this order, and from whence it has received the name of *Ruminantia*, consists in these animals being able to masticate their food a second time, by bringing it back from their stomach to the mouth, after it has passed a first deglutition. This property results from the structure of their stomachs, of which they possess four: the three first of these are so disposed that the food can enter indifferently into either of them, because the œsophagus abuts on the points of communication." The more scientific details on this extraordinary structure need not here be entered upon, but we may give a brief outline of the general functions of these organs. "The first and largest stomach is called the paunch; it is calculated to hold an abundance of the vegetable food, as it is swallowed by the animal, grossly pounded by a first mastication: from this it goes into the second, called the honeycomb, the sides of which are furnished with laminæ. analogous to those of the honeycomb. This stomach is very small and globular; it receives the food, which it imbibes and compresses into little pellets, which afterwards remount successively to the mouth, where they are again masticated. The animal, during this process, remains quiet, and it continues until all the food contained in the paunch has been thus treated. The food, after having been thus chewed a second time, descends directly into the third stomach, which the French writers have termed the *feuillet*, because its sides have longitudinal laminæ, disposed somewhat like the leaves of a book: and, finally, the food is carried to the fourth, termed *caillette*, the sides of which are in wrinkles: this is the true organ of digestion,

and is analogous to the simple stomach of ordinary quadrupeds. So long as the ruminating animals derive their sustenance from the mother, this last stomach is always the largest, for the paunch becomes gradually developed in proportion only to the gradual predominance of a vegetable over a milk diet; the intestinal canal and the cœcum are both very long, and the latter is smooth. The fat of these animals hardens more in cooling than that of any other quadrupeds, and even becomes brittle, in which state it is called *suet*.*

(249.) In treating of this tribe of quadrupeds, we shall be more than usually particular; first, because we have not to depend, as in almost all the preceding groups of quadrupeds, upon vague and theoretical speculations; and, secondly, because their history is unquestionably more calculated to interest the general reader, inasmuch as it concerns those animals which have been obviously designed, more than all others, for his use. It is to the highly valuable and original dissertations of major Charles Hamilton Smith, whose name so frequently occurs in this part of our work, that we are enabled to give a much more interesting account of the *Ruminantes* than could by any possibility have been otherwise done. Major Smith is not only a practical but a scientific naturalist of no ordinary stamp, whose knowledge of quadrupeds, and more especially of the animals now under consideration, is unquestionably greater than that of any zoologist in existence. We rejoice, indeed, in possessing the power of expatiating upon such parts of the animal kingdom as have been investigated with ability, since they will claim for our work both consideration and authority; while we feel no scruple in being more than usually concise upon such groups as we have not ourselves investigated, or on which others have only bestowed a cursory attention. We shall first point out some highly interesting peculiarities in these animals, and show how beautifully nature has adapted their structure to their habits.

* Règne Animal.

(250.) Ruminating animals generally, observes major Smith, in common with most quadrupeds, have the legs shorter in proportion to the length of the trunk, and their spinal vertebræ are more flexible than those of man: by means of this formation, their progressive motion is facilitated, and their food attained with ease. As connected with the construction of their peculiar horns, we find that the parietal bones of the skull form but one piece, assuming the shape of a belt, behind and above the frontals; these are very long, and form a powerful arch over the orbits to secure the eyes, and give a firm seat to the roots of the horns. By the length of the nose, and the convolute surface on which the Schneiderian membrane is stretched, ruminating quadrupeds are endowed with that acute *sense of smelling* necessary for the nice selection of their food, in the choice of which the preference is so predisposed, that, while nearly all the genera and species will feed on the most common plants, each have some particularly grateful or harmless to them; so that scarcely any exist that are not adapted to this special end of subserviency to animated nature. Their *ears* are placed far back, and very moveable; the most advantageous position for hearing behind while the animal is feeding, because at that moment it is most exposed to unseen danger, the attention and the eyes being engaged in a great measure before it. The pupil of the *eyes*, throughout the whole order, is invariably of an oblong form, enabling them to take a more extensive horizontal range of vision without turning the head, or lifting it from their food: the eye is furnished with a nictitating membrane, stretching from the inner cauthus to nearly half over the ball, thus protecting those organs from danger while in search of their food. In common with other quadrupeds, they possess a seventh muscle to the eye, called *suspensorius*, fixed in the sclerotic coat, and intended to sustain the weight of the orb, and to prevent the optic nerve being stretched; the posterior part of the cricoid coat (or *tapetum*) is, in them, generally of a greenish

blue colour, to enable them to see their food the better, and to facilitate their vision in the dark.

(251.) The means of defence enjoyed by the ruminants are almost peculiar to themselves; and consist in goring an enemy with their horns, or in kicking it with their hinder feet, both of which admit of some beautiful illustrations. Regarding the first, we shall here quote major Smith's words: — "To the strength of their skulls, already noticed, are added, in most species, osseous prolongations from the forehead, forming either sessile antlered horns or bony cores, upon which the horny covers vaginate and construct true horns; these being not only for defence against personal danger, but for conquest among themselves in the strife for females; it being intended by nature that the most powerful should chiefly procreate the breed, and thus transmit the character of the species in full vigour to posterity." Now, it is notorious, that among gallinaceous birds, which represent the ruminants, these nuptial combats among the males are more general and desperate than in any other tribe or order of birds; and this, not merely with such as are domesticated and within our actual observation, but equally so in a state of nature. In both cases the strongest are victorious; and the analogy is peculiarly strong. Then, as to the act of kicking: — "The haunch bone," observes our author, "is shaped like a hammer, with the anterior part of the spine extremely large, furnishing room for broad and strong muscles; this structure imparts to these quadrupeds a great force in kicking." We may add, also, that the solidity of the hinder extremities, formed on the principle of a knobbed club, are admirably adapted for defence, as well as to sustain the heavy mass which constitutes the trunk. Now, as this mode of defence is peculiar to the ruminating order of quadrupeds, it would be natural to expect it among the rasorial birds; and we accordingly find that these, and these only, are furnished with strong spurs to their feet, for the obvious and sole purpose of using these members

precisely in the same way as the hind feet of the ox or the horse, that is, for licking and wounding their foes. Did the natural analogies of these two orders rest on no other foundation than the circumstances we have here stated, we should not for a moment hesitate in expressing our full conviction that nature, in her own system, intends that one group should represent the other. We shall now consider the whole order before us more in detail.

(252.) Before we proceed to designate the primary divisions of the *Ruminantes*, it may be as well to advert to the only variation we shall make in the arrangement proposed by major Smith. That able zoologist has placed the camels within the circle of the ruminants, while we have removed them one step further, so as to exhibit them as forming a passage to these animals, rather than as constituting an integral part thereof. In both arrangements the camels stand between the horse and the *Camelopardalis*. And as the musks cannot be placed in the same family with the stags, the series is rendered complete, and the families will stand, in their typical distinctions, as follows:—

Tribe RUMINANTES—The Ruminating Quadrupeds.

1.	} Horns sheathing; form gracile, slender.	} ANTILOPIDÆ.	Antelopes.
<i>Sub-typical.</i>			
2.	} Horns sheathing; form heavy, robust.	} BOVIDÆ.	Oxen.
<i>Typical.</i>			
3.	{ Horns solid, deciduous. Horns wanting; fore legs shorter than the hinder. Horns very short, covered with a skin.	} CERVIDÆ.	Stags.
		} MOSCHIDÆ.	Musks.
		} CAMELOPARDÆ.	Giraffes.
<i>Aberrant Group.</i>			

(253.) Our space will not allow of comparing this group analogically with others of the animal kingdom, nor shall we attempt to designate the subordinate types of these groups when we come to speak of them in detail. This is the less to be regretted, from our being able to follow thus, more closely, the series in which they have been disposed by major Smith. Upon a future occasion we hope to lay before the reader that

full analysis of the two typical groups which we have long been engaged upon.

(254.) The antelopes and the oxen, although well distinguished by major Smith, have yet "so many characters in common, that we shall here introduce his general observations upon both. "These ruminants," observes our author, "seem to be constructed, in many respects, after one model, their osteological characters differing only in proportions or in the greater or less developement of their parts. The males of the whole, and the females of most of the species, are provided with real horns; that is, with osseous prolongations from the frontals, covered with a horny substance, not deciduous or growing out from the extremity, but receiving their increase from the base. Although the number of species is very considerable, it is difficult to assign sufficient characters to divide them by distinct and permanent indications. They may be viewed as forming one great group, divisible into two tribes, the caprine and bovine*; but it cannot be concealed that this division, certainly convenient, is nevertheless arbitrary in its limits, for the passage from one to the other leaves a doubt where that limit should be fixed. Nature, however, shows the same difficulty wherever the species allied have been studied in sufficient numbers. Neither artificial or natural characters enable us to mark the links of the chain, or rather the knots in the web, by which every kind of animated being is connected with others in a greater or less degree of affinity. We shall find the ruminants subjected to the same laws which pervade in other orders; namely, to undergo a sort of cycle of all the variations of subordinate characters consistent with their typical plan; the last of the series resuming some of the distinctions of the first, and both possessing others which connect them with the preceding or suc-

* This coincides exactly with the central group of Mr. Friers, and the theoretical normal group of Mr. MacLeay. But does this great group form a circle? No. Consequently it is not one group, but two.

ceeding genera."* Did the validity of any system rest upon the admission or the authority of great names, rather than of facts and deductions, we might here appeal to the above sentiments, given upon one of the most difficult and intricate groups of animals, by a zoologist whose knowledge of them is confessedly greater than of any one now living. Major Smith, in fact, not only admits, but maintains, three of the primary truths of natural classification. First, that natural groups or genera, or large assemblages of species, pass into each other by gradations almost imperceptible, thereby refuting the idea, now indeed obsolete, that no genus is valid which cannot be circumscribed; secondly, that there are *representations* of one group in another group; and thirdly, that the variation in the ruminating order, "like as in all others," shows every where a tendency to return to the type from whence we began our inquiry; in other words, that their affinities are circular, besides exhibiting the two *other* relations of resemblance and representation.

(255.) Having now given a general view of the whole tribes, we shall devote this chapter to the details of the first of the typical groups, forming the *Cavicornia*, or hollow-horned divisions of systematists. The ANTILOPIDÆ, or antelope family, as major Smith observes, "by the common consent of naturalists, is composed of species extremely different in shape and size, but linked together by a constant succession and interchange of subordinate characters. A fanciful theorist might view the numerous species connected by this sort of consanguinity, as resulting from several types originally endowed with the faculty of procreating, by their intermixture, subordinate prolific races, which in their turn become the types of species, and even of groups. Buffon clothes a theory of this kind with the gaudy colours of his brilliant imagination. But although it is asserted and believed, that the goat and sheep produce an intermediate prolific race, com-

* Hamilton Smith, in Griffl. Cuv. iii. 155.

parative anatomy and continued observation have gradually reduced these speculations to very restricted limits." In attempting to find characters sufficiently important to designate subdivisions of the caprine or antelope tribe, our author observes, "that those taken from the flexures of the horns were inapplicable, because they occur seldom more than in one animal of a group, though in all other characters its component species are perfectly homogeneous. As, therefore, horns assume, in osculent species, a great variety of shapes, recourse was had to the combined characters of stature and the superior elevation of the spinous processes, arising from the interscapular vertebræ, the comparative depression of the croup, the position of the osseous nuclei of the frontals, provided with a cell at their base, and other inferior distinctions, all of which we wish naturalists to verify. These afforded data sufficient to separate most of the larger anomalous species from the genus *Antilope*, and to place them, under the proposed name of *Damalis*, near the bovine tribe. To the *Bovina* we refer the *Gnus* of authors, under the new generic name of *Catoblepas*, which is the first of the *Bovina*, as *Damalis* constitutes the last of the *Caprina*. It was next desirable to arrange the succession of the sub-genera or groups retained in *Antilope*, so as to place those which still bore an analogy to *Cervus* nearest that family, and then to class the true antelopes and gazelles into approximating gradations to *Capra* and *Ovis*. At the head, the groups *Dicranocerus*, *Aigocerus*, and *Oryx*, might, perhaps, be more properly converted into genera; but that the two latter seem to form types to which the cycle of the tribe returns through *Damalis*; and besides, the *Oryges* contain the species from which the genus *Antilope*, as already noticed, obtains its name. Notwithstanding their size, the animals of the genus *Oryx* are truly antelopine; and the *Aigoceri* have so much affinity to them, that they cannot be separated with propriety by the interposition of others. As such, these two branches should take the lead, if the small

American group *Dicranocerus* did not appear more naturally placed before them, because they have a greater external similarity with deer. After these three, the gazelles and the antelopes follow, succeeded by the *Reduncæ*, *Cervicapræ*, and other groups, several of which we have thought it advantageous to place into additional sub-generic clusters: should some of these be hereafter considered as real genera, the proposed denominations and locality in a natural order may here, we hope, be found approaching to their fixed position in nature. The latter groups in the series assimilate gradually to *Capra*. Among these, *Nemorhædus* has nearly all the characters of true goats, but is still possessed of antelopine horns; and *Anoa* presents the combination of caprine characters, with horns which partake of the buffalo and *Ovis*; while *Aplocerus* shows another interchange of characters, in which *Nemorhædus* is compounded with both *Ovis* and *Capra*; and as such it is the last, and forms the connecting link with these two genera. After these we place our proposed genus *Damalis*, divided into groups according as their more obvious characters seem to lead them nearer to *Bovina*; the last being *Portax*, or the *Antilope picta* of authors. It is at this point that we think the separation may be deemed arbitrary, because all the *Damalis* might be viewed by some as more properly included in the bovine tribe; but reflecting that the acronotine group, in particular, recalls the high shoulders of the *Aigoceri*, it seems that we find the cycloid revolution of the characters which pass through the tribe; while the next, *Catoblepas*, shows a predominancy towards those which constitute true *Bovina*, in the head, which approaches *Bos Caffer*, through *Ovibos*, and the feet to *B. Bison*, where we terminate the order.* "Of this arrangement," observes major Smith, "we dare only say, that it seems to be the least objectionable in the present state of our knowledge on the subject." To this opinion, without entering into the minor objections, we

* H. Smith, p. 162.

not only most cordially subscribe, but consider that the views are more just and philosophical than any of those upon this family which have as yet been given to the world.

(256.) In accordance with the foregoing principles, the caprine, or rather the antelope family, that being the typical group, is divided into the following genera:—1. The antelopes (*Antilope*); 2. The goats (*Capra*); 3. The sheep (*Ovis*); and, 4. The bubales (*Damalis*). We shall now consider each of these groups separately in the same order of succession, and slightly notice the distinctions of the sub-genera belonging to each.

(257.) The ANTELOPES (*Antilope*) constitute by far the largest assemblage in the whole order of ruminants, while they exhibit among themselves so many subordinate deviations from the typical form, that it has been found absolutely essential to divide them into a number of small groups. Viewing them, however, as a whole, their general characteristics may be thus stated. In common with all the caprine group, the horns are persistent; that is, are never shed like those of stags, but consist of a solid bony core, sheathed over with a true horn. In general these horns are but two, but sometimes there are four; and they usually turn into various curves or directions, often without consimilarity in the kindred species of the groups: the ears are usually long, and the eyes large, prominent, and soft: beneath them, in the direction of the nose, is generally a sack, more or less developed, opening externally by a slit, as in certain deer; and in some appearing to communicate with the nostrils and the olfactory apparatus; while in others, again, a puncture is only seen, and a second sac, descending near to the corners of the mouth, likewise communicates externally by a slit or a puncture; the former of these seems to afford increased facilities for breathing, and greater powers of scent; but the use of the latter is not yet ascertained. The nostrils are usually shaped as in sheep, or without a naked and moist muzzle; but in others this latter

structure is more or less developed. The inguinal pores are certain small naked folds of skin, in the hollow part of the groin; there is one on each side, in many of the middle-sized and small species; they contain an unctuous and odorous secretion, the use of which is not known. The tails of the antelopes are round, and either short or descending to near the hough: the legs of nearly the whole are slender, firm, and elegant, often furnished with brushes or tufts of hair on or below the knees; and the greater number have the anterior quarters somewhat lower than the croup. The colour of the hide or skin is very remarkable, when considered in reference to the observation of major Smith, that all such species as have this part black, whatever may be the colour of the fur or hair, are inhabitants of the open and scorched plains and deserts of the tropics; while such as have a white skin beneath the hair reside invariably in more temperate regions, or live in the shade of forests.

(258.) The natural habits of the antelopes next claim our attention. The groups with spiral and lyrate horns are mostly gregarious, frequenting the open plains, and often preferring the most barren tracts: the larger species, however, more usually live in families or small troops, in the desert or in mountainous woods; while the smaller, which are not unfrequently solitary, reside in forest thickets, or the borders of rivers: the habitation of some few are confined to the highest mountains, inaccessible crags, and even to the elevated zones, on the confines of perpetual snow; in such situations, they walk with perfect composure along the giddy brinks of the most awful precipices, climb and descend with wonderful care and precision, and leap up or down to the smallest surface that will contain their collected feet with perfect firmness: but the speed of those who frequent the plains, and more particularly of the swiftest species, surpasses that of every other mammiferous animal. Though vigilant and timid by nature, the gregarious species have the same curiosity which deer and sheep evince at the sight of strange ob-

jects ; running with prodigious speed, and then stopping and turning to gaze. Their noise is mostly weak and seldom heard : it consists in some in a feeble bleating ; in others it is a groaning or whistling sound ; and there is one which barks so as to deceive the unwary traveller into a belief that he is near the abode of man, when, in fact, it is a proof of his being benighted in the deepest recesses of the wood. In regard to their food, each species appears to feed upon a few favourite plants : some, like many deer, nibble the leaves of trees and shrubs ; others, of the gregarious kinds, prefer grasses, heaths, and the many sorts of succulent plants abounding in the sandy plains of Africa. The females, particularly of these latter groups, are gentle and confident in captivity ; * but the males are subject to sudden and capricious fits. To conclude, the beauty of their soft and large dark eyes has long been the theme of the Arabian and Persian poets. Such may be considered the general features of the whole group of antelopes.

(259.) We now proceed to enumerate the subordinate divisions, amounting to no less than fifteen, under the following heads :—1. The dicronocerene group (*Dicronocerus*), or the prong-horned antelopes ; 2. The aigocerene (*Aigocerus*), or the pointed-horned antelopes ; 3. The oryGINE (*Oryx*), or twisted-horned antelopes ; 4. The gazelline (*Dorcas*. **Antilope* Sw.), or true antelopes ; 5. The antilopine (*Dorcas* Sw.), or stag antelopes ; 6. The reduncine (*Redunca*), or reitbock antelopes ; 7. The orestragine (*Tragulus*), or steinbocks ; 8. The raphicerene (*Raphicerus*), or awl-horned antelopes ; 9. The tetracerene (*Tetracerus*), or four-horned antelopes ; 10. The cephalophine (*Cephalophus*) or tufted antelopes ; 11. The neotragine (*Neotragus*), or pigmy antelopes ; 12. The tragelophine (*Tragelaphus*), or painted antelopes ; 13. The nemorhædine (*Nemorhædus*), or goral antelopes ; 14. The rupicaprine (*Rupicapra*), or chamois ; and, 15. The aplocerene (*Aplocerus*), or sheep antelopes.* It will be

* The buffalo antelopes, forming the genus *Anoa*, we have removed to the *Bovidae*.

observed that the first set of these names have been constructed by major Smith⁴, so as to Anglicise, as near as possible, the generic terms; but it appears to us, that for common use more definite ideas are conveyed by framing the English name from some remarkable peculiarity of the group itself: impressed with this belief, we shall proceed to designate them by the term so constructed.

(260.) The first group of antelopes forms the sub-genus *Dicronocerus*, and is immediately known by the broad and palmated form of the horns. We adopt the nomenclature of major Smith, both for the genus and the species; since he has satisfactorily established his claim to be recorded as the first describer*, at least in modern times. The two species now known are confined to the northern latitudes of America, where they represent, in their own family, the true elks. By the singular structure of their horns (fig. 93.), which have an anterior branch, and a prolonged posterior point turned down into a hook, there is a similitude, though not an affinity with the deer; which is further evinced by pearly rugosities, showing little incipient additional branches; by a white space on the rump, and a short tail.



These animals are exceedingly swift; living in small families upon the hills below the high mountains, and in the open plains of the fur countries round Hudson's Bay. Dr. Richardson† gives some valuable information on the *Antelope furcifer* (fig. 93.); but he considers the other species, indicated by major Smith under the specific name of *palmatus*, to be merely an old individual, with the horns possessing a greater breadth. We must confess, however, that our own opinion is more in favour of that formed by major Smith; because, if the figures

* Griff. Cuv. iv. 167. note.

† Northern Zoology, i. 263.

given in the work alluded to be correct, the horns of *furcifer* have irregular rugose wrinkles at their base, no indication of which appear on those of *palmatus*; although, was the latter an old individual of the same species, these wrinkles, from analogy, would be much more strongly marked. The *furcifer*, however, must be the type, since it is the only one which has been examined. It differs, says Dr. Richardson, from the true antelopes, in having a snag or branch on its horns, in wanting the lachrymal openings, and in being destitute of the posterior or accessory hoofs, there being only two on each foot. Its most northern range is latitude 53° . According to Lewis and Clark, they abound on the plains of the Columbia, to the west of the mountains. In other places they frequent open prairies and low hills, interspersed with clumps of wood, but are not met with in the continuously wooded country.*

(261.) 2. The pointed-horned antelopes (*Aigocerus*), as major Smith observes, may be viewed, in conjunction with the next division, as forming one genus, divisible into three subordinate racemi, by characters which are observable through the whole; but we have, continues our author, already stated the principles which guide our preference to retain them as genuine antelopes. The *Aigoceri* are distinguished from all the other groups by the large stature of the species, the elevation of the interscapular vertebræ, and the fore legs being somewhat higher than the posterior. The horns are large, as seen in *A. equina* (fig. 94.),

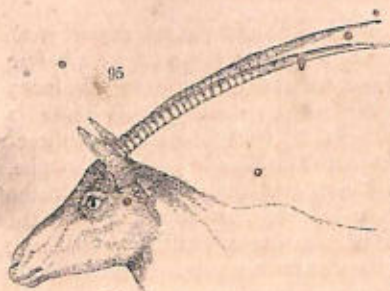


robust, annulated, and bent back, as in the *Ibex*, standing rather near the orbits, and rising vertically from the forehead; with the annuli most prominent towards the front, and reaching upwards to about two thirds of their whole length; the rest smooth and pointed. They are invariably black, and

* Northern Zoology, i. 264.

common to both sexes. The nostrils are placed near a widening half muzzle: a white streak passes before the inner canthus of the eyes, obliquely down the face; these are not provided with a lachrymary sinus: a mane of more or less length runs in a reversed direction along the neck: the tail descends to the houghs, and is terminated by a tuft: long hairs hang from the throat, and even from the chin, assuming in some the form of a beard. The skin, beneath the hair, is black; the ears long; and the legs without the slender elegance of other groups: the whole of their structure, in short, is remarkably powerful and sinewy. The group is confined to South and probably Central Africa, frequenting the scattered woody districts and the deserts: they live in small families, headed by an old male. The celebrated blue antelope of Southern Africa belongs to this group; and affords an instance of the extermination, to all appearance, of a species known to exist even in the last century. This beautiful antelope was formerly not uncommon in the district of Swellendam, and probably in other parts of the colony; but they gradually became scarce; and notwithstanding the numerous scientific and observant travellers who have journeyed in Southern Africa during the last thirty years, not one of these antelopes has been seen or heard of since the year 1799. The only preserved specimen in Europe is in the museum of Paris. The roan (*A. equina*), the great horned (*A. grandicornis*), and the bearded antelopes (*A. barbata*), belong to this section.

(262.) 3. The twisted-horned antelopes (*Oryx*) are also African, but appear more especially appropriated to the northern regions, and to extend to the confines of Asia. The group, observes major Smith, is distinguished by its large size, and very long horns common to both sexes. These horns are slender, without ridges, sharp pointed, and black; with annuli or rings somewhat spirally turned about half or two thirds of their length: the ears long, the eyes large, and the suborbital cleft almost obsolete (*Oryx Bessastica*, fig. 95.); the nos-



trils are ovine, or without a muzzle; and the tail, which is tufted, descends to the houghs: the front of the head is narrow, but its profile is rather square; the horns follow the prolongation of the plane

of the face. In most of the species, the neck and withers have the hairs reversed; and the shoulders are rather elevated, and there are no tufts on the knees. In general, there is a mane, which runs along the ridge of the neck, and is turned towards the occiput. The usual colours of the species are rufous grey and vinous yellow, upon a white ground, — the latter predominating. All the species have a white streak, bordered by another darker one, crossing the eyes, and upon the upper arm and haunch. The species which frequent woods seem to have the hide of a white colour, in opposition to those of the genus *Aigocerus*, and such others as live in the hot sandy plains, where, although the fur be pure white, the hide is always black.

(263.) The habits and geographic range of the genus *Oryx* deserve attention. The group, according to major Smith, is disposed over an immense extent of territory, perhaps from the borders of China, but certainly from the Moulton, through Southern Persia, Arabia, over the deserts of Northern and Middle Africa, to Senegal, and southward to the Cape of Good Hope. Their great strength and swiftness, aided by their ability to feed on acrid succulents and thorny shrubs, are sufficient to account for the vastness of their native regions. They live in pairs, or in small families of five or six: some species prefer mountains and elevated woody countries; while others keep to the plains and sandy deserts, where they subsist with very little water. Strong, active, and

vigilant, they not only repel the hyæna and the jackal, but can even intimidate the lion. To attack them is, indeed, dangerous; for if assailed, or put upon their defence, they raise the tail, couch the ears, toss their heads with a menacing look, and with a tremulous and shrill warning snort drop their head low between their fore legs, inverting the horns to near the ground, and dart with incredible velocity upon their enemy. From the sharpness of their horns they are still manufactured into the heads of spears, as in the time of Strabo. The Arabs, and other natives of the climates where these animals are found, do not consider them as antelopes, but as species of buffaloes; an idea which they extend to other ruminants usually classed in the antelope group, but here placed in the genus *Damalis*. The Dutch colonists, by the name of *Gemsbock*, intimate their belief of the animal being allied to the chamois of Europe. The Caffrarian *Oryx* (*A. Oryx*) is the type of the group, and an animal of remarkable beauty. A very fine specimen is said to be in the museum of the London Missionary Society. The white *Oryx* (*A. leucoryx*) is found in Persia; and the *Antelope suturosa* of Otto is supposed by Rüppell and Temminck to be the same as the *Antelope addax*, found by the former in the deserts of Nubia. With this group, major Smith classes what he terms a "subordinate racemus," or branch, "more anomalous in characters; but still osculating with it by the position of the horns on the frontals, their length, slender form, and terminal point, and their community to both sexes, — the insignificance or absence of the lachrymary sinus; the ovine nose, large stature, and even by the marks on the face, — yet assuming other characters which lead to the succeeding groups." Of this description is the beautiful *Antelope addax*, upon seeing which, the first impression is that of its being an *Oryx* with spiral horns. Major Smith discovered the horn of this species in the museum of Bordeaux: but the perfect animal was first made known to naturalists by Rüppell, who met with it in the deserts of Northern Africa. To

facilitate their progress over these oceans of yielding sand, nature has providently given to the hoofs an unusual degree of breadth; and the strength of the animal is very great. Major Smith, with great acuteness and indefatigable research, has brought together some highly interesting information on another species inhabiting the highest mountains of Nêpaul, where it is called *Chiru*: its most extraordinary character consists in having rough and very thick hair, but not quite so hard and long as in the musk, yet with much of the "same quill-like character:" it conceals a fleece of fine soft wool, set very close, and pressed against the skin. This wool is so abundant, that it is described as perfectly similar to that of the wild sheep of Bhote. According to the accounts of the natives, this singular antelope resides in the most inaccessible pine tracts of Chandang, on the Himalaya mountains, on the verge of the snow, and evinces great activity and vigilance. We owe the first clear and authentic information regarding this interesting quadruped to the zeal of Mr. Hodgson, the diplomatic and resident agent of the Honourable East India Company at Kalmandoo: a gentleman who has on many other occasions used his utmost influence and exerted his talents to elucidate the zoological treasures of the interesting regions in which, we believe, he now resides. Major Smith considers this animal, in all probability, to be the *Kemas* of Ælian, and supports this opinion by many sound and logical arguments.*

(264.) Some incidental remarks on the antelopes generally may be here introduced, as more suited to this stage of the investigation. Of this great genus there appears, says major Smith, "to be two parallel lines of affinities, descending, with trifling interchanges of subordinate characters, down to the lower groups included in it: the first, with horns in both sexes, passing from the sub-genus *Aigocerus*, through the gazelles; and the second from the sub-genus *Oryx*, through the genuine antelopes, to *Redunca*, *Cervicapra*, *Cephalophus*, *Neo-*

* See Griffl. Cuv. iv. 196.

tragus, *Tetracerus*, and *Raphicerus*, till we arrive at those which depart from the slender structure of the former, and gradually assume more the characters of *Capra* and *Ovis*. In connecting, therefore, the series by the gradations of character, either might be selected; as through the *addax*, a natural passage opens to the spirally horned antelopes, and through *Oryx* or *Kēmas* a similar osculation takes place with *Pallah*; but as, in the groups of *Antelope* and their connecting links, the females are hornless, it may be deemed preferable to follow, in the first instance, the aigocerene series, by means of *A. pygargus*, through the gazelles; and then, taking the antelopes connected, both with the origes (*Oryx*) and the gazelle (*Gazella*) immediately after them, continue that line till the antilopine type becomes confounded in the caprine. The gazelles have their females provided with horns; and the structure of these arms, particularly in the larger species, offer curves more decisive indeed, but still of a similar primitive direction, as in the *Aigoceri*. The annuli, or rings, are most prominent to the front, but they are placed lower down the frontals, nearly above the orbits, bending more outwards; and the tips turn in general again forward, so as to assume the shape of an ancient lyre when the head is seen in front. This instrument may be regarded as originally composed of the horns, and the frontals connected with the cerebral cavity of the skulls of antelopes; the strings being passed from a cross bar at their tips to some part of the molars in the upper jaw, or to a second bar thrust across the orbits. This primitive form may be recognised in all the subsequent modifications of the ancient lyre."

(265.) 4. The gazelle antelopes may, then, be said to have their horns lyre-shaped, with the bony cores solid: they are provided with a small lachrymary sinus, and with ungual pores: the knees also are generally tufted: they have two streaks, a dark and a lighter one, through the eyes; and a dark band separates the tints of the flanks from the white of the belly: the insides of the ears are marked with dark lines, occasioned by the ab-

sence of hair, which is placed in rows, and of a white colour: the nose is ovine. The eyes, particularly in the common gazelle (*fig. 96.*), are prominent, dark, and



soft; and it is to this group of antelopes that the complimentary allusion of the Oriental nations is confined. They mostly live in familiar herds; but the smaller species are gregarious, and inhabit by preference the open sandy deserts. It is said they are hunted by the noble and wealthy Mahometans, either with the hawk or the

hunting leopard (*Cynail. Jubata*). Of nine species enumerated by major Smith, seven are found in Africa, and two in Persia and Bucharina. The white-faced antelope (*A. pygargus*) is the largest, being superior in height to the common stag. The springer, or spring-buck antelope of Southern Africa (*A. euchon*), is another beautiful species; and the cora (*A. cora*) is very small. The kevel figured in F. Cuvier's great work (*fig. 97.*)



appears to differ in the direction of its horns from others of this group.

(266.) 5. In the fifth division we have the true antelopes (*Antilope*), distinguished from the last by never having their horns truly lyrated; on the contrary, they are spiral, or at least sub-spiral, while the females are without any. It is further characterised by a very small muzzle, or moist space, between the nostrils, where there is no hair: and all the species are more elevated at the croup than at the shoulders. Like

the gazelles, the larger species live in families or small flocks; but the smaller herd in vast numbers exclusively on the open plains, concealing themselves only when gravid among high grass or tufts of plants. In their geographic range they seem to be spread over the whole of Africa, part of Eastern Europe, and the plains of Western Asia. They are delicate and graceful animals, and show an acuteness of smell even greater than that possessed by any other group: some of these appear to possess this organ communicating with the suborbital sinus, and to consult it on all occasions; for if bread be offered to them, which has been handled, they will reject it. The group is restricted, in the arrangement we have here adopted, to but six species, of which the sarga (*Antilope Colus*) is the only example of the whole family which has been found in the European range. It occurs in some of the uncultivated wastes of Poland, on the shores of the Danube, and along the Black Sea; but specimens in museums are exceedingly rare.

(267.) 6. The reitbock antelopes (*Redunca*) form the sixth division: there are four species, all natives of Southern Africa; and they begin to recede from the elegance and delicate proportions of the groups already mentioned. They are chiefly distinguished from the antelopes properly so called, by the horns being more or less bent forward; they are placed behind the orbits, but they are little reclined; they are short, round, black, and annulated for about half their length: the ears are long, open, oval, and thickly covered on the inner side with white hairs; the suborbital sinus is not developed externally; the nostrils are ovine, or with a very small muzzle: the tail is long, and tipped with long loose hair: their limbs are strong, and lower in proportion than in true antelopes. Their habits also require them to have more power in springing than in running; for they prefer open rocky mountains, the covers of thickets along the banks, or the dry ravines of mountain torrents. The females are without horns. They live in pairs, or in small families; but are not gregarious. The reit-

bock (*A. Eleotragus*), which may be taken as the typical species, is full four feet and a half long, and more than three feet high at the croup. It lives in small families, among the reeds and bushes growing in dried watercourses, and along the edges of springs, in the interior of Caffraria. The orebi (*A. Scoparia*) deviates from the typical form, in having the suborbital sinus developed as in the sub-genus *Tragulus*, while at the same time it assumes one of the characters of the true antelopes in having hairy tufts on the knees in both sexes: the female is without horns; the horns of the male are nearly vertical, slightly bent forward, five inches long, with a few wrinkles at the base. This likewise inhabits Africa. Following this dubious species of *Redunca*, we shall place "the oreotragine group" of major Smith, since it consists but of a single example, which is probably an osculent form. Our author thus describes it. Its characters present a sudden passage from the "surrounding racemi," or, in other words, from the preceding groups, to the caprine forms and manners. The horns are short, slender, vertical, and parallel, with very few rings: the suborbital sinus is conspicuous, and marked with a dark spot; but the head is short, with the superior edge of the orbits projecting: the body and legs, when compared with the general size, are exceedingly robust. The hair is of a singular structure; being hard, flat, spiral, flexible, and erect upon the skin, with the tips turned back or reclining: the females are hornless, but in other respects they resemble the males: they have inguinal pores, and they are only inhabitants of barren precipitous rocks. The animal which furnishes these characters is the klip-springer antelope (*A. Oreotragus*), the form of which, our author observes, is very like that of an ibex of about seven months old. No other antelope has so completely the lively gamboling manners of the young goat as the klipspringer; it bounds with the greatest force and precision from rock to rock, and will often stand firm upon a point so rugged and small as to excite astonish

ment how it can retain its footing. It is a native of the rocky mountains of the Cape of Good Hope.

(268.) 7. The steinbock antelopes are arranged in the sub-genus *Tragulus*, and constitute the seventh division of the family. Our author thus defines it. It consists of animals small in stature, high upon the legs in proportion to their length, slender in form, and, like the preceding, nearly destitute of a tail; the ears are longer than the horns, rather broad, and not much pointed: as in *Tragulus rufescens* (fig. 98.), the horns are short,



distant, round, vertical, and parallel, inclining slightly forwards or backwards, with very slight indications of wrinkles at the base. These antelopes have a sub-orbital sinus, and a small black muzzle: the females are without horns, and

are furnished with inguinal pores. The true steinbock of the Dutch colonists at the Cape of Good Hope is the *Antilope rupestris* of systematic writers; but we apply this name to the whole group, as the species intimately resemble each other in appearance, and no doubt in many of their habits. The Dutch name properly signifies *Ibex*, and has been bestowed upon this antelope on account of its similar habits. It seems, however, that while some species, like the true steinbock, resides entirely among rocky cliffs, others, as the *A. rufescens*, discovered by Mr. Burchell, lives exclusively on the plains. Major Smith's labours in this part of his researches are peculiarly valuable, for he has unravelled, with great skill and sound judgment, an intricate group of animals which all preceding writers had viewed as mere accidental varieties of the same species. How much would science be advanced, did its followers pursue a similar mode of investigating nature!

(269.) 8. The sharp-horned antelopes (*Raphicerus*) might be united with the last group, if we looked only to the characters of the horns; for they are perfectly

round, smooth, and very sharp; entirely destitute of every vestige of wrinkles or striæ, but are not parallel; their position on the frontals is subvertical: the forehead is very narrow, indicating animals of a diminutive size, whose residence, besides being confined to the East Indies, or the islands of the Indian Archipelago, makes it probable that when all their characters are known others more important will appear. At present the validity of the group, as a sub-genus, rests only upon the horns, attached to part of the frontals, now preserved in the museum of the College of Surgeons of London; these, however, tend to show that they are the animals alluded to under the name of *small deer*, by Johnson, in his *Sketches of Field Sports*. This author says, they are found in the Rhamghur district, "where the *deer* with four horns, or *Chickara*, are likewise found." He describes them as not larger than an English hare, with long ears, exceedingly active in their movements, and of a very delicate shape. In the museum above named are two pair of horns, belonging to different species, viz. the sharp-horned antelope (*A. acuticornis*), and the awl-horned (*A. subulata*, fig. 99.); but of the first of these major Smith says, "We have some doubts whether the *acuticornis* be not the same species as the *chickara*, with the spurious horns and anterior part of the frontals wanting."



(270.) 9. The four-horned antelopes (*Tetracerus* Leach, fig. 100.) compose the ninth division.



There are but two species, both natives of the West Indies. There are few or no examples of quadrupeds in a state of nature, besides these, which have four permanent horns. The colus antelope, indeed, is reported to be

found sometimes with three; and several breeds of sheep have four, five, or six horns; but these are invariably monstrous productions, issuing from nearly the same base, and constituting a morbid superabundance of that organic substance. In the sub-genus *Tetracerus*, however, these productions are constant and uniform; the upper or true pair rising on the frontal crest, and the lower, or spurious, as invariably between the orbits. It is to the unwearied zeal and scientific labours of general Hardwick that we are indebted for the first knowledge of the typical species, the *Antelope Chickara* of the *Linn. Trans.* xiv. The female has no horns. It inhabits the forests and hilly tracts in the western provinces, where it is known by the name of chickara. It is extremely wild and agile, and can only be tamed when taken young. The other species, the *A. quadricornis*, is only known from a skull in the College of Surgeons. In this the spurious horns are sub-trigonal, or nearly three-sided, with three wrinkles, or small rings, at the anterior base.

(271.) 10. The tufted antelopes (*Cephalophus*) come under the tenth division. They vary considerably in stature, but are all distinguished by a prominent tuft of hair rising from the forehead, and more or less spread between the horns. Between the orbits and the nostrils there is an opening, like a pouch or sac, which in some species forms a black slit, shaped like the segment of a circle (*Ceph. Grimmea*, fig. 101.), while in others it assumes the appearance of a puncture near the corner of the mouth. Major Smith conjectures that this appendage is intended to perform a different function, in the animal economy, to that of the usual lachrymary sinus, common to so many groups of this family. The horns are small, black, reclining, and nearly straight, placed high on the forehead, with rings or wrinkles at



their base; the muzzle is rather developed and black; and several species have the forehead entirely covered with long fulvous hair, parting to the right and left from the centre: the tail is short, and tufted with long black hairs; and the females are without horns. This group extends over South Africa from Senegal to the Cape of Good Hope. They chiefly reside in bushes and low covers, standing up on the hind legs to look out for danger, even leaping into the air to overlook obstructing objects, and then running into concealment from one bush to another. These manners, and the strong family resemblance between them all, account for the confusion in which the species have been involved. The bush antelope of Sierra Leone (*Cephal. silvicultrix*), if truly belonging to this group, is by far the largest, measuring at the shoulders near three feet high. The four-tufted antelope (*A. quadriscopa*) is more typical, and is found in Senegal; it is distinguished by four tufts of dark hair, one on the knee of each foot. Mr. Burchell discovered another species, which has very justly been named after him by major Smith.

(272.) 11. The pigmy antelopes form the sub-genus *Neotragus*, which comprehends, as the name implies, the smallest species yet discovered of this family. These very delicate little creatures, of which there are, as yet, but two species discovered, are confined to Central and



Southern Africa, where they live solitarily in thick forests: their voice is said to be a "loud and shrill warbling kind of cry." The females have no horns, and those of the male are very small (*Neot. pygmea*, figs. 102, 103.); they lie horizontally on the top of the head, with a few annuli or semi-annuli to the front, and the base is not concealed by the tufts of the fore-

head, although the hair is somewhat lengthened, and retains much of that character seen in the last groups.

The head is oval, the snout pointed, and the muzzle small. The tail is short, the ears short and round, and the lachrymary sinus, in one species at least, appears to be wanting: the knees have no brushes or tufts of hair. The smallest species is the Guevi, or pigmy antelope of Shaw and the old writers of the Linnæan school. The size of the body in the stuffed specimens scarcely exceeded that of the Norway rat. The specimen in question stood under a bell glass, and, according to major Smith, could not be more than eight inches high at the shoulder, while the legs did not exceed the thickness of a large goose-quill. In its native country this little creature is said to be prodigiously active. It seems common in Guinea, but will not survive the voyage.

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It would seem that the suborbital sinus, in the *Neot. pygmea*, is much developed (*fig. 103.*).

(273.) 12. The painted antelopes, under the sub-generic name of *Tragelophus*, form a group

conspicuously beautiful, both on account of their colours and their graceful aspect. They seem to be more peculiar to Western Africa, where they reside chiefly in the deepest glens of woody mountains, living either solitary or in pairs, and feeding only during the night. They are timid, vigilant, and spring with great elasticity. Only three species have yet been described; they unite considerable elegance of form with singularly opposed colours. In their horns they deviate very much from the true antelope type; for they have ridges, which give them an angular and compressed character, in some slightly twisted, spiral, or lyrated. They have a small muzzle, no suborbital opening, and the females are supposed to be destitute of horns. We can scarcely conceive a more beautiful animal than the harnessed antelope (*A. scripta*), so named from the white stripes upon its bright bay fur being so disposed as to give it

the appearance, at a distance, of having a white harness* thrown over its body. It is found in the woods and plains of Senegal; but is not known, according to Mr. Burchell, in South Africa.

(274.) 13. The goral or goat antelopes (*Nemorhædus*) succeed the last, but are found only in India. "Several of the latter groups," observes major Smith, "show a gradual decline from the typical characters of the antelope, both in the horns and limbs; approaching more and more to the goats (*Capra*); and the present appears still more nearly allied to it." The deer-like conformation of their structure is not only replaced by robuster forms, but the head assumes a caprine shape; and the mild dark eye of the true antelope, gives place to the yellow or light hazel pupil. The skull is solid and heavy; but the horns still retain a round or falcated character, which is intermediate between the tufted antelopes (*Cephalophus*) and the goats (*Capra*): some show the pouch upon the intermaxillary bone, and the muzzle common to the former. On the other hand, the legs, and the character of the hair, which is coarse and often shaggy, belong to the goats. They seem to have, invariably, a white mark on the throat: the females are hornless. The three species already known, appear to reside principally in the forests and high mountains of Central Asia, and of the great Indian Archipelago. The first is the Cambing of the Malays (*N. Sumatrensis*,



fig. 104.)—a name which signifies wood goat: and truly the appearance of the animal is much more that of a *Capra* than of an antelope: the head and body are entirely covered with black hair, close on the face, but longer and rougher on the body: its height is two feet four inches at the shoulders. It is a mountainous animal, singularly active and lively. The goral is about the size of a common

goat. It inhabits, in numerous herds, the mountains of Nepaul.

(275.) 14. The chamois antelopes (*Rupicapra*) show obvious affinity to the last group; but receding still more from the type of the family. One species only, the European chamois, is known; but it is dispersed very widely, being found in the mountains of Europe, the Caucasian, and those of Persia. Its peculiarity is seen in the horns, which are vertical to the plane of the face, round, longitudinally striated, and with the tips uncinated. Behind the horns, on the posterior part of the head, are two small apertures. The limbs are strong, and resemble those of goats; the hair rather long, especially in winter; and there is a dark streak passing through the eyes, from near the horns, towards the mouth: the tail is short. Both sexes are provided with horns. There are neither the suborbital sinus, nor tufts of hair upon the knees; but, in common with the true antelopes, they possess ungual pores, and the ovine form of the nostrils. "Although," says major Smith, "this group is usually considered as most remote from the type of the genus (or rather family), we find no signs to separate them more decisive than may be observed in the klipspringer, the chickara, the chiru, the prong-horned, or the cambing" (*Nemorhædus*.) The chamois of Europe will be mentioned in another volume of our series; it is merely sufficient to mention in this place, that it inhabits the wildest and most abrupt regions of high mountains, yet it does not ascend to those elevated regions which the ibex alone delights to visit. It is sociable in its manners; living in herds of from fifteen to twenty, some of which always act as sentinels. It can, however, be partially tamed, and has been kept with common goats.

(276.) 15. The ovine or sheep antelopes (*Aplocerus*) have all the outward appearance of sheep. There are three species, all natives of the New World. We have seen, says major Smith, in the preceding groups, a gradual evanescence of characters, from the deer-like

forms and other attributes of the true antelopes, till we have reached those where the predominance seems to bear towards *Capra*. In the present, however, equally remote with the two last (*Nemorhædus*, *Rupicapra*), from the primitive characters, there appears to be an approximation to the sheep (*Ovis*) in the general form; though the horns still retain the structure which prevails in the thirteenth group (*Nemorhædus*) so closely, that if other distinctions, and an immense geographic distance, did not interpose, they might have been left in the same division. The horns of the animals now under consideration are simple, conical, obscurely annulated, and have the points turned back: there is no lachrymary sinus, no black and soft muzzle, or no inguinal pores: their skulls are solid and heavy, their limbs strong, the tail rather short, and they are exclusively confined to the western hemisphere. The want of a lachrymary opening in this and other ruminating groups, is most commonly an indication of their residence being confined to high latitudes, or elevated regions; and the remark is verified in the present case, at least as far as the only species perfectly established is applicable, and is not disproved by those whose existence is more problematical. The *Aplocerus*

lanigera, or wool-bearing antelope (fig. 165.), is the species here alluded to: it is the *Ovis montana* of Ord: and a fine specimen exists in the museum of the Linnæan Society of London: while for a more detailed account we must refer the reader to our projected volume upon living animals. The

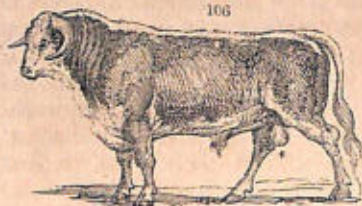


two other species, if such they be, are very imperfectly known.

CHAP. VII.

THE ORDER RUMINANTES CONTINUED — THE BOVIDÆ, CERVIDÆ,
MOSCHIDÆ, AND CAMELOPARDÆ.

(277.) WE may now commence our survey of the *Bovidæ*, or bovine family, the most important group of the ruminating quadrupeds, represented by the domestic oxen (*fig. 106.*). We cannot fail to have observed, among the last groups of the antelopes, a gentle and almost



imperceptible approach to those quadrupeds of the ruminating tribe, which, like the sheep and goat, have been destined for the comfort and convenience of man. In reference

to what we have already said on the probable designs of Providence in removing the *Anoplotheres*, and increasing or creating the *Ruminantes*, we have been much struck by finding it remarked by major Smith, that no fragments of fossil bones of the caprine or ovine races have yet been satisfactorily authenticated by geologists. Yet, in a recent state, the goats are found in three quarters of the globe, and, perhaps, in the fourth; while the sheep most certainly exist in a very great portion of the earth — New Holland, perhaps, excepted. It would almost seem, continues the same writer, as if this class of animals were added by the all-bountiful hand of Providence to the stock of other creatures, for the express purpose of being the instruments which should lead men to industry and peace; at least such an effect may, in a great measure, be ascribed to them; and if not the first companion, the goat may, nevertheless, be

regarded as the earliest passive means by which mankind entered upon an improved state of existence.° Certain it is, that with the dog, the ox, and the sheep, it has been domesticated from the earliest records furnished either by sacred or profane history.

(278.) The goats (*Capra*), as a zoological group, are distinguished from the antelopes by the osseous nucleus of the horns being partially porous or cellular, communicating with the sinus of the frontals. The direction of the horns is upwards, bending to the rear, more or less angular, compressed, nodose, and transversely wrinkled: they are present in both sexes; but they are smaller, less angular, and straighter in the females. The profile of the face is rather convex, and there is no lachrymary opening; the nose is without a muzzle, leaving only a narrow naked space between the nostrils. The chin of the male, in nearly all the species, is adorned with a beard. The tail is short, naked below, and often carried in an erect position. The fur is not very coarse, but of different lengths and colours, and accompanied beneath by a close woolly down. The males contend among themselves by butting, with their horns—not in the manner of the stags or bull, by running low at each other—but by standing on their hind legs and striking with their whole weight obliquely downwards. During these conflicts they mutter abrupt sounds, lick their lips, and paw the ground. They are by nature inclined to ascend while feeding, even when tame or domesticated; and, in a wild state, the species reside on the most elevated mountains, on the borders of perpetual snow. The common domestic goat is a familiar example of this genus, but the ibex is the most celebrated. Abyssinia, Persia, and the mountains of Caucasus, possess peculiar species; while the breeds of the common goat, varied by situation and climate, are very numerous. The rarest, and, at the same time, one of the most interesting species, is the Jemlah goat (*Capra Jemlanica*), of which the skull and skin was formerly in the British Museum: it is equal to the ibex

in size, and the breadth and thickness of its horns reminds the observer of those of the musk ox. It seems an inhabitant of the lofty mountains of Central Asia.

(279.) The goats are followed by the sheep (*Ovis*); and, indeed, the two groups are so nearly allied, that

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their distinctions are but very slight. Nevertheless, certain physiological traits are always obvious, and lead to other indications of more importance.

In the sheep (fig. 107.) the horns are very voluminous, more or less angular, transversely wrinkled, pale or whitish, turned laterally in spiral directions (fig. 108.), and

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growing upon a porous bony axis; the forehead, with its chaffron, is almost constantly arched, and protruded before the base of the horns; there are no lachrymary openings, and the nostrils are lengthened, oblique, and terminated

without a muzzle. The incisive teeth have the middlemost largest; they form a regular curve, touching at their sides: the goat-like beard is wanting. In most instances the females are furnished with horns; but they are smaller, pointed, almost vertical, and divergent. A rufous dun, passing into a chocolate grey, seems to be the primitive colour of the fleece, in a state of nature, of all the species. In a wild state, they herd in flocks on the most inaccessible mountains of Asia, Africa, Europe, and America.

(280.) The genus *Damalis* deserves our particular attention, as it comprises those large animals classed by the old writers with the antelopes, but which, in the opinion of major Smith, intervene between the sheep and the oxen. To the latter, in fact, they are so closely allied, both in

size, habits, and general aspect, that the natives of those countries wherein they are found, seem by common consent to have given them names expressive of their belonging to the cow or ox. The very aspect of these animals, as it has been well observed, is, indeed, sufficient to point out their difference from the antelopes. They are all of a large, or above a middle size: the interscapular, or first vertebræ of the back, are usually much elevated above the rest of the spine; and the posterior extremities more or less shortened when compared with the anterior. The horns are placed on, or even above the ridge of the frontals, and have within the osseous nucleus or core a considerable cavity, communicating (in all the species that have yet been seen) externally by a sinus which passes under the horny substance, nearly opposite the root of the ear. The head is long and heavy; the neck rather short in proportion, with something like a constrained arching; and both that and the throat are more or less provided with a mane and beard, hanging in a tuft, or loose along a true or partial dewlap. The tail descends to the houghs, being terminated by a large tuft. The legs, though well proportioned, are heavier, and the animals more unwieldy than antelopes: their form gives them a particular mode of standing with the haunches under them. Only one species is noted for spirit and fierceness. The name of *Damalis* has been given to this group, thus characterised by major Smith, because in the Greek it is applicable to the young bull and the adult cow. He considers the group in question as "osculating on the one side with the *Aigoceri*, in the genus *Antelope*, and on the other with the bisons, in that of *Bos*." Like the first of these, it is divided into several divisions or distinct types, which will be now briefly noticed.

(281.) The sub-genera of the *Damalis* group are thus characterised by major Smith:—The first is *Aeronotus*, which is followed by *Boselaphus*, *Strepsiceros*, and *Portax*. The whole of these large quadrupeds, with the exception of that which typifies *Portax*,

are inhabitants of Africa. The first, or acronotine



group represented by *A. canna* (fig. 109.), is characterised by horns with a double flexure, more or less bent, and seated on the summit of the frontal crest: they are approximating, annulated at their base, and smooth at the points, which are turned backwards or inwards; and they are common to both sexes. The head is long, the front narrow, the

muzzle small or none; and there are inguinal pores, and a small lachrymary opening. On the other hand, there are no tufts to the knees. The first vertebræ of the back are much elevated, and the croup is sloping: the tail terminates in a tuft, and hangs as far as the houghs. The species composing this group are the Bubalis, the Canna, the Koba, the Sassaby, and the collared Damalis (*Antilope suturosa* Otto); which latter is supposed, by Rüppell and Temminck, to be no other than the *Antilope addax*, or *Oryx addax* of major Smith. To this opinion we cannot subscribe without much better evidence than has yet been produced. The bubalis appears to be the type of the whole, and the singular elevation of its shoulders is remarkably striking: its general appearance is not unlike that of a small cow.

(282.) 2. Of the *Boselaphi*, or elands, there are but two species, but these are among the highest and most bulky ruminants. Although the horns have a distant resemblance with some of the middle-sized antelopes, their stature and ponderous make, their heavy dewlap, and elevated shoulders, bring them more properly into the present genus. The horns are the same in both sexes; and are placed on the summit of the frontals; they are heavy, very robust, transversely wrinkled, straight or slightly bent, with the tips forward, brown or grey in colour, twisted upon their own axis, which is on a prolongation of the plane of the face; they are also fur-

nished with a ridge more or less prominent, forming a spiral turn round them. There is a distinct muzzle, but no suborbital sinus. The neck is maned; and the dewlap is broad, deep, and furnished with long hair. The females are provided with four mammae, forming an udder. The Impooso, or Eland of the Dutch colonists, formerly considered as an antelope, is the type, and is so large and bulky as frequently to weigh 800 pounds: beneath the gullet is seen an enlarged larynx of the size of an apple. The canna, according to our author, is another species, and not a variety; an opinion which is another proof of the nice tact for discrimination which we have so often occasion to admire in this talented zoologist.

(283.) 3. The sub-genus *Strepsiceros* contains but one known example, namely, the Koodoo of South Africa. "In *Damalis*," observes major Smith, "we recall many of the antelopine characters; but others approach the genus *Bos* even more than the last. In relation to the former, the ridge and spiral figure of the horns, and the constant white mark passing over the eye and across the chaffron, show an affinity with the last species of the *Oryges*; while, to the latter, the texture of the horns, smooth, without wrinkles, pale in colour, and dark only at their tips: the breadth of the muzzle, and real dewlap, evidently bring the group into the intermediate state of the present genus. On the neck there is a long mane, and a beard on the chin; the osseous nucleus of the horns is porous at the upper end, and provided with a deep cavity near the base, communicating, at the back of the head, with blood-vessels passing over the parietal bone; the lachrymary sinus is wanting; the ears are broad and open, and the structure of the legs firm. The females are without horns, and are provided with four mammae, forming a small udder. The koodoo (*Damalis strepsiceros*) is the only species at present that is clearly established. This magnificent animal has perfectly smooth horns, forming regular and beautiful spiral curves; they are

placed on the summit of the frontal bones. This form, in all probability, represents the *addax Antilopes*. The koodoos live singly, or in pairs, in the woody districts of Southern Africa; it is powerful and active, bounding with great force to a considerable height, but, like the rest of those animals which are lower behind than before, they are not very fleet when chased by dogs. The fourth and last sub-genus (*Portax*) is represented by the neel-ghau of India (*Portax Risia* Sm.). "It is still more connected," observes major Smith, "with the bovine genus than the preceding, by the position of the horns at the sides of the frontal crest, the complete muzzle, bulky round body, and cow-like feet. It is still, however, connected to *Damalis* by the cavity in the nucleus of the horns, by the elevated shoulders and depressed croup, by the mane on the neck, the tuft beneath the throat, and an incipient dewlap. The females have no horns: the only character they exhibit, belonging also to the antelopes, is the deep suborbital sinus, and some portion of their manners. The name of *Neel-ghau* is derived from the Persian language, which signifies *Blue-ox*. 'It is said,' concludes our author, "that there is another species referable to this group, but as yet undescribed, which resides in some of the great islands of the Indian Archipelago. The sub-genus *Anoa* may ultimately unite or osculate with *Portax*." *

(284.) The last tribe of this extensive order comprehends the "oxen" (*Bovinae*), the largest ruminating animals in existence. They are most eminently serviceable to man, and seem devoted by Providence for those peaceful occupations which are connected with husbandry. The *Bovinae* comprise such ox-like groups as more or less assimilate to the domestic races; the horns being smooth, curved outwards and then forwards, round, and destitute entirely of those rings, knobs, or ridges, which are more or less prevalent in the genus *Damalis*: they have a broad muzzle, almost always naked; a short

* Hamilton Smith, in Griff. Cuv. iv. 366.

neck; and the females are always provided with an udder. On the other hand they are without inguinal pores, and have no lachrymary sinus. In no one group of the animal kingdom does there exist a greater harmony, and unity of plan, than in the natural arrangement of this important assemblage of quadrupeds; for by attentive study we shall be able to trace a representation of every division of the vertebrated circle. But our space will not permit us to enter upon this interesting topic; and, having hitherto followed the system of major Smith in the enumeration and disposal of the *Ruminantes*, we shall do so in this instance; fully aware that, where no attempt is made to investigate the circular succession of forms, and the analogical relations which they bear to one another, no system hitherto proposed has made so close an approximation as this has to nature. The primary divisions of our author will therefore be followed, under the generic names of 1. *Catoblepas*; 2. *Ovibos*; and, 3. *Bos*; the latter being again divided into the three sub-genera of *Bubalus*, *Bison*, and *Taurus*. It is necessary, however, to designate this latter group by the name of *Bos*, not only in accordance with the family name, but because it is unquestionably the type of the whole tribe of ruminants.

(285.) The name of *Catoblepas* was given by Ælian to an African animal, which he describes as resembling a bull, but with a more fierce and terrible aspect; its eyes are red with blood, resembling those of an ox, surmounted by large and elevated eyebrows, with an oblique look directed towards the earth; whence the name which it bears: its mane rises on the head, descends on the forehead, and covers the face, giving an additional terror to its aspect. The precise species of animal intended to be thus designated, is uncertain; but in all probability it was the common gnou of Africa (*fig. 110.*), which might have been seen by the Romans when they had pushed their conquest towards the central part of that vast continent. The generic characters more peculiar to *Catoblepas* are these: — The head is large



and square, with horns in both sexes; these latter are flat and broad at the base, where they are nearly joined; they lay outwards on the frontal ridge, and turn downwards, but with the points uncinating upwards, their whole surface being perfectly round and smooth: the muzzle is very broad; the nostrils bovine, and provided internally with a triangular valve which opens and closes at pleasure. There are glands on the cheek, a mane on the neck, and a considerable beard upon the throat: the dewlap is small; there is a ridge of hair on the chaffron, and bristles round the eyes and upon the lips. The body and tail are that of a horse, and the legs are like those of a stag. A more singular compound of characters cannot well be exhibited; and they conspire to produce an animal of a most extraordinary aspect. Of this genus major Smith has determined three species, all of which inhabit Central or Southern Africa; and describes the horns of a fourth. They are possessed of uncommon vigour and swiftness, although vicious and pugnacious, living in herds in the desert, and seemingly as regardless of shade as the ostrich.

(286.) The genus *Ovibos*, as the name implies, designates an animal between a sheep and an ox; and such is truly the aspect of the musk ox, peculiar to the frozen regions of North America. The whole animal appears enveloped in a long, thick, shaggy mass of woolly hair, which entirely conceals the shape of the body, and leaves only the head and the ends of the feet uncovered. Nevertheless, so closely does the proportions of this animal in its body resemble those of the gnoos (*Catoblepas*), that the appearance of a stuffed specimen of the musk ox, in a decayed state, when the woolly hair is destroyed, is very like a large gnoo in a similar condition. The body is low and compact; and the legs, although short, are not bulky: the muzzle is

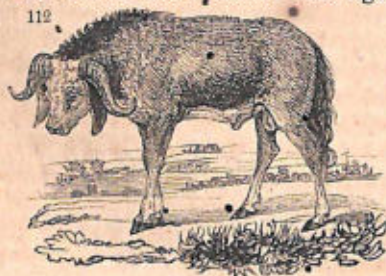
not naked; but the chaffron is narrow at the end, very square, and covered with close hair. There are horns in both sexes; they are close together on the summit of the head, which they cover, and where they are flat and broad; they then abruptly taper, and turn down against the cheeks, the points turning out: the ears are short, horizontal, and placed far backwards: the eyes small; and the tail short. There is but one existing species known; though, as major Smith conceives, there is some reason to suspect that another once existed in the north-east of Asia, and probably even now may exist in that desolate and extensive region. The American species lives in herds of thirty or forty, and is hunted on account of its flesh; each individual produces between 300 and 350 pounds of beef. The Asiatic musk ox (*O. Pallantis*) is considered by our author as in all probability distinct. Hitherto this animal is only known by its horns. Although these are termed fossil, they have all the characters of recent existence. Here again our author successfully refutes the supposition of M. Cuvier and others, that these musk oxen had been originally conveyed from America to Asia.

(287.) The three remaining groups of the oxen are composed of—1. The buffalos (*Bubalus*); 2. The bisons (*Bison*); and, 3. The genuine oxen (*Bos*). The first deserve to be described in our author's own words.

“Buffaloes in general are animals of a large stature, resembling a bull, low in proportion to their bulk, and supported by strong and solid limbs. The head is large; the forehead, though narrow, is remarkably strong and convex; the chaffron straight, flat, prolonged, and terminated by a broad muzzle; the horns being flat, or bending laterally (*fig. 111.*) with a certain direction to the rear, and therefore not very applicable in goring: the ears



are rather large, and funnel-shaped, but never erect; the eyes are large: they have no hump on the back, but a small dewlap on the breast. The back is rather straight; the tail long and slender; and the hide black, more or less covered with ashy or black coloured hair. Their manners present us with many peculiarities: they avoid hills, and show a decided partiality for aquatic situations, as swampy grounds, or damp forests, rather than open or dry plains; they love, in fact, to wallow in mire, and will lie for hours sunk deep in water: they swim well, or rather, by some peculiarity of organisation not hitherto explained, float on the surface; and consequently pass the broadest rivers with perfect facility. Their gait is heavy and unwieldy; and, from being principally guided by their sense of smell, they run almost always with the nose horizontal: but this attitude prevents their seeing beneath them, and conceals their horns. In their combats they usually strike or butt with the forehead; endeavouring to lift their opponent on their horns, and, when thrown, to crush him with their knees: they trample on the body of their foe; and their vindictive fury is so lasting, that they will return again and again to glut their vengeance upon the same inanimate corpse. They herd together in small flocks, but, in a wild state, are never strictly gregarious. They are capable of domestication; yet even in this state retain a great portion of their originally savage nature: this is indeed so great, that it has been asserted neither the tiger nor the lion are



inclined to attack this animal unless goaded by extreme hunger. The Cape buffalo (*Bubalus Caffer*) is one of the most conspicuous species. It is a terrible and ferocious beast, pos-

sessed of a tremendous bellowing voice, and as much dreaded by travellers in that country as the lion: its hide is so thick that it will resist an ordinary musket ball. Another species, the gigantic arnee, equally formidable, is found wild in the forests of the Himalaya mountains; while the *Bubalus Pegasus* (fig. 112.) only occurs in the interior of Western Africa."

(288.) The bisons (*Bison*) were long confounded by technical systematists, with the true oxen (*Bos*), until M. Cuvier explained their true distinctions. The forehead of the ox is flat, and even slightly concave; but that of the bison is arched, though somewhat less than in the buffalo: it is in the ox nearly equal in height and breadth, taking the base between the orbits; but in the bison, measured in the same place, the breadth surpasses the height in the proportion of three to two. The horns of the ox are attached to the extremity of the highest prominent line of the head, or that which separates the forehead from the occiput; while in the bison this line is two inches behind the root of the horns: the plane of the occiput forms an acute angle with the forehead in the ox; but that angle, in the bisons, is obtuse: finally, the ox has the plane of the occiput quadrangular, while in the bison it is semicircular. To these distinctions major Smith has added others. The bison has fourteen pair of ribs; while the ox, in common with most ruminants, has but thirteen; the legs are also more slender than either in the ox or buffalo. This genus, like the last, is spread over both hemispheres. It now seems to be established beyond doubt, that the true *Urus* of the ancients was a species of bison, formerly an inhabitant of the European forests, but now extinct. Looking to the general characters of the group, we may observe that the hair of the bison is of two sorts — one long, the other soft, and placed on the skin at an obtuse angle; while the hair of the ordinary ox is of one kind, hard, and lying close to the hide. The hair of the bison is very long under the jaw and throat, and upon

the shoulders; the tail descends to the houghs, and is provided with abundance of long hair; the summit of the head is covered with a bushy and spreading space of long hairs, strongly impregnated with musk; and the horns are short, lateral, black, and pointed. The hide is double the thickness of that of the ox; and the species shows a decided aversion to domestic cattle. The shoulders of the American bison (*Urus Americanus*), and, apparently, in a less degree, of all the other species, are much elevated. The *Urus Gavaus*, or Gayal bison of India, prepares us for entering upon the true oxen. It shows a disposition intermediate between the ferocity of its own congeners, and the gentleness of the ox. It has been domesticated by certain tribes of India, from time immemorial; and is particularly remarkable for a high and sharp ridge, which commences on the hinder part of the neck, and slopes gradually up till it comes over the shoulder joints: this evidently is but a modification of the hump on the ordinary bisons, and of the elevated shoulders of the *Camelopardalis*.

(289.) The taurine group contains the genuine oxen, to which we shall retain the generic name of *Bos*. In treating of these animals, so important to the interests of mankind that their scientific history acquires increased interest, we shall depart in some measure from the authorities we have hitherto followed, and give the result of our own studies on the natural types which it contains. All writers agree that the large skulls of oxen found in the more recent formations, and which still exist, in an unburied state, in several museums, belonged to a formidable race of these animals which once existed, even in Britain, in a wild state; that they belonged, without doubt, to the species named *Urus* by Cæsar and other ancient writers; and that these skulls not only possess a specific distinction, but exhibit the type of a form essentially different from that of the domestic ox. All these skulls are nearly one third larger than those of the *Bos Taurus*; they are square

from the orbits to the occipital crest, and somewhat hollow at the forehead. The horns, placed at the side of the above crest, show a peculiar rise from their roots upwards; then bending outwards, and then forwards and inwards. No domestic races show this turn; but numerous specimens of inferior sizes, found fossil in some of the Cornish mines, have this shape; and the wild bull of Scotland, the only example of this type now known to exist, retains it. The domestic oxen, on the contrary, of whatsoever country or breed they may be of, have the square concave forehead with the horns rising from the ends of the frontal ridge. These distinctions are so pointed, and have been so dwelt upon by all writers, that we should not have recapitulated them, were it not essential to our ulterior object. It appears, then, that the ancient *Urus*, or wild bull, was a perfectly wild, savage, and untameable animal: not only does every account handed down from remote antiquity assure us of this, but it is even verified by the only living example of this form we possess—the *Bos Scoticus*, still preserved in one or two of the northern parks. Although domesticated so far as to live within such precincts, without absolute unprovoked violence to its keepers, it retains essentially all the savage characters ascribed to the more powerful species mentioned by the ancients. Like that, also, it possesses, when at mature age, a kind of mane, about two inches long, and its throat and breast are covered with coarser hair. These characters, which are never found in the domesticated breeds of oxen, were no doubt much more highly developed in the ancient *Urus*. The second type is the domestic ox; the external characters of which, to use the words of major Smith, are “absolutely the same as the fossil *Urus*, and the wild breeds differ only in the flexures of the horns.” But though these two types come so near each other in external appearance, nothing can be more different than their moral character: the *Urus*, wild, savage, and untameable, remains with all these propensities unimpaired

and undiminished, from the period of its first creation down to the present day. The other, tame, harmless, and enduring, has voluntarily submitted to the service of man from the most remote antiquity, and seems to have been a companion of the earliest inhabitants of the earth. Both these, however, have no protuberance upon their shoulders. This character we find in the third type, which seems to have its greatest developement in Asia. Major Smith alludes to a "large species of India, equal to a bull of the largest stature, having a hump on the back which sometimes weighs fifty pounds; the horns are short and bent backwards, and the colour is usually red or brown." Nor is this very peculiar specific distinction (for such must we consider it) confined to a single breed or race; for various modifications or varieties occur in different parts of Asia, and even along the shores of Northern Africa. Neither is it the only distinction of this type; for these hunched races exhibit a certain liveliness and activity peculiar to themselves: they have also a different voice to the domestic ox; for they groan, and produce a sound like the shriller and weaker tones of the Gayals; and in China, some breeds have the horns placed further back, so that the forehead is actually arched. The fourth type appears likewise indigenous to the same continent, from whence, in fact, nearly all our domesticated animals have originated. It is typically distinguished by its very diminutive size, by the almost total disappearance



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of the hump so highly developed in the last, and by having no horns (*fig. 113.*). This species is seldom seen in this country, nor do we know where a full account and figure of it is to be found; we have, however,

seen it in Chinese paintings; and major Smith assures us that an individual of the small Zebu race is not larger than a hog!—the name of *Bos pusio* may therefore be correctly applied to this species. The same observing naturalist has furnished us with the means of judging of the nature of the fifth type, which we shall describe in his own words. "It is reared in Abyssinia, the Galla country, and in the north of Central Africa; it is of a large size, generally white, and armed with immense horns. Some travellers agree in stating that they are hunched, while in other accounts they are considered as buffaloes; nor does it appear proved that the hunch is a simple fatty excrescence; there is even some probability that the ridge of the withers is the principal cause of the elevation." Of this latter, which we consider as the fifth type of the genus *Bos*, our author enumerates two races: the galla or Zanga race, generally white, with a small hunch, black muzzle, small bone, and high legs, is the largest known. The horns turn up vertically, "are of a pale horn colour, extremely bulky, and near four feet in length;" in other words, nearly as long as the entire length of the *Bos pusio*! The second, or Bornou race, is likewise white, of a very large size, hunched back, and immense horns; but, instead of rising vertically, they are couched outwards and downwards, like those of the African buffalo, with the lips forming a small half-spiral revolution. We are indebted to captain Clapperton for a knowledge of this species; but its most surprising peculiarity remains to be described. "The corneous external coat is very soft, distinctly fibrous, and at the base not much thicker than a human nail; the osseous core full of vascular grooves, and very cellular inside; the pair together scarcely weighing four pounds. The skin passes insensibly to the horny state, so that there is no exact demarcation where the one commences and the other ends. The dimensions of one of these horns were as follow:—Length, measured on the curve, three feet seven inches; circumference at base, two feet; the

same midway, one foot ; length in a straight line from base to tip, one foot five inches and a half. The species has a small neck, and is the common domestic breed of Bornou, where the buffalo is said to have small horns."

(290.) The types of form of the genus *Bos*, above enumerated, we shall now demonstrate to be a natural group. We have seen that the first, represented by the *Bos Scoticus*, or Scotch wild ox, is an untameable savage race, which preserves, even in the domestication of a park, all that fierceness which the ancient writers attributed to the wild bulls of Britain and of the European continent. Let those who imagine that the influence of civilisation, of care, and of judicious treatment, will alter the natural instinct of animals, look to this as a palpable refutation of the doctrine. Where is that boasted power of man over nature? Where the fruits of long-continued efforts and fostering protection? The *Bos Scoticus* is as untameable now as it was centuries ago, simply for this reason, that it is in accordance with an unalterable law of nature ; a law by which one type in every circular group is to represent the worst passions of mankind, — fierceness, or cruelty, or horror. In the *Urus* we consequently have the type of the wild and untameable *Feræ* among quadrupeds, the eagles among birds, and the innumerable analogies which all the subordinate groups of these two great divisions present. Following this is the typical ox—a god among the ancients, and that animal, above all others, which, from its vital importance to man, we should naturally expect such a nation as the ancient Egyptians would exalt above all others. It is, in short, the typical perfection of the whole order of ruminants, and consequently represents the *Quadrumanæ* among quadrupeds, and the *Insectoræ* among birds. The third type is no less beautiful ; but it cannot be illustrated without going into details which it is not our present intention to make public ; suffice it, however, to say, that in the prominent hump upon the shoulders we have a perfect representation of the camel, one of the most striking types of

the order, while it reminds us at the same time of the buffalo, the genus *Acronotus* among the large antelopes, and numerous other representations of the same form. The fourth type is our *Bos pusio*: here we find the horns, when present, remarkably small, but in many cases absent; and the size is diminutive to an extreme. These, also, are distinguishing marks of the groups it is to represent: the *Tenuirostres* among birds, and the *Glires*, or mice, among quadrupeds, are the smallest of their respective classes; and both are typically distinguished by wanting all appendages to the head, either in the form of crests or horns. The fifth type is perhaps the most extraordinary of all: it should represent not only the order *Rasores* among birds, but also the *Camelopardalis* among ruminating quadrupeds. Hence we find that, in accordance with the first of these analogies, it is a peaceful domesticated race, and that it has horns of an unusually large size, even in its own group; while, at the same time, these horns have that particular structure which can only be traced in the *Camelopardalis*: they are covered with skin, which passes so imperceptibly to the horny state, that, as captain Clapperton observes, "there is no exact demarcation where the one commences and the other ends." The five leading types of quadrupeds and birds being now represented, and in precisely the same order, we demonstrate the groups to be natural by the following table:—

GENUS POS, the Natural Types.

1. Bos Scoticus.	Fierce, untamable.	FERE.	RAPTORES.
2. — Taurus.	Pre-eminently typical.	PRIMATES.	INSESSORES.
3. — Dermaceros.	{ Appendages on the head greatly developed. }	UNGULATA.	RASORES.
4. — Pusio.	Stature remarkably small.	GLIRES.	GRALIATORES.
5. — Thersites.	{ Fore part of the shoul- ders elevated. }	CETACEA.	NATATORES.

In regard to the last type, the analogies can only be traced through the animals or types of other groups; but should the habits of *Thersites* lead it to frequent the water (like the buffalos) more than any other species

of true oxen, — a supposition highly probable, — the analogy to the *Cetacea* and the *Natatores* would be direct. When we find in all the other four types such a surprising representation of the same peculiarities, we are justified in believing that want of information alone prevents this analogy from being so complete as the others. These analogies, in point of fact, may be traced through the whole of the principal groups in this order, the most important and the most numerous of ungulated animals. Having now demonstrated, in one of the very lowest groups of quadrupeds, the validity of those principles of natural classification we have so often illustrated, even in this volume, we shall close our exposition of the family by bringing into it a most singular animal of the ruminating tribe, referred by major Smith to the *Antilopidae*, but which, for very many reasons, we consider as belonging to this.

(291.) The last type of the bovine family is represented at present but by one species, the anoa (*Anoa depressicornis*), or flat-horned antelope (*fig. 114.*). Major Smith observes, that though he places this curious animal as the



last of the antelopes, he has little doubt, when it is better known, that an absolute separation from that group will be the consequence. The horns, as in other groups, form the distinguishing character: they are placed on the verge of the frontal crest, and on the same place with the face; they are exceedingly robust, a little depressed, sub-triangular, short, straight, wrinkled, and suddenly terminate in a very sharp point: the face is straight; and it is supposed that the lachrymary or suborbital opening is wanting. Of the species which furnished these characters, two specimens, of the head alone,

have reached Europe: one of these is in the British Museum; and the other was brought from the island of Celebes. "The form of these horns have, in fact, a mixed character, which bears some resemblance to those of a buffalo: it is not impossible that it may belong to the genus *Damalis*." Pennant calls it a buffalo.

(292.) The CERVIDÆ, or deer family, is the first of the aberrant families of the *Ruminantes*. It is composed of those ruminating animals in which the males have deciduous horns, or antlers, destitute of a horny sheath: in general, they are remarkable for the elegance of their forms, the lightness of their proportions, and the velocity of their movements. (*Cervus Dama*, fig. 115.) The legs are slender and firm,

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the body round and compact, the neck long, and the head well shaped. Their look is meek, yet confident; wild, yet curious; while the colours of their coat are clean, brilliant, and agreeable. Hence deer have been at all times interesting to mankind, and the chase of them an object of the great and wealthy. The most remarkable characters of this group are the

horns; that is, those osseous productions of the forehead, which fall and are reproduced successively; and which, with the exception of the reindeer, are the exclusive peculiarity of the males. The common opinion, however, of the annual shedding of the horns in the deer, must be restricted, in all probability, to those species which reside in temperate regions, or which have these productions of a large size. Sir Stamford Raffles considers that the Muntjak deer of Java seldom, if ever, renew theirs; and major Smith's researches in tropical America tend, in general, to confirm this opinion. The flattened or palmated shape which these horns

assume, in some species, seems to be a provision of nature to enable the animals to clear the snow off, their food; for it is remarkable that this structure is confined to those which inhabit the higher or northern latitudes, and is rendered more applicable in proportion as they inhabit more rigorous climates. Thus, in the reindeer, which lives in the arctic regions, it is most so; and least in the fallow deer, which belongs to the colder temperate regions. This form is also to be traced even in some of the antelopes of America. The *Dicranocerus palmatus*, which resides the furthest north, bearing horns much broader than the *D. furcifer*, or prong-horned antelope. The Caribou deer of America, who have to contend still more with deep snow than the reindeer of the old continent, have their horns broader and better adapted to that purpose; besides, both varieties, in addition to these natural shovels, have broad feet, not only to sustain them the better on snow, but also to clear it away. Thus these arctic inhabitants are provided with a double organisation for this purpose, while other less northerly ruminants have only one provision; as the horns of the elk, or the feet of *Ovibos* and *Aplocerus lanigerus*; these, besides, emigrate to latitudes of a milder character. The horns of the reindeer, indeed, drop in winter; but this takes place only at a period when the snow is already not only very deep, but frozen hard; and even then we see that the females, when gravid, and therefore in want of a greater supply of food, preserve theirs till May. Hence it may be taken as a maxim, that all the horns of a palmated shape belong to species of high latitudes; and that those of this class which belong to the species named *Cervus Mexicanus*, are, in reality, of animals of cold climates: nay more; for as we know South America to abound in deer, that we may naturally look for representations of the elk and the rein in the highest latitudes of Patagonia.

(293.) The texture of the hair in most of the species is particularly curious, and deserves attention: it is neither woolly like the monkeys, nor elastic as in most other

quadrupeds; but possesses a degree of crispness and fragility, which gives to the filaments of the hair or fur an appearance of being broken off short: we find this also among several antelopes, but in no animal which does not belong to this family. The general colour of all the deer family is different tints of brown, varied with white spots. In some, the males have canine teeth; and in the Muntjaks, or oriental deer, these teeth become as long as in the musk. Major Smith mentions having seen one of the latter which had these teeth double. The feet are perfectly cloven, the ears large, and their sense of hearing very acute: their power of smelling is delicate. As to the different sub-genera, or subordinate groups, major Smith observes that there are several, "distinguished as well by similarity of structure, as by the additional advantage of geographical unity; but we must except from the latter particularity those of the higher latitudes, who, in common with other animals, inhabit certain zones, rather than countries." Our author consequently divides the whole family into the following sections, which he terms groups:—1. The alcine (*Alce*); 2. The rangiferine (*Rangifer*); 3. The platicerene (*Dama*); 4. The elaphine (*Elaphus*); 5. The rusa (*Rusa*); 6. The axine (*Axis*); 7. The capreoline (*Capreolus*); 8. The mazamine (*Mazama*); 9. The subulone (*Subulo*); and, 10. The stylocerine (*Stylocerus*). We shall now proceed to a slight notice of these groups in detail, assigning to each a vernacular name more suited than are the above to general apprehension.

(294.) The elks (*Alce*) and the reindeer (*Rangifer*) constitute the two first groups. They are the most bulky of all the deer family; and both are inhabitants of the coldest countries of Europe and America. It was long supposed that the moose of America and the elk of Sweden (*fig. 116.*) were one and the same species; and this idea was entertained both by M. Cuvier and major Smith. It appears, however, from very recent investigations, that they are two very different animals;



a discovery which excites a suspicion whether the elk of Tartary and of Central Asia may not eventually prove a third species. At present, however, we can only reckon three as composing the alpine group of major Smith; the moose of America, the elk of Northern Europe, and the crowned elk. Of the two first we shall speak elsewhere; the testimony of the existence of the latter is thus adduced by our author:—“This species is known only by a pair of horns attached to a part of the frontal, in the museum of Paris, without indication from whence they were brought. The animal to which they belong was evidently an adult, since they bear fourteen snags, and yet they are not a foot in length: they stand about three inches asunder, and more on the forehead than those of the elk, with five snags forward, deeply indented into the blade, and the summits forked; their texture is thin and light, and they must have been borne by an animal probably not larger than the fallow deer. It is not impossible that this is the *Kistuhé*, or little elk of the Rocky-mountain Indians, which may be intermediate between the true elk and the reindeer. This would correspond with the opinion of the baron Cuvier, lately offered on this very pair; viz. that they are the growth of a reindeer, an opinion which he supports by showing several horns of reindeer, approaching in form to these: but it does not appear that the specimens so produced belong to the European species; we believe them all American, and may therefore be of the same species as our crowned elk in a junior state.” our author, by some oversight, has not informed us upon what principle he conceives the reindeers should

stand as a distinct group from the elks. These animals are in a great measure arctic, and are spread over the north of Europe and of America. It may nevertheless be questioned whether the varieties of races, as they are usually termed, of the two continents, do not belong to different species. True it is that there is no species of deer whose horns vary to such an extent, for it is difficult to meet with two individuals precisely alike; but then, as Major Smith remarks of the Caribou or American races, they may be distinguished from those of the old continent, by their horns always being shorter, less concave, more robust, the palms narrower, and with fewer processes. The American reindeer, like the elks, use their horns to remove the snow; but it does not appear that this practice has been noticed in the breeds of Lapland. On the three races belonging to the New World, the reader will find ample information from the pen of Dr. Richardson, in *Northern Zoology*, vol. i. Major Smith notices a fossil species whose fragments indicate a size not larger than that of the roebuck.

(295.) The platycerine group is represented by the fallow deer (*Dama*), the only species now known in a living state, although the fossil remains of several others have been discovered; among which is that generally

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called the fossil elk of Ireland (*fig. 117.*). This group, however, is small, and contains those animals whose horns, like the two former, are palmated, but only at the summit. The fallow deer is one of the best known and most domesticated quadrupeds we have; it seems to have

come originally from Eastern and Southern Europe. Of the celebrated fossil elk of Ireland, we need only observe, in this place, that its true situation, in conformity with its natural affinities, is with the fallow deers, rather than with the elks, strictly so termed. Another fossil species of this group has been dug out of peat ground in Sweden; and that found at Abbeville in France (*Cervus Somonensis*) is possibly a third.

(296.) The elaphine group (*Elaphus*) of our author follows next: it is composed of the true stags, the most celebrated of those ruminating animals in the annals of the chase and in the fictions of the poets: zoologically considered, they are remarkable for the males possessing canine teeth; while the beam of their



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horns are produced into three antlers, exclusive of the crown.

Besides the common stag (*fig. 118.*), there are three other well-authenticated species: 1. The Canadian, or Wapiti; 2. The north-western, or *E. occidentalis*; both natives of America; and, thirdly, the Ne-paul species: a fourth is only known by its fossil bones, found in various parts of North America.

(297.) The Rusa group (*Russa*) has been characterised by major Smith, both from external structure and from the peculiarity of its geographic distribution. It consists of stags entirely Asiatic, and is distinguished from all other deer, by having round horns with a brown antler, but no median or bezantler; the beam terminating in a simple perch, with a snag of more or less length, placed midway, or high up, on the anterior or posterior side of it (*Russa Marianna, fig. 119.*). The group is further distinguished by having, in common with the true stags, a broad muzzle, canine teeth in the males, large suborbital openings, a rugged mane,



lengthened tail, and uniform dark colours on the hair. In stature nearly the whole are large; and like the stags, although they reside in woody places, they have a predilection for water. These characters, common to several species, appear to separate them from the spotted axis of Be-

lon, Pennant, and others, and to designate them as a distinct group by the Malayan name of *Rusa*. Of six species inhabiting the hotter parts of India, that which the British sportsmen erroneously call the elk is the most remarkable (*Cervus Aristoteles*). It is described as excessively strong and vicious, fully as large as the true elk of Europe. The others appear scattered in Sumatra, Java, and in the islands adjacent, from whence they are sometimes brought to the menageries of Europe.

(298.) The axine group (*Axis*) contains but three species; and is so closely allied to the last, that their separation would not, at first, appear necessary. They are distinguished, however, by the males having no canine teeth; the general structure of the animal is more slender and smooth; the size also is small, the largest species not exceeding the fallow deer; and the fur is mostly spotted with white. Among the British sportsmen and residents in India, these animals are called hog-deer; they are most usually found in the heavy grass jungles in the lower provinces, and to the northward in the *Jaw* and *Surput* jungles, along the banks of the rivers; they feed in preference on the silky grass used for making twine. They are extremely indolent in their habits, feeding at night, and passing most of the day in sleep. To this we may probably trace the repugnance of the hog-deer to remain in districts much frequented by the wild peacocks, whose loud and discordant voice must frequently disturb the

day-slumbers of these quadrupeds. During the pregnancy of the females, they keep under cover, at which time the bucks are unusually vigilant and fierce in their defence.

(299.) The capreoline group (*Capreolus*) is formed to contain the roebucks (fig. 120.); of which major



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Smith considers there are two species. Their horns, he observes, in general, are a diminutive representation of those borne by the ruses of India; but the animals are shorter, and more elevated on the legs; they are destitute of any tail, and are without the lachrymary sinus. In general the horns developing, as in the rest of the genus, from a first pricket to

a second, with antlers; and these in their turn enlarging with age. The complete form, however, consists in having only two antlers, or rather processes; the inferior forwards, and the superior to the rear; which, with the point, makes three; but occasionally tubercles swell into processes, and then they seem to have four or more. Indeed, the roebuck group is more subject to diversity of horn than any other deer, the rein excepted; probably from their residing much in under-wood, which, being apt to inflict wounds while the horn is tender, produces disease and monstrous formations. The roebucks belong exclusively to the Old World; they are represented in the New by the succeeding division, and by the brockets of South America.

(300.) The next group is the mazamine (*Mazama*) deer; and is composed exclusively of American animals — (*Mazama nemoralis* fig. 121.): this name is derived from *mazatl*, or *mazami*, the Mexican appellation of these animals. They are distinguished from other deer by having, in general, smaller horns, with a tendency to flatten, bending more or less into segments of a circle, the concave part to the front; with only one



anterior antler, and the others either posterior or vertical. Their tails are longer than those of the preceding; the heads longer and finer; and they are furnished with a brush of erect hairs on the inner face of the hinder joint: they have a small sub-orbital pore, appearing like a simple fold of the skin; a muzzle, but no canine teeth: their eyes are large, prominent, and soft; and the ears in general long. It is yet a question whether all those described as species, of which eight have been enumerated, constitute in reality different species. The Virginian deer (*Cervus Virginianus*) forms the most prominent species of the group, and serves for a type of the others. This elegant species stands rather more than three feet at the shoulder, and lives in large herds over a considerable portion of North America. Dr. Harlan mentions that it displays great enmity towards the rattlesnake, which it contrives to crush, by leaping with the fore feet conjoined, and dropping perpendicularly on the serpent, bounding away again with great lightness, and repeating this attack until its enemy is dead: the skin is used for gloves; and the native Indians of the interior prepare them in a superior manner for various articles of dress.

(301.) The brockets of the New World constitute the subulonine group (*Subulo*) of major Smith (*S. apara* Sm., fig. 122.), whose valuable observations, not admitting of abridgement, are expressed as follow:—"Although the specific discrimination of the deer in general is sufficiently intricate, none, perhaps, have been involved in greater obscurity



than the group now under consideration. From the circumstance of the females being more numerous than the males, an opinion was long entertained that there were deer in South America which had no horns; and this notion induced artificial classifiers, without further inquiry, to lend females and fawns of real deer to the genus *Moschus*; then, as the bucks of this group never bear other than prickets, or single dags, on the head, it was inferred, from analogy, that they were specimens with their prickets, or first horns, and consequently not adults. This second question, when it began to be cleared up, involved the difficulty of distinguishing those who in reality never bear antlered horns, or the true *Subulones*, from the young males, who are so only temporarily, and bear antlered horns at a later period; and next, of indicating what number of species might be distinctly characterised. Some of these desiderata are not as yet satisfactorily determined, although some species have been long observed in Guiana and Honduras, where we have seen them many years ago. This group, however, is clearly distinguished by the simplicity of their horns,—they being destitute of branches or processes at every age. They are of middling, and below the middling, stature; their nose is pointed, with a small muzzle extending at the side of the nostrils into a glandular termination; they have a small lacrymary sinus, and are of uniform colours, in which the bright rufous predomipates. In their manners they are polygamous, and prefer swampy woods to the open plains. In the Brazilian, Guarani, and Tapuia districts, these, together with all the light-footed ruminants, whether deer or not, are distinguished by the common name of *Guazu*, from which the French have derived the word *Couacou*. We have adopted the term *Subulo*, or brocket, to distinguish this group from the others; the word itself designating, in the technical phraseology of the chase, the stag, with his first or simple horns.”*

(302.) The last division of this family is the stylo-

* Ham. Smithy iv. 139.

cerene group (*Styllocerus Muntjak*, fig. 123.), and consists of those deer who have high pedunculated horns: they all appear to belong to the continent and islands of the Indian Ocean, and to be of a small size. The males have long canines in the upper jaw, which protrude beyond the lips; a muzzle, and a deep suborbital sinus; but their most obvious character resides in the elevated peduncles upon which the horns are fixed, the root of which descends in prolonged ridges towards,



and very near to, the nose. In the females, who are always, destitute of horns, this character is replaced by two bristly, broad, and dark spots, above the eyes, resembling eyebrows; or by a coarse dark patch of hair, like a mask or chaffron, which covers the forehead, and descends on the nose, and also retains the brown-like bristly terminations over the eyes. The females have four teats in a quadrangular position. The tongue of these animals is extremely long, so that they can extend it even beyond the eyes; a conformation which they have in common with the musks, who are observed often to lick their eyelids. None of this group appear to shed their horns more than once,—the first pricket being replaced by a permanent horn with a small anterior basal antler. The fawns are chestnut coloured, with numerous white spots, if we may judge of the whole by one brought from Sumatra, and another said to be from Ceylon.* Our author indicates five species, two of which are, however, marked with a note of interrogation. That which is best known has been described both by sir Stamford Raffles and Dr. Horsfield, under the name of *Cervus Muntjak*; but the manners of these animals are as yet very imperfectly known; they seem, however, to reside in the woods in pairs or small families: when domesticated, they

*H. Smith.

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are very gentle and familiar. The union of this aberrant genus of the *Cervidæ* with the musks is placed beyond doubt by the *S. moschatus*, which exhibits, in its pedunculated horns and canine teeth, the united characters of both groups (*fig. 124.*).

(303.) The *Moschidæ*, or musk deer, constitute the most aberrant group of the ruminants. They have been generally placed close to the last family (*Cervidæ*), to which, as major Smith observes, they assimilate in many particulars; like the camelopardaline group, they are destitute of real horns, and they “advance towards the stags, whose horns are deciduous.” They are, in fact, externally distinguished from all other known ruminants, by this deficiency of horns; but they have, in common with the stag, two pointed and edged incisors, or canines, in the upper jaw of the males, which in some species protrude outside of the mouth. Internally they possess a *pironium*, which is wanting in all others of this order, while the eyes are destitute of a lachrymary sinus. The name of these animals, forming at present but one group, has been derived from the common musk, *Moschus moschiferus* Lin., the males of which secrete that particular odoriferous substance so called. They are said to be shy and solitary animals, inhabiting rocky woods. In confinement, they are playful, active, and gentle, but showing little instinct or attachment. The fore quarters are lower than the hind, but the general appearance of these animals is that of deer. They are all probably natives of the continent of Asia, and of the great islands of the Indian Ocean.

(304.) The celebrated giraffe, or *Camelopardalis*, of which more than one species is now known, is placed both by M. Cuvier and by major Smith immediately after the family of stags. “We are now,” observes the latter, “to consider an animal of so extraordinary a form, of lofty

stature, that even the stuffed spoils, the almost shapeless representative of the living creature, produce upon the eye of the beholder a mixed effect of awe and astonishment. Our imagination is involuntarily led back to the early epochs of the world, when colossal beings peopled the earth, and were the undisputed possessors of every region: we fancy ourselves in the presence of one of the survivors of the great diluvian catastrophe, when the *Mastodon*, the *Megatherium*, and perhaps its own congeners, were swept away, to leave this one species, among a few others, to attest what were the forms of a primitive animated nature. The giraffe stands isolated among the ruminating animals in family, genus, and even species: its characters offer a mixture of several genera; among which, the followers of the quinary system may select whether to class it, with Illiger, among cameline, or with other naturalists, among cervine or antelopine animals. By the length of the neck, the callosities on the sternum and knees, and by the want of spurious hoofs, it assimilates with camels; and so obvious is this approximation, by the addition of stature, that it did not escape the notice of the ancients; but the pedunculated form of the frontal process, in the shape of horns, recall that character in the *Styloceri*, or Muntjak deer; while the stiff hairs which crown their summits, seem to want only the gluten to cement them into true horns, and embody it, in systematic arrangement, with the *Cavicornia*. This affinity is, indeed, maintained by other characters, such as the elevation of the anterior extremities, and of the spinal processes of the shoulders, and the corresponding depression of the posterior quarters, which seems to connect it, through *Bubalis*, with the acronotine group of our proposed genus *Damalis*. The similitude of conformation is further perceived in the general shape of the head, the ears, the eyes, the body, and the tail: yet the giraffe is possessed of characters exclusively its own; for besides the bony processes, covered with skin, and surmounted with strong bristly hairs, there is a spherical

elevation on the forehead, elongated towards the nose; the nose and lips resemble those parts in a horse; and the colour of the coat is dirty white, marked with large approximating angular and somewhat regular blotches of a dark brown or rufous colour: from the back of the head to the end of the shoulders, a short erect mane passes down the neck, marked by alternate spaces of black and white. From a comparison of these characters, the giraffe appears most naturally placed immediately after the Muntjaks, and before the family of *Cavicornia*, or those ruminants which are distinguished from all the preceding by the possession of true horns.*

(305.) We have given the above passage, explaining major Smith's views of the relations of the giraffe, at full length, in order that the naturalist may see how completely they are verified and explained by the station assigned to the *CAMELOPARDÆ* in our tabular exposition of the families of the *Ruminantes* (p. 242.); so that we may use the very words of our author, as evidence in support thereof. The giraffes pass immediately into the group of camels, "by the length of the neck, the callosities on the sternum and knees, and by the want of spurious hoofs." "So obvious," observes major Smith, "is this approximation, that it did not escape the notice of the ancients." This affinity establishes another; for it brings the circle of the *Solipedes* into direct contact with that of the *Ruminantes*. Again: the giraffes, according to major Smith, recall to our minds the *Styloceri*, or Muntjak deer, "by the pedunculated form of the frontal process in the shape of horns:" this we should naturally expect in two groups which were to represent each other; *Stylocerus* being the group, among the *Cervidæ*, which represents the *Camelopardæ* in the circle of the *Ruminantes*. "The stiff hairs," as our author truly observes, "which crown the summits of the giraffe's horns, seem to want only the gluten to cement them into true horns, and embody the animal, in systematic arrangements, with the *Cavicornia*: this

* H. Smith, p. 150.

affinity, indeed, is maintained by other characters." This opinion is quite in unison with our table, where the two families follow each other in close affinity. We very much regret that want of space obliges us altogether to omit our views on the natural arrangement of this interesting tribe, and of the beautiful relations which the groups bear to other animals. The above remarks, however, will give some degree of authority to our tabular synopsis of the natural arrangement of this tribe, and will induce the reader to place some faith in it, although circumstances debar us from producing full evidence, by citing those facts which are necessary to demonstrate its correctness. The same cause will also prevent us, in this place, from entering into those reasons which have induced us to consider the northern and the southern giraffe as two distinct and decided species; but this we hope to do in another volume of this series, devoted to the account of animals living in menageries.

(306.) There seems good reason for believing that a third species of giraffe exists in the interior of Africa; for Mr. Park, in describing his escape from captivity among the Moors, notices an animal of a grey colour, which he refers to the *Camelopardalis*; and although it was seen by him passing, the form cannot well be mistaken for any other creature. Major Smith considers this animal as the wild camel of the mountains, the existence of which he has had attested by several negroes, who had been brought from the interior; and in the Prænentine mosaics, where two spotted *Camelopardales* are seen together, a larger animal is likewise represented with short horns, but without spots, and the name of TABOTC written over. In a drawing of the same mosaic, the word appears to be partially effaced, but to have been PAΦOTC. It is remarkable that, while the spotted figures are without a name, the animal in question, occupying that part of the picture which designates the cataracts of the Nile, should be called by the Æthiopian appellation; which, according to Pliny,

was *nabis*, resembling the Hottentot *naip*; or by the second reading be like the Arabic, or one of its dialects. The negroes who asserted there is a wild camel in Central Africa, agree in the colour being ashy, and in the animal having horns and tusks; they represented it to be very large and fierce, but none had been near one. The Prænentine mosaic is said to be of the time of Marius; but what appears better proved is that Egyptian Greeks were the artists employed to make this kind of work even in Italy and Spain, as is evident from the birds fish, &c. figured. In the fragments of a mosaic at Avenches (*Argentium*), in Switzerland, the *Mormyrus Oxyrhynchus* of the Nile cannot be mistaken.*

CHAP. VIII.

ON THE ORDER GLIRES — THE GRAZING AND FRUGIVOROUS MARSUPIALS AND THE RODENTIA.

(307.) THE fifth primary order among quadrupeds has been named by Linnæus *Glires*, and by M. Cuvier *Rodentia*. We shall retain the former designation, first, because, not being in any way objectionable, no effort should have been made to set it aside; and, secondly, because there is good reason to suppose that many animals, besides the *Rodentia* of Cuvier, enter herein. We have now reached a group of quadrupeds peculiarly constructed for gnawing their food; hence their teeth form a prominent and distinguishing character, which will be hereafter explained. As a whole, we may describe these animals as generally of a very small size; for although a few exceed the dimensions of a dog, there are others so diminutive as to be capable of nestling in an eggshell. The *Glires*, in fact, contain the smallest

* H. Smith, p. 154.

quadrupeds in existence. Their external appearance is but little diversified, considering the number of species already known, and the numerous sections into which they have been divided; and when we look to the structure of a rat or a mouse, we shall attain a very correct notion of the typical character of the whole group. To this general character, however, there are a few exceptions; since the beavers have the tail unusually broad, and the porcupines are covered with sharp spiny quills. The geographic range of these animals is almost universal; for although particular genera are evidently confined to certain regions, the largest family in the group, in regard to the number of species—forming the Linnæan genus *Mus*,—is very widely distributed, and is still extending its range wherever man begins to cultivate the wilds and to erect dwellings.

(308.) The scientific characters of the typical groups, may be thus stated.—The chief of these consists in the total absence of canine teeth; the space in the jaws, between the incisors and the grinders, which these teeth occupy in other quadrupeds, being void: the construction of the lower jaw is also peculiar; it is articulated by a longitudinal condyle, by which its movement is confined to a horizontal motion forwards and backwards: this is in strict conformity with the mode of eating pursued by all rodent animals—the food being divided by the incisors, and triturated or ground by the molars. The former teeth, from being used for a purpose so important, are consequently, in nearly all the species, remarkably strong; and are sometimes so excessively developed, that they appear to project more like tusks than ordinary teeth: they are generally bent, so as to curve upwards: by being exposed to almost constant use from the friction of such substances as are gnawed by the animals, they wear away; but THE CREATOR, as it has been well observed, “ever willing to relax in those general laws, subject to which his works are constituted, when the necessities of a particular race of

creatures may require an exception, has provided that these teeth, as they are exposed to wear, shall be also capable of renovation." * Accordingly we find that the incisors, when they spring from their sockets, are pointed, and grow from the lower part of their posterior side, in proportion as they wear away above: their anterior face is covered with a thick hard enamel; and as the detrition is always oblique, the teeth preserve, in the upper jaw at least, a constant sharp edge of enamel. With these the food is filed down, or reduced by continual labour into fine particles. The *Glires*, therefore, will gnaw many of the hardest substances, and are well known to devour wood and the bark of trees. The molar or grinding teeth have flat coronets, the enamelled tubercles of which are always transversal, so as to be in opposition to the horizontal motion of the jaw, the better to effect trituration. Those genera in which these eminences are simple lines, and where the coronal is perfectly plane, are more particularly frugivorous; while those which have the eminences of these teeth divided into smooth tubercles, are omnivorous: some few, having the teeth pointed, are partly carnivorous. The fore feet are hardly capable of turning, and the two bones are frequently united. In short, observes M. Cuvier, the inferiority of these animals is manifest in most of the details of their organisation.

(309.) On the analogies of this order to the wading birds, we shall now say a few words. It being absolutely necessary, on our part, to prove the correctness of this theory, and to exhibit nature, not in isolated relations, but as preserving the same chain of representations throughout the whole animal creation. Without entering, therefore, into a more critical examination than is necessary of the arguments that have been urged in favour of a contrary opinion, we shall request the reader's attention to a few prominent facts. 1. The *Glires*, or gnawing animals, in their typical character unquestionably comprehend an assemblage of the small-

* Griff. Cuv. 311. 96.

est-sized quadrupeds in creation: 2. They have the most elongated and pointed muzzles or faces: 3. They are the most untameable and unintelligent of all quadrupeds; 4. the most uniform in colour; 5. the swiftest runners, yet the shortest footed, in this class of animals: 6. The greater part turn up the ground for their food, and construct their habitation in the shape of a horizontally placed purse, or burrow, at the termination of which is their nest: finally, they are the most provident of all quadrupeds, living more in societies than any others, and showing extraordinary ingenuity in the construction of their habitations.

(310.) Let us now illustrate each of these points by some details; comparing them, one by one, with the prominent characters of the order of waders (*Grallatores*), and with other grallatorial types, in other circles. First, as regards *size*. The rats, the mice, the hamsters, and the marmots, are well known to be the most pigmy of quadrupeds; and they comprise nearly all the typical forms of the *Glires*. So striking, indeed, is this typical character, that the largest, in point of size, is the porcupine, a quadruped not much bigger than a hare.* Now, if we look to the birds composing the rasorial (*Rasores*), wading (*Grallatores*), and aquatic (*Natatores*) orders, and then ask which of these is most remarkable for the number of small-sized individuals it contains, we shall at once answer in favour of the waders; the typical groups of which, as *Scolopax*, *Tringa*, &c., contain very few birds as big as a fowl, and very many smaller than a lark. But this analogy is rendered much more apparent, on comparing the *Glires* with the *Tenuirostres*†, or suctorial tribe, where the smallest of quadrupeds are represented by the smallest of birds; these latter being also representatives of the grallatorial order. 2. The muzzles of the rats cannot be termed short, but there is a very peculiar and abrupt termination of the snout, which

* The porcupines, moreover, belong to an aberrant genus in this order.

† The *Tenuirostres* have long been admitted to represent the *Grallatores*.

* belongs to no other class of quadrupeds in the same degree; and this is precisely the character of the bill in all the typical wading birds, the tip of which is invariably thickened and abruptly blunted. Let the naturalist examine, for this purpose, the bill of any species of sandpiper (*Tringa*), snipe (*Scolopax*), tatler (*Totanus*), or curlew (*Numenius*), all of which are pre-eminently typical of the *Grallatores*, and all distinguished by this peculiarity. This fact, again, opens to us another beautiful analogy between the two orders. The *Rodentia*, as a whole, are well known to be the most burrowing of all quadrupeds, while the wading tribes are the most burrowing of all birds; not, indeed, precisely in the same manner, but each seek for their food beneath the surface of the earth. The rats and mice burrow with their feet and snout, either for constructing their dwellings, or for procuring esculent roots: on the other hand, the sandpipers, &c. burrow in the sand and mud with their bills, in search of worms and such insects as lie hid beneath the surface. The construction of the bill, therefore, is peculiar; nor is its thickened termination seen in any ornithological group, excepting the *Tenuirostres*, which is a grallatorial type.

(§11.) The third and fourth points of comparison regard the untameable nature of the *Glires*, and the almost total absence of gay or lively colouring among them. We have frequently demonstrated in another work*, that the rasorial types throughout ornithology always contain birds which seem to have an instinctive disposition towards domestication; and we may observe that all grallatorial types, however sociably they live among themselves, are yet so remarkably different from the former, that they appear to shun the very approach of man,—never, from choice, coming near his dwellings.† Now this character truly belongs to the *Glires*; for although there are two or three species of *Mus* which live in houses, they are but solitary exceptions to the

* Northern Zoology, vol. ii.

† The trumpeter bird (*Psophia*) is not a grallatorial but a rasorial type.

general character of the whole order; which does not present us with a single animal used either for the service of man, or which evinces any degree of affection towards him in captivity. We must, indeed, consider Cowper's tame hares an exception, even to this point: but what is one exception opposed to hundreds of a contrary nature? We look not upon rabbits, squirrels, and Guinea-pigs as tameable animals, for they merely exhibit that passive endurance of confinement, which all indiscriminately possess, who are supplied with their natural food, and are well taken care of. Colour is likewise one of the most important indications, not only of natural affinities, but of natural analogies. The uniformly dull tint among the *Glires*, is well known; and we see the same prevalence throughout the whole of the wading birds: there is, in both, almost a total absence of beautiful colours, of ornamental crests, and of those outward attractions which so conspicuously belong to the gallinaceous birds, and the ungulated animals. The characteristic of all grallatorial birds, and of other groups by which they are represented in ornithology, is to have mineral or earthy colours; the humming-birds showing us the gems, and the grey and brown of the waders and the *Glires* the surface colour of the earth.

(312.) Fifthly, with regard to speed. Every one knows that the speed of an animal should be estimated by comparing its size with its rate of going over a certain extent of ground. The *Glires* are consequently the swiftest runners among quadrupeds, as are the whole of the sandpipers, and other typical wading genera, among birds. It is notorious that the hare is by far a swifter-footed animal than the horse; for, notwithstanding its diminutive size and vast inferiority of muscular strength, it will very often elude the hunters. So that, if the fleetness of a horse were only proportionate to that of a hare, it would be able to go over the same ground in one tenth part of the time, because its size and muscular power is certainly ten times greater. But the whole order of *Glires* are peculiarly quick in their motions. Rats and mice,

considering their diminutive size, run with much greater celerity on the ground than any other quadrupeds, as the whole of the squirrels do among the branches of trees. The swiftest running birds, in like manner, are the typical *Grallatores*, for they only make use of their wings when suddenly disturbed; they are in continual motion, and their pace is always a swift run. Here again, the analogy of the two groups is unquestionable.

(313.) Sixthly, It has been shown that both these orders burrow in ground for their food, although in different ways. We observe, however, that the *Glires* are remarkable for building a sort of nest, always placed at the extremity of their burrows, so as to resemble a purse placed horizontally. Now this is by no means the case with the *Grallatores*; yet it is one of the most striking and beautiful distinctions of those groups which are grallatorial types, or, in other words, which represent the *Grallatores* in other circles. We have demonstrated* that the orioles (*Oriolinæ*) form one of these groups, and that the American hangnests (*Icterinæ*) constitute another: it is here, therefore, that we must look for an explanation of this curious peculiarity of the *Glires*. The nests of these birds, in like manner, are in the form of a purse; but this purse-shaped fabric is suspended perpendicularly; it is entered by a passage analogous to the burrowed gallery of a gnawing quadruped; and the real nest, in both cases, is placed at the extremity of this approach: lay one of the nests of these American birds upon the ground, and we have a perfect model of those made by the *Glires*. Nor is this all: in tracing the analogies of the *Glires* through other classes of the animal kingdom, we find they represent the intestinal worms (the true *Vermes*). But how is this analogy established? it may be asked. The *Vermes* live in the interior of other animals; the *Glires* in the bowels of the earth. Hence the habitation of all the typical *Glires* is constructed in long and tortuous subterranean cavities. There many of them remain ex-

* North, Zool. ii.

cluded from the light of day for a considerable part of the year, in a lethargic or dormant state, as we see in the marmots, dormice, and many others.

(314.) There seems an insuperable obstacle against the analogy of the gliriform quadrupeds, to the grallatorial birds, when we come to the feet; because, while those of the first are very short, those of the latter are longer than in any other birds; so that a naturalist unacquainted with the grallatorial types in other circles, would be sorely perplexed by this fact. How, then, can it be reconciled with what we have already advanced? Simply by looking to the well known modifications which other grallatorial types assume. The humming-birds, for instance, have been long ago said to represent the *Grallatores*, notwithstanding that they have the shortest legs in the class of birds, while those of the waders are the longest. Gliriform quadrupeds stand precisely in the same relation, and by comparing them with the humming-birds, we immediately perceive that both agree in the excessive smallness of their feet; the analogy is conclusive, although it is not immediate: were it otherwise, were all grallatorial types * to have long legs, or, in other words, to possess all the characters of their type, there would be little variety in nature; the *Amphibia*, instead of having the shortest legs of all vertebrated animals, as seen in the sirens, would have the longest; and yet all naturalists are aware that these reptiles are analagous to the *Grallatores*. The *Glires* thus preserve their analogy to the *Grallatores* through the medium of the *Tenuirostres*; nor could this latter relation have been made out if they had not one character in common, namely, extreme shortness of foot. Finally, the social habits of the *Rodentia* are at once explained by comparing them with the *Grallatores*, an order of birds almost as gregarious as the *Rasores*; while the great ingenuity displayed in their nests, no less than in the form of these nests, is equally

* These are but modifications of the *suctorial* type of nature (Classification of Animals, p. 254.); both humming-birds and waders suck up their food, all other birds seize it.

remarkable in the European orioles (*Oriolinæ*) and the American hangnests (*Icterinæ*) — two families wherein this sort of architecture is seen in the highest-perfection, and which we have already shown are *Grallatorial* types.

(315.) Let us now briefly glance at what has been considered proofs of analogy between the ungulated quadrupeds (*Ungulata*) and the grallatorial birds. The giraffe has been compared to *Himantopus*, on account of its long legs. Now, if we are to believe Le Vaillant, this comparison is not just, inasmuch as the legs of the *Camelopardalis* are not at all out of proportion to the size of the body. Had the comparison been made between the kangaroo and the *Himantopus*, it would have been better, and we shall therefore use it as a strong argument that the *Gliræ* represent the *Grallatores*. *Myrmecophaga* and *Scolopax* have the longest faces. True, because both, in fact, are gliriform types. *Myrmecophaga*, although in the circle of the *Ungulata*, being the gliriform type of that circle. *Hippopotamus* and *Platalea* are thought to be analogous, because of their flat muzzles. True again: but *Hippopotamus* is not a typical *Ungulata*; neither is *Platalea* a typical *Grallatores*; both, in fact, are modifications of the aquatic form. *Rhinoceros* and *Palamedia* are instanced for the same purpose. The analogy is not only indisputable, but beautiful. But *Palamedia* does not belong to the *Grallatores*, but to the *Rasores*! and therefore this analogy, although true, is against the theory it is brought to support. The last instance that has been brought forward to prove that the ungulated quadrupeds represent the grallatorial birds, is the analogy between the stags and the crowned cranes, both having, as it is urged, ornamental appendages to their heads. This analogy stands precisely in the same predicament as the last. The crowned cranes are not typical grallatorial forms, but *rasorial*. In short, we might go on in this manner through all the instances that have been brought forward to uphold the analogy between the *Ungulates* and the *Grallatores*; nay, we may admit each of the animals so compared to

represent each other, and yet show that they only become so many proofs against the theory they are intended to establish. These errors have all originated in not drawing the comparisons from the *pre-eminently typical forms of each*, but wandering about among the aberrant forms, and drawing analogies from them, and from them only. The truth is, that in trying to establish relations of analogy between groups, no matter whether large or small, we must strictly confine our attention to the typical examples of such groups; for it follows, as a matter of course, that if we compare the *typical* examples of one group with the *aberrant* examples of another, we shall be perpetually led astray; while we violate one of the most unquestionable and most beautiful principles of nature, by which the system of representation is carried down from the highest to the very lowest of her groups. The high eminence of the authority which we have here questioned on this interesting matter, and its great importance to the right understanding of one of the first principles of zoological science, has obliged us to go into the question at greater length than we originally intended. We shall now resume the survey of the order before us.

(316.) In dividing the *Rodentia* into families, M. Cuvier has successively pursued two methods — both, of course, artificial; but the last, it may be presumed, he considers the best for determining the species. We shall, however, subjoin both these systems, as we had adopted the first before the appearance of the last. A glance at these tables, moreover, brings immediately under the reader's eye the rank assigned to each group.

RODENTIA. (Cuvier.) — DIVISION I. — *With clavicles.**

Castor. Beaver.
Mus. Rats generally.
Arvicola.
Fiber.
Hypudæus. Camp-mice.
Georychus. Lemming.
Loncheres Ill. Echimus.
Myoxus Gm.
Hydromys Geoff.

Mus Lin.
Cricetus Gm. Hamsters.
Dipus. Jerboa.
Spalax. Mole-rat.
Helamys F. Cuv. (Pedetes).
Arctomys Gm.
Sciurus Linn.
Pteromys Cuv. Flying squirrel.
Cheiromys Cuv. Aye-aye.

DIVISION II. — *Without clavicles.*

HYSTRIX. Porcupines.

Acanthion *F. Cuv.*Spigurus *F. Cuv.*Erethizon *F. Cuv.*

LEPUS. Hare.

Lagomys. Rat-hare.

CAVIA. Cavies.

Hydrochærus. Water cavy.

Cavia *Ill.* Guinea-pig.Dasyprocta *Ill.* Cavy.Cælogenus *Cuv.*

(317.) By the above method of arrangement, it appears that the presence or absence of the clavicles is considered the best principle for dividing the order; but in the new edition of the *Règne Animal* this distinction is thrown aside, and the groups of the *Rodentia* are placed in the following series: —

Squirrels.

Sciurus *Lin.* True Squirrels.Pteromys *Cuv.* Flying Squirrels.Cheiromys *Cuv.* Aye-aye.

Rats.

Arctomys *Gm.* Marmot.Myoxus *Gm.*Loncheres *Ill.*Hydromys *Geoff.*Capromys *Desm.*Mus *Lin.* True Rats.Dipus *Lin.*Meriones *F. Cuv.*

Cricetus. Hamster.

Arvicola *Lacep.* Field Mouse.Fiber *C.*

Arvicola. Field Mouse.

Georhynchus *Ill.*Otomys *F. Cuv.*Dipus *Gm.* Jerboa.Pedetes *Ill.*Spalax *Gm.* Mole-rats.Euthiergus *Ill.*Geomys *Raf.*Diplostoma *Raf.*Castor *Lin.* Beaver.Myopotamus *Com.*Hystrix *Lin.*Hystrix *Lin.*

LEPUS.

Lepus. True Hares.

Lagomys *Cuv.*

CAVIES.

Hydrochærus *Ill.* Water Cavy.Cavia *Ill.* Guinea-pig.Dasyprocta *Ill.* Cavy.Cælogenus *Cuv.*

(318.) This latter table shows that M. Cuvier has not given to his divisions that equality of rank, either as regards number or primary distribution, which he has assigned to his groups in other orders; we shall not, therefore, attempt any thing of the sort ourselves, but take a brief survey of these animals, under the divisions of, 1. Beavers (*Castor*); 2. Rats (*Mus*); 3. Marmots (*Arctomys*); 4. Squirrels (*Sciurus*); 5. Porcupines (*Hystrix*); 6. Hares (*Lepus*); and 7. Cavies (*Cavia*).

(319.) The beavers (*Castor*) are few in number; two only being known; one is still found on the banks of the European rivers, the other is peculiar to the cold countries of America. In reference to the first, M

Cuvier observes, " We have been unable to determine, after the most scrupulous comparisons, if the beavers (fig. 125.) which burrow along the Rhone, the Danube,

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and the Weser, are different in species from those of North America, or if they are prevented from

building, by the vicinity of man. His great rival, M. Geoffroy St. Hillaire, however, seems to have made up his mind upon the question, and has figured the two as distinct. We must pass over the natural history of these intelligent animals, although highly interesting; but it will be given in a subsequent volume: in the mean time the reader will receive ample information on the American beaver, by consulting Dr. Richardson's volume. The beavers, in M. Cuvier's first systematic table, are placed at the head of those gnawers, which are provided with clavicles: they are all animals possessing considerable sagacity, and make use of their fore feet to carry their food to the mouth.

(320.) The Rats constitute a very extensive and diversified family, to which it is difficult at present to assign any common zoological character. Nevertheless, the general aspect and appearance of the whole may be seen in those common species familiar to every one. They are all very small, and highly destructive animals to the farmer and agriculturist; burrowing up new sown ground, destroying the seed, gnawing the bark of young trees, and attacking all sorts of grain. They run and jump, considering their size, with amazing agility. Many species migrate in vast troops, and preserve their analogy to wading birds by crossing rivers of considerable width. As to their zoological characters, M. Cuvier makes the following remark:—"Linnæus and Pallas seem to have united, in a single group, under the name of *Mus*, all the *Rodentia* (*Glires*) provided with cla-

vices, which are not otherwise distinguished by any very obvious external mark. From this it results, that it is next to impossible to assign them any common character, unless we have recourse to that of the lower pointed incisors, suggested by the first of these naturalists. Still it would be advisable to separate the genus *Spalax* and *Helamys*. The other rats may then be properly subdivided by the grinders into many subgenera, which may all be united into three small groups. The first of these will contain such as are furnished with prismatic molars, or with flat coronals, and crossed to the full extent of their height by plates of enamel; a structure which we again discover in hares and some other animals, and is observable even in the elephant.* To this division belong the different groups of the field mice (*Arvicola*). The second contains the rats, whose grinders are divided from their base into roots; but the flat coronals of which present transverse and projecting lines. Like the last, these animals are frugivorous; and the group comprises the genera *Loncheres* of America, and that of the dormice (*Myoxus*) of Europe. A third division have the grinders more or less tuberculous, but without exhibiting any transverse furrows. They are much more omnivorous than those of the two preceding sections, and contain many more genera. The common rat and mouse are familiar examples of this group. Finally, M. Cuvier places at the end of this large assemblage, or family, as it may at present be termed, the three genera of *Spalax*, *Bathyergus*, and *Pedetes*. A few additional remarks on these minor divisions will assist us in the clearer elucidation of this family.

(321.) The field mice (*Arvicola*) are arranged in the first section; and the first genus of this group is seen in the musk rat of Canada (*Fiber Zibeticus* Ill.), the only species yet discovered. It is of the size of a small rabbit, and seems to have some affinity to the beaver, with which it was associated by Linnæus, on

* Griff. Cuv.

account of its social nature and aquatic habits. The tail, however, is not broad, although it is slightly compressed in a lateral, not a horizontal direction. It constructs, with several individuals of its own species, a winter habitation sufficiently capacious to hold them all. These retreats or cabins are round, covered with a concave top about a foot in thickness, and made so compactly of grass, twigs, clay, &c. cemented together and hardened by the atmosphere, as to be impenetrable to the weather; and so only rendered doubly secure and firm when the ground is frozen. They do not, however, provide a winter store of provisions; but they appear to sally out, at nearly all seasons, through numerous long and winding passages or galleries in the vicinity of their dwellings, and to which they convey esculent roots and leaves. They are said, also, to feed upon fish; for, although their feet are much less palmed than those of the beaver, they are still sufficiently webbed to be serviceable in swimming. The common water rat (*Arvicola amphibius*) is a good example of the next genus, *Arvicola*. This animal, however, differs greatly from the domestic species; it never enters our habitations, and resides only in the banks of ditches and ponds. The true field mouse (*A. arvalis*), together with numerous other European species, likewise belongs to this section. To these succeed the lemmings (*Georychus*), chiefly northern animals, whose general economy and extraordinary migrations has afforded to the celebrated Pallas materials for one of the most interesting memoirs in the natural history, properly so called, of animated nature. Of seven species of the lemmings, only one (*G. Hudsonius*) is found in North America, the rest being distributed in the northern parts of Asia and the eastern provinces of Russia. The spiny rats (*Echinys*) form another remarkable group, so called from having spines intermixed with the hair on the back. In other respects they have the general form and appearance of rats, and the tail, although longer or shorter in different species, is always round, and ge-

nerally scaly. Two of these spined rats, however, are placed by methodists in the last genus, as possessing more the characters of *Mus* than of *Echinys*; a probable indication of the natural affinity between the two: all the species belong to tropical America. Following these, M. Cuvier places the genus *Myoxus*, composed of the



European dormice, in which group is also the *M. avellanarius* (fig. 126.), and some of the prettiest little animals in the whole order. Their ha-

bits are too well known to detain us at present. It may be observed, however, that these active little creatures are either related by direct affinity or analogy to the squirrels; for they live in woods, ascend trees, jump from branch to branch, and live, in short, like squirrels, upon nuts and fruits. After providing a small supply of these in their winter retreat, as a repast to them upon awakening from their winter lethargy, they pass the rest of this season in profound sleep. Of the sub-genus *Hydromys* there are but two species, both natives of Australia, where they seem to represent the dormice of Europe; but nothing is yet known of their manners. In South America, also, we have the dormouse represented in the *Myopotamus Coypus*,—a solitary example of this form; it is a gentle, tameable animal, much larger than any of the preceding, and measures nearly two feet in length. It seems to be amphibious; living in the banks of rivers, swimming well in the water, and digging holes in the earth with its large and powerful nails. With this animal M. Cuvier terminates his first great division of the rat family.

(322.) The series of the genuine rats commence with such animals as are now distinguished by the generic name of *Mus*. This genus, although so much

restricted, is still very numerous in species, of which no less than thirty-three are described in the valuable work of M. Desmarest. Their size, in general, is seldom much larger than that so well known to every one; but the *Mus giganteus*, or gigantic rat, of general Hardwicke, is a remarkable exception, for it is fully as big as an ordinary rabbit. Every part of the habitable world is peopled by some species of these singularly agile quadrupeds. In England we have the Norway and the black rats; both of which, as it is confidently asserted, were originally imported, or migrated of themselves, from Asia, and are now become universal throughout Europe. Of the mice (which now, by common consent, has been given to the smaller sized rats), we have also three, if not four, species; while tropical America, again, possesses others unknown to Europe. The next genus is *Cricetus*.

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It contains the common hamsters (*C. vulgaris*, fig. 127.), the etymology of whose name we cannot discover. This group also presents us with some of the most provident and typical ani-

mals of the whole order. The hamsters are eminently distinguished among those quadrupeds which burrow, and live almost entirely in the ground; they construct numerous and complicated avenues to their secret retreat, in the intricate recesses of which they lay up considerable magazines of provisions against winter. It seems, however, that these creatures are no less carnivorous than frugivorous. M. Sonnini, in whose observations we have every reason for placing the highest confidence, assures us, that although the hamsters derive their chief subsistence from vegetables, they will also devour birds and other weak creatures. He further states, that they are so ferocious as to attack whatever other animal comes in their way, however large: even among themselves they are exceedingly quarrelsome — fighting with the greatest fury — the conqueror being

sure to devour the dead body of his opponent. Among the three American species placed in this genus by M. Cuvier, is the chinchilla, so well known for the softness and warmth of its delicate fur, and which has recently been so ably described and illustrated by Mr. Bennett.*

(323.) The jerboas (*Dipus*) are remarkable for possessing the longest hind legs of any quadrupeds yet discovered, while the fore legs are as disproportionably short; this structure is seen also in the kangaroos, which seem to be represented in miniature by these little animals. Like their pouched prototypes, they use the fore feet only as organs of rest upon the ground; for if they are frightened, or wish to proceed at a quick pace, they stand upon the hind legs only, and take prodigious leaps: the tail, however, from being slender, would seem not to be capable of giving much impetus to this motion; yet it has been found, by some cruel experiments of a Frenchman, who cut off the tails of these poor little creatures, that such as were so mutilated were unable to stand upright, or to leap at all. We would remind such persons, that although the Creator has given us the faculties, and permits us to use them in studying his works, we have no right to violate the common feelings of humanity towards his creatures. The jerboas use the fore feet like hands, for conveying the food to their mouth, and their diet seems to be entirely vegetable. The best known species is the gerbo, or Egyptian jerboa (*Dipus sagitta*), in which country it is very common. It lives in large societies, and constructs burrows underground; it is shy and timid, nor can it be kept in confinement any considerable time. Of four typical species already known, three inhabit the sandy deserts in the heart of Asia, and the shores of the Caspian; the rest have been separated as a sub-genus, under the name of gerbil (*Gerbillus*); but their distinctions are so very slight, that we have not adopted the name. The genus *Pedetes*, represented by the Cape jerboa, clearly belongs to the same group. America, which has no jerboas, nevertheless presents us with

* Zoological Gardens.

their prototypes in the jumping mice of Canada (*Meriones* Ill.).

(324.) The genera *Spalax* and *Bathyrgus*, or mole rats, are the last that have been placed in the series of this family. There is but one species of *Spalax*, which is found in Eastern Russia. It is remarkable for its resemblance to the mole, both in living almost entirely underground, and in the extreme smallness of its eyes and ears; its body is unusually long and cylindrical; and its square cut incisive teeth, both as to size and strength, are enormous. As this animal lives entirely upon roots, it bores the earth just below the ground; but when on the surface, the head is very generally carried in a raised position, apparently for the purpose of more effectually hearing. The African mole-rats (*Bathyrgus*) are of two species, both inhabitants of the sandy tracts of the Cape of Good Hope. Mr. Burchell gives us the following information of their burrows, which seem to be conducted on the same principle as those of the common European mole: — “In every part of the sand flats I observed innumerable molehills, and my foot very often sunk into their burrows; for this reason it is very unpleasant, if not dangerous, to ride on horseback in such places, as persons are liable to be thrown by the feet of their horses unexpectedly sinking into these holes. The animal which makes these hillocks is a very large kind of mole-rat, nearly as big as a rabbit, with a very soft, downy, ash-coloured fur, having, at least in appearance, neither eyes, ears, or tail, the Dutch name of which is *Zand Moll* (sand mole).”

(325.) The third division of M. Cuvier's *Rodentia* includes the marmots, arranged under the genera *Arctomys*, *Spermophilus*, and *Aulacodus*. Of this group we have only three representatives in Europe: the common marmot (*A. Marmotta*), the souslek (*A. Citillus*), and the Bobac marmot (*A. Bobac*); the remainder inhabit the colder parts of America. All these are distinguished from the seed-eaters (*Spermophilus*), in being destitute of pouches at their cheeks for the purpose of conveying

food,—a character universally prevalent in the genus *Spermophilus*: here likewise we find but one species in Europe, the rest being American. All these genera, in a greater or less degree, contain subterranean animals; the largest not exceeding the size of a rabbit, and the smallest much less than an ordinary rat. The European marmot (*Arctomys Marmotta*), lives in communities, constructs long galleries, and, although hybernating in winter, seems to prefer constructing its habitation on the sides of high and cold mountains. It would be interesting to know why an animal, which is thus evidently prevented from enjoying a considerable portion of the year by a lethargic slumber, caused by extreme cold, should, nevertheless, for its habitation, prefer such situations as were most calculated to hasten the suspension of all its active faculties. So careful are these provident little animals in gaarding against all interruption during their long winter of repose, that M. Cuvier informs us they make up a round bundle of dry grass, pressing it smooth and even: their couch being thus prepared, they lie down, placing their head, as a means of greater warmth, between the legs. He adds further, that in order to close the mouth of the tunnel which leads to their sleeping apartment the more effectually, they have the wonderful instinct of conveying their last load of hay by entering backwards, so that, by quitting their hold of it just at the right moment, this bundle blocks up the aperture as effectually as if it had been thrust in from the outside. It is curious, however, to observe, that although the marmot passes the whole of winter in slumber, it does not, like very many hybernating animals, devour food in its dwelling, or lay up any store of provisions.

(326.) Very little was known either of the habits or species of the North American genus, *Spermophilus*, until the publication of Dr. Richardson's admirable account of the quadrupeds of British America.* This enterprising traveller and acute zoologist has amply described no less than seven species, all characterised by cheek pouches; the only peculiarity, in fact, by which they are separated

* North. Zool. i.

from the genuine marmots (*Arctomys*). The most beautiful of these is the leopard marmot, elegantly marked by yellowish stripes and spots upon a chocolate brown ground: this, and most of the other species, live in large societies in the open plains, or on the sides of wooded mountains; burrowing in the ground, and passing the winter therein. Sometimes, when the whole community wish to enjoy themselves in playing, without the anxiety of watching for their safety, a trusty sentinel is placed on an elevated situation, from whence he can see any approaching danger to the frolicsome party: should this occur, he gives the signal of alarm by a very peculiar cry, which at once warns his companions to desist, and seek shelter in their burrows. This is, in fact, one of the most remarkable and most general peculiarities among the typical *Rodentia*; and as this order is analogous to that of the wading birds, so do we find it more universal with these latter than with any other class in ornithology. It must be curious to see these animals, as Dr. Richardson has contemplated them, each seated upon a little hillock of earth, placed at the entrance of their burrow, sitting upon their hind legs, and carefully reconnoitring all around before they venture to make an excursion. In speaking of the burrows of the tawny marmot (*Sp. Richardsoni*), our author observes, "there are many little well-worn pathways, diverging from each, and some of these paths are observed, in the spring, to lead directly to the neighbouring holes, being most probably formed by the males going in quest of a mate. The males fight when they meet in these excursions; and it not unfrequently happens that the one which is worsted loses a part of its tail as he endeavours to escape. They never quit their holes in winter; and I believe they pass the greatest part of that season in a torpid state. They run pretty quick, but clumsily; and their tails at the same time move up and down with a jerking motion."* We have, on this and other occasions, drawn largely from the

* North. Zool. This jerking of the tail is almost peculiar to Gallatoria types, of which the wagtails are a notable example.

interesting volume of Dr. Richardson,—almost the only one in our language which unites a lively and popular account of quadrupeds with original and important scientific research. Of the sub-genus *Aulocodus*, founded upon a single species, not even the native locality is known.

(327.) We come now to the squirrels (*Sciurus*),—the fourth great division, as before intimated, of the rodent animals. The great resemblance which several of the American marmots (*Spermophilus*) have to squirrels, leads us to believe that the two groups naturally follow one another; a supposition which is considerably strengthened by the sub-genus *Tamias* Ill. putting on, as it were, an intermediate form. Of these ground squirrels, as they may be justly called, Dr. Richardson accurately describes the habits and manners of two species, both of which live almost like the marmots, and both construct burrows beneath the surface of the ground. Some of the squirrels have short and rounded ears (fig. 128.), but the generality of species have



these members tufted with a pencil of hairs. Of these, our own most elegant species (*Sciurus vulgaris*) affords a perfect example. Every motion of these sprightly little animals is full of grace: their agility upon all occasions of motion is very great, but when exerted to the utmost it is truly surprising; so quick, indeed, do they bound from branch to branch, and so great is the rapidity with which they suddenly turn and wind about, that the eye, partly confused by the intervention of other objects, is frequently unable to follow their movements. The true squirrels, unlike those of the sub-genus *Tamias*, live almost entirely in trees, and build their nests on a fork of the branches. The geographic range of this group is very wide; and the species are so numerous, that nearly forty have been enumerated by systematic writers; nor does there appear much difference in structure between those of

the Old and the New World ; none, however, have yet been discovered in Australia. The squirrels are arborial animals, living almost entirely in trees ; and so, also, are the flying squirrels (*Pteromys*), which are placed next in the series : these, as their name implies, have an expansive skin, forming a sort of sail, between the fore and the hind feet ; examples of which structure we also see among the marsupial or pouched quadrupeds of New Holland. There are six species of *Pteromys* found in India, three in America, and one — common in Siberia — is likewise an inhabitant of Lapland. Of the habits belonging to the oriental species we know but little or nothing ; but those of the Siberian *Pteromys* have been recorded by Pallas. It feeds principally on the young shoots of the pine tree ; and these, after being digested, preserve so much of their resinous quality, that the dung will burn with a bright flame, and a strong scent of resin. Like the ordinary squirrels, this species lives entirely in trees, sits erect, feeds itself with the fore paws, and takes prodigious leaps, assisted greatly by the expansive membrane between the legs, which acts as a support to break the force of its descent. It appears, however, that the flying squirrels are nocturnal animals ; in which respect they differ essentially from the true squirrels, which are diurnal. Dr. Richardson, speaking of an American species, expressly states this : “ the *Pteromys Alpinus* of the Rocky Mountains lives in dense pine forests, and seldom ventures from its retreat except in the night.” Pallas, alluding to the Siberian species, asserts the same ; and adds, that its eyes are provided with a nictitating membrane.

(328.) At the end of this family M. Cuvier places the celebrated animal forming the genus *Cheiromys* of Geoffroy St. Hillaire, the *Aye-aye* of Madagascar ; but as we have already treated of this singular genus in another place, we need not here again advert to it.

(329.) The porcupine (*Hystrix* Lin.), although in all probability connected with the spined rats, are placed,

in the method we are now following, immediately after the squirrels, and constitute the sixth division of the order. The genus *Hystrix* is also the first group of those to which we have now arrived, where the clavicles are only seen in the shape of slight rudiments. The porcupines are known at the first glance, by the long and sharp spines which cover nearly the whole body. In the hedgehogs we have already seen an example of this structure, but the present genus exhibits it in the highest perfection. The common European species has been correctly fixed upon by M. Fred. Cuvier as the type. It is, perhaps, the largest animal among the *Rodentia*, measuring almost three feet: it has been aptly compared to a pig,—a simile from whence its name is derived. From the structure of the teeth M. F. Cuvier considers it omnivorous; and Linnæus gave it the name of *cristata*, from the sort of mane which it has on the neck and back. All these circumstances, trivial as they may now appear, will be found hereafter of the highest importance in tracing the analogical relations of this curious animal with its representatives in other orders. For ourselves, we venture to express a suspicion that the genus is one of the most typical in the order *Rodentia*. M. F. Cuvier, moreover, appears to have discriminated the five types of forms which every natural group, when perfect, is sure to contain. It will be, therefore, highly interesting to give some further details upon this subject. The typical or common porcupine (*fig. 129.*) has the spines of a very great



length; but the tail is very short, terminated by two open tubes carried on pedicles, and which, as M. Cuvier says, make a noise when the animal shakes them. This species, originally imported, as it is said, from Africa, is still found in some parts of the south of Europe.

(330.) The next type, representing the last in North America, is the sub-genus *Erethizon*, where the proportions of the European species, as it were, are completely reversed: the hair of the body, which in *Hystrix* is much shorter than the spines, in this type is considerably longer; while the spines themselves are so short, that at a distance they are scarcely seen. The tail, also, is nearly half as long as the body. It is sluggish and unsightly, walks slowly upon the ground, but seems to live chiefly among the branches of trees. This latter character we do not find belong to the European type.

(331.) The third sub-genus is *Syntheres*, a type belonging exclusively to tropical America. The tail, which is short in *Hystrix*, and moderate in *Erethizon*, in this is of considerable length; and is further distinguished by being prehensile; a more important circumstance, therefore, for considering this animal as the type of a sub-genus, could not possibly be named. One half of the tail is covered with spines, and the other with scales; the spines are short, and about the same length as the hair with which they are thickly interspersed. There is no doubt that M. F. Cuvier is perfectly right in supposing that the species described by Azara is different from that mentioned by Buffon. We ourselves, in fact, although unable to transport the skins, have seen two very different kinds of these prehensile tailed porcupines in the forests of Brazil; and no doubt others exist in that vast continent. This fact, however, is sufficient to show that M. F. Cuvier, one of these "amateurs of generic divisions," as he is spoken of by a modern compiler, has founded this genus upon the most solid principles. The Indian porcupines constitute the sub-genus *Acanthion*, and they differ very remarkably from all the preceding: the spines are no longer round, but assume the flattened appearance of strips of parchment: indeed, M. Cuvier remarks, that in one species, the *Hystrix fasciculata* of Linnæus, the spines of the body are flattened like a sword-blade: the tail is long, and terminated by a bundle of spines, "flattened

like strips of parchment." There must be something very different in the habits of these Indian porcupines from those of America and Europe; nor would an ordinary observer class them in the same genus; for we even find that Desmarest, one of the best zoologists of France, considers the animal in question as belonging to the genus *Mus*, or, in other words, a species of spined rat. Thus much for the distinctions of the sub-genus *Acanthion*, of which three species have already been discovered. The last sub-generic type is *Spigurus*; but we regret the want of materials for illustrating this group, containing two species, since there are no specimens in the London museums, and we cannot, at this moment, consult M. F. Cuvier's valuable monograph on the genus. We could have wished, indeed, that this assiduous naturalist had enriched his admirable work on the teeth of quadrupeds with some slight intimation of their general form and habits; every part of which is just as essential to point out the genera of nature, as are the teeth, or any other organ which a naturalist may select as the key-stone of his system. However this may be, we feel almost fully persuaded that our author, without having the least intention of so doing, has marked out the circular arrangement, and defined the natural sub-genera, of the genus *Hystrix*. In further proof of which we may remark that the two most typical, *Hystrix* and *Acanthion*, agree in their teeth; while the three aberrant types; namely, *Erethizon*, *Sinetheres*, and *Spigurus*, possess certain modifications, constant among themselves, but sufficiently distinct from the former. M. F. Cuvier's monograph is stated to be contained in the *Mémoires du Muséum d'H. N.* (tome ix. p. 413).

(382.) The seventh division of this order contains the hares and rabbits, of which there are but two genera, *Lepus* and *Lagomys*. The first contains the common European hare and rabbit, and requires no particular illustration in this place; the second receives the *Picæ*, or calling hares of America and Asiatic Russia. They differ but little from the other genus, except in size,—

being very small. These little animals, inhabiting cold and inhospitable regions, are pre-eminently endowed with the provident instinct of hoarding provisions for the winter. Dr. Richardson describes a new species from North America, which increases the number of those already known to four.

(333.) The caviés (*Cavia*) are placed in the eighth and last division. They are among the largest sized animals of this order, although, when compared with ordinary quadrupeds, they would be termed small. The hares and rabbits, from the thickness and warmth of their fur, are evidently intended by nature to inhabit cold countries; and we consequently find them totally excluded from the vast continent of tropical America. In those regions, however, are found the caviés, living much in the same manner, equally swift and equally inoffensive as hares, but clothed with hair so fine and thin, as to convey to the touch a feeling of coolness rather than of warmth. Their flesh, generally speaking, is excellent, as we can personally vouch for, these animals being the favourite game of the Brazilian hunters. The first sub-genus on the list is *Hydrochaerus*, of which there is but one species, the *Capybara*, or water cavy of Brazil (fig. 130.).



Although it seems to inhabit the sides of nearly all the great rivers of South America, it is probably the largest animal in this order, measuring about three feet in total length. In its general appearance it reminds us of an hippopotamus in miniature, being thick and heavy, with a large, thick, and blunt muzzle; yet it has not even the rudiments of a tail, and the hairs are thin and bristly. Its semi-aquatic habits are shown by the feet being palmated: by this structure it can both swim and dive with much activity: upon land it makes but little progress, running badly, and generally diving in the water to avoid danger: it lives in small

societies, and seems to be a nocturnal feeder. The Guinea-pig — improperly so called, since it is wild only in South America — enters also into the present group. We shall not occupy the reader's time by repeating the eloquent but nonsensical effusions of fancy which Buffon and other writers have indulged in, regarding the "weakness, insensibility, and insignificance" of this animal, drawn up from an exaggerated representation of its manners in a state of imprisonment. Equally unfounded is the hypothesis, that the Guinea-pig has doubtless been tamed "for a long series of years by the original inhabitants of South America." A moment's reflection would have taught these fire-side naturalists, that savages, totally ignorant of agriculture, living by the spoils of the chase, with no other habitation than leafy tents, formed of the leaves of palm trees, and which are deserted with as little ceremony as they are erected, were very unlikely to rear domestic animals, much less would they trouble themselves to domesticate a native species, like the present, which could be of no possible use, but rather would certainly be a perpetual incumbrance during their wandering and irregular movements. For ourselves, we never met with this or any other domesticated quadruped in South America, save and except such as are absolutely necessary to man, as the horse, the ox, and the dog. The flesh of the *Aperia*, or Guinea-pig, is, no doubt, as savoury as that of the cavies in general, although not eaten in Europe; but the animal is so small, that, in a country abounding in larger game, its insignificance secures it from the pursuit of the native hunters. Besides the well known domesticated species (*Aperia cobaya*, fig. 131.), there is another species, very recently discovered in the same country. The genuine cavies form the genus *Dasyprocta* Ill., and it consists of four species, of which that called the *Agouti* is the most common; it is about the same size as the



European hare, and it runs with almost as much celerity. In its food, however, it shows a much greater preference for nuts than for herbage; the former being a never-failing resource in tropical countries, while the latter, for a considerable part of the year, is parched and withered by excessive heat. In its manner of feeding, also, it is much more like the squirrel than the hare, for it sits on its haunches. The agouti, like the hare, is known frequently to roll over in descending a hill, when at full speed; an accident which arises from one and the same cause in both animals; namely, the great length of the hinder legs. When angry it stamps with the fore feet, grunts like a young pig, and erects the bristly hair of the crupper in the manner of a porcupine. Endowed with great perfection of sight and smell, the agouti nevertheless becomes, in confinement, as "weak, insensible, and insignificant," as the writers of romantic zoology have made out the Guinea-pig. The habits of this species, and also of another, the Patagonian cavy, have been detailed at some length by the celebrated Azara, the best, and almost the only, naturalist which Spain has produced. M. Fred. Cuvier separates, as a sub-genus, the *paca* cavies, of which there are two species, by the name of *Cælogenus*. The brown *paca* is stated to have the thick, heavy appearance of the pachidermatous animals; its legs are heavy, the neck short, the head thick, and the body round. This animal and its congeners are, among the omnivorous *Rodentia*, what the *Capybara* is among the herbivorous division of the same order.* But to proceed. The *paca* cavies resemble the genus *Dasyprocta* in very many respects, but they differ in the additional small toe on the internal side of the fore feet; the hinder feet have five toes; they have also a cavity in the jaw, which deepens under a border, formed by a very large and prominent zygomatic arch.

(334.) Here terminates the series, made by M. Cuvier, of his order *Rodentia*. It would have given us much

* Griseb. Cuv. iii. 247.

satisfaction, could we have presented the philosophic naturalist with a more perfect exposition of this important group, arranged according to its internal affinities, instead of following a system confessedly artificial. But as natural history has hitherto been studied, the present generation must not expect such results beyond a very limited number of groups. Old prejudices must be overcome, and new views established on an extensive scale, before we can expect any very considerable progress in the most philosophic, and certainly the most beautiful, part of the science: long study and matured reflection are both essential to such expositions; and while the labourers are few, the progress will be proportionably slow. We have, however, ventured to discuss the analogies of this order as a whole, in reference to the circle of birds, because we deemed it absolutely necessary to enter upon such a subject, in order to establish, as far as possible, the same principles of variation throughout the animal world. Nevertheless we are fully sensible that complete demonstration on this point cannot be attained, until the groups of the *Rodentia* are fully analysed, and brought into analogical comparison with the corresponding divisions of the *Grallatores*. This subject has, consequently, engaged much of our attention; but as we have studiously avoided offering to the public the result of partial reasoning and superficial examination, we have deemed it preferable, in the present unfinished state of the analysis we are prosecuting, to present the reader, in a slight and cursory manner, with a survey of the order as arranged by M. Cuvier; rather desiring that such should remain in use, than that the circular theory should be applied, as it unfortunately too often has been, to the mere effort of tacking groups together, without any attempt to substantiate the circles so formed by any of those numerous tests which are necessary to prove them natural.

(335.) Yet, while we refrain from attempting to arrange the circle of the *Glires* by mere synthesis, we

have ventured upon such an important innovation in the breaking up of the marsupial order of M. Cuvier, as to render some further reasons for its total abolition, on our part, absolutely necessary: nor can this important question be discussed without a reference to our general views on the natural arrangement of the whole order. It will be remembered, that in the beginning of this chapter we intimated that one of our objections to the name of *Rodentia*, as applied to the whole order, was, that it contained many genera to which the name was altogether inapplicable. Now these genera, as we believe, are to be found in the remaining groups of the *Marsupialia* of M. Cuvier, which, after subtracting from it such as are decidedly carnivorous, will be composed only of animals either wholly or partially herbivorous. Previous, however, to entering upon details, it will be necessary to give the reader a general idea on the construction of this singular group of quadrupeds.

(336.) The term marsupial has been given to all those animals which are possessed of an abdominal bag or pouch, in which the young are brought to maturity, and subsequently sheltered. The word is derived from *marsupium*, a purse, more aptly rendered into English as *pouch*. "The chief peculiarity," observes M. Cuvier, "of these animals, is the premature production of their young, which are born in a state scarcely comparable to the developement at which ordinary young arrive within a few days after conception. Incapable of motion, scarcely showing the germs of limbs and other external organs, these little ones remain attached to the teats of the mother until they are developed as far as the young of other animals are at their birth. The skin of the abdomen is most usually disposed in the form of a pouch round the teats, and the imperfectly developed young are there preserved as in a second matrix; and even after they have learned to walk, they constantly return hither when they fear any danger. Two peculiar bones, attached to the pubis, and interposed between the muscles of the abdomen, afford a sup-

port to the pouch, and, according to Cuvier, are found in the males as well as the females ; and in those species where the fold of skin which constitutes the pouch is scarcely visible. The matrix of the animals of this family is not opened by a single orifice in the bottom of the vagina, but it communicates with this canal by two lateral tubes in the form of a handle. It would seem that the premature birth of the young is connected with this very singular organisation ; and, in the males, the generative organs are reversed from those of all other quadrupeds, the usual posterior parts being here anterior, the others posterior. It is needless to follow our author in the reasons he adduces for placing all the marsupial animals, whether carnivorous or herbivorous, in one family ; it is sufficient for our present purpose that the above details apply to the group now under consideration. Further details on the comparative anatomy of the marsupials cannot be here introduced ; but the reader will find the subject admirably treated in the valuable papers of Mr. Morgan, inserted in the late volumes of the *Linneæan Transactions*. We shall now proceed to a more particular account of the genera we retain in this family, and then offer some remarks upon their relations. They consist of the following :— 1. *Halmaturus*, or the kangaroos ; 2. *Hypisprimnus*, or the kangaroo rats ; 3. *Phalangista*, or the spotted phalangiers ; 4. *Petaurista*, or the flying phalangiers ; and, 5. *Phascolomys*, the wombats.

(337.) The true kangaroos (*Halmaturus* Ill.), may be viewed as standing at the head of the herbivorous marsupials, whether we consider the high state of developement of the organs in question, the great size of the individuals, or the remarkable developement of their tail. This latter character, as we have seen in the carnivorous opossums, and brushtails (*Dasyurus*), constitutes, in fact, one of the primary characters of the marsupial type. The kangaroos, moreover, are purely herbivorous, grazing, like the deer or cattle, in the grassy plains of their native country, and associating in herds.

A more extraordinary shape does not exist among quadrupeds. Were it not for the amazing disproportion between the fore and the hinder feet, the kangaroo would remind us of a gigantic rat. But the chief peculiarity of these animals is shown in the astonishing power they possess in their thick and strong tail, which they use for a support, when walking nearly upright, as a third foot: the fore feet, in fact, are obviously not made for vigorous action; they merely serve to rest the animal upon when browsing, and are used at such times for gentle exercise; but no sooner is danger apprehended, than the kangaroo springs upwards upon its strong hind legs, applies its tail to the ground, and darts off at enormous bounds, leaving its enemies far behind. They are mild and docile animals, easily kept in confinement, and breed very freely in Europe: in their native country the flesh is reckoned delicious, much resembling venison. The young ones, when born, have but one thumb: they live in the pouch of their mother, even when they are old enough to graze; an operation which they perform by thrusting out their muzzles from their mother's pouch while she is herself grazing. The large nail on the hinder feet, compared by M. Cuvier to a wooden shoe, seems to be used as a weapon of defence; for by resting on one leg and on their enormous tail, they can give very violent blows with the foot which is at liberty. As indicative of their herbivorous food, we may observe that the grinders exhibit only transverse cones: they are five in number, the anterior of which are frequently lost in age, so that the old ones will then only possess three. Anatomically considered, the stomach, according to Cuvier, is formed of two long pouches, divided into cavities like the colon; the cœcum is large and cavernous, and the radius allows a complete rotation to their fore feet. Nearly all the species are more or less of a mouse colour, but they differ greatly in size, some being no larger than a hare.

(338.) The kangaroo rats form Illiger's genus

Hypsiprinus, and have been placed by all the moderns close to the genuine kangaroos. There is but one species yet discovered, and which is not larger than a rabbit. In its outward appearance it resembles *Halma-turus*, from which it differs only in the teeth: it is stated, however, to be frugivorous, that is, to feed upon fruits rather than upon herbage. A comparison of the teeth will show, however, that this difference is really not very great, and only to that degree which might be expected from the necessity imposed by a difference of food. If, as M. Cuvier asserts, this animal is frugivorous, the circumstance of its possessing a canine tooth in one jaw only would seem to indicate that the tooth was used to hold or to break nuts, instead of bones; while the formation of the lower jaw, on the other hand, shows at once that the animal cannot subsist upon flesh, and therefore that it has nothing to do, in point of affinity, with the carnivorous marsupials. The two toes of the hind feet are united as in the phalangers; but, like the kangaroos, it has no posterior thumb.

(339.) In the phalangers, placed under the genus *Phalangista* (*P. Cookii*, fig. 132.), there are several

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important modifications of structure, sufficient to constitute generic (or sub-generic) types. M. Temminck has illustrated the species very ably; but as he confines himself to their details, we are still in great want of a philosophic and extended investigation of the whole, with a view to understanding the natural series of the subordinate modifica-

tions. The phalangers, as a whole, and judging from their teeth, would seem to have a greater tendency to a carnivorous diet than any of the genera in the family of marsupials, as here restricted. Yet M. Cuvier himself admits that their "regimen is chiefly frugivorous," and

“consequently,” as he observes, “their intestines, especially their cœcum, are longer than in the (carnivorous) opossums.” Yet, admitting these animals to be omnivorous, and occasionally to eat flesh, the fact, if established, would no more entitle them to be removed from this order, than a similar diet would justify our excluding the rat from the circle of the *Glires*. The thumb in all the phalangers is very large, and so widely separated from the toes, that it seems to incline backwards, like that of birds; but it has no nail, and the following toes are completely syndactyle, that is to say, united to each other as far as the last joint: this structure is very remarkable, and will exercise great influence in any effort that may be made to work out the natural series of the marsupials, because it is obviously analogous to the syndactyle structure of many types in ornithology. Looking to the teeth of the phalangers we find two broad and long cutting teeth in the under jaw, assuming the aspect and direction of those of the genuine *Glires*; but their edges are cutting. Between these and the cheek teeth there is a space, with only the slightest possible rudiments of canines; and even these are so minute, that they are frequently hidden in the gums, and may be termed obsolete. In the upper jaw, however, there are six cutting teeth, — four very small in front, and one on each side large and strong. The upper canines also, are well developed, and are long and pointed. This system of dentation is assigned by M. Cuvier to all the divisions of the phalangers, comprehended under *Cuscus* Lacepède, *Phalangista* Geoff., and *Petaurus* Shaw. The group denominated *Cuscus* by Lacepède, is confined to the Molucca Islands: they differ from *Petaurus* in not having a dilated skin for flying, or rather springing; and are known by having the tail somewhat scaly. When these animals see a man, as it is said, they suspend themselves by the tail; and it is possible to make them fall through lassitude, by continuing to stare at them for some time: they diffuse an unpleasant odour, yet their flesh is eat-

able.* Some of these are as large as a domestic cat, and others equal to a civet. There are three animals, however, which connect these Molucca phalangiers with those of New Holland, and which differ in having the whole of the tail hairy: these are the *P. Vulpina*, as big as a cat; *P. Cookii*, which is somewhat less; and *P. Bougainvillii*, which is the size of a squirrel. These and the Molucca animals form the modern genus *Phalangista*. To this genus, also, has been referred a very remarkable animal described by Mr. Bell†, under the name of *Phalangista gliriformis*, which differs entirely from all the New Holland species, in having the tip of the tail, which is also greatly attenuated, completely naked; the whole appearance of the animal, as expressed in the admirable figures by which the paper is accompanied, is so different from the vulpine and other New Holland species, that we consider it as an intermediate sub-genus between *Phalangista* and *Petaurus*: indeed, the "remarkable approximations," which it exhibits to this latter group, is more than once pointed out by Mr. Bell. If the present view we have taken of its true situation is correct, it will come between the two genera, and thus give us the gliriform type of this family; rendering the specific name it now has, of *gliriformis*, peculiarly appropriate. From the specimens being alive when the account was drawn up, a full examination of the teeth could not be obtained. All gliriform types are the smallest in size; and we consequently find this animal is not much bigger than a common dormouse. The *Phalangista nana* Tem. certainly belongs to the same type‡: it is further distinguished, as a species, from *P. gliriformis*, by the whole of the tail, above and beneath, being thinly covered with hair to the very tip.

* Règne Animal.

† Lin. Trans. xvi. 121.

‡ By means of a specimen of this exceedingly rare and interesting animal, sent me from Van Diemen's Land by the kindness of Mr. W. Lempière, I am enabled not only to confirm Mr. Bell's supposition, that it is a different species from his *P. gliriformis*, but also to state that its system of dentation possesses some peculiar characters.

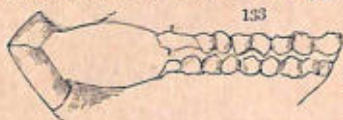
(340.) The proximity thus evinced by the two last-mentioned animals, brings us at once to the genus *Petaurus* of Dr. Shaw. • These marsupials are exclusively Australian. There are no less than six species already known, all distinguished by the very conspicuous dilatation of the skin on the flanks, so that the anterior and posterior feet are, in a manner, united. By this structure the flying phalangers are able to sustain themselves for some moments in the air, while making an unusually wide leap. In some of these species the lower canines are extremely small; while the upper, and also the three first grinders in each jaw, are remarkably acute. Much variation, however, is observed in the dentation of this group; for in the *Petaurista Taguanoides**, which M. Cuvier compares to the flying lemur (*Galeopithecus*), the lower canines are entirely wanting, and the upper ones are very small. The pygmy flying phalanger† has the tail feathered with hairs on each side like the shafts of a quill: in *P. Taguanoides* it is more like that of a squirrel, and tufted at the end; while in *P. macrourus*, besides its great length, it is quite round, being neither feathered nor tufted. The lateral expansion of the skin, however, is the same in all; and the variation in the tails of the different species must therefore be looked upon as offering so many points of connection with the neighbouring groups. It is worthy of remark that, of all the marsupials, *Petaurus* makes the nearest approach to the true kangaroos, by its system of dentation, while *Hypsiprymnus*, on the other hand, evinces an equal affinity in all its other characters.

(341.) The last group of marsupial animals, provided with teeth not indicating carnivorous habits, is the genus *Phascolomys*, in which we include both the wombat and the koala. The aspect and structure of these animals, with the exception of the marsupial pouch, are totally dissimilar to any of those we have been describing: not only their form, but their dentation,

* The *Hoppona* of White, Voy. pl. 61.

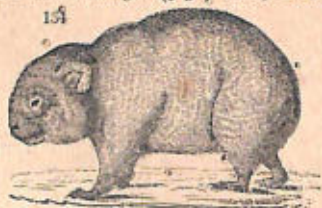
† *Petaurus pygmaeus*. See Zool. of New Holland, pl. 2.

(fig. 133.), brings them so close in resemblance to the true *Glîres*, that it seems impossible to deny that this resemblance is one of affinity, and not of analogy.



At least, such is the opinion even of Cuvier, who considers them to form the passage of connection be-

tween the marsupials and his order *Rodentia*. Both of them are moderately sized, thick, clumsy, bear-like looking animals, with short legs, no tail, and tufted ears. The Koala is described as living equally among trees, and burrowing into the ground; two habits, we must confess, very opposite, and which leads us to believe that the statement is inaccurate: we are, in short, but ill-informed upon this point. The mother is said to carry her young for a considerable time upon her back. Its precise characters are taken from the teeth: in the lower jaw there are two long incisors without canines; and in the upper, two long incisors situated in the middle, some small ones on the sides, and two small canines. The feet are very short: the anterior pair have five toes, divided into two groups, for the purpose of grasping, analogous to the parrots among birds, and to chameleons among reptiles; the thumb and index being on one side, and the remaining three toes on the other. On the hinder feet the thumb is wanting, and the first two toes are joined together like those of the flying opossums. The sixth and last division of M. Cuvier contains but one genus, that of *Phascolomys* (figs. 133, 134.), better known in our



Australian colonies by the name of wombat; a thick, heavy animal, with a large flat head, shapeless body, and very short legs: like the last genus, it has no tail; and its strong

nails show that it possesses the habit, in no small degree, of burrowing under ground. The wombat is herbivorous, living upon grass, and very slow in its motions; its size is that of a rabbit. On the affinities of this singular animal M. Cuvier observes, "It is a true *Rodentia*," judging by the teeth and claws: its only affinities to the order wherein it is now placed consists in the articulation of the lower jaw; while in every other respect it would, in a rigorous system, be necessary to class it with the *Rodentia*." He adds that the stomach of the wombat is purse-shaped; while the cœcum, broad and short, is provided, like that of man and the oran-outang, with a vermiform appendage.

(342.) We have now laid before the reader a general account of the whole of the animals composing Cuvier's order of *Marsupiatæ*, excepting those decidedly carnivorous species belonging to our order *Feræ*. And we may now inquire as to the propriety of considering them—1. As belonging to and forming a part of the order *Glires*; 2. Whether, with certain restrictions, they do not form a circular group; and, 3. Which of the primary types of nature does that group represent.

(343.) 1.—The question as to the propriety of placing the frugivorous and herbivorous marsupials in this order, may be answered by another. If they are not connected with this, to which other of the primary orders do they belong? We have seen that the order *Quadrumanæ*, with the exception of the aquatic type, is perfect; or at least that there is no interval wide enough, or no affinities near enough, to permit the insertion of the marsupials between the American monkeys and the lemurs, or between these latter and the bats. They cannot follow the *Vespertilionidæ* in the same circle, because they are in no wise aquatic, and it is the aquatic type, and no other, which we want. The order *Feræ* appears at first sight to be that in which the whole of the marsupials would arrange; but we have already

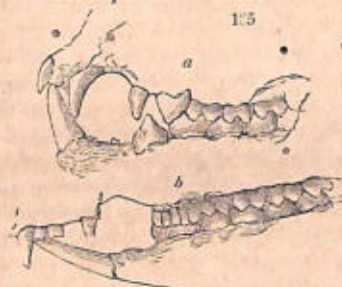
* Règne Anim. 2d ed. i. 172.

given such strong reasons and offered such opinions against this theory, that it must be given up. To arrange an entire family of quadrupeds feeding principally upon fruit and herbage, in an order which is pre-eminently carnivorous, would appear a great violation of nature. We may leave the aquatic order of *Cetacea* entirely out of this question; so that there will only remain two others—the *Ungulata* and the *Glires*—between which we cannot for a moment hesitate, seeing that these marsupials show a much greater affinity to the latter than to the former.

(344.) 2.—The order *Glires* being thus shown to be that in which we should arrange these animals, our next question concerns their situation in that order. The only certain mode of solving this is by analysing the whole; but as this has not been done by any one—not even so far as the determination of the primary groups—we can only approximate to a plausible opinion by analogical reasoning. Now we see that the *Didelphidæ*—that is, the carnivorous marsupials—occupy an aberrant station in the circle of the feline order, and we are therefore led to believe that the other marsupials will fill a corresponding station in that of the *Glires*. In support of this theory there are many strong, and, we had almost said, conclusive reasons. Besides the common character of the marsupial pouch, both groups are especially remarkable by having the tail more developed than any other group in their respective orders. Nor does this latter analogy rest alone with them; but extends, on the contrary, to all rasorial types in the animal kingdom. Among quadrupeds, in fact, we see it in the lemur family, the genus *Canis*, the *Ungulata*—represented by the horse—the squirrels, and in many subordinate groups. The strong analogy, moreover, between the phalangers and the lemurs has been repeatedly noticed; a resemblance which can be accounted for by the theory of their mutually representing each other. So far, therefore, we may safely affirm, that if the marsupials we are now considering enter into the circle of

the *Glires*, they form an aberrant rather than a typical family.

(345.) 3.—But all this may be admitted, and yet it may be contended that there is such a marked difference between some of these genera, — *Halmaturus* and *Petaurus*, for instance, — the kangaroos and the phalangers, that it is difficult to believe they truly follow each other; the kangaroos appearing to stand by themselves, as being grazing animals, besides possessing other distinctions. But it is quite evident, that wherever we place *Halmaturus*, we must also place *Hypsi-prymnus*; and there is too close a resemblance between this latter genus and some of the phalangers, to admit of their separation. So far, then, the kangaroos are by



no means isolated; while, if we look to the teeth of the Phalangers (fig. 135. a), and compare them with those of *Hypsi-prymnus* (fig. 135. b), the same reasons, although, perhaps, not so strong, exist against the separation. But

there is another consideration which has never yet been mentioned, and which appears to us all but conclusive on the present question. It has already, we trust, been proved to the satisfaction of the most sceptical that the *Ungulata* follow the *Glires*? no two orders, indeed, in their typical examples can be more different; the one composed of bulky grazing animals, the other of small gnawers. Now, to establish the chain of connection between these two, there must be a great, although by no means a sudden, change of structure in some family, which would thus become a bond of union. Such a family we see in the marsupials, as now restricted; there is a gradual progression from the wombats, having a decidedly gnawing structure, to the kangaroo, which,

although a marsupial, assumes the bulk, the food, the gregarious habits, and something even of the physiognomy, of the ungulated and ruminating groups. Without the existence of an animal so compounded, it would be almost impossible to connect two such dissimilar orders; but, by considering the marsupial family as aberrant, it will touch, as it were, the circle of the *Anoplotheres*, and thus fill up the hiatus which would otherwise exist.

(346.) 4. Having now stated those reasons which may be urged for considering this group to be aberrant, and as connecting the *Glires* with the ruminating (or more properly the grazing) order, it remains for us to consider in what way the genera we have just noticed can be best arranged according to their apparent affinities. There is less difficulty in this than might at first be imagined. The kangaroos may be regarded as typical of the whole, and as representing that primary group which is analogous (in the *Glires*) to the *Ungulata*; they are therefore of the largest size, and are purely herbivorous. Next to these come the kangaroo rats, as the sub-typical form; while the aberrant genera are composed of the walking, the gliriform, and the flying phalangers. These three divisions are placed together by M. Cuvier, under one common name; and their close connection is so obvious that some naturalists have doubted the expediency of separating them, even as sub-genera. So far, therefore, the facts before us, and the inferences to be drawn from the opinion of others, are quite in unison with the theory of the union of all aberrant groups into one, and so far there is *primâ facie* evidence that these types indicate a circular group. But there remains one other genus, the *Phascolomys*, or wombat, which has not been included. This genus we may consider as the first of the *Rodentia*; touching the circle of the *Marsupidæ*, but not entering therein. Dissimilar as the koala is, in aspect, to the climbing phalangers, there seems to be more than one link of connection between them. "Mr. Gray observes,

that the skull of the specimen of the koala, which he examined, had a short canine tooth in the upper jaw; and five grinders in both on each side, all with two fangs; the first on each side small, rather compressed, and the rest depressed with acute tubercles; so that they exactly agree with the *Potorus* (*Hypsiprymnus*, Ill.) in the number; but the length of the jaws was more equal, and the skull was compressed and depressed, so as to be sub-quadrangular; the temporal fossæ larger. Mr. Gray refers the animal to the group of phalangers.* So far, then, we have presumptive evidence that the koala unites the wombat with the phalangers, and has even a relation to *Hypsiprymnus*. We shall now offer further evidence for the union of the wombats with those other marsupials which have the rudiments of canine teeth. It seems that Illiger was induced to establish his genus *Amblotis* upon an animal called a wombat, found by Bass and Flinders, and which has been described as having six cutting and two canine teeth in each jaw; whereas the common wombat has only two cutting and no canine teeth. What the former of these animals really is, there are no means at present of ascertaining; but the above facts, if correct, are at least sufficient to establish an indisputable connection between the whole of the phalangers and the wombats.

(347.) Nevertheless, we must only look upon the foregoing circle of the *Marsupidæ* as conditional,—as possessing, indeed, so far as the mere circular succession of the genera is concerned, much appearance of being natural; yet still unsupported in its details by analogical proofs, drawn from the remaining families and subdivisions of the order, or even from the primary types of animals. There is no form or genus in this supposed circle, which represents the aquatic type, where the head is large, and the tail very short. If some of the wombats, as supposed by Mr. Gray, really enter among the phalangers, then, indeed, this objection

* Synopsis of Quadrupeds, in Griff. Cuv. p. 205.

would be cancelled ; and such, after all, may possibly be the precise situation of these singular animals in nature ; a station which they could hold, without in the least diminishing the probability of their connection also with the true *Rodentia*. There is another circumstance, also, which forces itself upon the attention. Why should such an evident tendency towards a carnivorous dentation be developed in a family which, it is said, connects the grazing order with the gnawers ? neither of which are purely carnivorous. Does not this fact materially strengthen the hypothesis, that part of the marsupials really occupy that station among the *Quadrumanæ* which we have assigned to the lemurs ; and that the remaining, or carnivorous portion, enters within the circle of the *Feræ* ? There are many apparently valid reasons that can be urged in support of this hypothesis ; but these again may be met by so many others, that we think it unnecessary to detail either the one or the other. Nothing, in short, can be definitely known until the entire circle of the *Glires* has been thoroughly analysed with reference to these important questions. It is a problem which requires, in all its bearings, to be worked out ; and until then we should look upon this circle of the *Marsupidæ* as predicated—not proved.

(348.) On the primary groups of the *Glires* we may form, however, a few conjectures. If we look upon the *Marsupidæ* as the family by which this order is connected to that of *Ungulata*, it becomes, as already mentioned, the rasorial type. The true *Rodentia* will then probably form two typical groups ; while the caviæ, the porcupines, and the marsupials would seem to point out the three divisions of the aberrant group. In what manner, however, the marsupials and the porcupines are united, is a difficult question to answer. *Echidna*, the porcupine ant-eater, which is a marsupial animal, might possibly effect this union ; but the relation between *Echidna* and *Ornithorhynchus* appears to be one of affinity ; and the two, moreover, according to our present views, would seem to form a part of the tooth-

less *Ungulata*, rather than of the *Glires*. Hence it will be necessary to analyse both such orders, before any sound opinion can be formed on such questions. We have thought it advisable, nevertheless, to lay them before the reader as mere conjectures; and to show that, in the view we have now taken of the marsupials, there are not wanting considerations, drawn from the animals among which they are placed, which give a colour of probability to our theory; yet at the same time rendering it advisable to suspend all decision upon any of these questions, until the requisite analysis, upon which our final judgment should alone be founded, has been gone into.

CYNICTIS.

WE have omitted to notice, in its proper place, a small animal of Southern Africa, considered by Mr. Ogilby as a new genus of *Carnivora*, called *Cynictis*, and which he views as connecting the civets with the dogs, at the same time remarking its "analogy" to *Proteles*. "The *Proteles*, however, partakes in some degree of the characters of the hyænas;" the present animal is more immediately interposed between the dogs and the ichneumons, to the latter of which it bears a pretty close resemblance in external form and appearance. The legs are high, and completely digitigrade; the toes long, and well separated; and the form of the claws, head, and body, is similar to the kindred genera of *Herpestes* and *Rhizana*: the fore feet have five toes, the hind only four.* For the other details we must refer the reader to Mr. Ogilby's elaborate description. We fully and entirely agree with this able naturalist in the situation he has assigned *Cynictis*, which renders the connection of the *Viverræ* to the dogs, through the medium of *Rhizana*, still more perfect than what we have already stated it to be. The *Proteles*, being analogous to the dogs in its own group, would, of course, have a resemblance to this new type, because both occupy the same position in their respective circles.

* Zool. Trans. i. 29.

ORDER GLIRES.

To the same volume, p. 35., we must refer the systematic reader for a long and elaborate dissertation by Mr. Bennett on many of the herbivorous *Rodentia* of M. Cuvier, and for the descriptions of three species, which the author characterizes as three genera. We regret that our confined limits will not permit us to enter upon this subject. It will be remembered that this is almost the only order in which we have refrained from attempting any improvements upon the series of M. Cuvier; satisfied, that to do this effectually, a much more extended investigation is necessary than we are now able to give. We have, in short, taken a rapid view of its principal genera, and nothing more. This plan we shall invariably follow where the primary groups of a circle have not been made out; because, until then, it seems impossible to determine either the value of the component groups, or whether the relations they exhibit are those of analogy or of affinity. Several of the genera, recently proposed among the *Rodentia* appear to us to constitute only *aberrant species*, which all natural groups must have, or every genus or sub-genus would be isolated. All such deviations should, of course, be duly noticed; but it is only by extensive analysis that we can at all determine the true value of such variations of form; whether, in short, they merely indicate aberrant or osculant species, or whether they possess a higher rank, as sub-genera or genera.

PART III.

THE CLASS MAMMALIA, ARRANGED ACCORDING TO
ITS NATURAL AFFINITIES.

ORDER I. QUADRUMANA. *Four-handed*
Quadrupeds.

FAMILY 1. SIMIADÆ. *Ape monkeys.*

Cutting teeth $\frac{1}{4}$; canine $\frac{1\frac{1}{2}}{1.1}$; grinders $\frac{2.5}{5.5}$, obtuse, tubercular. Teats two, pectoral. Tail, when present, never prehensile.

SIMIA, Linn. *Oran-outang*. Facial angle 65° ; without cheek pouches, tail, or posterior callosities. Superciliary ridges seen in the adult, or only in the young state. Arms very long. *Simia Satyrus*, oran-outang. Aud. pl. 2. Indian Islands, 2 sp.

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TROGLODYTES, Geoff. *Chimpanzee*. Facial angle 50° . Without cheek pouches, tail, or posterior callosities; superciliary ridges distinct; arms short. Ex. *Simia Troglodytes*, Gm. (fig. 136.). Adu. pl. 1. Africa, 1 sp.

HYLOBATES, Ill. *Gibbons, or long-armed apes* (fig. 137.). Facial angle 60° ; without cheek pouches or tail; but the posterior parts callous; arms excessively long. *Simia Lar*, L. Schreb. tab. 3. f. 1. Indian Islands, 5 sp.

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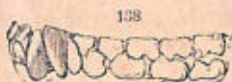


PRESBYTIS, Esch. Facial angle

60°. Cheek pouches none; posterior parts callous;

arms reaching to the

knees; tail long. *P. mitrula*. Sumatra, 1 sp.



PITHECUS, Geoff. *Pongo*. Facial angle —? Cheek pouches and tail none; arms long; muzzle lengthened, similar to the baboons; canine teeth very large: fig. 14. p. 68.

P. Wurnbii. India, 1.

CERCOPITHECUS. *Pouched Monkeys*. With cheek pouches, callosities, and long tails not prehensile; muzzle round.

LASIOPYGA, Ill. Facial angle

45°; muzzle slightly

lengthened; hands very

long, all furnished with

thumbs, the anterior very

short; tail long; posterior

parts fringed with hair.

Simia nemæa, Gm. Co-

chin China monkey (fig.

139.). Indian, 1 sp.



SEMNOPITHECUS, F. Cuv. Facial angle 45°; nose flat; ears moderate; arms very long;

the anterior thumbs very

short and remote; tail very

long and thin. (Fig. 140.)

Simia maura, Gm. Edw.

pl. 311. India, 6 sp.



COLOBUS, Geoff. Facial angle 40—45°; muzzle short; cheek pouches and posterior callosities very distinct; anterior hands destitute of thumbs; tail slender and very long. *Simia comosa*, Shaw. Gen. Zool. pl. 24. Africa, 3 sp.

CERCOPITHECUS, Geoff. Facial

angle 50°; nose flat; mar-

gin of the orbits smooth;

superciliary ridges obso-

lete; nostrils open to the

nasal fossæ; ears moder-

ate; tail longer than the

body. *Simia petaurista*,

the vaulting monkey (fig.

141.). Africa, India, 10

sp.

CERCOCEBUS, Geoff. Facial

angle 45°; head triangu-

lar; muzzle rather long;



nose flat and convex; anterior thumbs slender, approximating to the fingers, the hinder larger and more distant; posterior callosities very large. *C. cynosuroides* (fig. 142.). Africa, India, 7 sp.

NASALIS, Geoff. Facial angle $40-45^{\circ}$; muzzle slightly lengthened; nose particularly prominent and large; tail longer than the body; posterior parts callous. *Simia nasalis*, Gm. Afd. pl. 4. § 2. f. 1. Borneo, 2 sp.

INUUS, Cuv. Muzzle slightly lengthened; nose hardly longer than half the length of the face, not terminal; nostrils lateral; tail none, or very short. *I. sylvanus*, C. Magot Geoff.

MACACUS, Lacep. Muzzle lengthened; nose as in **INUUS**; facial angle $40-45^{\circ}$?; superciliary and occipital ridges very distinct; tail lengthened; cheek pouches and callosities distinct. Ex. *Simia Silenus*, L. Gen. Zool. 1. pl. 16.; also *Macacus speciosus*, F. Cuv. (fig. 143.).

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PAPIO. Baboons. Muzzle long, dog-shaped; nose placed at the extremity, the nostrils opening beneath the tip, and not on the sides.

PAPIO, Auct. Facial angle $30-35^{\circ}$. Resembles the last; but the tail, when present, is very short, and perpendicular to the dorsal line. Ex. *Sphinx*, L. Great Baboon Penn. Gen. Zool. pl. 10. Africa, 8 sp.

CYANOCEPHALUS, Bris. Facial angle $30-35^{\circ}$; muzzle long, and truncated at the end; canine

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teeth strong; tail as long or longer than the body.
Simia porcarius, Linn. (fig. 144.) Africa, 4 sp.

FAMILY 2. CEBIDÆ, Sw. *American Monkeys.*

Cutting teeth $\frac{1}{2}$; grinders $\frac{6-8}{6-6}$, obtuse, tubercular; nostrils separated by a broad septum, and opening laterally; tail long, generally prehensile; cheek pouches and posterior callosities wanting. Inhabits the New World only.

MYCETES, Ill. Facial angle 30° ; head pyramidal; visage oblique; os hyoides unusually ventricose, and externally prominent; anterior hands provided with a thumb; tail as in the last. *Simia seniculus*, L. Aud. 5. f. 1. 7 sp.

LAGOTHRIX, Humb. Facial angle 50° ; head round; anterior hands provided with thumbs; tail as in the last. *L. Humboldtii*. Obs. Zool. p. 32. 2 sp.

ATELES, Geoff. Facial angle 60° ; head round; limbs very thin; anterior hands destitute of thumbs; tail very long, strongly prehensile, the lower part towards the end naked. *Simia paniscus*, L. (fig. 145.). Gen. Zool. 1. pl. 28. 8 sp.



CEBUS, Erx. Facial angle 60° ; head round; muzzle short; os hyoides not prominent; tail prehensile, hairy at the lower part towards the end. *Simia Apella*, L. Aud. 5. § 2. pl. 2. *Cebus Capucinus* (fig. 146.), 15 sp.



CALLITHRIX, Geoff. Facial angle 60° ; muzzle short; nostrils narrow; ears very

large; tail not prehensile. *Simia Sciurus*, L.
Gen. Zool. pl. 25. 8 sp.

HAPALÆ, C: (fig. 147.).

Small; muzzle short;
 cutting teeth¹, canine
 $\frac{1}{1}$, grinders $\frac{6-6}{6-6} = 36$.
 Extremities penta-
 dactylous; the thumb
 of the anterior hands
 in the same direction



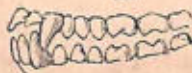
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as the fingers, all of which are furnished with claws
 instead of nails. *H. vulgaris*, Geoff. 8 sp.

MIDAS, Geoff. Ears very large: teeth pointed; canine
 teeth conic, strong; grinders acutely tubercular. *Mi-
 das rufimanus*, Geoff. 9 sp.

PITHECIA, Desm. Facial angle 60° ; muzzle short;
 nostrils wider than

the range of the upper
 canine teeth; ears
 moderately round;



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tail short, not prehensile, covered with long hair;
 habits nocturnal. Ex. *Simia sangulata*. Trail,
Wern. Trans. 7. p. 167. tab. 9. *Pith. melanocephala*.
 (fig. 148.).

FAMILY 3. LEMURIDÆ. *Lemurs*.

Form approaching that of quadrupeds; cutting teeth $\frac{1}{1}$
 or $\frac{3}{6}$; canine $\frac{1-1}{1-1}$; grinders $\frac{5-5}{5-5}$, or $\frac{6-6}{4-4}$; obtusely tuber-
 cular; head long, triangular; nostrils terminal; ears
 generally concealed, very small.

LEMUR, Linn. Cutting
 teeth $\frac{1}{1}$; lower hori-
 zontal grinders $\frac{6-6}{6-6}$;
 tail very long. Ex.
Lemur nigrifrons
 (fig. 149.). Aud.
 f. 5, 6. Madagascar,
 12 sp.



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INDRIS, Lacep. Cutting teeth $\frac{1}{4}$; grinders $\frac{5.5}{5.5}$; tail very long. *Lemur laniger*, Gm. *Gen. Zool.* pl. 34.

LICHANOTUS, Ill. Cutting teeth $\frac{1}{4}$; canine $\frac{1.1}{1.1}$; grinders $\frac{5.5}{5.5}$; tail very short, or none. Ex. *Lemur Indri*, Gm. *Gen. Zool.* pl. 32. 1 sp.

SCARTES, Sw. Cutting teeth $\frac{1}{4}$, the two middle in the upper jaw remote and larger, the six under ones larger than the upper, all equal and close together; canine $\frac{2}{3}$; grinders $\frac{1}{4}$, the anterior sharp, the posterior lobed; feet palmated; tail hairy, as long as the body. *S. murinus*. Brown, pl. 44. Madagascar, 1 sp.

STENOPS, Ill. Cutting teeth $\frac{1}{4}$, lower horizontal; canine $\frac{1.1}{1.1}$; grinders $\frac{6.6}{5.5}$; tail short or none. Ex. *Lemur tardigradus*.—*Loris*. Shaw, *Gen. Zool.* pl. 31. 3 sp.

OTOLICNUS, Geoff. Cutting teeth $\frac{2.4}{6}$, lower horizontal; canine $\frac{1.1}{1.1}$, small; grinders $\frac{6.6}{5.5}$; ears very large; hind legs lengthened; tail very long. *Lemur Senegalensis* (fig. 150). Africa, India.



CEPHALOPACHUS, Swains. Head very large; face obtuse; ears small; tail as long as the body, very slender, and almost naked; cutting teeth $\frac{2}{3}$, the upper very minute and wide apart, the lower close together, slender, and long. *Tarsius Bancanus*, Horsf. India, 1 sp.

TARSIPS, Storr. Cutting teeth $\frac{1}{4}$, unequal; canine $\frac{1.1}{1.1}$, small; grinders $\frac{6.6}{6.6}$; ears large, naked; hind legs very long; tarsi and tail long. *Lemur Tarsier*. Shaw, *Gen. Zool.* pl. 35. India, 3 sp.

AOTES, Humb. General structure of *Hapales*. Head round and large; muzzle short; ears very small; eyes large, approximating; tail long, covered with

short hairs, not prehensile; all the nails flat. *Aöles trivirgatus*, Humb. 1 sp.

GALEOPITHECUS, Pallas. Cutting teeth $\frac{1}{1}$, the two intermediate small, the edges of the lower indented; canine $\frac{1-1}{1-1}$, small, acute; grinders $\frac{6-6}{5-5}$, the anterior similar to the canine, the posterior many-pointed; the neck, limbs, fingers, and tail enveloped by a membrane; fingers equal; nails semicircular; mammae two, pectoral. *Lemur volans*, L. Gen. Zool. pl. 35. 38. 3 sp.? Indian islands.

CHEIROGALEUS, Geoff. Teeth——? ears short, oval; whiskers large; tail long, cylindrical, tufted, revolute; hair short. 3 sp. Described by Geoffroy from Commerson's drawings.

FAMILY 4. VESPERTILIONIDÆ, Gray. Bats.

Anterior fingers excessively prolonged; the membranes between them assuming the form and office of wings.

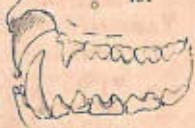
SUB-FAM. RHINOLOPHINÆ, Gray

Nasal appendages membranous, complicated; the index finger of only one joint.

NYCTOPHILUS, Leach. Cutting teeth $\frac{2}{2}$, the upper elongate-conic, and the under equal; canine $\frac{1-1}{1-1}$; grinders $\frac{4-4}{4-4}$, the first in the upper jaw is acute, with one tubercle; the second and third with four tubercles; the fourth with three; in the lower jaw the first grinder is acute and conical; the other three tuberculated. Ex. N. *Geoffroyi*, Leach. Linn. Tr. xiii. p. 78. pl. 1. 1 sp.

MEGADERMA, Geoff. Cutting teeth $\frac{6}{4}$, canine $\frac{1-1}{1-1}$, grinders $\frac{4-4}{5-5} = 26$; ears very large at their base, united, interior ears long, slender; nasal appendages three; tail none; third finger of the hand without the last phalanx. *Vesp. Spasma*, L. Shaw, Gen. Zool. pl. 42. 5 sp.

RHINOLPHUS, Geoff. Cutting teeth $\frac{3}{3}$; the upper incisors very small, and not permanent; canine $\frac{1-1}{1-1}$; grinders $\frac{5-5}{5-5}$, furnished with sharp points = 30; ears distinct; two false mammæ on the pubes; tail long, free. Ex. *Rhin. vulgaris*, L. (fig. 151). 12 sp. The Old World.



NYCTERIS, Geoff. Cutting teeth $\frac{4}{4}$, lobed; canine $\frac{1-1}{1-1}$; grinders $\frac{4-4}{4-4}$, with sharp tubercles = 30; forehead with a deep groove; interfemoral membrane larger than the body, comprehending the tail, which is terminated in the form of the letter T.; mouth with a pouch on each side, communicating to a large membranaceous sac, formed by the skin of the body. *Nyct. hispidus*, Gm. 3 sp.

SUB-FAM. PHYLLOSTOMINÆ, Gray.

Nasal appendage simple, fleshy, entire or double; the index finger of two phalanges.

MORMOOPS, Leach. Cutting teeth $\frac{4}{4}$, the two intermediate in the upper jaw largest; canine $\frac{1-1}{1-1}$; grinders $\frac{5-5}{5-5}$; ears large, furnished with auricles; nasal appendage one; index finger of two joints; tail naked only at the end. Ex. *M. Blainvillii*, Leach (fig. 152). *Linn. Tr.* xiii. p. 76. f. 7. 1 sp.



PHYLLOSTOMA, Geoff. Cutting teeth $\frac{4}{4}$, pressed close between the canine teeth, the intermediate being the largest; canine teeth $\frac{1-1}{1-1}$; grinders $\frac{5-5}{5-5}$ = 32; nasal appendages in two pieces, one leaf-shaped, the other lyre-shaped; ears large, naked, not united; tongue fur-



- nished with sharp prickles. Ex. *Vespertilio Na-
sutus*, Gm. *P. unicolor*, Sw. (fig. 153.) Schreb.
pl. 46. a.

VAMPIRUS, Spix. Cutting teeth $\frac{1}{2}$, conical, the two intermediate in the upper jaw being largest; canine teeth $\frac{1-1}{1-1}$; grinders $\frac{4-4}{3-3}$, the first with one tubercle, the remainder with three; mouth rather obtuse; tail short, involved (except at its apex) in the membrane. Ex. *V. cirrhosus*, Spix. *Sim. Braz.* 64. f. 36.

GLOSSOPHAGA, Geoff. Cutting teeth $\frac{1}{2}$, regular; canine $\frac{1-1}{1-1}$; grinders $\frac{3-3}{3-3}$; tongue extensible, very long, suctorial; interfemoral membrane and tail obsolete or none; habit, sucks blood. Ex. *V. soricinus*, Pall., Edw. pl. 201.

MEDATEUS, Leach. Cutting teeth $\frac{1}{2}$, the two intermediate in the upper jaw longest; canine $\frac{1-1}{1-1}$; grinders $\frac{4-4}{2-2}$; nasal appendages two; tail none. Ex. *M. Lewisii*, Leach. *Linn. Tr.* xiii. p. 81. 1 sp.

RHINOPOMA, Geoff. Cutting teeth $\frac{2}{2}$, the upper separated; canine teeth $\frac{1-1}{1-1}$; grinders $\frac{4-4}{3-3}$; nose long; ears large, united, and hanging over the face, with an internal pair; nasal appendage one; tail long, and extending beyond the membrane. Ex. *R. microphylla*, Desm. 2 sp.

ARTIBEUS, Leach. Cutting teeth $\frac{1}{2}$, the two intermediate in the upper jaw the largest, in the lower jaw truncated; the two intermediate larger and grooved in front; grinders $\frac{6}{10}$; nasal appendages two. Ex. *A. Jamaicensis*, Leach. *Linn. Tr.* xiii. p. 75. pl. 1. 1 sp.

DIPHYLLA, Spix. Cutting teeth $\frac{1}{2}$, the upper middle teeth the largest, apex six pointed; canine teeth $\frac{1-1}{1-1}$, scarcely exerted; grinders $\frac{4-4}{4-4}$? or $\frac{5-5}{5-5}$? short, the tips crenulated; nasal appendages two, short, erect, truncate; tail 0. *D. ecaudata*, Spix. 1 sp.

MONOPHYLLUS, Leach. Cutting teeth $\frac{1}{2}$, the two intermediate the largest; canine $\frac{1-1}{1-1}$; grinders $\frac{5-5}{6-6}$, the

two first in the upper jaw distant, the rest tuberculated. *M. Redmani*, Leach. *Linn. Tr.* xiii. p. 76. pl. 1. 1 sp.

SUB-FAM. PTEROPINÆ, Gray.

Grinders obtusely tubercular; wings conical; inter-femoral membrane and tail mostly wanting; index finger with three joints; head long, hairy.

PTEROPUS, B. Cutting teeth $\frac{1}{1}$, conical; canine $\frac{1.1}{1.1}$; grinders $\frac{5.5}{5.5}$, each with two roof-shaped ridges, forming a longitudinal furrow between them; nose simple; tail short or wanting; index finger with a third phalanx and a nail; tongue papillary; habits nocturnal, frugivorous. *Pteropus megacephalus*, Sw. (fig. 154.) 18 sp. 154



CEPHALOTES, Geoff. Cutting teeth $\frac{1}{1}$, the upper insulated, remote, the lower almost close; canine $\frac{1.1}{1.1}$; grinders $\frac{5.5}{5.5}$ (Geoff.), $\frac{4.4}{5.5}$ (Fred. C.), in general worn down, the posterior with a large upper surface, but without tubercles or ridges; tail very short. Ex. *V. cephalotes*, Pall. *Sp. Zool. fas.* 3 pl. 1, 2. 2 sp.

CYNOPTERUS, Fred. C. Cutting teeth $\frac{1}{1}$, canine $\frac{1.1}{1.1}$; grinders $\frac{4.4}{5.5}$, two of which in each jaw are false; head resembling the last; tail very short. *Pteropus marginatus*, Geoff. 1 sp. Obs. The genus *Macroglossus* of F. Cuvier (*Dents des Mam.* p. 39.) is not yet well understood; if the division is judicious, the name, having been long used in entomology, must be changed for some other. Some few other obscure genera we have also omitted.

SUB-FAM. NOCTILIONINÆ, Gray.

Grinding teeth acutely tuberculated; wings long, narrow; index finger of two joints; head short, obtuse; lips very large; tail incurved.

STENODERMA, Geoff. Cutting teeth $\frac{1}{1}$ (Geoff.), $\frac{2}{2}$ (Cuv.); canine $\frac{1}{1}$; grinders $\frac{4-4}{4-4} = 28$; ears moderate, lateral, distinct; interfemoral membrane nearly obsolete; nose simple; tail none. *S. rufa*, Geoff. 1 sp.

NOCTILIO, Geoff. Cutting teeth $\frac{1}{1}$, the two upper intermediate teeth largest, the lower placed before the canine teeth; canine $\frac{1-1}{1-1}$ very strong; grinders $\frac{4-4}{4-4} = 26$; ears small, lateral, remote; interfemoral membrane large; tail slightly exerted; muzzle short, thick, tuberculated; hinder claws very large. *V. Leporinus*, Gm. *Gen. Zool.* pl. 41. 3 sp.

CHELANO, Leach. Cutting teeth $\frac{2}{2}$, the upper sharp and simple, the lower formed, as it were, of four columns, grinders $\frac{3}{3}$, the anterior teeth in both jaws acuminate, the three posterior acutely tuberculated. *C. Brooksiana*, Leach. *Linn. Tr.* xiii. p. 70. 1 sp.

ÆLLO, Leach. Cutting teeth $\frac{2}{2}$; grinders $\frac{3}{3}$, the two upper anterior acuminate, the third bifid, and the fourth with three edges; lower jaw with the three anterior acuminate, and the three posterior bifid. *A. Cuvieri*, Leach. *Linn. Tr.* xiii. p. 71. 1 sp.

SCOTOPHILUS, Leach. Cutting teeth $\frac{1}{1}$, the two lateral in the upper jaw shorter; grinders $\frac{3}{3}$, furnished with acuminate processes. *S. Kuhlî*, Leach. *Linn. Tr.* xiii. p. 72. pl. 1. 1 sp.

PROBOSCIDEA, Spix. Cutting teeth $\frac{1}{1}$, the upper teeth very small, distant, and diverging, the lower lobed; canine $\frac{1-1}{1-1}$; grinders $\frac{5-5}{5-5}$, the front one small, the rest tuberculated; wings narrow; tail long, partially exerted. *Ex. P. saxatilis*, Sp. 1 sp.

CHEIROMELES, Horsf. Cutting teeth $\frac{2}{2}$; canine $\frac{1-1}{1-1}$; grinders $\frac{4-4}{5-5}$; face conical; ears distant and spreading; operculum short, semicordate, blunt; interfemoral membrane short; tail exerted; thumb



distinct; claw flat, fringed on the margin with bristles. *C. torquatus*, H. (fig. 155.).

MOLOSSUS, Geoff. Cutting teeth $\frac{2}{2}$; superior teeth bifid, converging and separated from the canine teeth; inferior teeth very small, crowded, and three pointed; canine $\frac{1}{1}$; grinders $\frac{4-4}{5-5}$, large and many pointed; head and muzzle very large; nostrils open; ears large, their base united, provided with a smaller tragus; nose simple; interfemoral membrane narrow; tail long. *Mol. Geoffroyii*, Tem. (fig. 156.) America.



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SUB-FAM. VESPERTILIONINÆ, Gray.

Grinding teeth acutely tubercular; wings large, broad; the index finger of only one joint; head long, hairy; lips simple; tongue short; tail long.

PLECOTUS, Geoff. Cutting teeth $\frac{4}{6}$; canine $\frac{1}{1}$; grinders $\frac{5-5}{5-5}$; ears larger than the head, their base united; the other characters agree with those of the next genus. Ex. *V. auritus*, L. Edw. pl. 201. fig. 3. *P. barbastellus* (fig. 157.). 7 sp.

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VESPERTILIO, L. Cutting teeth $\frac{4}{6}$; the upper in pairs, cylindrical and pointed; the lower very close, with two lobes directed forward; canine $\frac{4-4}{5-5}$; $\frac{5-5}{5-5}$, $\frac{6-6}{6-6}$, or $\frac{5-5}{6-6}$; anterior grinders simple, conic; posterior with sharp points; ears lateral and distinct, with a small internal pair; tail not exceeding the membrane; glands under the skin of the face. *V. murinus*, L. Edw. pl. 201. *Vesp. noctula* (fig. 158.). 33 sp. "The Old and New World.

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THYROPTERA, Spix. Teeth —; body slender; nose small; wings very narrow, running down to the tarsus; thumb of the hand furnished below with a concave patella; interfemoral membrane expanded, not extending beyond the feet; tail long, exerted. *T. tricolor*, Spix. p. 64. pl. 36. f. 69. 1 sp.

ORDER II. FERÆ. *Beasts of Prey.*

FAMILY FELIDÆ.

Large; muzzle short, obtuse.

FELIS, L. *Cats*. Claws completely retractile; muzzle short and round; jaws short; two false grinders above, and two below; upper carnivorous tooth with three lobes and an obtuse heel within; the lower with two lobes, pointed and sharp, without any heel; one very small tuberculous tooth above; none below.

LEO, Antiquorum. *Lions*. Head and neck furnished with a mane of long hair; tail tufted.

FELIS, L. *Cats*. No mane; tail long, not tufted.

CYNAILURUS, Wag. *Hunting Leopards*. Claws semi-retractile.

PRIONODON, Horsf. Body and limbs slender; head elongated; muzzle very pointed; grinders $\frac{5}{6} - \frac{5}{6}$; anal pouch none? Ex. *P. gracilis*, Horsf. Zool. Java. Affinities uncertain.

LYNX, Antiq. Ears tufted with hairs; tail short.

HYÆNA, Antiq. (fig. 159). Three false grinders above, four below, all conical, blunt, and two very large; upper carnivorous tooth with a small tubercle within; tongue rough; tail with a deep and glandulous pouch



beneath; hind legs shortest; feet four-toed; nails not retractile. Africa, 3 sp.

PROCTES, Isidore Geoff. *Hyæna Dog*. Form intermediate between the hyæna and dog; neck maned; ears large; toes, five before and four behind. Africa, 1 sp. *P. Hyenoides*, Desm.

CANIS. *Dogs*. Muzzle longer; two flat tuberculous teeth behind the upper carnivorous tooth.

CANIS, L. *Dog*. Tail recurved. Cutting teeth $\frac{6}{2}$; canine $\frac{1}{1}$; grinders $\frac{6-6}{7-7}$, the first three above and the first four below false; the upper carnivorous tooth with only one tubercle within; the



lower with its posterior point entirely tuberculous; anterior feet five-toed; posterior four-toed; pupil of the eye circular (fig. 160.). *Canis familiaris*, L. The Dog.

VULPES, Ant. *Fox*. Habits of the last; muzzle more pointed; upper cutting teeth less sloped; pupil of the eye long; tail long, and bushy towards the end. The Jackall, Fox. 9 sp.

LUPUS. *Wolf*. Tail straight.

LYCAON, Brooks. Head short; cutting teeth not forming a regular series, the central one in each jaw being placed more internally than the others; body higher before than behind; joints of the carpus very weak. *Canis picta*, Desm. Pl. in *Burchell's Travels*.

MEGALOTIS, Ill. Teeth as in *Canis*; head long, acute; ears enormous; toes five; tail tufted. *Megalotis Landii*, Sm. (*Canis Megalotis*, C.) 2 sp.

THYLACINUS, Tem. Dentation approximating to that of *Felis*. Cutting teeth $\frac{6}{2}$, equal, close to each other, the external one on each side larger than the others; canines $\frac{2}{2}$, very large, strong, curved and pointed like those of cats and dogs; grinders $\frac{7}{7}$, = 46; marsupial; tail compressed at the end. *T. Cynocephalus*, *T. ursinus*? Lin. Trans. ix. tab. 19. Australia.

FAMILY MUSTELIDÆ, Sw.

Smaller; muzzle lengthened; claws slightly or not at all retractile.

RYZÆNA, Ill. Form intermediate between the genets and the dogs; snout pointed; legs lengthened; feet with four toes; anal pouch large; walk plantigrade. *R. capensis*. 1 sp. Africa.

CROSSARCHUS, F. Cuv. Walk plantigrade; dentation of *Ryzæna*; snout pointed; legs rather short; five-toed; muzzle pointed; pouch at the tail. *C. obscurus*, Cuv. Africa, 1 sp.

SUB-FAM. VIVERINÆ, Sw. *Musk-Weasels*.

Three false grinders above, four below, the anterior lower ones not always permanent; two rather large tuberculous teeth above, one below; on the inner side of the lower carnivorous tooth are two projecting tubercles; tongue prickly; pouch beneath the tail.

CYNICTIS, Ogilby. Dental system similar to *Herpestes*, but with no rudimentary false molar in the lower jaw; anterior feet five-toed, posterior feet four-toed; head short; muzzle small, naked; ears short and elliptical; body long, slender; tail lengthened, bushy; legs high; walk digitigrade. 1 species. S. Africa. *C. Steedmanii*, Ogilby.

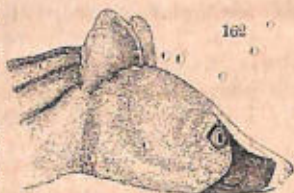
HERPESTES, Ill. Grinders $\frac{6-6}{6-6}$; anal pouch very large, simple, at the bottom of which is the vent; feet five-toed. Ex. *Viverra Ichneu-mon*, L. (fig. 161.). 8 sp.



VIVERRA, L. Grinders $\frac{6-6}{6-6}$; anal pouch very deep, divided into two sacs, containing a musky secretion.

GENETTA, Desm. Anal pouch formed merely by a fold of the skin, containing very little secretion;

tail straight. *Viverra*
Genetta, L. (fig.
 162.), *Gen. Zool.* 1.
 pl. 96. 6 sp.



CRYPTOPROCTA, Bennett.

Dentation, so far as known, similar to the gennets; muzzle short; ears very large; toes united nearly to their ends; claws completely retractile; tail long; anal pouch covered with hair. *C. ferox*. *Zool. Tr.* 1. 137. Madagascar, 1 sp. The natural station of this animal seems very uncertain.

PARADOXURUS, Fred. C. Grinders $\frac{8}{6.6}$ or $\frac{5.5}{5.5}$; feet plantigrade; claws half retractile; tail convolute; anal pouch none. Ex. *Viverra nigra*, Desm. $\frac{1}{4}$ sp.

SUB-FAM. MUSTELINÆ, Sw. *Martens*, &c.

Cutting teeth $\frac{6}{6}$; canine $\frac{1.1}{1.1}$; grinders $\frac{4.4}{5.5}$ or $\frac{5.5}{5.5}$, one of which only is tuberculous; head small, oval; ears short, round; body long, slender; feet short.

PUTORIUS, C. Two false grinders above, and three below; the great carnivorous tooth below, without an internal tubercle; muzzle short. Fœtid. Ex. *Mustela Putorius* L. The Polecat, Weasel, &c. 10 sp.

MARTES, C. Three false grinders above, and four below; lower carnivorous tooth with a small interior tubercle. Ex. *M. Abietum*, Ray. The Pine Marten. 9 sp.

MEPHITES, C. Two false grinders above, and three below; the inferior carnivorous tooth with two tubercles on the inner side; upper tuberculous tooth very large. Ex. *Viverra striata*, Shaw.

MYDAUS, F. Cuv. Dentation of *Mephites*; walk plantigrade; form thick, heavy; snout pointed, hog-like; ears nearly concealed; tail very short;

anal glands two. *Mydaus Meliceps*, Horsf.
Java, 1 sp. 163

LUTRA, Ray. Three false grinders above, and three below; the lower carnivorous tooth with two points on its outer side; feet palmated; tail flattened horizontally; head compressed. Ex. *L. vulgaris*. The common Otter (fig. 163.). 9 sp.



ENHYDRA, Flem. Cutting teeth $\frac{1}{2}$; grinders $\frac{4-4}{3-3}$; false grinders $\frac{2-2}{3-3}$; body very long; hind legs and tail very short. Ex. *Mustela Lutris*, L. The Sea Otter. Gen. Zool. pl. 101. 1 sp.

GULO, Storr. Grinders $\frac{5}{6}$, the first three in the upper, and the first four in the lower jaw, small, succeeded by a larger carnivorous tooth, and a small tuberculous tooth behind; tail moderate, the skin folded beneath. *Ursus Gulo*, L. Gen. Zool. pl. 104. 4 sp.

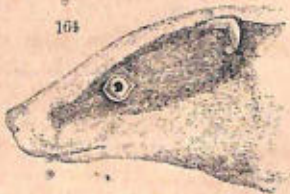
RATELLUS, Fred. C. Grinders $\frac{4-4}{5-5}$, with two false grinders in the upper jaw, and three in the lower; habit of the last. Ex. *Viverra Mellivora*, Gm. Schreb. pl. 125. 4 sp.?

SUB-FAM. URSINÆ, Sw. Bears.

Walk plantigrade; grinders more or less tuberculated; statue generally large; carnivorous and frugivorous; claws formed for digging; tail generally short.

MELES, Briss. Grinders $\frac{5-5}{5-5}$, the first very small, second and third pointed, fourth truncate, fifth tuberculous and largest; tail short, with a pouch beneath containing a foetid secretion; anterior nails

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very large. Ex. *Ursus Meles*, L. (fig. 164.).
The Badger. 2 sp.

URSUS, L. Statue very large; tail remarkably short; grinders large and entirely tuberculated; toes five, with strong curved claws. *Ursus arctos*, L. The Common Bear.

PROCHILUS, Ill. Grinders $\frac{3}{3}$, the anterior simple, posterior bi-tuberculated, the three anterior and the sixth in the under jaw simple, the fourth and fifth tuberculated. Ex. *Bradypus ursinus*, Shaw. (*Ursus labiatus*, Blainv.) 1 sp. India.

HELARCTOS, Horsf. Grinders $\frac{3}{3}$, the three anterior above and below simply cuspidate; tongue slender, very long, extensible, the base papillary, the tip smooth; claws very long. *H. Malayanus*, Horsf. *Zool. Jour.* No. 6. p. 221. pl. xi. India.

PROCHYON, Storr. Canine teeth large, and compressed on one side; grinders $\frac{6-6}{6-6}$, the first three pointed, the three hinder tuberculated; muzzle pointed; ears small; tail long, pointed; stand on the heel of the hinder legs, but walk on the toes; mammae six, ventral. *Ursus Lotor*, L. Raccoon (fig. 165.). 2 sp. N. America.



NASUA, Storr. Teeth of the last; muzzle elongated; nose moveable; feet semipalmate; nails strong; tail long. *Nasua rufa* (fig. 166.). 2 sp. S. Am.

FAMILY DIDELPHIDÆ. Opossums.

Carnivorous; typically marsupial; tail long, naked or hairy, generally prehensile; lower incisors not much longer than the upper; thumb of the hind feet opposable to the toes; the nail small or wanting.

ARCTICTIS, Tem. Head short; muzzle pointed; ears small, tufted with long hairs; tail long, very hairy, prehensile. Not marsupial. *A. albifrons*, Geoff. (fig. 167.). India, 2 sp.



CERCOLEPTES, Ill. Grinders $\frac{5.5}{5.5}$, the first two pointed, the next three tuberculated; muzzle short; tongue extensible; tail long and prehensile. Not marsupial. Ex. *Viv. caudivolvula*, Gm. Schreb. pl. 125. 1 sp.

DIDELPHIS, L. Cutting teeth $\frac{10}{8}$, the upper two intermediate, longest and isolated, the lower small and equal; canine $\frac{1.1}{1.1}$, strong, compressed; grinders $\frac{7.7}{7.7}$ or $\frac{6.6}{7.7}$, the first three, above, false and triangular, the rest furnished with sharp points; in the lower jaw the first four are also false; head long and conic; muzzle pointed; ears large, rounded; hind nail on the thumb wanting; tail long, half hairy and scaly. *Did. Virginiana*, P. 16 sp. In several species the female is destitute of a pouch.

CHEIRONECTES, Ill. Cutting teeth $\frac{10}{8}$; canine $\frac{1.1}{1.1}$; grinders pointed; feet five-toed, the posterior palmated; nails sharp and bent, that on the thumb wanting; tail long, scaly, and prehensile; females with the abdominal pouch. *Didelphis palmata*, Geoff. Brazil, 1 sp.

DASYURUS, Geoff. Cutting teeth $\frac{8}{8}$, small, regular; canine $\frac{1.1}{1.1}$, large; grinders $\frac{6.6}{6.6}$, the first two compressed, the rest terminating in points; anterior feet five-toed, nails crooked; posterior four-toed, the thumb short, resembling a tubercle; tail entirely covered with hair. *Did. Viverina*, Shaw. Gen. Zool. pl. 111. Australia only, 8 sp.

PARAMELES, Geoff. Cutting teeth $\frac{10}{6}$ or $\frac{10}{8}$, the last pair

in the upper jaw long, of the lower bifid; canine $\frac{1-1}{1-1}$, long; grinders as in *Didelphis*; the great and little toe of the anterior feet like tubercles; posterior thumbs short, the two next toes united by a membrane as far as the nails; the latter large and nearly straight; tail hairy,^o not prehensile. *P. nasuta*, Geoff. 3 sp.

CLADOBATES, F. C. Cutting teeth $\frac{2}{6}$; canines $\frac{1-1}{1-1}$; grinders $\frac{7-7}{6-6}$; body lengthened; head triangular, much attenuated, obtuse; tail very long; mammae four, ventral; inhabits trees; not marsupial. Ex. *T. Tana*, Raff. *Lin. Tr.* xiii. p. 257. 3 sp. Asiatic isles. *Tupaia*, Raff.

GYMNURA, Raff. Head lengthened, acuminate; ears round, naked; eyes small; body rather stout, having bristly hairs, intermixed with soft fur; claws small, retractile; tail long, naked. Not marsupial. *G. Rafflesii*, Zool. Journ. 3. 246. pl. viii. Sumatra, 1.

FAMILY SORECIDÆ, Sw. Shrews, Moles, and Hedgehogs.

Muzzle lengthened, pointed; legs short, feeble; feet pentadactylous; lower incisors generally very long, pointing forwards; no lateral membranes; mammae ventral.

ERINACEUS, L. Cutting teeth $\frac{6}{6}$; the upper intermediate teeth very long, remote; canine $\frac{1-1}{1-1}$, rather short; grinders $\frac{5-5}{4-4}$; body protected above by prickles; nails formed for digging; tail short, or 0. *E. Europæus*, L. Common Hedgehog. 3 sp.

SOREX, L. Cutting teeth $\frac{2}{2}$; the two superior middle teeth crooked and indented at their base; lateral cutting teeth (or false canine) $\frac{3-4}{2}$; grinders $\frac{4-4}{5-5}$; body covered with hair; mammae six or eight, both pectoral and ventral. *S. Araneus*, L. Schreb. pl. 160. The common Shrew. 12 sp.

MYGALE, Geoff. Cutting teeth $\frac{2}{2}$, the two upper large, triangular, and flattened; of the four lower, two

- are very small and intermediate; false canine $\frac{12}{12}$; muzzle prolonged, and forming a small flexible trunk; tail long, scaly, laterally compressed; toes palmated. *Castor Moschatus*, L. Schreb. pl. 159. 2 sp.
- SCALOPE, C. Teeth as MYGALE; muzzle elongated and simple; no external ears; anterior toes large, united as far as the third joint, and armed with large nails formed for digging. *Sorex aquaticus*, L. The Water Shrew.
- CHRYSOCHLORIS, C. Teeth as MYGALE; anterior feet with only three toes, armed with strong nails like the last; hinder feet with five toes; muzzle ending in a cartilaginous appendage. *Talpa Asiatica*, Gm. 1 sp. Africa.
- TALPA, L. Cutting teeth $\frac{6}{6}$; canine $\frac{1-1}{1-1}$; grinders $\frac{7-7}{6-6}$; head elongated; eyes very small; anterior feet very large, remote, turned outwards; toes united, palmate, nails strong; hind feet weak. *T. Europæa*, L. The common Mole.
- CENTENES, C. Cutting teeth $\frac{6}{6}$ or $\frac{4}{4}$; canine $\frac{1-1}{1-1}$, similar to the grinders, which are $\frac{6-6}{6-6}$; muzzle pointed; body covered with spines; toes 5; tail none. *Erinaceus ecaudatus*, L. 3 sp.
- CONDYLURA, Desm. Cutting teeth $\frac{6}{6}$, the two intermediate, above, largest; canine $\frac{1-1}{1-1}$; grinders $\frac{6-6}{7-7}$; muzzle very long, the tip radiated; ears none; feet five-toed; anterior nails formed for digging. *Sorex cristatus*, L. Pen. Quad. pl. 28. f. 4. 2 sp.

FAMILY PHOCIDÆ. Seals.

Feet short, enveloped in skin, and the toes connected by a membrane; external ears generally obsolete. Marine.

PHOCA, L. Teeth variable; external ears obsolete; nose simple. Ex. *P. Vitulina*, L. Common Seal. (fig. 168. a, b, *P. Leptonyx* (c), *P. mitrata* (d). 8 sp.

MIROUNGA, Gray.

Cutting teeth

$\frac{4}{3}$ or $\frac{6}{5}$; canine

$\frac{1}{1}$; grinders

short, broad,

roots simple;

crown stri-

ated; nearly flat;

external ears none;

nose elon-

gated into a

trunk. *Phoca*

cristata (P.

Proboscidea,

F. Cuv., fig.

168.), Gm.

5 sp.



OTARIA, Peron. Cutting teeth $\frac{6}{5}$; canine $\frac{1}{1}$; grinders

$\frac{6}{5}$; root simple;

the four

middle cut-

ting teeth with

a double edge;

crown with a

conical point,

and another smaller one before and behind; ex-

ternalearsdis-

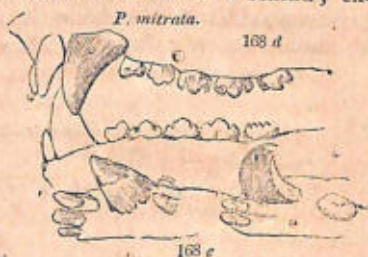
tinct. Ex.

Phoca Ur-

sina, L. (fig.

168. e, f.)

7 sp.



TRICHECUS, L.

Cutting teeth

$\frac{6}{5}$, small, de-

ciduous; ca-

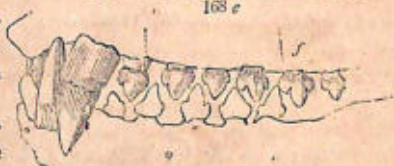
anine teeth

two only in

the upper

jaw, so enor-

mously large



as to resemble tusks; nostrils directed upwards, and not terminating the muzzle. *Trich. Rosmarus*, L. *Gen. Zool.* pl. 78. 2 sp.?

ORDER III. CETACEA. *Aquatic Mammalia.*

Body pisciform; pectoral fins two; caudal fin one, horizontal; ears with a very small exterior opening.

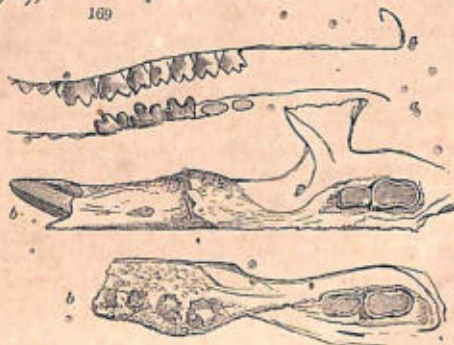
FAMILY SIRENIA. *Herbivorous Cetacea.*

Grinding teeth with flat crowns; whiskers hairy; nostrils placed at the end of the muzzle in the skin; body very large; mammae two, on the breast.

MANATUS, L. Grinding teeth $\frac{8-8}{5-5}$, the crowns flat, and marked by two transverse ridges; cutting and canine teeth wanting in the adults; pectoral fins with vestiges of nails at their edges; body long, ending in a crescent-shaped caudal fin. Ex. *Manatus Americanus*, Desm. (fig. 169. a, a). 2 sp. America, Africa.

HALICORE, Ill. Cutting teeth (in the adult) $\frac{2}{3}$, large, cylindrical, straight, strong, forming tusks, but covered by the lips; grinders $\frac{5-5}{5-5}$, resembling two cones joined at their sides; lips fleshy and hairy; caudal fin bilobed. Ex. *H. Indicus*, (fig. 169. b, b), Ill. 2 sp. Indian seas.

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RYTINA, Ill. Cutting and canine teeth none ; grinders $\frac{1-1}{1-1}$, consisting of a plate on each side the jaws, not attached by roots, but by a number of small vessels and nerves ; external ears none ; lips double ; eyes covered by a cartilaginous membrane. Ex. *Stellerus Borealis*, Cuv. The whale-tailed Manati, Penn. 1 sp. The South Seas.

FAM. CETE, Cuv.

Teeth conical or wanting ; nostrils assuming the form of spiracles ; skin smooth, shining, and destitute of hairs in every part ; mammæ placed near the vent.

SUB-FAM. ? DELPHINÆ. *Dolphins*.

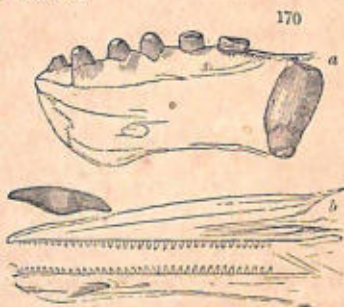
Small-headed *Cetaceæ* ; head moderate ; canine teeth, or none ; carnivorous.

CERATODON, B. Teeth consisting of two large tusks (straight, long, and pointed), placed in the situation of the cutting teeth, in the intermaxillary bone ; habits, those of the dolphins. Ex. *Monodon Monoceros*, L. 3 sp. ?

PHOCÆNA, C. Mouth not prolonged ; the head short and convex ; teeth numerous in each jaw ; dorsal fin one. Ex. *Delphinus Phocæna*, L. The Porpus. 9 sp. The Ocean.

DELPHINUS, Lin. C.

Mouth prolonged and narrowed ; base large ; apex rounded ; jaws widened posteriorly ; the edges furnished with numerous teeth ; dorsal fin one. *D. tursio* (fig. 170. b). 5 sp.



DELPHINAPTERUS, Lacep. Head obtuse; jaws not prolonged, but beak-formed; teeth $\frac{2-3}{9-9}$; dorsal fin none. Ex. *D. Leucæ* (fig. 170. a). 1 sp.

URANODON, Ill. Two acute teeth in the upper jaw, and spurious teeth in the palate; mouth depressed and narrow; dorsal fin one, medial. Ex. *Hyporodon Butskopf*, Lacep. C. 6 sp.

SUB-FAM. ? • BALÆNINÆ. *Whales.*

Head disproportionably large: of these, the two first genera are furnished with teeth in the lower jaw, which are wanting in the two last groups.

PHYSETER, Lacep. Head very much enlarged in the fore part; lower jaw with about twenty-one teeth on each side; spiracles nearly terminal; dorsal fin one. Ex. *P. microps*, Lacep. 2 sp.

CATODON, Lacep. Habit of the last; spiracles terminal; dorsal fin none. Ex. *C. macrocephalus*, Lacep. Species obscure.

BALÆNA, L. Head smaller; teeth none, but the upper jaw (which is keel-shaped) is furnished on each side with close thin plates called whalebone; spiracles distinct, and situated towards the middle of the upper part of the head; dorsal fin none. Ex. *B. mysticetus*, L. The common Whale. 4 sp.

BALÆNOPTERA, Lacep. Jaws somewhat pointed and rostrated; dorsal fin one. Ex. *Balæna Physalus*, L. 2 sp. The rest uncertain.

ORDER IV. UNGULATA. *The Hoofed Quadrupeds.*

TRIBE I. PACHYDERMES.

Feet with the toes, united together: their tips only distinct.

ELEPHAS, L. Cutting teeth assuming the form of two enormous tusks, slightly arched towards their ends, composed of ivory, and covered with enamel; grinders $\frac{2}{2} \cdot \frac{2}{2}$; feet five-toed; nose elongated into a long cylindrical proboscis. The Elephant. 2 sp.

HIPPOPOTAMUS, L. Cutting teeth $\frac{1}{1}$, the upper thick, short, conical, the under cylindrical; canine $\frac{1}{1} \cdot \frac{1}{1}$, assuming the form of strong tusks; grinders $\frac{7}{7} \cdot \frac{7}{7}$, the first three or four conical and simple; head thick and square; legs short, terminated by four nearly equal toes with small hoofs. 2 sp. Africa.

RHINOCEROS, L. Number of the teeth varying in the species; the cutting teeth unequal; the anterior grinders small, the posterior increasing progressively; one or two horns on the nose; feet three-toed; tail short, the tip compressed. Ex. *R. Indicus*, Cuv. Edw. pl. 221. India (fig. 171). *R. Sinus*, Burchell. *Tr. in Africa* (wantonly changed by some writers to *Camus*).



HYRAX, Gm. Cutting teeth $\frac{2}{2}$, the upper very strong and curved inwards, and detached from the grinders, which is the same as in the last genus; anterior toes three or four; posterior four, the inner furnished with a crooked nail. Ex. *H. Capensis*, Gm. *Pall. Mis.* pl. 3. Africa, 3 sp.

TRIBE II. ANOPLOTHERES.

Toes more than two, cleft into distinct hoofs.

SUS, Ant. Cutting teeth $\frac{4}{6}$ or $\frac{6}{6}$; canine $\frac{1}{1} \cdot \frac{1}{1}$, increasing in size by age; grinders $\frac{6}{7} \cdot \frac{7}{7}$, simple, tuberculous;

feet four-toed, the two middle ones only touching the ground; nose elongated. *S. Scropha*. The Hog. ° ° °

PHACOCERUS, F. C. Cutting teeth $\frac{3}{2}$, the two intermediate lower ones remote, and smallest; canine $\frac{1-1}{1-1}$, forming large rounded tusks, directed upwards from the sides of the jaws; grinders $\frac{5-5}{4-4}$, composed of cylinders united by a corticle; head large, with fleshy lobes. *P. Æthiopicus*. The Æthiopian Boar. 2 sp.?

DICOTYLES, Fred. C. Cutting and grinding teeth as in *Sus*; canines or tusks not projecting beyond the mouth; anterior toes four, posterior three, the small exterior toe of *Sus* being wanting; loins with a glandulous opening, secreting a foetid humour; tail obsolete. *D. torquatus*. The Pecary. 2 sp.

TAPIRUS, L. Cutting teeth $\frac{6}{6}$, the intermediate shorter than the exterior; canine $\frac{1-1}{1-1}$, moderate, detached; grinders $\frac{7-7}{7-7}$, their crowns forming two transverse ridges; anterior feet four-toed, posterior three-toed; nose forming a small fleshy trunk. *Tap. Americanus*, L. Gm. 2 sp.

PALEOTHERIUM, C. (Extinct.) Cutting teeth $\frac{6}{6}$; canine $\frac{2}{2}$; grinders as in *Rhinoceros*; nose lengthened into a short fleshy trunk; feet three-toed (*Cuv.*). The bones of this group (now extinct) have been discovered by M. Cuvier in the lime quarries near Paris, and in other parts of France. Eleven species have been detected, varying in size from that of a rhinoceros to a sheep. They appear, says M. Cuvier, to have frequented fresh-water lakes.

LOPHIODON, Cuv. (Extinct.) Allied to the last, but the inferior molars marked by transverse ridges. 12 sp.

ANOPLOTHERIUM, Cuv. (Extinct.) Teeth in a continuous series; incisors $\frac{6}{6}$; canines $\frac{3}{3}$; grinders $\frac{7}{7}$; feet with two toes on each, similar to the rumi-

nants, but deeply cleft; tail long, thick, and strong; form assimilating to the ruminants.

XIPHOON, Cuv. Anterior molars with their edges thin and sharp, the lower posterior molars (directly opposite to the concavity of their crescents) have a point, which, when worn, assumes the form of a crescent, so that then the crescents are double, as in the ruminants.
X. gracile. 1 sp.

DICHOBUNES, Cuv. Outer crescent of the molars pointed at their beginning, lower posterior grinders with points, disposed in pairs.*

N. B. It may probably be found, by analysis, that this is the only genus which truly belongs to this tribe; and that the tapirs, the pigs, and even the *Palæotheria* are aberrant forms of the true *Pachydermes*.

TRIBE III. EDENTATES.

Cutting teeth none; the nails large, and embracing the extremities of the toes.

MEGALONYX, Jefferson. (Extinct.) Size gigantic; head small, muzzle short, obtuse; trunk or proboscis small?; no incisors or canines; grinders $\frac{4-4}{4-4}$ approximating, prismatic, squared; fore feet longer and more slender than the hind, the three middle toes thick and long, their last joint enormous and ending in a strong claw; hinder feet with only one such toe. America. 2 sp.

BRADYPUS, L. Canine $\frac{1-1}{1-1}$; grinders $\frac{4-4}{3-3}$; canines larger than the grinders, pyramidal, pointed: grinders cylindrical; head small; muzzle truncated; anterior extremities longer than the posterior, with three toes armed with strong falcate nails. Fur long, lax. *B. tridactylus*, L. The Three-toed Sloth.
B. melanotus, Sw. S. Am.

CHÆLOPUS, Ill. Habits and general characteristics of the last; but the soles of the feet are callous and naked, instead of being hairy; muzzle rather pointed; anterior feet with only two toes. *Brad.*

* Cuvier, Theory of the Earth. Ed. Jameson, p. 271.

didactylus, L. Several species are probably founded under the name of varieties.

CHLAMYPHOTUS, Harlam. Cutting teeth none; grinders $\frac{8 \cdot 8}{8 \cdot 8}$, the crowns of the first two somewhat pointed, of the rest flat; head moderate, pointed, above broad. The whole upper parts of the animal defended by a coriaceous covering, the lower parts by fine silky hairs; tail rigid, inflexed beneath; claws very strong. *C. truncatus*, Harlam. (*Ann. of the New York Lyceum*, vol. i.) *Zool. Jacern.* No. 6. 1 sp. Chili.

DASYPIUS, L. Cutting teeth and grinders variable; their form, however, is cylindrical, separate, and without enamel on the inner side; head long, pointed; mouth small; tongue extensible; body entirely covered by a shelly armour, composed of small plates and transverse joints; anterior feet four or five-toed; nails formed for digging; tail long, round. *Das. septemcinctus*, L.

TOLYPTENTES, Ill. Habit of the last, but separated by Illiger, on account of there being no teeth in the intermaxillary bone. Ex. *Das. tricinctus*, L. Fred. Cuvier has also made a genus of such species as have cutting teeth, which he calls *Tatous*, but the name is altogether inadmissible.

ORYCTEROPUS, Geoff. Grinders $\frac{6 \cdot 6}{6 \cdot 6}$, each distinct, formed of a bony substance, and traversed longitudinally by parallel tubes; head elongated; anterior feet four-toed, posterior five-toed; nails very thick, and resembling hoofs. *Myrmecophaga Capensis*, Gm. 1 sp.

MYRMECOPHAGA, L. Teeth none; head much lengthened; muzzle tapering to a point; tongue long, protractile; toes united to the base of the nails; anterior feet four-toed, posterior five, or two before and four behind; nails strong, formed for digging; tail sometimes prehensile. Ex. *M. Jubata*, L. Great Ant-eater. Several species or varieties.

MANIS, L. Teeth none; body slender and elongate;

muzzle pointed ; tongue long, protractile ; feet with five toes formed for digging ; tail long ; body covered with hard plates, and capable of being rolled up into a spherical shape. Ex. *M. pentadactyla*, L. The short-tailed Manis. 2 sp.

MONOTREMA, Cuv. Teeth none ; the palate aculeated ; muzzle flat, small, and pointed ; eyes small ; external ears none ; legs short, five-toed ; males furnished with a perforated acute spur on the hinder legs, through which a poisonous secretion is ejected. The natural situation of the animals composing this division, in which are the two following genera, seems to be in this tribe.

ECHIDNA, C. (*Tachyglossus*, Ill.) Muzzle elongated ; mouth small ; tongue extensible ; teeth none, but the palate furnished with several rows of small spines, directed backwards ; body covered with short stiff spines ; tail very short ; claws long, strong. *Myrmecophaga aculeata*, Shaw. 2 sp. Australia.

ORNITHORHYNCHUS, Blumes. Grinders $\frac{2}{2} - \frac{2}{2}$, the tops flat, fixed only in the gum ; muzzle elongated, horny, flattened, resembling the bill of a duck, the edges armed with transverse plates ; feet formed for swimming ; the toes united by a membrane, which in the fore feet extends beyond the nails ; tail flattened. Ex. *O. rufus*. 2 sp. Australia.

TRIBE IV. RUMINANTES. *Ruminating Quadrupeds.*

FAMILY BOVIDÆ, Smith. *Oxen.*

Horns (in both sexes) persistent, vaginating upon a bony nucleus, porous and cellular, the horny sheath increasing by ringlets at the base ; the horns round, quite smooth, never straight, and invariably placed upon or at the sides of the frontals ; muzzle broad ; females always bearing an udder. Statue large, powerful ; habits gregarious.

CATOBLEPAS, Sm. Cutting teeth $\frac{2}{2}$; canine 0; grinders $\frac{6-6}{6-6}$. Horns curved outwards, the base broad, approximating, the tips turning down, and the points uncinating upwards; cheeks with a glandular excrescence; neck and throat matted; tail hairy as in the horses. Ex. *Antelope*, *Gnu*, L. Africa, 4 sp.

OVIPOS, Sm. Horns in contact on the summit of the head, where they are flat and broad, beyond which they bend down against the cheeks, having the points turned up; ears short, posterior; eyes small; tail short. Ex. *Bos Moschatus*, Gm. The Musk Ox, Penn. 2 sp. North America.

BOS, Sm. Skull very strong, dense about the frontals, which are convex, concave, or nearly flat; horns invariably occupying the crest, projecting at first laterally; osseous nucleus entirely porous; muzzle broad, naked, moist, black; ears moderate.

The concluding groups Major Hamilton Smith considers as sub-genera.

BUBALUS, Sm. Horns lying flat, or bending laterally in a posterior direction; head large; forehead very strong, narrow, convex; ears funnel-shaped; no hump on the back; limbs very solid; stature low. Ex. *Bos Caffer*, L. The Cape Ox, Penn. Africa, 4 sp.

BISON, Sm. Forehead slightly arched, much broader than high; shoulders rather elevated; tail shorter, and the legs more slender than in the last group; hair soft and woolly. Ex. The Bison. 5 sp.

TAURUS, Sm. Forehead somewhat concave; horns curving, outwards, upwards, and forwards; mane none; tail long. *Bos Ūrus*. *B. Taurus*. The other species and varieties not well ascertained.

ANŌA, Sm. Horns placed on the edge of the frontal crest, on the same plane with the face, exceedingly robust, slightly depressed, sub-triangular, short, straight, wrinkled, pointed; facial line straight; no suborbital opening. Ex. *A. depressicornis*, Leach. Sm. 1 sp. India.

FAM. ANTILOPIDÆ*, Sw. *Antilopes.*

Horns persistent, sheathing upon an osseous nucleus, nearly solid; the horny sheath receiving its increase by annual rings at the base, which form in most species annuli, wrinkles, or knots; the horns often compressed, and more or less angular; canine teeth none; form, in general, light, graceful; structure calculated for springing or for swiftness.

ANTILOPE, Sm. Cutting teeth $\frac{4}{6}$; canine none; grinders $\frac{4}{6}$; horns in both, or only in the male sex; bony core solid without sinus or pores, round or compressed, generally placed beneath the frontal crest; variously inflected.

DICRANOCERUS, Sm. Horns greatly compressed, rough, with an anterior process, and the point uncinating backwards, placed upon the orbits, and impending over the eyes; facial line convex; tail very short; structure cervine. Ex. *Antilope Furcifer*, Sm. *Lin. Tr.* xiii. 2 sp. North America.

AIGOCERUS, Sm. Horns (in both sexes) very large, pointed, simply bent back, annulated, placed above the orbits; tail as long as the thigh; mane reversed; throat and under jaw somewhat bearded; suborbital sinus and inguinal pores wanting; large. Ex. *Ant. leucophæa*, L. The Blue Antelope. 4 sp. Africa only.

ORYX, Sm. Horns (in both sexes) horizontal, very long, slender, pointed, annulate, and somewhat spirally twisted; ears long; mane on the neck reversed; tail as long as the thigh, the tip tufted; knees smooth; large. Ex. *A. Oryx*, L. 7 sp. The Old World.

GAZELLA, Sm. Horns (in both sexes) incurved, or turned outwards and again inwards, constituting a

* We should have gladly retained the name of *Capridæ* to this group, had we not ascertained that the goats were an aberrant, and not a typical genus; these latter groups always giving their name to the family.

- lyrate form, black, annulated, and striated; lachrymary sinus small; nose ovine; eyes very large and dark; knees generally tufted; tail short and tufted. Ex. *A. Pygarga*, L. 10 sp. Africa, Asia.
- ANTILOPE**, Sm. Horns (in the male only) never truly lyrate, seated below the frontal crest, and sometimes more or less spiral; suborbital sinus developed; inguinal pores distinct; a small bare space representing the muzzle; knees often tufted; gregarious. Ex. *Ant. Cervicapra*, L. The common Antelope. 6 sp. Asia, Africa.
- REDUNCA**, Sm. Horns (in the male only) placed behind the orbits, black, reclining, the tips bending forwards, annulated below, above smooth, short and slender; ears long; muzzle small; knees smooth; tail rather short. Ex. *A. Eleotragus*, Desm. 5 sp. Africa only.
- TRAGULUS**, Sm. Horns (in the males only) simple, straight, inclined, round, and shorter than the ears, generally quite smooth; ears long; tail very short; habits solitary. Ex. *A. Dama*, Cuv. 5 sp. Africa only.
- RAPHICERUS**, Sm. Animals of diminutive size; forehead narrow; horns without wrinkles, annuli, or striæ, round, very sharp, sub-vertical. 2 sp. Asia.
- Major Hamilton Smith observes, that the two species he notices are known only from their skulls; both of which are described from specimens in the museum of the College of Surgeons, London.
- TETRACERUS**, Leach. Horns (in the male only) four; the two upper, or true horns, simple, straight, smooth, acute, and rising on the frontal crest; the two lower, or spurious horns, much shorter, conical, and placed between the orbits; tail short. Ex. *Ant. Chickara*, Hardwicke. *Lin. Tr.* 2 sp. India.
- CEPHALOPHUS**, Sm. Horns (in the male only) small, straight, reclining, placed high on the forehead, annulated; muzzle small, black; hair of the forehead lengthened, tufted; knees smooth; tail short,

tufted. Solitary. Ex. *A. silvicultrix*, Sm. 11 sp. Africa.

NEOTRAGUS, Sm. Horns (in the male only) horizontal, very small, sub-annulate, black, pointed; suborbital slit none; head round; nose pointed; muzzle small; tail short; size very diminutive. Ex. *A. pygmaea*, Shaw. *Nat. Mis.* pl. 1. 2 sp. Africa.

TRAGELAPHUS, Sm. Horns (in the male only?) with angulated and somewhat spiral ridges, placed high on the frontals, and reclining; muzzle very small; lachrymary opening none; form elegant, though assuming that of goats; mammae four. Ex. *A. sylvatica*, L. 3 sp. Africa.

NEMERHÆDUS, Sm. Structure assuming the caprine form; skull solid, heavy; horns (in the male only?) short, round, bent back, and annulated at their base; muzzle small; the intermaxillary bone, in general, furnished with a pouch; hair coarse, loose; legs robust. Ex. *A. Sumatrensis*, L. 3 sp. Mountains of Asia.

RUPICAPRA, Ant. Sm. Structure caprine; horns (in both sexes) slender, vertical, attenuated, suddenly hooked at their extremities, the base with a few wrinkles; limbs strong; two glandular apertures behind the horns; hair rather long, with a small quantity of wool beneath. Ex. *Capra Rupicapra*, L. The Chamois. 3 sp.? Mountains of Europe and Asia.

APLOCERUS, Sm. Horns simple, sub-recumbent, coriaceous, obscurely annulated, the points smooth and bent back; muzzle and lachrymary opening none; tail short; structure approaching to the ovine forms. Ex. *A. lanigera*, Sm. *Lin. Tr.* Mountains of America, 3 sp.

CAPRA, Auct. Cutting teeth $\frac{6}{6}$; canine none; grinders $\frac{6}{6}$; horns (generally common to both sexes) either vertical or inclined, nodose, and more or less angular; muzzle, lachrymary sinus, and inguinal

pores wanting; chin bearded; forehead concave; tail short, flat, and naked at the base. Ex. *Capra Ibez.* 5 sp. The highest mountains of the Old World.

Ovis, Auct. Teeth as in *Capra*; horns (generally common to both sexes) large, spiral, more or less angular, vaginating upon a porous bony axis; forehead arched; beard under the chin obsolete; tail rather short; hair of two sorts, one harder and close, the other woolly; mammae two. Ex. *O. Aries*. The domestic Sheep; considered as a variety of *O. Musmon*. 3 sp. Gregarious in the mountains of all the quarters of the globe, except Australia.

DAMALIS, Sm. Cutting teeth $\frac{6}{6}$; canine none; grinders $\frac{6-6}{6-6}$; horns (common to both, of one sex) placed on the frontal crest, variously bent; the osseous core provided with a basal cavity, communicating externally by a sinus passing beneath the horny sheath; body large; head heavy; legs stout; neck short; generally furnished with a mane and beard; anterior parts elevated, hinder depressed.

The four following groups are considered by Hamilton Smith as sub-genera.

ACRONOTUS, Sm. Horns (in both sexes) with double flexures more or less developed, approximating and annular at their base; smooth and turned back at their tips; head narrow, long; inguinal pores; lacrymary opening small; knees smooth; shoulders elevated; tail moderate, tufted. Ex. The *Bubalis* of Pliny. 5 sp. Africa.

BOSELAPHUS, Sm. Horns (in both sexes) heavy, robust, placed on the summit of the frontals, wrinkled, nearly straight, but twisted, and partially armed with a ridge; neck maned; females with an udder of four mammae; stature very large. Ex. *Ant. oxeus*, Pall. 2 sp. Africa.

STREPSICERUS, Sm. Horns (in the male only) smooth,

without wrinkles, forming regular spiral curves, and placed on the frontals; muzzle broad; mane long; chin bearded; shoulders elevated; tail covered with long hair; stature large. Ex. Striped Antelope, *Penn.* 2 sp. ? Africa.

PORTAX, Sm. Horns (in the male only) placed on the sides of the frontal crest, short, robust, sub-angular, without rings; shoulders elevated; neck maned; throat hairy; dewlap small. Ex. *A. picta*, L. The Neel Ghau. 1 sp. Asia.

FAM. CERVIDÆ, Sm. *Stags.*

No canine teeth in the upper jaw of the male; no permanent horns, they being either deciduous, or none; feet truly bisulcated: hoofs succentorial. *Sw.*

CERVUS, L. Horns (in the male only) deciduous, solid, palmated, branched, or simple; the horn consisting in a burr, or rose-shaped foot, a beam and branches, or antlers; cutting teeth $\frac{1}{2}$; canine $\frac{1}{2}$ in the male, none in the female; head long, terminated by a muzzle; ears large; pupils elongated; hoofs succentorial. *Sm.*

Having analysed this group, we have here designated the genera and the sub-genera.

ALCE, Sm. *Elks.* Canine teeth none; horns united into one blade or palm, more or less indented; muzzle none; tail very short. Ex. *Cervus Alces*, L. 2 sp.

RANGIFER, Sm. Canine teeth in both sexes; muzzle incipient; horns in both sexes palmated or pointed. Ex. *Cervus Tarandus*, L. The Reindeer. 2 sp.

DAMA, Sm. Canine teeth none; muzzle developed; horns round, with the brow and bezantler pointed, and the summits palmated lengthways. Ex. *C. Dama*. The Fallow Deer. 4 sp., three of which are only known in a fossil state.

CERVUS, Lin. *Sw. Stags.* Canine teeth in the male

only; muzzle and suborbital sinus developed; horns round, three antlers turned to the front, summits terminating in a fork, or in snags, from a common centre. *Cervus Elaphus*. The Stag. The Wapiti. 9 sp., 1 extinct.

RUSA, Sm. Males, and sometimes the females, furnished with canine teeth; neck with a mane; horns trifurcate, with a basal but no medial antler, with one process (or snag) on the side of the beam, and forming a fork; muzzle broad; suborbital aperture deep. *C. Hippelophus*. The Great Axis of Pennant. 7 sp. India.

AXIS, Sm. Canine teeth none; horns similar to the last, but more slender; the suborbital aperture small or wanting; no mane on the neck; size moderate or small. *Cervus Axis*, L. 3 sp. India.

CAPREOLUS, Sm. *Roebucks*. Canine teeth and lachrymary sinus wanting; horns somewhat allied to the former; a small antler to the front, high over the beam, and the superior being turned backwards forms a fork. Ex. *Cervus Pygargus*, Shaw, and *C. Capreolus*, L. The Roebuck. 2 sp. Europe and Asia.

MAZAMA, Sm. Canine teeth none; muzzle developed; horns inclining to a flattened shape, bending into segments of a circle, the concave part to the front; one anterior internal antler, the others posterior and mostly vertical; tail long; suborbital pore forming a fold of the skin. *Cervus Mexicanus*, Penn. 8 sp. The New World.

SUBULO, Sm. *Broekets*. Muzzle widened to a glandular termination near the nostrils; lachrymary sinus small; horns simple, without branches or processes. *Cervus Nemoricagus*, Desm. 3 sp. Tropical America.

STYLOCERUS, Sm. *Munjaks*. Canine teeth (generally found in the males) long; muzzle small; suborbital sinus deep; horns small, with only one anterior process, standing upon elevated pedicles. *Cervus Philippinus*, Desm. 5 sp. Tropical Asia.

FAM. MOSCHIDÆ, Sw. *Musks.*

No horns in either sex, upper canines in the males only.

MOSCHUS, L. No horns; cutting teeth $\frac{0}{0}$; canine $\frac{1-1}{0-0}$, (mas.); grinding teeth $\frac{6-6}{0-6}$; the canine teeth of the male are long, and project out of the mouth; hind quarters more elevated than the anterior.
Ex. *M. Moschiferus*, L. The Musk of Thibet.
6 sp. The Old World.

FAM. CAMELOPARDÆ, Sw. *Giraffer.*

Frontal processes (in both sexes) prolonged in the shape of horns, covered with hairy skin, which is continued from the scalp, and terminated by long hard bristles.

CAMELOPARDALIS, Ant. Cutting teeth $\frac{0}{0}$; canine none; grinders $\frac{6-6}{0-6}$; head long; upper lip entire; lachrymary sinus wanting; neck enormously long, with a short mane; the anterior parts much elevated; back sloping; legs slender, the hinder ones shortest; tail tufted. 2 sp. Africa. 1. *Cam. Antiquorum*, Sw. Northern Giraffe. 2. *C. Australis*, Sw. South African Giraffe.

The ruminants are united by this genus and *Camelus* to the *Solipedes*.

TRIBE V. SOLIFEDES. *Single-hoofed Quadrupeds.*

One toe, or an undivided hoof, on each foot; no horns.

CAMELUS, L. Cutting, teeth $\frac{2}{0}$; canine $\frac{1-1}{1-1}$, conical, straight, and robust; false grinders $\frac{1-1}{1-1}$, detached; grinders $\frac{3-3}{5-5}$; back with one or two hunches; toes of the feet united underneath almost to the ends, ending in crooked nails. Ex. *C. Bactrianus*, L. The Camel. 3 sp.? The Old World.

AUCHENIA, Ill. Teeth in general resembling those of the camel; back without protuberances or hunch.

Ex. *Camelus Lama*, L. The Lama. 6 sp. The New World.

Equus, Antiq. Cutting teeth $\frac{3}{3}$, the crowns hollow when young; grinders $\frac{6-6}{6-6}$, furrowed on each side, the crowns square, flat, and marked by plates of enamel which form four crescents; feet ending in a single undivided hoof.

Ex. The Horse (*fig. 172.*), Ass, and Zebra. 6 sp.



ORDER V. GLIRES.—*Gnawing Quadrupeds.*

Two long incisors or cutting teeth pointing forwards, and no canines, in the lower jaw; upper canines, when present, small or obsolete. Sw.

DIV. I. GLIRES PROPER, with clavicles. (Order RODENTIA, Cuv.)

Canine teeth generally none; the lower jaw articulated longitudinally, so as to move only backwards and forwards; stomach simple. Cuv.

CASTOR, L. *Beavers*. Cutting teeth $\frac{3}{3}$, strong; grinders $\frac{4-4}{4-4}$, with a folded ridge of enamel on the outer edge, where there are three notches; tail flat, horizontal, scaly; a pouch, beneath, in the male. C. *fiber*, L. The Beaver. 2 sp. Europe and America.

FIBER, C. *Musk Beaver*. Cutting teeth $\frac{2}{2}$; canine $\frac{3-3}{3-3}$; grinders $\frac{3-3}{3-3}$, the summits flat, and presenting scaly transverse undulated laminae; anterior feet four-toed, with the rudiments of a thumb; posterior five-toed, margined with stiff hairs; tail long, compressed; no pouch. *Castor Zibethicus*, L. 1 sp.

MYOPOTAMUS, Com. Size, teeth, and general structure

of *Castor*, but the tail is long and round. Cuv.
M. coipus, Cuv. S. Am. 1 sp.

- 1.* *Rats and Mice*. Cutting teeth $\frac{3}{2}$, the inferior pointed; grinders variable; canine teeth, generally none; anterior toes four or five; posterior five; the hinder limbs furnished with clavicles.

ARVICOLA, Lacep. (*Hypudæus*, Ill.) Teeth as in the last; hind feet not furnished with lengthened hairs; tail long, round, hairy. *Mus amphibius*, L. The Water Rat, Penn. 19 sp.

GEORYCHUS, Ill. *Lemmings*. Cutting teeth $\frac{3}{2}$; grinders $\frac{3}{2}$; habit of the last; anterior toes formed for digging; tail and ears very short. *Mus Norvegicus*, L. The Lemming. 7 sp.

ECHIMYS, Geoff. *Spined Rats*. Cutting teeth $\frac{3}{2}$; grinders $\frac{4-4}{4-4}$; head long; eyes large; ears short; tail long, generally scaly; back covered, more or less, with short spines. *E. cristatus*, Desm. Gilt-tailed Dormouse, Penn. 8 sp. America only.

MYOXUS, Gm. *Dormouse*. Cutting teeth $\frac{3}{2}$; grinders $\frac{4-4}{4-4}$, divided by transverse bands; ears large and round; tail long, more or less villous; fur soft. *Mus avellanarius*, L. The common Dormouse. 5 sp. The old world.

HYDROMYS, Geoff. *Water Rat*. Cutting teeth $\frac{3}{2}$; grinders $\frac{2-2}{2-2}$, their crown, or tops, obliquely quadrangular and hollowed in the middle; hind feet semipalmated; tail long, cylindrical, covered with thick hair. *H. Leucogaster*, Geoff. 2 sp. Australia.

MUS, Auct. Cutting teeth $\frac{3}{2}$; grinders $\frac{3-3}{2-2}$, furnished with blunt tubercles, the anterior the largest; tail long, naked, and scaly; fur of the back rarely intermixed with spines. *Mus Rattus*, L. Common Rat. 33 sp.

CAPROMYS, Desm. Grinders $\frac{4-4}{4-4}$; tail moderate or long, very thick at the base, scaled, nearly naked;

* These divisions are purely artificial, and merely formed to facilitate the search among so many unranked groups.

scansorial ; fore feet four-toed ; thumb rudimentary ; hind feet strong, thick, five-toed ; walk plantigrade. *Cap. prehensilis*. South America.

CRICETUS, G. *Hamster*. Teeth like those of *Mus* ; cheek pouches very large ; head thick ; ears oval, round ; tail short and hairy. *C. vulgaris*, Desm. The Hamster. 9 sp. Europe and Asia.

2. Fore legs very short, hind legs long. *Jumping Mice*.

DIPUS, C. *Jerboa*. Cutting teeth $\frac{3}{2}$, the lower acute ; grinders $\frac{3-3}{2-3}$ or $\frac{4-4}{4-4}$, simple, with tuberculous crowns ; anterior feet short ; hind feet disproportionately long, with one metatarsus for the three middle toes. *Mus Jaculus*, L. (*D. Sagitta*, Dum.) 5 sp.

GENIBILLUS, Desm. Cutting teeth $\frac{3}{2}$; grinders $\frac{3-3}{2-3}$; the first with three tubercles, the second with two, and the last with one ; ears moderate ; feet as in *Dipus* ; but each of the five toes of the hind feet have a distinct metatarsus ; tail long, covered with fur. *Mus Tamariscinus*, Pall. Tamarisk Jerboa, Sh. Gen. Zool. 2. pl. 1. Africa and India only.

MERIONES, F. Cuv. Tail long, nearly naked. *M. Labradorius*. N. Zool. 1. 144. 3 sp. America only.

PEDETES, Ill. Cutting teeth $\frac{3}{2}$, the lower not pointed ; grinders $\frac{4-4}{4-4}$; head short, large, flat ; muzzle obtuse ; ears long, narrow, pointed ; eyes large ; cheek pouches none ; fore feet with five toes, hind feet with four ; the nails strong and formed for digging ; tail long, thick ; female with an abdominal pouch ; mammae external. *Mus Caffer*, Pall. Cape Jerboa, Penn.

LAGOSTOMUS, Brooks. Canine $\frac{2-2}{2-2}$; molars $\frac{4-4}{4-4}$, united by enamel ; fore legs short, with four toes, claws small ; hind legs with three unequal toes, the middle longest, the inner shortest ; tail bushy, pectinated. *L. trichodactylus*. Linn. Tr. xvi. p. 102.

CHINCHILLA, Bennett. Fore legs with five toes ; hinder with four ; ears large. *C. lanigera*, B. 1 sp.

LAGOTIS, Bennett. All the legs four-toed ; ears and tail much lengthened. *L. Cuvieri*, B. 1 sp.

3. Tail very short. *Mole and Sand Rats.*

GEOMYS, Schmaltz. *Sand Rat*. Incisors $\frac{2}{2}$, gr. molars $\frac{4-4}{4-4}$; lower jaw very thick and strong; head large, depressed; ears hardly seen externally; cheek pouches large and pendulous, opening internally; tail round; feet short, five-toed. *G. Douglasii*. *N. Zool.* 1, 200. pl. 18.b. America.

DIPLOSTOMA, Schmaltz. Cheek pouches very large; the opening being exterior. The other characters are uncertain. See *N. Zool.* 1. p. 206. America.

APLODONTIA, Richardson. Incisors $\frac{2}{2}$; molars $\frac{5-5}{4-4}$; lower jaw very strong; head large, depressed; ears short, round; cheek pouches none; feet five-toed; claws large, strong, compressed; tail minute, concealed by the fur. *Ap. leporina*. *N. Zool.* 1. 211. America.

ASPALAX, Guld. Cutting teeth $\frac{2}{2}$, large, square, the inferior much larger than the superior; grinders $\frac{3-3}{3-3}$, with tuberculous crowns; body long, cylindrical; eyes very small, entirely covered by the skin; no external ears; feet short, five-toed; tail naked. *Mus Typhlus*, Pall. *Glires*, pl. 8. Asia.

BATHYERGUS, Ill. Cutting teeth $\frac{2}{2}$, very long, large, square; grinders $\frac{4-4}{4-4}$, slightly tuberculous, the edges indented; body thick, cylindrical; head thick; muzzle truncated; eyes small, no external ears; feet short; toes five, the nails formed for digging; tail very short. *Mus maritimus*, Gm. 3 sp. Africa.

4. Tail long, bushy. *Squirrels.*

ARCTOMYS, Gm. Cutting teeth $\frac{2}{2}$, very strong, anterior surface rounded; grinders $\frac{5-5}{4-4}$, the upper surface ridged and tuberculous; body thick, heavy; head and eyes large; ears short; cheek pouches none; paws strong, anterior with four toes and an obsolete thumb, posterior five-toed; nails strong; tail short. *Mus Marmotta*, L. The Marmot. 6 sp.

SPERMOPHILUS, F. Cuv. "Teeth and habits of the last, but the cheeks are furnished with large pouches,

and the habits of the species are solitary. *Mus citellus*, Pall. Tab. 21. 13 sp. Chiefly America.

SCIURUS, Auct. Cutting teeth $\frac{1}{2}$, the upper flat in front, and wedge-shaped at the extremity, the lower pointed and laterally compressed: grinders $\frac{5.5}{4.4}$, tubercular, the upper occur only in the young; head small; eyes large; ears erect; anterior feet short, with four long toes, posterior with five; nails long, curved; tail long, covered with long bushy hair. *S. vulgaris*, L. The common Squirrel. About 40 sp.

PTEROMYS, Geoff. Teeth as in *Sciurus*; the skin dilated on the sides of the body, and extending from the anterior to the posterior extremities, by which the animal is sustained a few moments in the air. *Sciurus volans*, L. Gen. Zool. 2. pl. 149. (*G. Sciuropterus*, F. Cuv.) 8 sp.

CHEIROMYS, C. Cutting teeth $\frac{2}{2}$, strong; canine none; grinders $\frac{4.4}{3.3}$; fore legs short; the middle toe thin and very long; hind legs lengthened; tail long, tufted. *Lemur psylodactylus*, Shaw. (fig. 173.) Gen. Zool. pl. 34. India. 1 sp. Affinities uncertain.



DIV. II. Clavicles rudimentary, or none. Cuv.

G. HYSTRIX, L. Cutting teeth $\frac{2}{2}$; canine 0; grinders $\frac{4.4}{4.4}$, cylindrical, the tops flat, but furnished with ridges of enamel; head thick; tongue with spiny scales; body armed with rigid sharp spines, sometimes intermixed with hair; tail short. *H. cristata*, L. (*H. dorsata*, Gm.) The remaining species Fred. Cuvier has formed into the following subgenera, but we reject that of *Atherura*, as being only an aberrant species.

ACANTHION, F. Cuv. Tail long, more or less tufted. *H. fasciculata*.

ERETHIZON. Hair long; spines short, concealed; tail moderate, prehensile. *Hyst. dorsata* Gm.

SINETHERES. Body covered only with spines; tail long, pointed, and prehensile. *H. Cuandu*, Desm. Brazilian Porcupine, Penn. Quad. pl. 73.

SPIGURUS. Tail beneath naked. Ex. *Le Coni* of Azara. The two first of these types inhabit the Old World; the remaining three are found in the New.

G. LEPUS, Auct. Cutting teeth $\frac{1}{2}$, the upper in pairs, two in front large and grooved, and two smaller behind; lower teeth square; grinders $\frac{6 \cdot 6}{5 \cdot 5}$, composed of two soldered vertical plates; a sixth, very small, in the upper jaw; soles of the feet, hairy; anterior feet with five toes; posterior with four; tail very short, turned upwards. *L. timidus*, L. The common Hare. 11 sp.

LAGOMYS, Geoff. Teeth and feet like the last; ears moderate; hind legs not much larger than those before; tail none; clavicles more developed. *Lepus Alpinus*, Pall. Gl. pl. 2. 3 sp.

G. CAVIA, L. *Cavies*. Body covered with hair like bristles; tail none.

HYDROCHÆRUS, B. Cutting teeth $\frac{2}{3}$, without a groove, the lower compressed and acute; grinders $\frac{4 \cdot 4}{4 \cdot 4}$, lamellar; muzzle compressed; eyes large; ear moderate, round; anterior feet with four palmated toes, posterior with three; hair scattered and bristly. *Cavia Capybara*, Gm. 1 sp.

COBAYA, C. Cutting teeth $\frac{2}{3}$; grinders $\frac{4 \cdot 4}{4 \cdot 4}$; body thick; eyes large; ears round; legs short; feet not palmated, four toes before and three behind. *Mus BraziKensis*. The Guinea-pig. 1 sp.

DASYPROCTA, Ill. Cutting teeth $\frac{2}{3}$; grinders $\frac{4 \cdot 4}{4 \cdot 4}$; head rather elongated; forehead flat; muzzle thick; eyes large; anterior feet with four toes and an obsolete thumb, posterior longer, three-toed; nails long, strong; soles of the feet naked and callous. *Cavia Aguti*, Gm. 5 sp.

CAVIA, F. Cuv. Cutting teeth $\frac{2}{3}$; grinders $\frac{4 \cdot 4}{4 \cdot 4}$; all the feet with five toes; the interior toes of the fore feet, and the lateral toes of the hind, very small. *Cavia subniger*. 2 sp.

Marsupial Rodentia. Situation uncertain.

PHASCOLOMYS, Geoff. Cutting teeth $\frac{2}{2}$, strong; canine none; grinders $\frac{5-5}{5-5}$, detached from the cutting teeth; head large, flat; ears short; feet five-toed, anterior claws strong; posterior thumb small, indistinct; claw none; tail very short. *P. fusca*, Geoff. The Wombat.

AMBLOTES, Ill. Habit of the last; cutting teeth $\frac{6}{6}$; canine $\frac{2}{2}$.

Amblotes Fossor. 1 sp.

PHASCOLARCTOS, Blainv. Cutting teeth $\frac{6}{6}$; false grinders 2, above; grinders $\frac{4-4}{4-4}$, with two tubercles; ears large and pointed; feet five-toed, the anterior divided into two portions, the thumb and under finger in one, and the three others in the second; hind feet with a large clawless thumb, the two inner toes small and united. *P. cinereus*, the Koala. Australia.

FAMILY MARSUPIDÆ, Swainson. *Herbivorous Marsupials.*

Teeth various, but the canines wanting in the under jaw or in both; lower incisors two, very long, pointing forwards, generally acute; thumb of the hind extremities mostly distinct and opposable to the other toes; in a few species wanting; tail very long, saltatorial or scansorial (prehensile); abdomen with a marsupial pouch.

HALMATURUS, Ill. *Kangaroo*. Cutting teeth $\frac{6}{6}$; canine none; grinders $\frac{5-5}{5-5}$; hind legs very large and



long, four-toed, the two inner toes small and united, the middle very large and strongly clawed, the outer moderate; the metatarsus very long and thin; tail very strong. *Did. gigantea*, Gm. (fig. 174.) The great Kangaroo. *White's Voy.* 10 sp.

HYPSIPRYMNUS, Ill. *Kangaroo Rat*. Cutting teeth



$\frac{6}{2}$, the lower, very long; canine $\frac{0.0}{2}$, very small; grinders $\frac{5.5}{3.5}$; head long, pointed; ears large; feet five-toed, anterior short, hinder saltatorial; the third toe very large; tail moderate, thick, scaly. *Hypsiprymnus murinus*, Ill. (Fig. 175: the under jaw.) *Potoo-roo*. *White's Voy.*

PHALANGISTA, Geoff. *Phalangers*. Cutting teeth above, 6, the two middle longest and narrow; below, 2; canines?, above, 4, beneath, 0; grinders $\frac{6}{3}$; * tail prehensile; feet distinct, formed for walking,



five-toed; hinder thumb wanting. *Did. orientalis*, Gm. *D. Lemurina*, Sh. *Ph. rufa*, Cuv. (fig. 176, the upper jaw.)

PETAURISTA, Bell. Sw. *Mouse Phalangers*. Cutting teeth $\frac{4}{1}$, the two middle in the upper jaw approximating, the two lateral somewhat remote; cutting teeth above, one on each side; ears large, round; tail thick at the base, tapering to a point, slightly hairy, nearly naked; anterior thumb with a nail, posterior thumb without. 2 sp. 1. *Phalangista nana*, Tem. ? 2. *P. gliriformis*, Bell. *Lin. Tr.*

PETAURUS, Shaw. *Flying Phalangers*. Cutting teeth $\frac{6}{1}$; lower canine none; grinders $\frac{5}{3}$, the anterior conic, the posterior tuberculated; head elongate; feet five-toed, united by a loose skin to the body; the posterior thumb wanting; tail elongated, hairy, prehensile. *Did. petaurus*, Shaw. *Hepoona Roo*. *White's Voyage*, p. 208.

* The teeth in this group would seem to vary in the species, for no two authors have stated them in the same way.

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