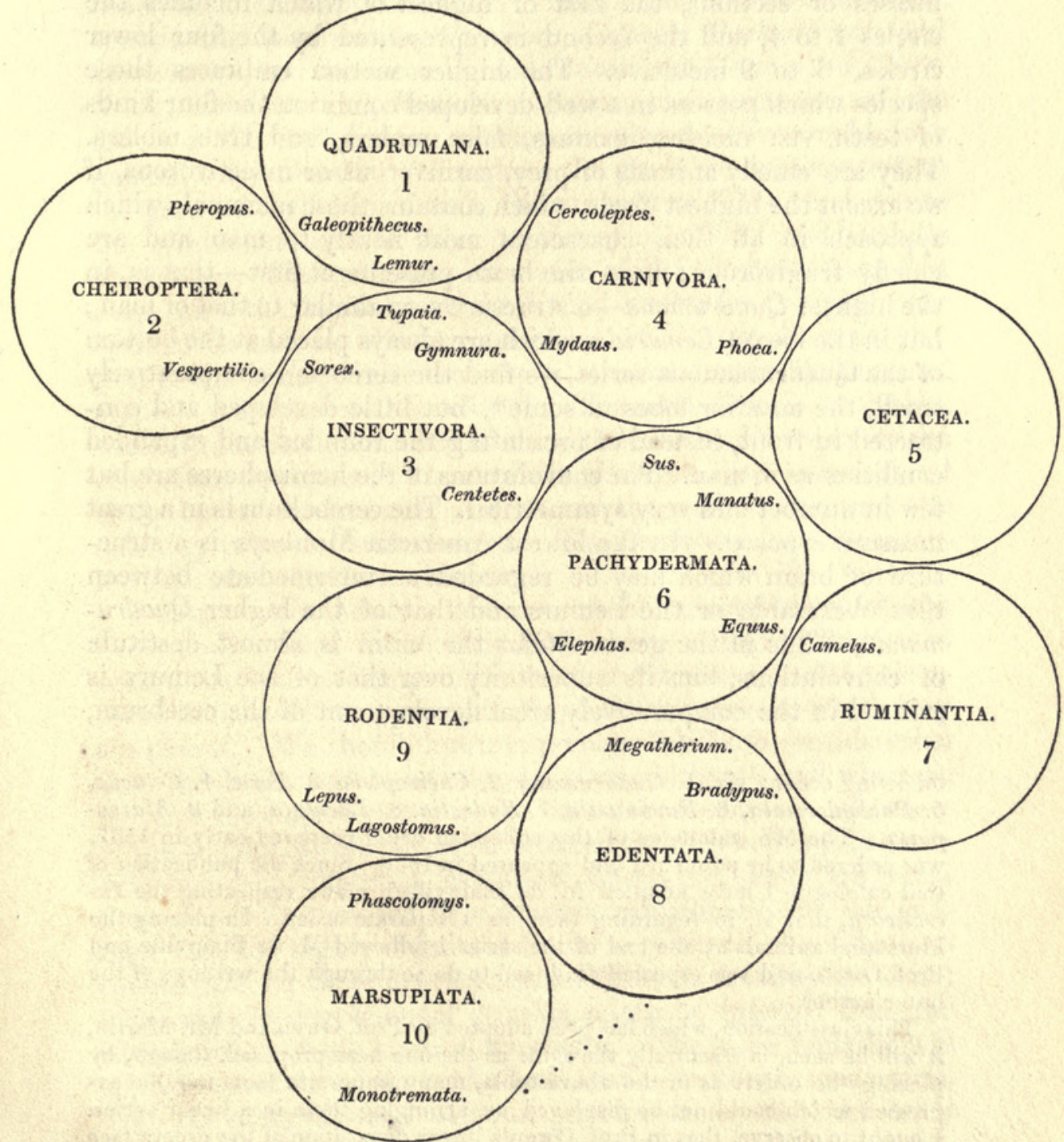


L.—*Observations on the Classification of the Mammalia.* By  
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 rator to the Zoological Society, &c.

THE following observations are chiefly explanatory of the accom-  
 panying tabular arrangement, in which I have attempted to group  
 the various orders of the class Mammalia so as to display their  
 mutual relations :



In this table the orders are represented by circles : the numbers  
 in the circles indicate the order of succession in which it appears  
 to me the great groups should follow each other when it is ne-  
 cessary to treat of them as though they formed a linear series\* :

\* The extensive collection of Mammalia belonging to the Zoological  
 Society was arranged by myself, towards the end of the year 1836, in the

those numbered 1 to 9 inclusive comprise the nine orders of Placental Mammalia; and the lowest circle, 10, represents the Implacental Mammals, which in the structure of their brain, and in their generative and vascular systems, exhibit the lowest grade of organization observable in the class; that is, the most remote from man, and the most approximate to the oviparous classes.

The Placental series appears to divide itself into two great masses or sections, the first or highest of which includes the circles 1 to 4, and the second is represented by the four lower circles, 6 to 9 inclusive. The higher section embraces those species which possess in a well-developed condition the four kinds of teeth, viz. incisors, canines, false molars, and true molars. They are chiefly animals of prey, carnivorous or insectivorous, if we except the highest circle, which contains those mammals which approach in all their characters most nearly to man, and are chiefly frugivorous: here the brain presents at first—that is, in the highest *Quadrumana*—a structure very similar to that of man; but in the lowest *Lemuridæ*, which are always placed at the bottom of the *Quadrumanous* series, we find the cerebrum comparatively small, the anterior lobes in some\*, but little developed and contracted in front, instead of presenting the rounded and expanded condition as in man. The convolutions of the hemispheres are but few in number and very symmetrical. The cerebellum is in a great measure exposed. In the lowest American Monkeys is a structure of brain which may be regarded as intermediate between that observable in the Lemurs and that of the higher *Quadrumana*. Thus in the genus *Midas* the brain is almost destitute of convolutions, but its superiority over that of the Lemurs is evinced in the comparatively great development of the cerebrum,

following order: viz. 1. *Quadrumana*, 2. *Cheiroptera*, 3. *Feræ*, 4. *Cetacea*, 5. *Pachydermata*, 6. *Ruminantia*, 7. *Rodentia*, 8. *Edentata*, and 9. *Marsupiatæ*. The MS. catalogue of this collection being prepared early in 1837, was ordered to be published and appeared in 1838. Since the publication of that catalogue I have adopted M. de Blainville's views respecting the *Insectivora*, that is, in regarding them as a separate order. In placing the Marsupial animals at the end of the series I followed M. de Blainville and Prof. Owen, and was especially induced to do so through the writings of the latter author.

This classification, which has been adopted by Prof. Owen and Mr. Martin, it will be seen, is essentially the same as the one here proposed, though, by placing the orders as in the above table, many important facts may be expressed which could not be displayed by arranging them in a linear series. I ought to observe, that in Prof. Owen's linear disposition of the orders (see the 'Cyclopædia of Anat. and Phys.' part 21), the *Edentata* precede the *Rodents*, and are not, as in the Catalogue of the Zoological Society's Collection, placed *after* that group. This change I adopt, but with some hesitation.

\* See Recherches d'Anatomie comparée sur le genre *Stenops* d'Illiger, by Prof. Vrolik.

which is much less contracted in front, and is produced posteriorly so as almost totally to conceal the cerebellum\*.

Taking the general form of the brain into consideration, the Placental Mammalia would appear divisible into two sections: first, those in which the cerebrum is generally of a rounded form, obtuse in front and provided with distinct convolutions; and secondly, those in which the cerebrum is destitute of convolutions, or nearly so, and usually contracted in front. The first division would contain the *Quadrumana*, *Carnivora*, *Cetacea*, *Pachydermata* and *Ruminantia*, and the second would contain the *Cheiroptera*, *Insectivora*, *Edentata* and *Rodentia*. Again, the succession of the orders of the first division as they are placed above would, in a general way, tolerably well express the grade of development in the parts of the brain of each, the proportion of the cerebrum to the cerebellum, and of these to the spinal chord and medulla oblongata. The medullary substance of the cerebrum is at first deep, and the capacity of the lateral ventricles is small; the optic lobes and the olfactory tubercles are also small in proportion to the brain, whilst the corpus striatum, optic thalami and corpora striata are well developed. The cerebellum is concealed, whilst in the last-mentioned of these orders (the *Ruminantia*) the cerebellum is exposed; the medulla oblongata and spinal chord are proportionately large, and so are the optic lobes, and the olfactory tubercles still more so. The *Carnivora* form an intermediate group in these characters.

I must notice however the remarkable exception which the Seals and *Cetacea* form: they both have a highly organized brain; the Seals as compared with other *Carnivora*, and the Cetaceans immensely so, as compared with the orders near which they are placed. We should however perhaps take into consideration that the brain has to be educated from without; and when we perceive the imperfections in the educatory media—the senses—in the Whales, where the organ of smell is either wanting or exists only in a very imperfect condition, where the hands are transformed into fins covered by a common integument, we can conceive that the highly organized brain is given to the Whale to compensate for these deficiencies, and that its intelligence is not necessarily in degree equal to what might be inferred from the consideration of the brain abstractedly. The same remarks will apply to a certain extent to the Seals, and to some other mammals.

In the other classes I will not pretend to say that the order of succession of the groups will display the modifications exhibiting a higher or lower grade of organization in the brain; the

\* The brain of *Midas rufimanus* is figured and described by Prof. Owen in Part I. of the Philosophical Transactions for 1837.

materials at my disposal for forming a just conclusion on this point are most inadequate.

But are we in a condition to take for basis of a classification of the Mammalia, the structure of the brain?—I think not: though in the case of the *Marsupialia* it has afforded characters serving to separate that from other sections, and to indicate its proper position in the system, I am not prepared to follow those naturalists who would, in our present state of information, take this organ as one of primary importance in the distribution of the orders of the Placental series of Mammals. I cannot adopt the two great sections of this series as apparently indicated by the smooth and anteriorly contracted cerebrum on the one hand, and the convoluted cerebrum with its rounded anterior portion on the other. Were I to do so, I should find it necessary to remove some of the Lemurs from their group in the highest order of the first section, and to place them in the second section.

As regards the Cetaceans, although the condition of the senses may be taken into account in considering the brain with a view to forming an estimation of their intelligence, so highly an organized brain as is possessed by that group, it appears to me, forbids its being placed at the end of the class, as has been done. The stomach is very complicated, being divided into four or more compartments. The dentition is very abnormal; the teeth however will, I strongly suspect, bear a closer comparison in their structure with the simple teeth, sometimes observed in the first great carnivorous section (as in some of the Seals) than with the simple teeth of the *Edentata*. On the whole, the *Cetacea* are perhaps most conveniently located between the great carnivorous and the herbivorous sections; and as in the table, they may be connected with the *Pachydermata* through the Lamantin, &c., and with the *Carnivora* through the Seals. As regards the latter, the relationship of the *Cetacea* to the Seals, this is certainly somewhat remote, for the multilobulate kidneys, formed in both groups, as well as those characters which are simply adaptive for their aquatic habits, I cannot but regard as of little value as indicative of affinity.

The Manatus, Dugong and Rytina have by Cuvier been associated with the true Whales. From this view De Blainville, Prof. Owen\*, and some other zoologists and anatomists have dissented. De Blainville places the animals in question with the *Pachydermata*, and Prof. Owen strongly inclines to the same opinion: "We have seen (observes Prof. Owen) that the whole of the internal structure in the herbivorous *Cetacea* (Dugong,

\* See this author's account of the anatomy of the Dugong in the Proceedings of the Zoological Society for March 1838; and Ann. Nat. Hist. vol. ii. p. 300.

Manatus, &c.) differs as widely from that of the carnivorous *Cetacea* as do their habits: that the amount of variation is as great as well could be in animals of the same class, existing in the same great deep. The junction of the Dugongs and Manatees with the true Whales cannot therefore be admitted in a distribution of animals according to the organization. With much superficial resemblance, they have little real or organic affinity to the Walrus, which exhibits an extreme modification of the amphibious carnivorous type. I conclude, therefore, that the Dugong and its congeners must either form a group apart, or be joined, as in the classification of De Blainville, with the Pachyderms, with which the herbivorous *Cetacea* have the nearest affinities, and to which they seem to have been more immediately linked by the now lost *Dinotherium*."

On the whole then it appears to me, that the researches of the author just quoted, and of De Blainville, will bear out the assumption, that the animals forming the family of herbivorous *Cetacea* in the 'Règne Animal' are in fact aquatic *Pachydermata*, bearing the same relations to the ordinary Pachyderms as do the Seals (of which group the Walrus forms part) to the *Carnivora*. That there is a strong analogy between these animals and the true Cetaceans cannot be denied, but that there is any direct affinity I think is doubtful.

In the circles representing the different orders, I have introduced those genera belonging to each which appear to approach most nearly to other orders. Most of these approaches of genera of one order to the general characters of other orders have been before pointed out; I cannot pass on, however, without making some observations upon the nature of these approaches. Examples of this kind are numerous, and have given rise to a common belief, that, as a general rule at least, the various sections of animals, even those of the highest value, are gradually linked together. It has been most frequently stated, that the groups, large and small, of which the animal kingdom is composed, blend imperceptibly into each other; and supposing this view to be correct, it follows that there are many species so well balanced in their characters, that they cannot in a classification, without doing violence to those characters, be placed in any particular order; these links must be arranged *between* the orders, the characters of which they combine. But in those groups to which I have paid most attention, I will venture to assert, that species which even appear to require to be so located, are far from being numerous, and moreover, that in proportion as knowledge of the groups and species increases, so does the number of supposed links decrease; that is to say, it becomes less and less doubtful as to the group in which an animal should be placed. A short

time back the section *Marsupiata* was regarded by many as an unnatural assemblage of species which in reality belonged to other orders or groups; and on this point Prof. Owen observes, "It may be admitted, that at the period when the most judicious and learned naturalist, the then Vice-secretary of the Zoological Society, published his reasons for rejecting the *Marsupialia* as a distinct group in the 'Systema Mammalium,' and for distributing them among different placental orders, according to their supposed closer affinities, the contrary views set forth by M. de Blainville were defective in that kind of evidence which could alone render them convincing. The organization of the Marsupial animals was not at that time sufficiently elucidated to render any opinion as to their natural affinities really valid. Subsequent dissections have however shown, that the hypothesis which Cuvier had sanctioned by his authority was correct. The Marsupial animals have been proved to agree among themselves, and to differ from the analogous placental species by several important modifications not suspected when the Mammalia in the museum of the Zoological Society were arranged according to the quinary system\*."

Here we have a case, which, though it goes beyond my proposition, will serve to illustrate the impression which I wish to convey: various Marsupial animals, which are now all but universally admitted to form a natural group, have been supposed (when materials for forming a just conclusion were not at hand) to be members of other great divisions of the Mammalia.

Mr. Bennett asks, "What is there of importance in the structure of the Wombat, except this solitary character of the Marsupium, to separate it from the Rodent order?" But further information of the Wombat is acquired; it is found to possess some other characters in common with the other *Marsupiata*. "Surely the different groups of animals are imperceptibly linked together," might then have been the remark; or, it might have been discovered that other animals possessing the pouch approached very nearly to this supposed Rodent on the one hand and to the carnivorous Marsupials on the other, and the same remark might have been uttered. What said Cuvier in 1839 relating to this same animal?—"That it is a true Rodent as regards its dentition and intestines, its only relation to the *Carnivora* being evinced in the articulating portion of the lower jaw; and in a rigorously exact system it would be necessary to place it with the *Rodentia*; we should, in fact, have there arranged it, if we had not been led to the Wombat by a regular uninterrupted series from the Opossums to the Phalangers, from them to the Kangaroos, and from

\* Trans. Zool. Soc. vol. ii. part iv. p. 330.

these last to the Wombat; and, finally, if it were not that the organs of generation in that animal were perfectly similar to those of all belonging to the family *Marsupialia*." The Wombat then is an animal which appeared to link two orders or large sections, the *Rodentia* and the *Marsupialia*; but this case would have been insufficient to support the belief that these two groups very gradually blended into each other; for (admitting the Wombat approached very near to the Rodents) it would have been further necessary to point out the species of Rodents which linked the order, of which they formed part, with the Wombat. Cuvier observed that this animal was gradually linked with other *Marsupialia* (very dissimilar to the Rodents) by intermediate species, and mentions that fact as one which induced him to place it in the Marsupiate division, but he does not point out similar links on the Rodent side. A thorough examination of the Wombat and numerous other *Marsupialia* has now shown that these animals are much more closely connected than was supposed; most important peculiarities in these animals have been discovered, and the degree of relationship which the animal under consideration bears to the Rodents must in proportion be modified. On the other hand, Prof. Owen, in his dissection of a certain Rodent (the Biscacha\*, *Lagostomus trichodactylus*), has discovered peculiarities in the female generative organs of that animal in which it approaches nearer to the Marsupial type than has hitherto been observed in any of the Placental series: this is evinced in the presence of a longitudinal septum dividing the vagina into two canals for upwards of an inch beyond the *ora tinæ*; "rudiments of a vaginal septum," the Professor remarks, "occur in the young or virgin state of several genera; but it is only in the *Lagostomus* that a continuation of the median separation of the genital tubes has been continued beyond the uterine portion along so great an extent of the vagina and as a permanent structure." Let it be added to this, that in the order *Rodentia*, generally, other characters have been pointed out which indicate that this group evinces the nearest approach to the *Marsupialia*, yet as regards the two nearest species respectively of these neighbouring groups I cannot perceive, on the one hand, any traces in the Wombat of the peculiar characters which distinguish the *Lagostomus*, or the little family to which it belongs, from other Rodents, and *vice versâ*. There is, in fact, a considerable hiatus between the two groups. The *Lagostomus* is essentially a Rodent, but being one of the members of an order which in the Placental series is perhaps, on the whole, the furthest removed from the head of that series, and also it being certainly one among the

\* Proceedings of the Zoological Society for December 1839, p. 177; Ann. Nat. Hist. vol. vi. p. 68.

lowest species of that order, it begins to present that condition of the generative organs which characterizes the last section of Mammals (the *Marsupiata*), and which is there accompanied with other characters approaching the oviparous types. These facts and conclusions relating to the Biscacha induce me to place the genus to which it belongs in that part of the circle representing the Rodent order which is nearest to the circle of the *Marsupiata*. But I cannot place the Wombat (*Phascolomys*) in the corresponding part of the Marsupial circle without observing, that it appears to me its relationship to the Rodent group is of a different nature (or at least differs in degree); that it is only in what has been aptly termed 'adaptive characters' that its approach is evinced. These adaptive characters (which I conceive are by no means necessarily connected with affinity) consist in a superficial resemblance, owing to certain similar modifications of organs connected with the habits of the species: thus the Flying Lemur (*Galeopithecus*), Flying Squirrel (*Pteromys*), and Flying Phalanger (*Petaurus*) have a considerable resemblance to each other, arising from each being adapted to a mode of life which is in some respects the same in all, but the groups to which the three animals belong are in important zoological characters essentially different; yet it must be observed, that as the Rodents and *Marsupiata* are more near to each other than either are to the *Lemurida*, there exists a difference of degree as regards the extent of the hiatus which separates the three flying animals referred to: so it is I believe with the Wombat; it resembles the Rodents in certain adaptive characters, and the approach to the Rodents is only in degree equal to the approach of the order *Rodentia* to the order *Marsupiata*. The *Lagostomus* not only possesses characters which link the *Rodentia* to the *Marsupiata* generally, but goes beyond other species of its order in having a modification of its generative system which approaches it still more nearly to the last-mentioned group. The Wombat even in dentition agrees essentially with the Marsupial type, and not, as was supposed, with the Rodent.

It is in cases like one or the other of the two which I have endeavoured to illustrate, that I believe the several genera introduced in either of the circles of my table evince an approximation to other circles. I do not perceive that the orders imperceptibly blend into each other, nor am I at all satisfied that even in minor groups (such as families and genera) this perfect blending takes place.

The question which arises from such a position is, whether any species is formed essentially on two types of the same rank? Each animal is framed to perform certain functions, and is most perfectly adapted to those functions; but beyond this, is not each



species framed upon some general and particular model? Certainly it may be said with respect to the Water-rat (*Arvicola amphibia*), that it is framed on the Vertebrate model; on the Mammalian type of that model; on the Rodent type of the Mammalia; and it is equally clear to my senses that it possesses the same general structure of skull, combined with the anchylosed fibula to the tibia, &c., which characterize the Murine family of the Rodent order; but, beyond this, it exhibits a modification in the structure of the teeth in which it agrees with numerous other species of the family mentioned, and which are classed under the generic title *Arvicola*. So that in one sense the Water-rat may be said to be essentially framed upon more than one model, but, from the lowest to the highest of the divisions mentioned, each model is a modification of the type of the division which precedes it; and the case might be therefore symbolically represented by concentric circles of different sizes, the largest of which would typify the *Vertebrata*, and the smallest the genus *Arvicola* and so on. It does not appear that the Water-rat is framed upon two or more types of equal rank, and I strongly incline to the belief, that what is true of one species, as regards the point under consideration, is true of all.

There is one other point relating to the genera introduced in the table to which I wish to call attention, viz. that it often happens that those species of one order which approach most nearly to other adjoining orders, are not met, as it were, by a corresponding approach in those adjoining orders. Each order may throw out rays (to speak figuratively) to other orders, but the rays are seldom in the same direction. I have noticed one case illustrative of this point, that of the Wombat and *Lagostomus*: many might be adduced. Among the *Carnivora*, the genus *Mydaus* in general appearance and in its insectivorous diet resembles the species of the order *Insectivora*; but it differs widely in its dentition, having but one true molar to each side of each jaw, as in others of the group to which it belongs. On the other side we find a considerable approach evinced in the genus *Gymnura* (one of the *Insectivora*) to the Carnivorous order\*, displayed in the general form of the skull, in the presence of six incisors (a number unusual in the *Insectivora*), and well-developed canines. Here I can only perceive an approach, on the one hand, of one of the *Insectivora* to the order *Carnivora*, and on the other, one of the *Carnivora* approximating to the *Insectivora*. But the two animals mentioned do not approach towards each other in corresponding modifications of structure, for the *Gymnura* would bear a closer comparison with some of the small *Ursidæ*, where the

\* This animal in fact was originally described as a *Viverra*.

true molars are two in number, and sometimes not only assume the quadrate form but the prickly crowns, and even the four principal cusps as in *Gymnura*. In *Mydaus* (which is one of the *Mustelidæ*\*) the single true molar is of a very different general form, though the tubercles on its surface are somewhat acute: neither of these cases, in my opinion, exhibits an approach of direct affinity; and that instance of a certain resemblance between the *Gymnura* and the *Ursidæ*, just alluded to, it will be perceived, affords another illustration of points discussed in this paper; for among the *Ursidæ*, that species which in the structure of its molar teeth approaches more nearly to the *Insectivora*, is one which in other points is most removed from that order,—I allude to the *Ailurus*, which is remarkable in its group for the possession of retractile claws. It might be asked, “Does this latter animal then evince any affinity with the Cats, which are pre-eminently distinguished for their retractile claws?” In no one other character can I perceive the slightest approach; and yet many zoologists insist much upon the modifications of the extremities as of primary importance in classification. There are undoubtedly cases in which such characters are of considerable value, but this is when they are combined with others of acknowledged value, as in the case of the hoofed foot of the Ruminants, which is combined with the ruminant stomach and other peculiarities. I wish not to be misunderstood: I would reject no character, but I do not regard the same modification as always of the same value; that I should estimate by its constancy, *combined* with other peculiarities.

In the circle *Quadrumanæ*, I have placed the *Galeopithecus* or Flying Lemur near the Cheiropterous group †; not only be-

\* *Mydaus*, as well as *Arctonyx* and *Ratelus*, I do not hesitate to arrange with the Badgers (*Meles* and *Taxidea*), which form, according to my views, a little group of the *Mustelidæ* (and may be called *Melina*), and not of the *Ursidæ*, with which they are generally associated. They are clearly linked with the typical *Mustelidæ* by means of the Skunks (*Mephitis*). From the *Ursidæ*, among other characters, they are readily distinguished by their possessing but one true molar on each side of each jaw—the Bear tribe having two. The *Mustelidæ* approach the *Ursidæ* and the *Insectivora* in having no cæcum, and in the absence of any decided division between the large and small intestines.

† The *Galeopithecæ* are arranged by many mammalogists with the *Cheiroptera*; I have always however regarded them (as well as the Aye-Aye) as constituting an aberrant form of the *Lemuridæ*, and in addition to the points of resemblance noticed in my paper on the group, published in the Zoological Society's Transactions, I may call attention to others existing in the intestinal canal, pointed out by Cuvier in his ‘Leçons d'Anatomie Comparée:’ “Les *Galéopithèques* se distinguent des autres *Cheiroptères*, et se rapprochent des *Lémuriens* par la présence d'un très grand cæcum, et la division du canal intestinal en gros et petit intestin.”—M. de Blainville, in his great work on Osteology, now in course of publication, has placed the group in question with the *Lemuridæ*, and shown ample reasons for so doing.

cause it has the flank membranes extended from limb to limb, which enable it to sustain itself to a certain extent in the air, but because in its dentition, more especially in the structure of the molar teeth, there is a great resemblance to the ordinary *Vespertilionidæ*. The higher *Quadrumana* are remarkable among Mammals for the possession of a perfect bony socket for the eye, as in man; but as we descend in the Quadrumanous group the socket becomes less perfect; the malar bone, which forms the outer and part of the lower boundary of the orbit, is at first produced backwards, and joins with the sphenoid, superior maxillary and frontal bones to form a complete socket for the eye: this character runs through the whole of the old and new world Monkeys with slight modifications only, indicative of a receding from man. In *Tarsius spectrum*\* the socket is still comparatively perfect as compared with other *Lemuridæ*, where the orbital process of the frontal bone, joined with the malar bone, merely forms a broadish ring forming the outer boundary of the orbit. Lastly, in *Galeopithecus* we find the orbital process of the malar and frontal bones unconnected; there is indeed a considerable hiatus between the two processes. Here, again, we find an approach to the Bats: in these animals the orbital processes are generally wanting, but in the *Pteropi* those of the frontal bones are much produced; and so far, as well as in the general form of the skull, in having more perfect hands than other Bats, and in their frugivorous diet, they evince the nearest relationship observed in this group to the *Lemuridæ*; but there is no gradual blending of the two groups. The dentition of the *Pteropi* is most unlike that of *Galeopithecus*: the resemblance existing between the molar teeth of the latter animal and the Bats, before alluded to, holds good with the Bats generally, *with the exception of the Pteropi*.

Among the *Insectivora* is a genus (*Tupaia*) which has a skull and dentition remarkably approximate to that of the Lemurs. In the *Insectivora* generally the zygomatic arch is but little developed or is incomplete, and there is no orbital process; but in *Tupaia* the zygomatic arch is well developed, and the malar and frontal bones join to form a complete though slender bony orbit: the latter bone (the malar) is remarkable for being perforated, a

\* In the *Tarsius*, an approach to that extraordinary animal the Aye-Aye may be perceived in the superior development of the two foremost incisors of the upper jaw. The canines are very small compared with the ordinary *Lemuridæ*; and it is in the loss of these teeth and the other incisors (which are minute in *Tarsius*), and some of the false molars, which produce in the Aye-Aye so strong a resemblance (as regards the condition of the teeth) to the *Rodentia* as to have induced Cuvier and others to place it in that order. De Blainville has most ably combated this opinion and shown the true relations of the animal in question, and has not omitted to notice this fact, which had struck me, however, before I had seen his paper.

character which I do not recollect to have met with, except in the *Lemuridae*; here it is sometimes of moderate size, but generally very small\*. The resemblance in the dentition may be said to extend to number and form, excepting that in *Tupaia* there is an extra small false molar in the lower jaw: the lower incisors here have moreover the same horizontal direction and the same little keel along their upper surface as in the Lemurs.

I will here make one or two general remarks upon dentition. On the structure I will not comment; but as regards the number of certain teeth, some generalizations may be obtained which are important, and none of which are violated by the arrangement adopted. In the first place, in the Placental series there are never more than six incisors in each jaw; this is what may be termed the normal number in the *Placentalia*; an occasional absence of the full number in some groups is unimportant, as nearly allied species (in the *Carnivora* for instance) sometimes differ in the number of the incisors, and even the same individual may, when young, have the full number, but not when adult. There are cases, however, in which there is a permanent reduction in the number of incisors, as in the *Quadrumana*, which have normally  $\frac{4}{4}$ . I can only call to mind two exceptions even in which there are less than this number, and they are in *Tarsius spectrum*, where there are  $\frac{4}{2}$ , and the Aye-Aye, where there are  $\frac{2}{2}$ . The *Cheiroptera* have never more than four incisors in the upper jaw, and it is only in the lower divisions of the group that that number is exceeded, there being  $\frac{4}{6}$ . In the *Insectivora* the incisors are sometimes clearly  $\frac{6}{6}$  and sometimes less, but in the greater portion of the species the intermaxillary suture is obliterated at so early an age, that the precise number of incisors has never been determined. The *Marsupialia* are remarkable either for having the incisors exceeding the normal number, being sometimes as many as  $\frac{10}{8}$  or  $\frac{8}{6}$ , or for having but two incisors in the lower jaw when there are less than eight above; no Marsupial has incisors  $\frac{6}{6}$ , and there is but one species (the Wombat) in which the number in both jaws is the same. As regards true molars, there is no case among the *Placentalia* clearly made out in which there are more than  $\frac{3-3}{3-3}$ . In the *Marsupialia* there are normally  $\frac{4-4}{4-4}$ . The *Carnivora* (with one exception only) never

\* Often there is more than one of these minute perforations in the malar bone of the Lemurs.

have more than  $\frac{2-2}{2-2}$  true molars, and the decrease from this number to  $\frac{2-2}{1-1}$ , or  $\frac{1-1}{1-1}$ , or  $\frac{1-1}{0-0}$ , is important, inasmuch as, with but one or two exceptions, it is combined with other characters indicative of the great divisions in that group.

The *Pachydermata* vary much in their dentition, in some there being the four kinds of teeth well developed and greatly resembling that condition which characterizes the first great carnivorous and frugivorous section, as in the genus *Sus*, to which the little insectivorous animals forming the genus *Centetes* bear considerable resemblance in the general structure of the skull and the greatly developed canines, as well as in external characters. Other Pachyderms again (as the Horses) approach the Ruminants in a very marked degree; and lastly the Elephants, though linked with the ordinary *Pachydermata* through the extinct Mastodons, &c., differ remarkably from the normal species in their dentition, in which there is an approach to that of the Rodents; an approach is also perceptible in the sanguiferous system.

A relationship between the Sloths and the Ruminants is displayed in the structure of the stomach.

In all these instances of approach of species of one order to other orders here noticed, there is not a single case which would fairly bear out the notion that these orders imperceptibly blend into each other. There is always a tolerably well-marked line between them (hence I have enclosed the orders in circles). The aberrant species are readily traced back as it were into their own groups, and when they evince an approach to other circles, it is rather to the *order* than to any particular species of the order.

In conclusion, I would offer the following propositions and observations for consideration:—

Species of animals belonging to the same genus have an affinity to each other; genera of the same family have a mutual affinity; relationship of affinity may likewise exist between families of the same order and orders of the same class, but the degree of affinity is different in the different cases; it is more or less remote. Thus species of the same genus have an affinity of the *first* or nearest degree;

species of different genera of the *second* degree only;

—— of different families of the *third* degree;

—— of different orders of the *fourth* degree;

—— of different classes of the *fifth* degree.

A relationship may exist between species of different groups, which differs from either of the cases just mentioned; that which is commonly termed by naturalists a relationship of analogy. This again may vary in degree according to the affinities and

relative rank of the groups which present the cases of analogy. The analogy may be more or less remote: thus the case of analogy (so often quoted as such), as existing between the Goatsucker (*Caprimulgus*) and the Bat—members of different classes—might be regarded as an instance of analogy, say of the *fifth* degree; that of the Otters to the Beavers (animals of different orders of the same class), an analogy of the *fourth* degree; and that of the Beaver to the Coypu\* (both Rodents), an analogy of the *third* degree: again, the relationship existing between the Whales and Fishes may be one of analogy of the *fifth* degree; that existing between the Dugong and the Porpoise may be one of affinity or analogy; but in either case is less remote than the relationship of the *Cetacea* to the Fishes.

According to these propositions moreover, the relationship of the *Lagostomus* to the *Marsupiatæ* might be one of affinity of the *fourth* degree, whilst that of the Wombat to the *Rodentia* might be one of analogy of the same degree: that of the Wombat to the *Phalangistidæ*, an affinity of the *third* degree, and of the Koala to *Phalangista*, an affinity of the *second* degree; and lastly, that of *Phalangista vulpina* to *Phalangista Cookii*, of the nearest or *first* degree. The affinity of the *Monotremata* to the class *Reptilia* would be several degrees further removed than that of the *Echidna* to the *Ornithorhynchus*.

LI.—*Catalogue of the Birds found in Corfu and the other Ionian Islands, also on the coast of Albania; from Notes made during a sojourn of four years.* By H. M. DRUMMOND, 42nd R.H. With Notes by H. E. STRICKLAND, M.A.

[THIS valuable paper was read to the Zoological Section at Cork, and being afterwards placed in my hands, I have ventured to append a few notes before sending it to press. When I was at Corfu in 1835 I had the pleasure of becoming acquainted with Captain Drummond, at that time I believe the only ornithologist in the Ionian Islands. He had even then formed a considerable collection, and the following list will show the great extent of his subsequent researches. The nomenclature is that of Temminck's 'Manuel d'Ornithologie,' and though the names have undergone modifications from later ornithologists, yet there will be no difficulty in recognising the species by means of them. I have annexed the letter B. to those species which have also occurred in Britain.—H. E. S.]

\* These two animals are essentially modelled upon different types of the Rodent order.