

February 1, 1881.

Professor Flower, LL.D., F.R.S., President, in the Chair.

The following papers were read :—

1. On the Evolution of the Placenta, and on the possibility of employing the characters of the Placenta in the Classification of the Mammalia. By F. M. BALFOUR, M.A., F.R.S., Fellow of Trinity College, Cambridge.

[Received January 22, 1881.]

From Owen's observations on the Marsupials it is clear that the yolk-sac in this group plays an important (if not the most important) part, in absorbing the maternal nutriment destined for the foetus. The fact that in Marsupials both the yolk-sac and the allantois are concerned in rendering the chorion vascular, makes it *à priori* probable that this was also the case in the primitive types of the Placentalia; and this deduction is supported by the fact that in the Rodentia, Insectivora, and Cheiroptera this peculiarity of the foetal membranes is actually found. In the primitive Placentalia it is also probable that from the discoidal allantoic region of the chorion simple foetal villi, like those of the Pig, projected into uterine crypts; but it is not certain how far the umbilical region of the chorion, which was no doubt vascular, may also have been villous. From such a primitive type of foetal membranes divergences in various directions have given rise to the types of foetal membranes found at the present day.

In a general way it may be laid down that variations in any direction which tended to increase the absorbing capacities of the chorion would be advantageous. There are two obvious ways in which this might be done, viz. (1) by increasing the complexity of the foetal villi and maternal crypts over a limited area, (2) by increasing the area of the part of the chorion covered by the placental villi. Various combinations of the two processes would also, of course, be advantageous.

The most fundamental change which has taken place in all the existing Placentalia is the exclusion of the umbilical vesicle from any important function in the nutrition of the foetus.

The arrangement of the foetal parts in the Rodentia, Insectivora, and Cheiroptera may be directly derived from the primitive form by supposing the villi of the discoidal placental area to have become more complex, so as to form a deciduate discoidal placenta, while the yolk-sac still plays a part, though physiologically an unimportant part, in rendering the chorion vascular.

In the Carnivora, again, we have to start from the discoidal placenta, as evinced by the fact that in the growth of the placenta the

allantoic region of the placenta is at first *discoidal*, and only becomes zonary at a later stage. A zonary deciduate placenta indicates an increase both in area and in complexity. The relative diminution of the breadth of the placental zone in late foetal life in the zonary placenta of the Carnivora is probably due to its being on the whole advantageous to secure the nutrition of the foetus by ensuring a more intimate relation between the foetal and maternal parts, than by increasing their area of contact. The reason of this is not obvious, but, as shown below, there are other cases where it is clear that a diminution in the area of the placenta has taken place, accompanied by an increase in the complexity of its villi.

The second type of differentiation from the primitive form of placenta is illustrated by the Lemuridæ, the Suidæ, and *Manis*. In all these cases the area of the placental villi appears to have increased so as to cover nearly the whole subzonal membrane, without the villi increasing to any great extent in complexity. From the diffused placenta covering the whole surface of the chorion, differentiations appear to have taken place in various directions. The placenta of Man and Apes, from its mode of ontogeny, is clearly derived from a diffused placenta (very probably similar to that of Lemurs) by a concentration of the foetal villi, which are originally spread over the whole chorion, to a disk-shaped area, and by an increase in their arborescence. Thus the discoidal placenta of Man has no connexion with, and ought not to be placed in, the same class as those of the Rodentia, Cheiroptera, and Insectivora.

The polycotyledonary forms of placenta are due to similar concentrations of the foetal villi of an originally diffused placenta.

In the Edentata we have a group with very varying types of placenta. Very probably these may all be differentiations within the group itself from a diffused placenta such as that found in *Manis*. The zonary placenta of *Orycteropus* is capable of being easily derived from that of *Manis* by the disappearance of the foetal villi at the two poles of the ovum. The small size of the umbilical vesicle in *Orycteropus* indicates that its discoidal placenta is not, like that of the Carnivora, directly derived from a type with both allantoic and umbilical vascularization of the chorion. The discoidal and dome-shaped placenta of the Armadillos, *Myrmecophaga*, and the Sloths may easily have been formed from a diffused placenta, just as the discoidal placenta of the Simiidæ and Hominidæ appears to have been formed from a diffused placenta like that of the Lemuridæ.

The presence of zonary placenta in *Hyrax* and *Elephas* does not necessarily afford any proof of affinity of these types with the Carnivora. A zonary placenta may be quite as easily derived from a diffused placenta as from a discoidal placenta; and the presence of two villous patches at the poles of the chorion in *Elephas* very probably indicates that its placenta has been evolved from a diffused placenta.

Although it would not be wise to attempt to found a classification upon the placental characters alone, it may be worth while to make

a few suggestions as to the affinities of the orders of Mammalia indicated by the structure of the placenta. We clearly, of course, have to start with forms which could not be grouped with any of the existing orders, but which might be called the Proto-placentalia. They probably had the primitive type of placenta described above: the nearest living representatives of the group are the Rodentia, Insectivora, and Cheiroptera. Before, however, these three groups had become distinctly differentiated, there must have branched off from the primitive stock the ancestors of the Lemuridæ, the Ungulata, and the Edentata.

It is obvious on general anatomical grounds that the Monkeys and Man are to be derived from a primitive Lemurian type; and with this conclusion the form of the placenta completely tallies. The primitive Edentata and Ungulata had no doubt a diffused placenta which was probably not very different from that of the primitive Lemurs; but how far these groups arose quite independently from the primitive stock, or whether they may have had a nearer common ancestor, cannot be decided from the structure of the placenta. The Carnivora were certainly an offshoot from the primitive placental type which was quite independent of the three groups just mentioned; but the character of the placenta of the Carnivora does not indicate at what stage in the evolution of the placental Mammalia a primitive type of Carnivora was first differentiated.

No important light is thrown by the placenta on the affinities of the Proboscidea, the Cetacea, or the Sirenia; but the character of the placenta in the latter group favours the view of their being related to the Ungulata.

2. On some Birds collected by Mr. E. F. im Thurn in British Guiana. By P. L. SCLATER, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received January 17, 1881.]

Mr. Everard F. im Thurn having placed in my hands for determination a series of bird-skins collected by himself or under his supervision in British Guiana in 1878 and 1879, I have had great pleasure in putting names to these specimens. Amongst the 160 species, examples of which are in the collection, are some which require a few remarks for their better identification. These are:—

1. VIREOLANIUS LEUCOTIS (Sw.).

Vireolanius leucotis, Salvin, Ibis, 1878, p. 443, pl. xi.

One example, obtained in June 1879 on the Mazaruni river by H. Pauli, a collector employed by Mr. im Thurn.

The acquisition of this specimen is very satisfactory, as it enables



Balfour, Francis M. 1881. "On the Evolution of the Placenta, and on the possibility of employing the characters of the Placenta in the Classification of the Mammalia." *Proceedings of the Zoological Society of London* 1881, 210–212.
<https://doi.org/10.1111/j.1096-3642.1881.tb01279.x>.

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