Anatomy. — *"On the external nose of Primates"*. By G. P. FRETS. (Communicated by Prof. Dr. L. BOLK).

The distinction of monkeys into Platyrrhini and Catarrhini is of ancient date and generally adopted. It seems to be little known by whom this distinction has first been made, in the systematical works at least the name is not mentioned. The object of the present communication is to premise the description of this classification, as it has been given by BUFFON and E. GEOFFROY ST. HILAIRE and amended by Is. GEOFFROY ST. HILAIRE, and to test by this formularization the result of an investigation I have made.

About 1765 BUFFON was the first to use the external nose as a systematic characteristic for the classification of monkeys, which coincides with their geographical dispersion over the two continents [1]). He writes: [2]) "les singes de l'ancien continent ont la cloison des narines étroite, et ces mêmes narines sont ouvertes au-dessous du nez comme celles de l'homme" and "les singes du nouveau monde ont tous la cloison des narines fort épaisse, les narines ouvertes sur les côtés du nez et non pas en dessous."

In 1812 ET. GEOFFROY ST. HILAIRE [3]) divides the monkeys in his Tableau des Quadrumanes into catarrhinins, catharrini or monkeys of the Old World and platyrrhinins, plathyrrhini or American monkeys. He borrows BUFFON's description and adds to it, that with catarrhine monkeys the nose-bones dissolve before the shedding of the teeth (p. 86) whilst with platyrrhines the suture between these bones disappears only at a later age. Later French authors sometimes bring out still more distinctly that the characteristic has been derived from the external nose. So DESMAREST [4]) writes : "les singes catarrhinins ou singes de l'ancien monde (ont les) narines rapprochées l'une de l'autre" and "les singes platyrrhinins ou singes du nouveau continent (ont les) narines écartées l'une de l'autre". In the same way G. CUVIER (ed. 1829 I p. 99) F. CUVIER [5]), DE BLAINVILLE [6]), P. GEWAIS [7]), BROCAC [8]).

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[1]) Compare Is. G. ST. HILAIRE, Mém. du Muséum, T. 17, p. 129; 1828.

[2]) BUFFON, Oeuvres complètes; ed. 1837 IV, 2, p. 687, 1,

[3]) E. G. ST. HILAIRE, Annales du Muséum, T. 19, 1812.

[4]) DESMAREST, Mammologie 1, Partie, p. 30, Paris.

[5]) G. ST. HILAIRE et F. CUVIER, Hist. Nat. des Mammiféres, T. 1, Paris 1824.

[6]) DE BLAINVILLE, Ostéographie des Mammifères, T. 1, p. 6, Paris 1839—64.

[7]) P. GERVAIS, Hist. nat. des Mammifères, p. 8 and p. 113, Paris 1854.

[8]) BROCAC, L'Ordre des Primates, Mém. d'Anthropologie, T. III, p. 11, 1877.

Likewise SCHLEGEL [1]). Less exact descriptions are given by GIEBEL [2]), CLAUS [3]), and M. WEBER [4]).

In order to preclude incorrect representations, it is necessary to premise that the classification of monkeys into Catarrhini and Platyrrhini is based on external distinctive features namely on the distance and the location of the nostrils. Catarrhini or monkeys of the Old World are monkeys with small distantia internarina and nostrils turned downward, Platyrrhini or monkeys of the New World have a large distantia internarina and nostrils turned sideways.

ISIDORE GEOFFROY ST. HILAIRE [5]) takes the classification of BUFFON and of his father as point of issue for his investigations. He comes however to the conclusion that the distinction of monkeys according to their external nose, without more, does not coincide with their geographical dispersion over the two continents. According to him *Eriodes*, *Lagothrix* and *Nyctipithecus*, all of them American monkeys, agree, with regard to their nostrils, almost entirely with the monkeys of the Old World; on the other hand *Semnopithecus* and especially *Miopithecus* come very near up to the monkeys of the New World. Is. G. ST. HILAIRE therefore proposes the following compromise: "Il est permis de conserver à ces caractères toute leur généralité, à la condition d'en modifier l'expression, la cloison internasale étant toujours mince ou médiocrement épaisse *jamais large* chez les Singes de l'Ancien Monde, à quelque tribu qu'ils appartiennent; large ou médiocrement épaisse, *jamais mince* chez les Singes américains.

I have controlled this view by a great number of individuals. In my opinion it is not correct; when examining many monkeys, we see that the external nose of Platyrrhini with "la cloison internasale médiocrement épaisse" can always be distinguished from Catarrhini with a similar distantia internarina. It is true that it is difficult to express this difference in a single sentence.

Let us first pass under review the shape of the external nose of typical representatives of the two groups. The different species of Cebus have all a large distantia internarina and nostrils turned sideways; between these lies a superficial fossa internarina. The nostrils are rather wide oval, the oral part is the wider; from above and medial the processus naviculares of the maxilloturdinale penetrate

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[1]) H. SCHLEGEL, Muséum d'Histoire naturelle, p. 3 and 4, Leyden 1876.

[2]) GIEBEL, Die Säugetiere, 1859, S. 1025.

[3]) CLAUS. Lehrbuch der Zoologie, 3 Aufl. II, S. 1199, 1876.

[4]) M. WEBER, Die Säugetiere, Jena 1904, p. 771 and 776.

[5]) Is. G. ST. HILAIRE, Extr. d'Archives du Muséum d'Hist. nat. T. 2, p. 6 and p. 39, Paris.

into them. Consequently the opening of the nose is kidney-shaped, with the convexity to the outside. The cartilaginous nose consists of the two cartilagines alares and the cartilago triangularis. The cartilago alaris is a rather broad, shell-shaped cartilage blade, surrounding the nostril at the top, medially and orally. The dorsal, lateral angle of the cartilago alaris is continued in the processus navicularis. If we prepare the median parietis of the cartt. alares separately and spread them out, we can follow the downward extremity of the cartilago triangularis that is continued in the foremost edge of the septum. The septum does not protrude free from between the cartt. alares. The proportions of Chrysothrix and Hapale are exactly like those of Cebus.

The form and composition of the cartilaginous nose of Plathyrrhini can easily be derived from its form in the embryo. There it is the uninterrupted continuation of the internal nose, its frontal termination. The septum is gradually transformed into two cartilaginous blades, which at the top medially and orally limit the nostrils. In older foetal stages both the cartt. alares and the cartilago triangularis take their origin from these blades.

The slight prominence of the nose of Platyrrhini (DESMAREST) is caused by a slight protuberance of the region of each nostril separately. By their boundary the nostrils are more independent and wider open than those of Catarrhines; the cartt. alares are thicker. There is a sharp oral boundary of the nostril with regard to the upper-lip.

The external nose of Catharrini, as e.g. of Macacus, M. sinicus, M. rhesus is characterized by a small distantia internarina and downward directed nostrils. Instead of a fossa internarina a sulcus interalaris is often found here. The nostrils are in the direction of the lips not separated from these. They lie at the distal end of the cartt. alares and are enclosed by the latter only medially and not at the inferior side; therefore there is, between the two nostrils, a free duplicature of the skin, a septum mobile, that extends more or less on the upper-lip and forms here a slight protuberance. In the septum mobile a projecting part of the cartilago alaris, crus mediale, extends; I found this likewise in microscopic preparations of the full-grown nose. The region of the cartt. alares is often a little arched, as if it were inflated. The nostrils are narrow oval and long, the two rims almost touch each other, also on account of the thinness and flabbiness of the cartt. alares. Medially the beginning of the processus navicularis arches into the opening of the nose from the maxilloturbinale, which originates from the upper part of the cartt. alares. The cartt. alares are narrower and less curved than those of Platyrrhini; they run pretty well parallel. The sulcus supraseptalis

terminates in the cartilago triangularis. If one prepares the cartt. alares separately, and spreads them out, one sees that the cartilago triangularis extends between them as front edge of the septum nasi and protrudes a little to the front. Cercopitheci of which I examined several specimens are of exactly the same structure as these described Macacus.

If now types with a distantia internarina "mediocrement épaisse" are compared with these two types, one sees that the American monkey always represents the platyrrhine type, the monkey of the Old World always the cathyrrine type. Is. Geoffroy St. Hilaire mentions *Semnopithecus* and *Miopitecus* (talapoin) as monkeys of the Old World with a rather large distantia internarina. In Semnopithecus namely in a specimen of *Lophopithecus melalophos* (s. Semnophitecus melalophos) I found the greatest distantia internarina of monkeys of the Old World. In the mentioned Lophopithecus this distance was 0.6 cm., over against 0.55 cm. in an Ateles, to be mentioned by-and-by. Yet one recognizes by the prominence of the whole nose, by the absence of the separation of the nostrils with regard to the upper-lip, by their regular narrow oval shape the catarrhine nose. On the other hand the nose of an examined *Ateles grisescens* with a distantia internarina of 0.55 cm., with the sharply limited nostrils opening spontaneously indicates the platyrrhine monkey. The physiognomy of *Nyctipithecus trivirgatus*, likewise mentioned by Is. Geoffroy St. Hilaire, is greatly different from that of the other Platyrrhini. The animal has a prominent nose and nostrils directed downward and sideways. A fossa internarina lies on the inferior part of the nose. The distance between the upper part of the nose and the rim of the upperlip is short. The nostrils have for the rest the sharp limitation of Platyrrhini.

With the prepared nose the distinction of the two forms is also always possible. With Semnopithecus the nostrils do not lie — as with Macacus — any longer on the oral but on the lateral extremity of the cartt. alares, they are however not enclosed in a labial direction, but a little crus mediale extends into the septum mobile. The cartilago alaris of Platyrrhini is stronger and more curved than that of Catarrhini.

The shape of the nose in the different tribes of Platyrrhini is little divergent. Only Nyctipithecus forms an exception. With *Ateles* the distantia internarina seems to vary considerably. So Is. G. St. Hilaire mentions *Lagothrix Humboldti*, belonging to the same family, as a specimen with rather small distantia internaria; it was not the case with the specimen that I examined. Of Catarrhini some species

have a more or less one-sidedly specialized nose. So with *Cynocephalis* (C. porcarius, hamadryas, sphinx, mormon) the nostrils are to the front, they lie at the oral extremity of the cartt. alares; these have a crus mediale. A detailed description of *Semnopithecus nasicus* has been given by WIEDERSHEIM[1]). With Colobus (Cursinus, C. Pennanti, C. Kirkii) the prominent part of the medial rim of the nostril, which extends inwardly into the processus naviculàris of the maxilloturbinale, is strongly developed; the nose is flabby, the medial rim covers almost the nose-opening. With a Colobus ursinus the distantia internarina was "rather large", 0.55 cm. Of Catarrhini the external nose of Semnopithecus is least differentiated.

With Cebus the distantia internarina varies between 1,2 and 1,4 cm.; with Ateles between 0,55 (Ateles grisescens) and 1,15 cm.; with Macacus between 0,15 and 0,3 (1 specimen 0,4) cm.; with Cercopithecus between 0,3 and 0,4 cm.; with Semnopithecus between 0,3 and 0,55 (Lophopithecus melanophos 0,6 cm.).

Anthropoides are catarrhini like man. In the opening of the nose no Processus navicularis protrudes. *Hylobates* has entirely the nose of Catarrhini. The form of the nostrils is lengthened oval, the medial side however regularly curved; as no processus navicularis penetrates into the opening of the nose; the nostrils are not limited with regard to the upperlip. The flabby cartt. alares possess a crus mediale, which extends into the septum mobile. In two young specimens of *Simia satyrus* I found in the angle cartilago triangularis a small cartilaginous piece, a cartilago sesamoidea (of the human anatomy). There is here a vestige of a wing of the nose, the latter does not contain any cartilage. The oval nostrils lie in the plane of the face. The external nose of a specimen of a new born human being which I examined, agrees very much with that of a young Chimpanzee; in the latter the nostrils are likewise turned somewhat downward and to the front. In the new-born and young human beings the cartilago alaris extends still very regularly into the crus mediale. Only in the full-grown individual the crus mediale passes with a sharp deflection, angulus pinnalis, into the remaining part of the cart. alaris, crus laterale. Cartt. alares minores lie in the lateral continuation of the cartilago alaris (major). The wing of the nose does not contain any cartilage. Cartt. sesamoideae lie as with Orang between cart. alaris and cart. triangularis.

For Is. GEOFFROY ST. HILAIRE the result of his comparative examination — consequently his conclusion, that the gulf between Catar-

[1]) Zeitschr. f. Morph. und Anthropol. Bd. III S. 300.

rhini and Platyrrhini was almost entirely bridged over both by some Catarrhini and some Platyrrhini with a middling distantia internarina — was a support for his transformistical conception of the natural development. This was incorrect, as, I suppose, I have shown: the external nose of the monkeys of the Old World always differs from the nose of those of the New World. This fact can be connected with a supposed common descent, if we admit that in a mutation period of the ancestors, the two forms of the nose came into existence.

Anatomy. — *"On the Jacobson's organ of Primates"*. By G. P. FRETS. (Communicated by Prof. Dr. L. BOLK).

When examining older stages of development of some platyrrhine monkeys, *Chrysothrix*, *Cebus*, *Ateles*(?) and *Mycetes* I always found a well developed Jacobson's organ. In some of these foetuses I ascertained the innervation by olfactoriusfibres. In embryos of 40 mm. of *Macacus cynomolgus* and *Semnopithecus maurus* no Jacobson's organ is extant, but a well-developed basal cartilage, of which the Jacobson's cartilage forms a part. Very young embryos of catarrhine monkeys have always a Jacobson's organ. I made microscopic sections through the regions of the nose of two fullgrown specimens of *Cebus hypoleucus*. A well developed Jacobson's organ was extant [1]) (Fig. 1). It terminates in the ductus nasopalatinus. A nerve-bundle (Fig. 1 *n. J. o*) is in connection with the mucous membrane. I ascertained in series of older embryos, as I said before, that the nerve for the Jacobson's organ belongs to the olfactorius, and consequently I am of opinion that I may admit, that the nerve found in the full-grown animal is an olfactorius-bundle. The nerve nasopalatinus of the second branch of the trigeminus runs through the canalis nasopalatinus and in a groove between the processus palatinus of the maxilla and the lateral part of the Jacobson's cartilage (Fig. 1, *n. np.*). A lamina praeductalis can be distinguished at the basal cartilage — before the ductus nasopalatinus —, continuations of which extend to the interior and to the front. The continuation to the interior and medially is the Jacobson's cartilage.

Of Catarrhini I examined microscopic sections of the nasal region of a young *Macacus rhesus* and a *Semnopithecus entellus*. In both I find a well developed basal cartilage; the Jacobson's organ however is missing. In *Macacus rhesus*, of which I examined a hardly interrupted series, a groove separates itself on both sides of the ductus

[1]) HERZFELD found a Jacobson's organ in Hapale.