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which the two tangents in the point B are identical with the tangents

$$nx_1 \pm ax_3 = 0$$

of the curve k_4 in the same point, then this pair will meet k_4 in two points U_1, U_2; we obtain the joining line of these points out of the equation of the considered pair of conics, i. e. out of

$$ax_2x_3 \pm (mx_3^2 - nx_1x_2) = 0;$$

so we have by the latter definition

$$U_1U_2 \equiv a^2x_2 + d = 0$$

or

$$U_1U_2 \equiv 4\,mnx_1 + bx_3 = 0,$$

and this is the line passing through the vertex B and the common point (M) to the double tangent and the cuspidal tangent. Therefore the four points U_1, U_2, B, and M lie on a straight line.

On each line passing through M we have obtained four points of k_4 as intersections of this line with two conics belonging to a pencil, which has three consecutive base-points in A, and the fourth base-point in B. To this pencil of conics belongs also the pair of lines $x_3 = 0$, $x_2 = 0$ as a degenerated conic. We can now say, that on each line s, passing through M, the two pairs of intersections with k_4, the point M and the common point to s and $x_3 = 0$ are *three pairs of elements of the same involution.*

All the relations considered here, remain unaltered, if the double point B is a "conjugate point" (acnode).

Anatomy. — *"On the development of the Hypophysis of Primates especially of Tarsius".* By Prof. L. BOLK.

(Communicated in the Meeting of November 26, 1910).

When studying an Embryo of Tarsius spectrum belonging to the embryological Institute of the Utrecht University (Catalogued as Tarsius n° 666), my attention was drawn by the peculiar shape of the pharyngeal part of the Hypophysis. In this Primate a form is developed more complicated than is known to us in other mammals. In most cases we know, as follows from the description of various authors, that the Hypophysis-vesicle unstrings itself from the roof-epithelium of the stomadeum, places itself against the anterior surface of the infundibularstem; and is then, when the nervous part of the Hypophysis begins to develop, invaginated by the latter. The pharyngeal — or more correctly expressed — the oral part of the Hypophysis consequently becomes a vesicle with double parietes in the invaginated cavity of which the cerebral part of this organ is received.

There was sufficient reason to accept, likewise for Tarsius, this very simple mode of development, as ZIEHEN, who has made a special study of the development of the brain of this primate, with specimens likewise belonging to the Utrecht university, does not speak of any deviating form of development, but points emphatically to a conformity with the usual course of development. So he says e. g. on page 351 of the second volume, third part of HERTWIG's Handbuch der Vergl. u. Experimentellen Entwicklungsgeschichte der Wirbeltiere: "Die charakteristische Umklammerung des Hirnteils der Hypophyse durch den Rachenteil giebt die nachstehende Figur wieder." In his communication, published in the reports of this Academy [1]) he holds the same view.

My observation with regard to Tarsius suggested to me the idea of studying the first origin and the formation of the Hypophysis vesicle likewise in the other embryological specimens of Primates that were in my possession. And the result of this study was that at least one of the peculiarities I found in Tarsius, was elucidated. For it appeared to me, that the way in which the Hypophysis of Primates originates and develops itself corresponds almost entirely to that of Reptiles. An exact description of it we owe to GAUPP. With this group of vertebrates the vesicle does not originate in a single but in a triple invagination, a median and two lateral ones. Whereas the median invagination more specially joins the nervous part of the Hypophysis, the parts distinguished by GAUPP as lobuli laterales develop from the lateral invaginations [2]). It is exactly so with Primates. Here also what GAUPP calls the "Vorraum" develops itself first, and behind it follow the three invaginations lying beside each other.

In Figure 1*a*—*f* are represented, as a proof of this fact, a few sections through the origin of the Hypophysis of a young embryo of Macacus cynomolgus (Embr. Mus. Utrecht Selenka's Material Embryo "Grethe". The direction of the section was a little slanting. In *a* the "Vorraum" has been struck, in *b* the invagination of one of the lobuli laterales is to be seen, in *d* the median part has placed itself against the infundibular-stem, and the unstringing begins, which is completed in *e* and *f*. I shall not enter into further details of these facts. I only mentioned them to comprehend more easily the form of the Hypophysis of Tarsius. Only this be added to the above, that

1) These Proc. of 26 Nov. 1904.

2) STADERINI afterwards observed these lobes likewise in larvae of Triton cristatus.

with Primates the glandular differentiation of the organ is limited to the lobuli laterales, and to the "Vorraum", whilst the median

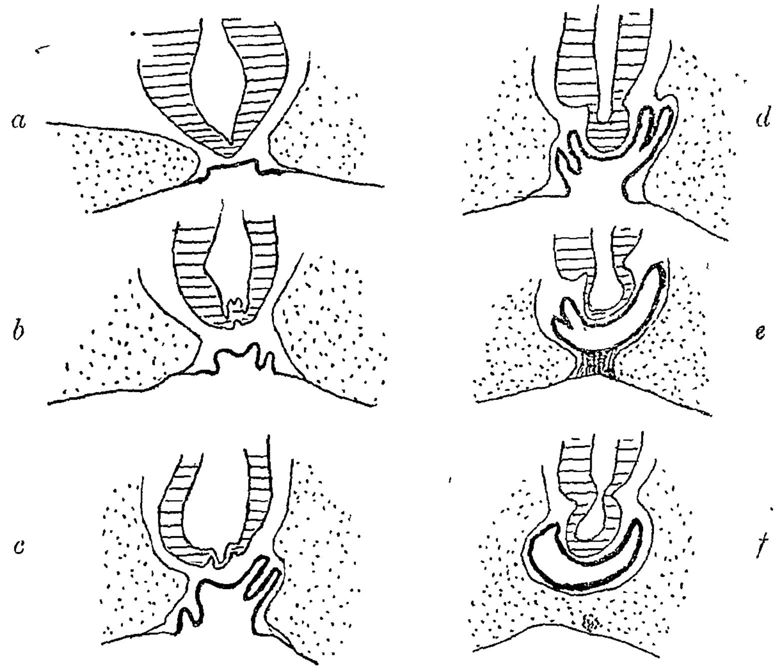

Fig. 1.

invagination constitutes only a covering parietes round the nervous part.

Let us now return to Tarsius. I have reconstructed a model a hundred times enlarged of the Hypophysis of the above mentioned Embryo N°. 666 corresponding in its development to N°. 34 of KEIBEL's Normentafel. This model is represented in fig. 2 as seen from aside. The lines running vertically through this figure indicate the direction of the section, and the sections indicated by these lines are sketched in the figures 3*a*—*i*.

In the first place it is conspicuous in this figure that the pharyngeal part of the Hypophysis consists of two parts, a larger, the real vesicle, into which from behind the nervous part (indicated by a thicker line) is invaginated, and a narrower one apparently turned down between the basis of the brain and the larger part in the direction of the infundibular-stem. As this part bifurcates in the shape of a two-pronged fork, I shall indicate it as Lobulus bifurcatus.

As appears from figure 2 this lobe is connected at the forepole of the Hypophysis with the other part. In this anterior part the formation of cell-strings has begun. This is the reason that the surface shows here irregular outward protuberances. These are still continued at the very beginning of the Lobulus bifurcatus. The section corre-

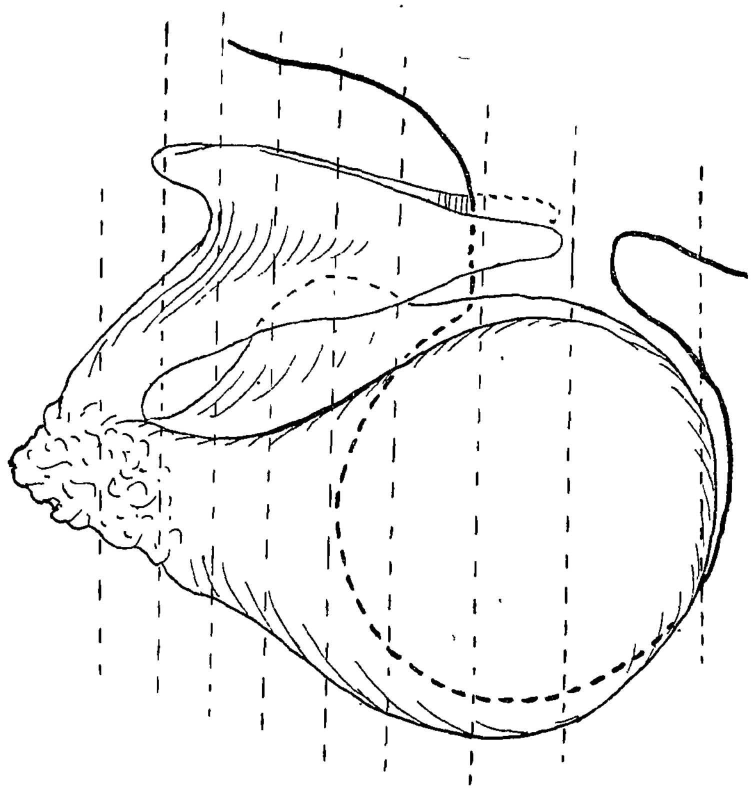

Fig. 2.

sponding to the line *a* in figure 2 is sketched in figure 3*a*. One sees that at one side (in the figure to the right) the Lobulus bifurcatus is already separated from the rest of the mass

More backward this lobe assumes in the section the shape of a little hood, the two sides of which meet under an obtuse angle. The parietes become flat (figure 3*b*) and whilst the connection between the two halves in the median-line becomes broader, an offshoot is formed from the foremost edge in a frontal direction. In order to understand this, one should compare the section figure 3*b* with the level indicated in figure 2 by line *b*. We see that this line passes successively through this offshoot, the stem of the Lobulus bifurcatus and the foremost part of the Hypophysis vesicle. No lumen however is to be seen in any of these sections.

Afterwards a combshaped protuberance develops itself from the concave superior plane of the vesicle, penetrating into the concavity of the Lobulus bifurcatus (figure 3*c*). In connection with this the last

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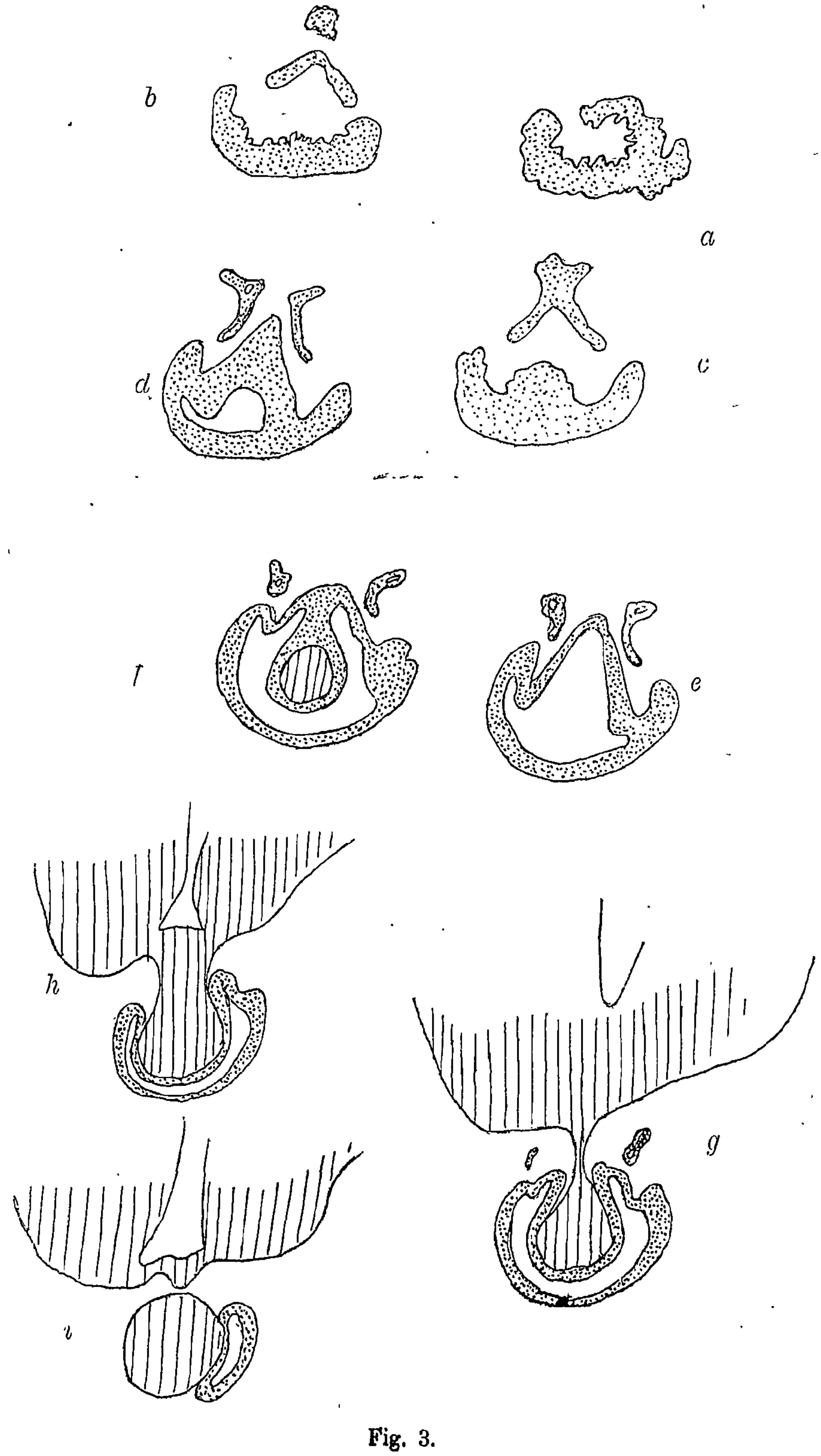

Fig. 3.

mentioned lobe divides into a right and a left half, and as soon as this division has taken place (figure 3*d*) a lumen appears in both halves. These two halves might be designated as the horns or cornua of the Lobulus bifurcatus. In section they are hook shaped, the outside plane is, especially in the foremost part, very concave. Both horns become more pointed towards the hind-parts, preserve however their lumen nearly to their extremities. These ends lie on either side of the infundibularstem (figure 3*g*). Into the hindmost part of the Hypophysis vesicle the nervous part is invaginated. This pars nervosa is not completely surrounded by the pharyngeal one, the part that is turned to the back remains free.

If we contemplate the shape of this vesicle more carefully, we can clearly distinguish a central part and two lateral parts. Especially in the foremost half, where the comb-shaped protuberance of the central part begins, these lateral parts are very distinct. As appears likewise from Figure 2, they can be followed as far as the hindmost part of the vesicle. From what I know about the first origin of the Hypophysis vesicle of other Primates I do not feel the least doubt that these lateral parts are the lobuli laterales, described by GAUPP with the Reptiles. I repeat that it is in these lateral lobes that, with Primates, the ensuing histological differentiation of the Hypophysis vesicle is continued. They form consequently an essential ingredient part of the Hypophysis.

I shall not venture to express a view of the signification of the lobulus bifurcatus. Certain it is that the two cornua do not play an important part in the further development. This appears from the condition found in an older Embryo (Embryol. Laborat. Utrecht Tarsius N°. 555). Three sections through the Hypophysis of this specimen are represented in Figure 4. Section *a* in this figure is nearly similar to Figure 3*b*. One recognises the foremost part of the vesicle, differentiated to cell-stems, but the part of the Lobulus bifurcatus (ridge-shaped in the section) lying above it shows also a similar course of development. On the top of it lies the section of the beginning of the cornua, each provided with a lumen. The fact that the latter likewise still show progressive symptoms of development, appears from Figure 4*b*, where on either side of the infundibular-stem groups of cells are found, among which there are some with a lumen, which have taken their origin in the cornua. And that such epithelium-isles extend as far as the hindmost edge of the infundibular-stem appears from Figure 4*c* in which a section is sketched, lying behind the above-mentioned stem, and where after all, at least on one side, remains of the Lobulus bifurcatus are found.

Especially from the location of these latter remains appears a topographical peculiarity of the Lobulus bifurcatus of Tarsius which

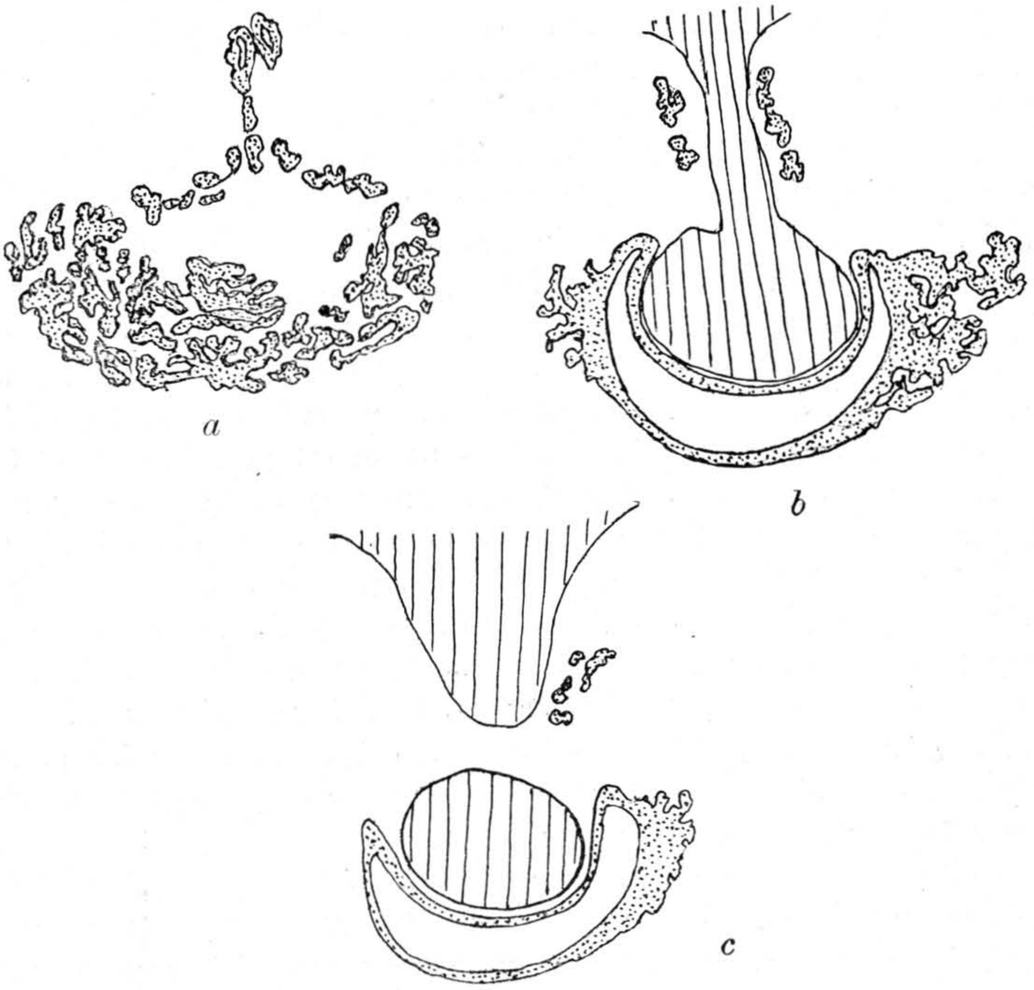

Fig 4.

perhaps is not unimportant for its significance. It is clear in fact that these parts of the pharyngeal Hypophysis are not lying in the sella turcica. They lie in the subarachnoideal sinus directly against the basalplane of the brain, above the diaphragma sellae formed by the Dura mater.

Finally I draw the attention to the fact that from Figure 4^b it appears that it is chiefly the lateral parts of the Hypophysis vesicle that constitute the principal part of the pars glandularis of the fullgrown Hypophysis. The centralpart remains — at least with Primates — more indifferent.

The study of the earlier periods of development of the Hypophysis vesicle of younger embryos of Tarsius than I had to dispose of for the moment, is certainly to be recommended, especially with a view to the way in which the Lobulus Bifurcatus originates.