

NOTE ON THE TÆNIA PONTIS.

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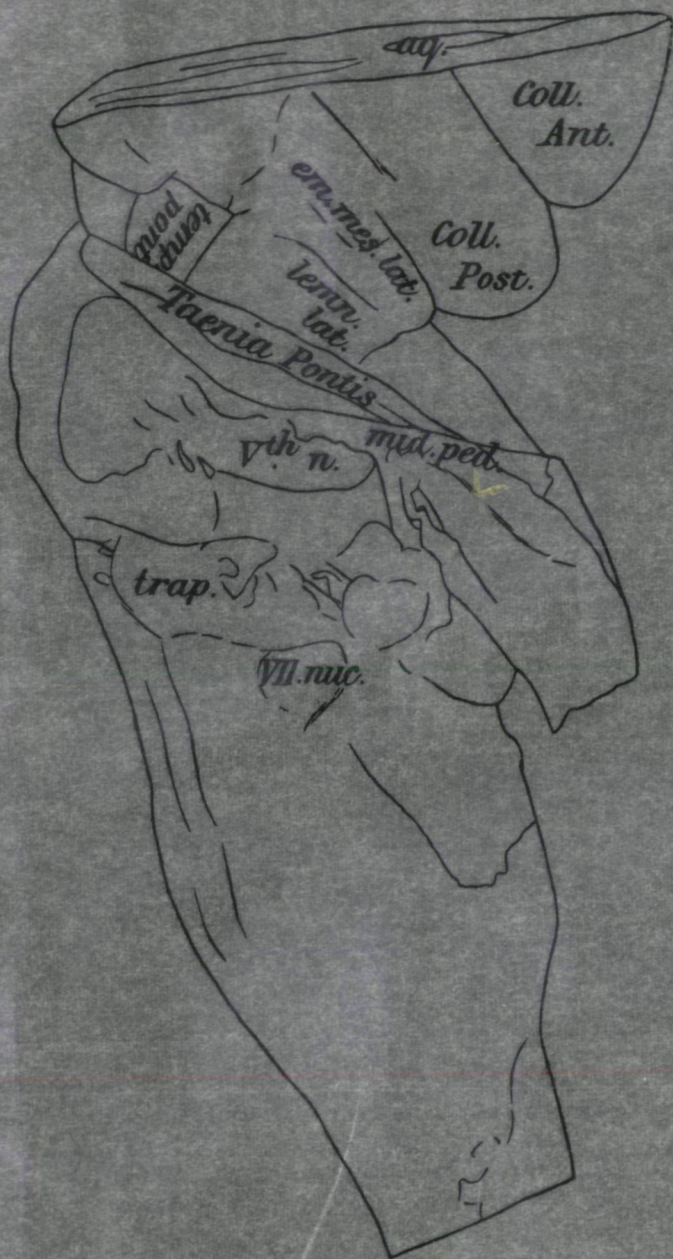
(1) GENERAL ANATOMICAL INTRODUCTION.

RUNNING along the frontal border of the pons varolii is a bundle of fibres which, when developed on the external surface of the mesencephalon, appears to emerge from the pons where the mesial border of the crus cerebri is lost in the interpeduncular ganglion. The tract runs dorsally and caudally over the crus and lower third of the lateral fillet to reach the outer border of the superior cerebellar peduncle. Guided by the dorsal surface of the peduncle, the bundle reaches the anterior border of the cerebellar cortex just where the primary fissure (Elliott Smith) debouches on the free surface of the superior and middle peduncle. This tract, to which Henle gave the name of tænia pontis, has customarily been regarded as an aberrant part of the pons, though the origin, destination and true direction of its fibres are as yet unknown.

Some facts bearing on these points have gradually accumulated in my records, and may now perhaps be worth publication.

(2) COMPARATIVE MORPHOLOGY.

The individual and comparative anatomy of the tænia pontis are both interesting. In the first place, in all genera of animals in which it is obvious it is rarely symmetrically exposed on the surface of the mesencephalon, and in the very large majority it is in fact imbedded in the lateral wall of the mesencephalon and lateral fillet region (*vide infra*).



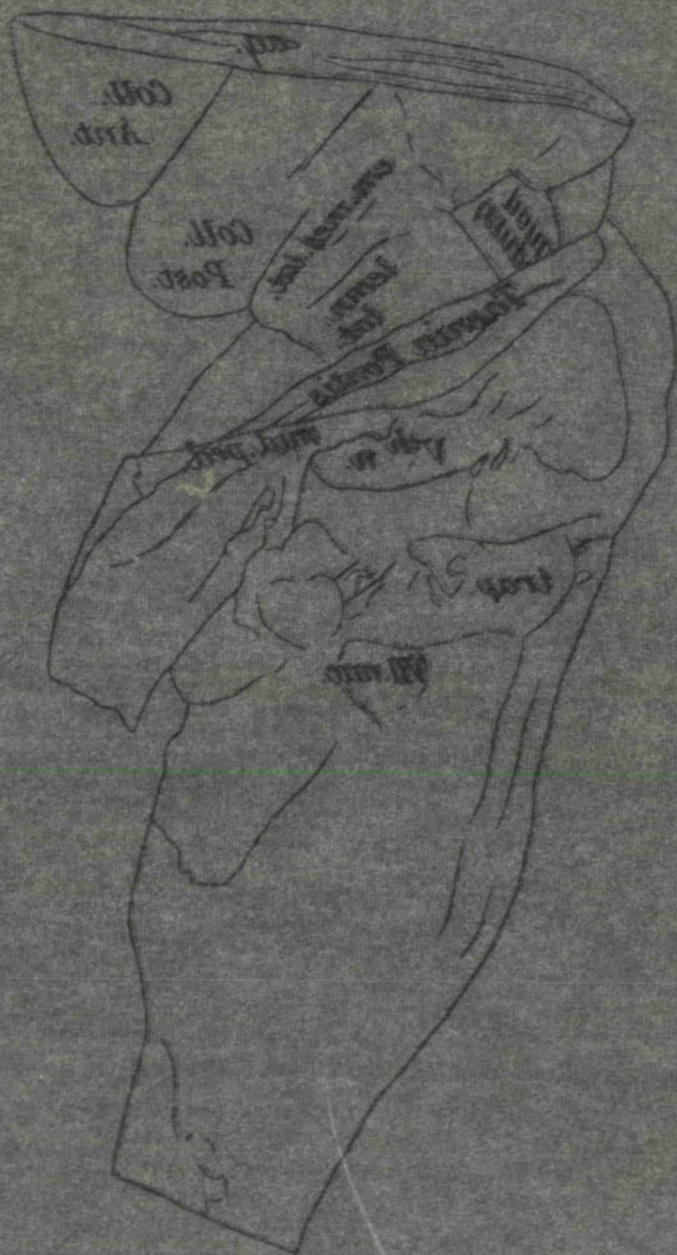




FIG. 1.

Brain Stem of the Camel. $\frac{1.25}{1}$.

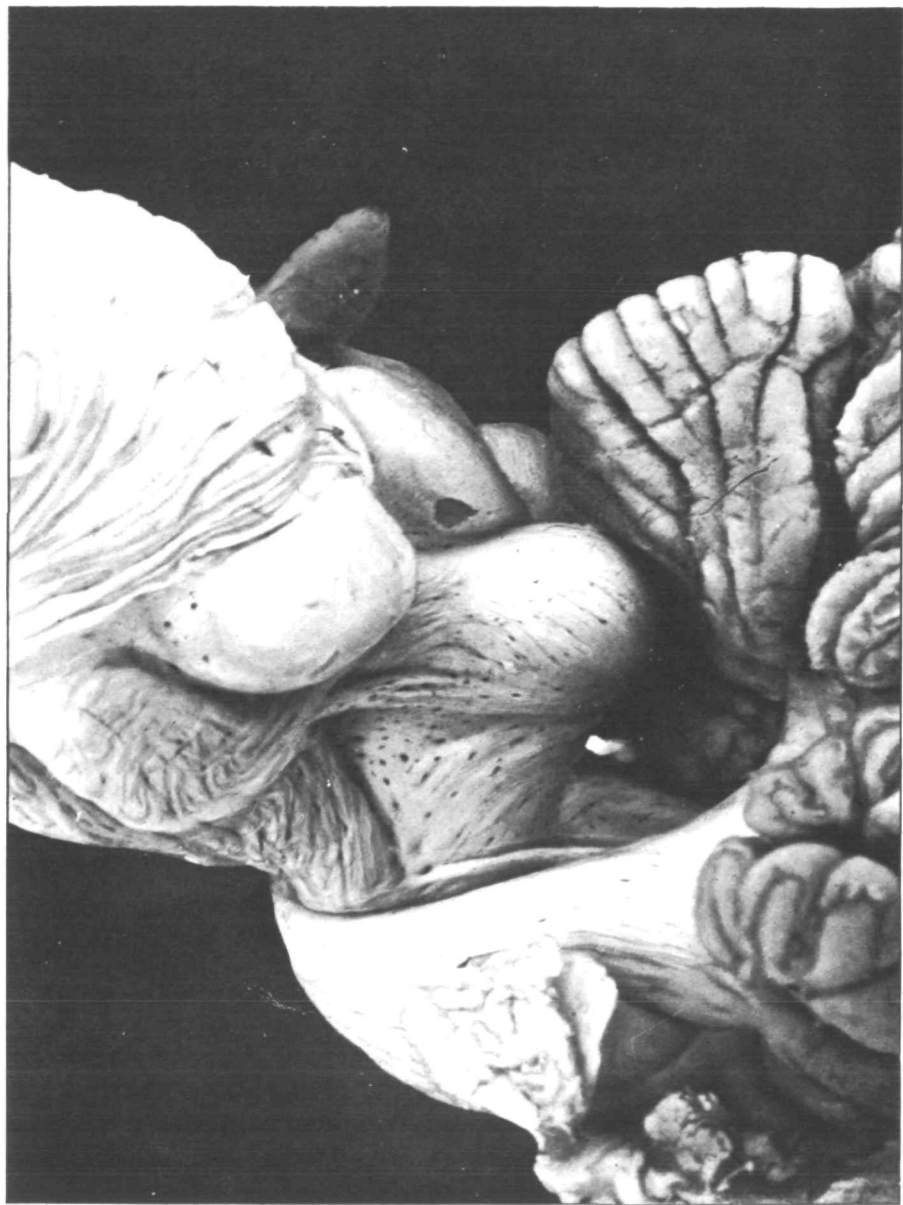
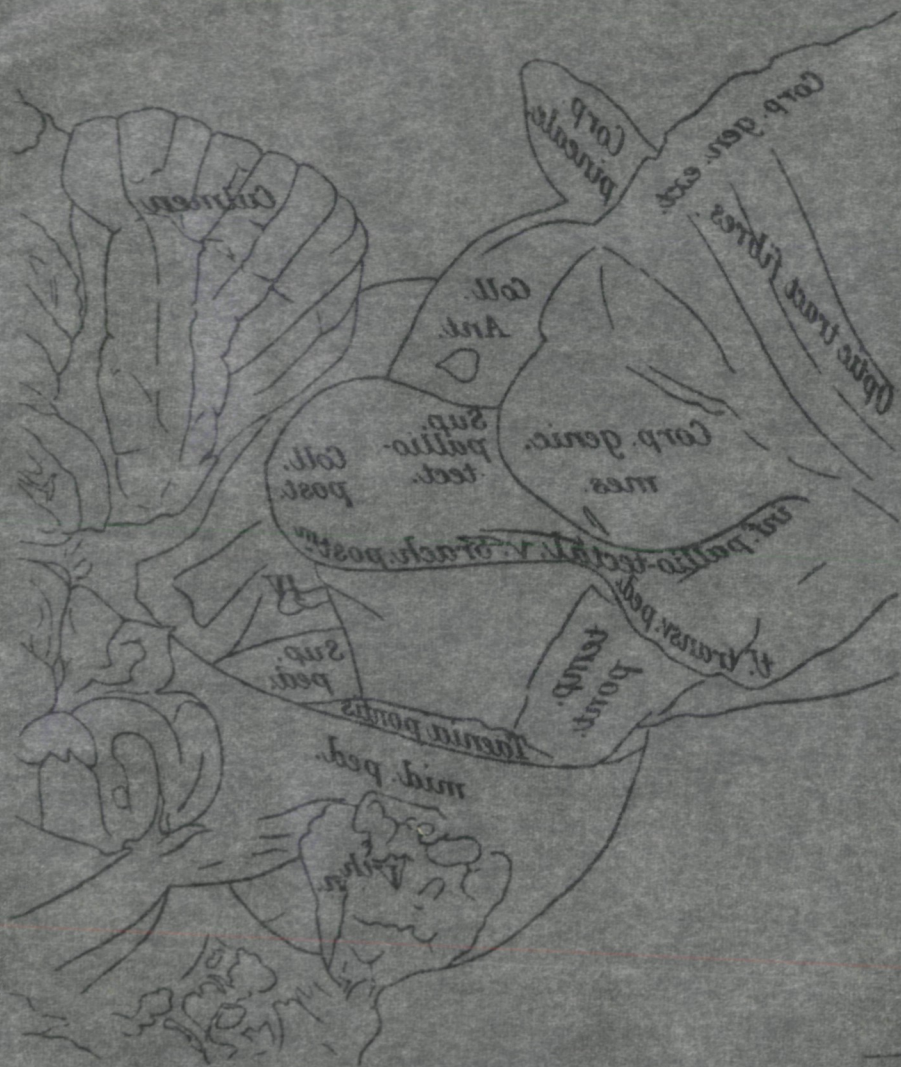
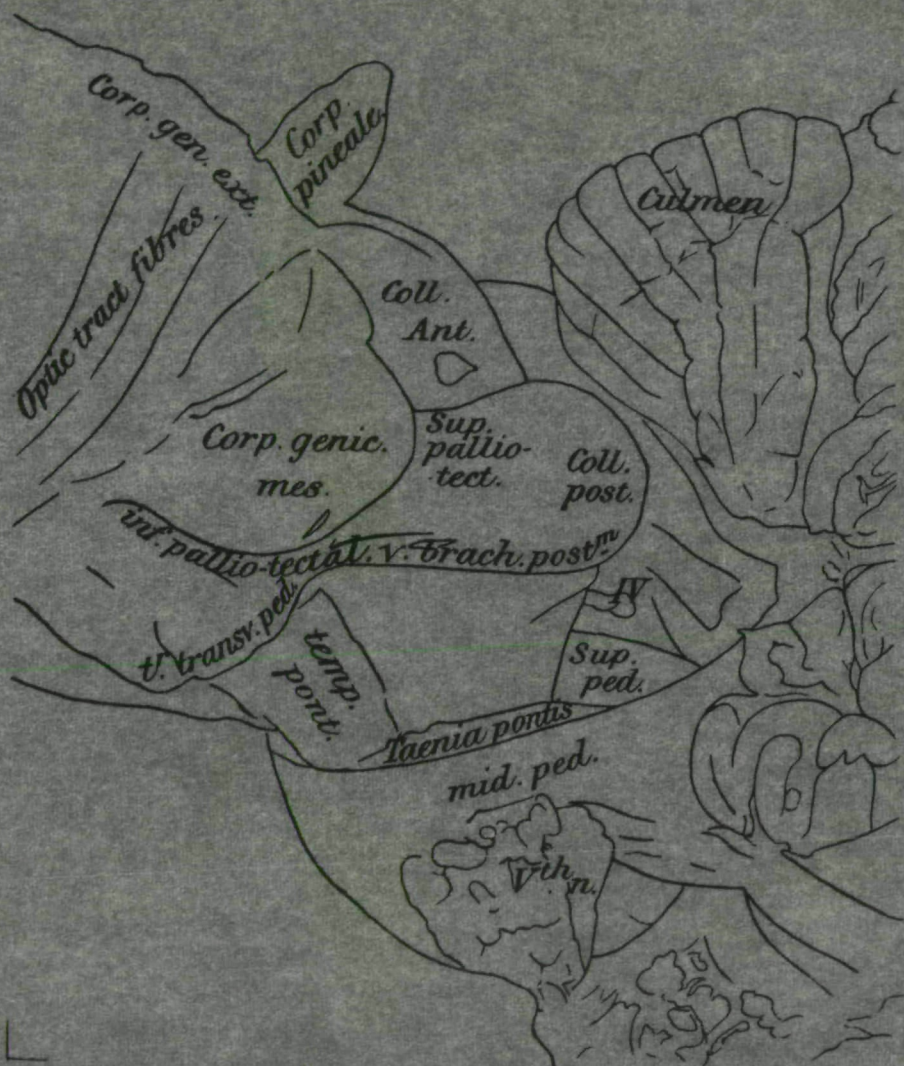
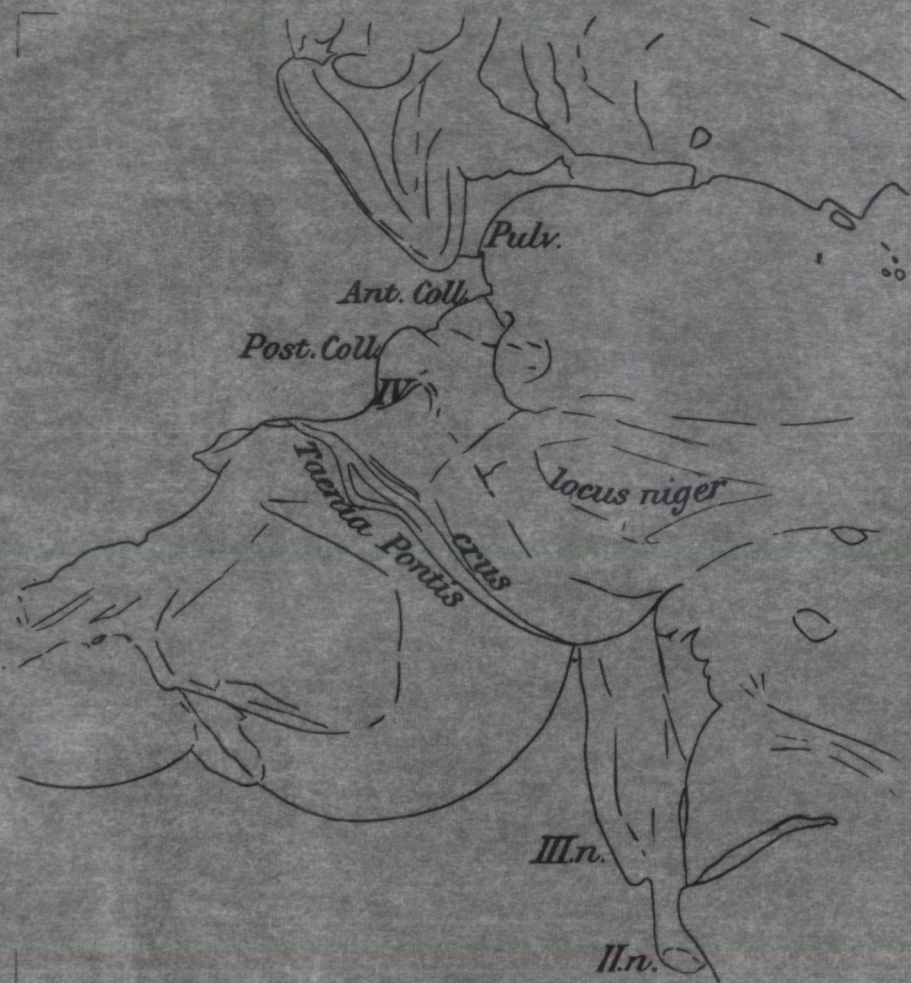


FIG. 2.

Brain Stem of the Hippopotamus. $\frac{7}{1}$.







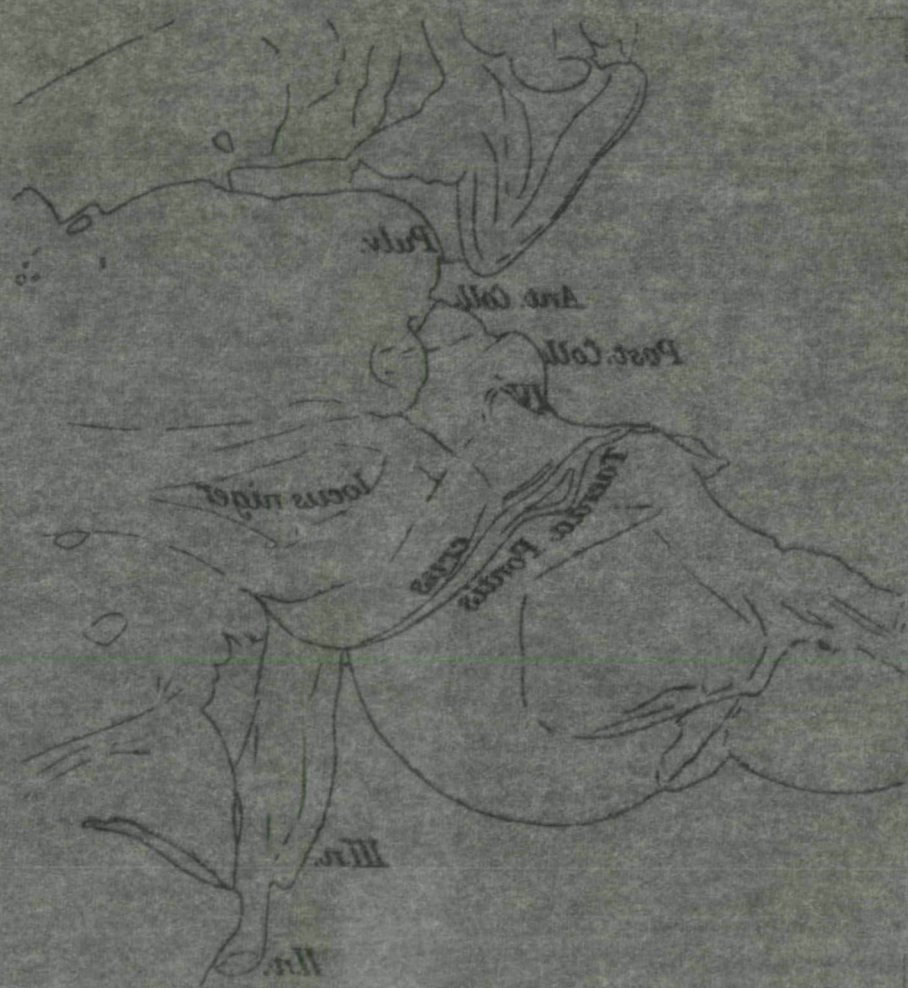




FIG. 3.
Brain Stem of Man. (Case of Microgyria.) $\frac{2}{1}$.

In the second place, it more frequently tends to lie superficially as the zoological scale is successively descended, but as far as I have seen, it is more exposed in the ungulata than in other classes.

The photographs (figs. 1, 2, 3) show the tract in the camel, hippopotamus, and man.

It will be seen that in all animals the course of the tract is the same, and that the only structural variation is the relatively unimportant fact that the tract is often sub-divided into two or more bundles, instead of constituting one larger fasciculus.

At the same time the fact of its asymmetrical development, even in the quadrupedal ungulates deserves some attention, since it is reasonable to surmise that since, as we shall presently see, the tract is a cerebello-petal one, it may have an analogous function to the middle peduncle, and be concerned in the orientation of the body around its longitudinal axis, or with the special function of the dentate nucleus (see forthcoming paper by Dr. Clarke and myself).

Should this be so, then its habitual asymmetry would assume more importance in view of Guldberg's interesting and valuable work on the relation between asymmetry and the occurrence of rotatory courses and movements in quadrupedal as well as bipedal animals.

(3) LITERATURE OF THE TRACT.

The tænia pontis was probably first recognised as a definite tract by *Malacarne* [1], who spoke of it as "accessorii d'motori comun" and traced it to the "linguetta laminosa," now known as the lingula cerebelli.

Rolando in his well-known monograph [2] figures the fibres, and states that he found them in the ox and sheep.

Friedrich Arnold also figured [3] the tract under the name "filamenta pontis lateralia."

Henle [4] was the first systematically to describe the bundle in its macroscopic course and to name it as the "tænia pontis."

He stated, however, that it arises from the cerebellar nuclei (thus according to him it "aus dem Mark-kern des Kleinhirns hervortritt"), and that it loses itself on the mesial surface of the crus.

Retzius [5] in describing the isthmus of the brain, points out that the tænia is very constant in occurrence, though differing in degree of superficial development.

Dejerine and *Mme. Dejerine-Klumpke* [6] describe it as passing from the lateral sulcus of the mesencephalon and winding round the crus cerebri penetrating the groove of the third nerve to enter the pons varolii.

Thus, all authors appear to have regarded the tænia as a cerebello-pontine, *i.e.* cerebello-fugal tract, but I propose to adduce facts which go to prove that this view is the converse of the actual truth.

Further, it is frequently spoken of as being inconstant, *i.e.*, as though often absent. This is only owing to the fact that it is often covered by the sub-pial tissue, and so thickly as to be entirely obscured. It should therefore, as *Retzius* has said, be regarded as a constant anatomical entity, and not described as an exceptional rarity, or an aberrant portion of the pons.

(4) ORIGIN AND NATURE OF THE FIBRES OF THE TRACT.

So far the precise origin and destination of the tænia has not been determined.

In an interesting case (B—n. U.C.H., 1905) of bilobate cerebellum recently under my observation where agenesis of the vermis was practically complete, there was a concurrent defect in the development of the pontine region, especially of its frontal third.

In this case also the mesencephalic tectum was very poorly developed, hardly any differentiation existing between the corpora quadrigemina.

All the transverse circumferential tracts were exposed, and the frontal portion of the pons spread out in a thin layer over the feebly developed crura. Under these circumstances the well developed (or exposed) tænia pontis was easily seen



FIG. 4.

Macacus Rhesus. Microphotograph of a horizontal section (Marchi stain) of the side of the fourth ventricle and brain stem. The lesion, which was a vertical cut through the lateral fillet, is seen as the horizontally-directed gap in the lowest part of the section.

Dentate
Muscles

Inferior
Peduncle

Superior
Peduncle

Flocculus

from part around

anterior

Corp.
Verm.

lesion

lingula

Dentate
Nucleus

Inferior
Peduncle

Superior
Peduncle

flocculus

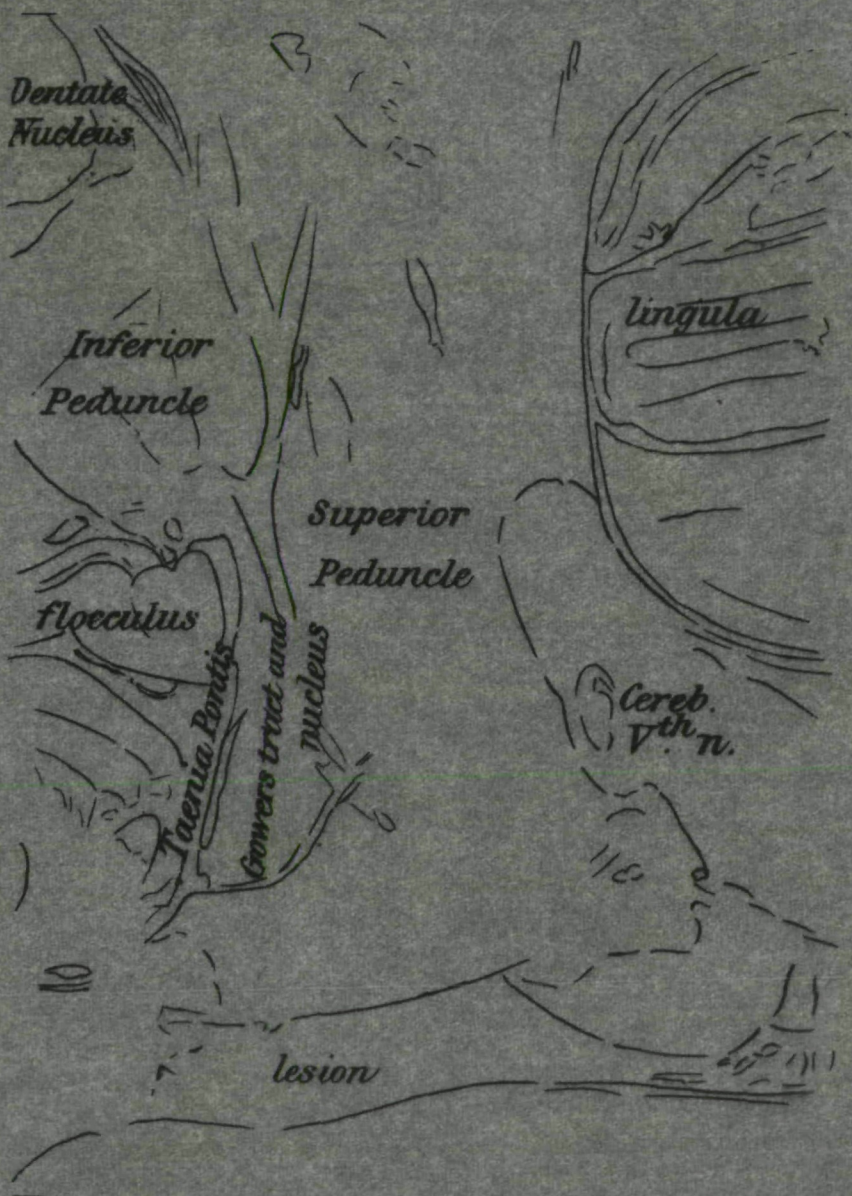
Taenia Pontis

Gowers tract and
nucleus

lingula

Cereb.
Vth n.

lesion



to take origin contralaterally in a mass of embryonic grey tissue continuous with that of the ganglion interpedunculare but ventral to it.

Cerebellarwards the tænia ran in the normal manner over the lateral fillet to the superior cerebellar peduncle, curved over it and passed beneath the edge of the cortex cerebelli towards the nucleus dentatus which was well developed.

The tænia thus in this case behaved like the other ponto-cerebellar tracts, and as a localised bundle of association fibres, united a portion of the frontal border of the pontine grey matter with that of the cerebellum, apparently the nucleus dentatus (*vide infra*).

In another case of agenesis of the cerebral pallium with bilateral occipital microgyria the tænia was exceptionally well-marked (see fig. 3), and as in the previous case the nuclei of origin and termination were both adequately represented.

As a purely basal tract, the tænia is naturally one which is quite likely to be present, even in cases of considerable failure of growth of the higher centres.

DIRECTION AND TERMINATION OF THE FIBRES OF THE TRACT.

I wish now to show that the direction of the fibres of the tænia pontis as estimated by the only means at our present disposal, viz., the Marchi degeneration method, is cerebello-petal like the other ponto cerebellar systems in parallel position.

In a *Macacus Rhesus* (1904) I divided with the lateral fillet the tænia pontis without injuring the neighbouring border of the pons and middle peduncle of the cerebellum.

As far as can be seen the whole of the fibres of the tænia in this case degenerated cerebello-petally, and as seen in the micro-photograph (fig. 4) and the (Edinger) drawings (figs. 5 and 6) ran up and along the mesencephalon, coursing over the remnant of the lateral fillet and along the lower border of the superior cerebellar peduncle.

As the tract lies on the lateral fillet, it is separated from it by a thin layer of grey substance, which is really continuous with that surrounding Gowers' bundle. The fibres

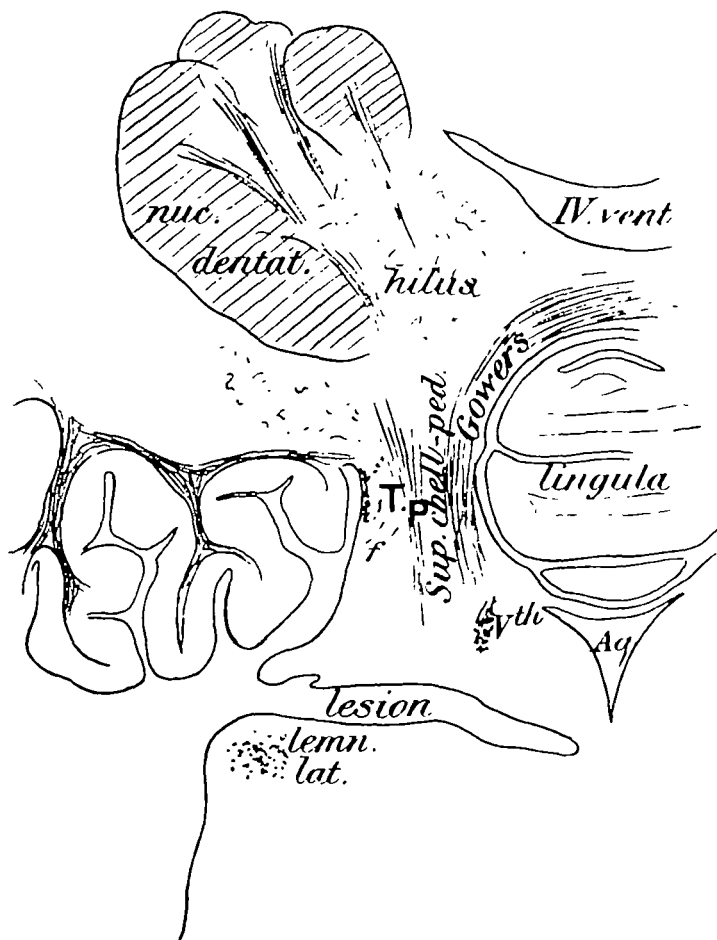


FIG. 5.

Section (higher) through the lower third of the anterior cerebellar commissure. The degenerate tænia is seen to left of letter T. A few fibres marked *f* are already leaving it to pass in and through the superior peduncle P.

cross the superior peduncle close to the edge of the cerebellar cortex, and thus reach the ventral or frontal commencement of the primary fissure of the cerebellum.

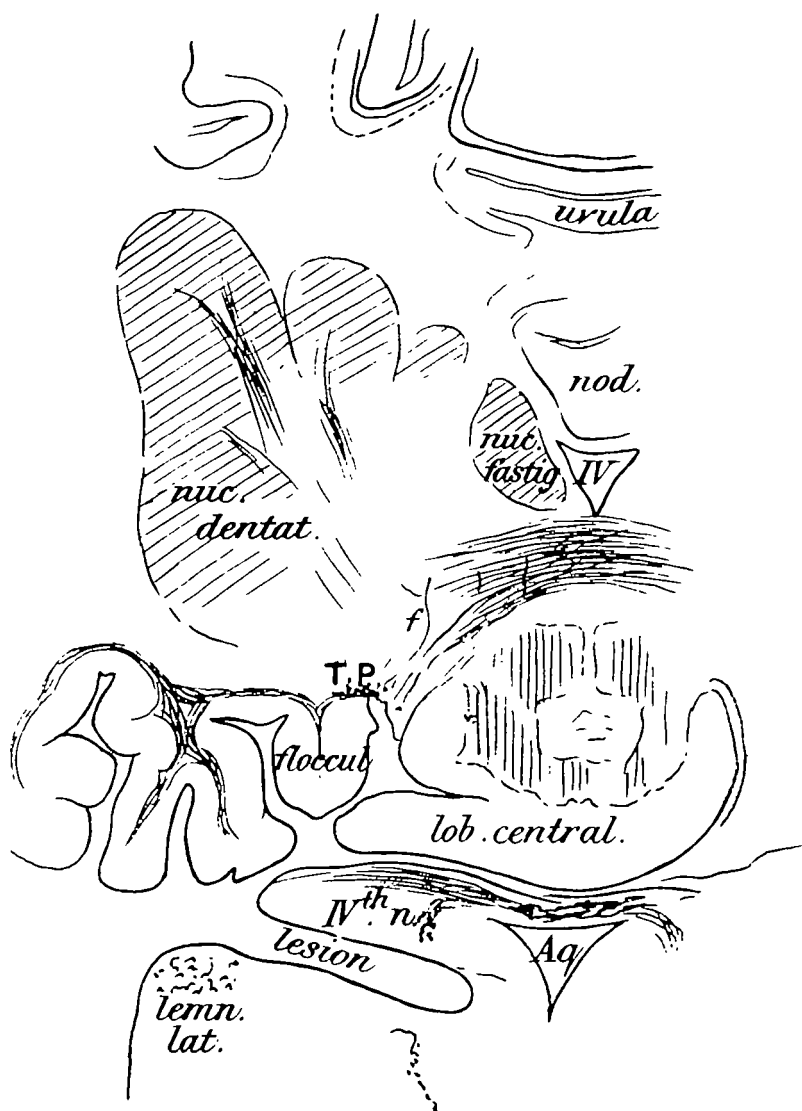


FIG. 6.

Section (higher) at level of decussation of fourth nerve. The tænia T. P. is now breaking up and its fibres *f* passing inwards to reach the nucleus dentatus and fastigii.

When it is thus behind the edge of the cerebellar cortex, the tract is a bundle triangular in section which soon spreads laterally while closely applied to the cortex cerebelli of the innermost leaf of the flocculus.

Behind the fasciculus is the mass of the inferior peduncle turning up in front of the frontal edge of the outer shell of the dentate nucleus. The majority of the fibres of the tænia gradually merge themselves between the fibres of the peduncle passing towards the nucleus dentatus in which they appear to end, while a few pass inwards to terminate in the roof nucleus.

A certain loss of fibres was noticeable while the tract was near the cerebellar cortex, but contrary to expectation (in view of the homology between this tract and the mass of ponto-cerebellar fibres) none could be definitely traced into the granular layer of the neighbouring folium.

The termination of the tract in the nucleus dentatus probably explains why Henle with coarser methods of investigation regarded the fibres as coming from that nucleus, at any rate it is evident that he observed a certain relationship between the tract, and what is in this paper asserted to be its real termination.

LITERATURE.

- [1] Malacarne (Quoted by Rolando), "Neuroencefalotomia," p. 171.
- [2] Rolando "Recherches Anatomiques sur la Moelle allongée." *Memorie della Reale Accademia della Scienze di Torino*. Vol. xxix. Read December 29, 1822.
- [3] Arnold "Tabulæ Anatomicae." Tafel IV., fig. 3, Fasc. 1, 1838.
- [4] Henle "Handbuch der Systematischen Anatomie des Menschen." 1871. Bd. III., Abth. 11, S. 129.
- [5] Retzius "Das Menschen Hirn," 1896, S. 49; also "Biologische Untersuchungen." 1898. N. F. viii., S. 65.
- [6] Dejerine et Klumpke "Anatomie des Centres Nerveux." Paris, 1895, T. 1, p. 327, T. 2, p. 483.