THE INSULA OF THE PIG.

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With Plate I.

The insula (island of Reil) of the pig (*Sus scrofa*) is located between the frontal, parietal and temporal lobes and the olfactory tract.¹ A small portion of this area is included in the Sylvian fissure, but by far the greater part, as in the sheep, lies in what some authors call the vallicula or Sylvian fossa (rhinal fissure, Turner), cephalad of the temporal lobe and dorsad of the enormously developed olfactory tract. The operculums are not well developed and if present at all are very rudimentary. Lusana and Limoigin say they are wanting in the pig.¹ In at least three-fourths of the 20 brains examined, a fissure was found at P. (see Figs. 2 and 4,) and I have assumed it to be constant inasmuch as the brains in which it was wanting were those of pigs under one year old. This fissure, although rudimentary, is well defined and may be the rudiment of the presylvian.

The insula is entirely overlapped dorsally and, when concealed, is also covered laterally by the area in figs. 2 and 4. Its cephalic portion is somewhat concealed by the area N (fig. 2). Accordingly I have concluded that the operculum (m) and the prae-or sub-operculum (n) are sometimes present though rudimentary.

Professor Sir Wm. Turner³ names the fissure dorsad of the olfactory crus (ex, fig. 1) the rhinal fissure (r). This fissure may be no other than the rhinal fissure if the frontal and parietal lobes are so developed as to completely overlap the insula laterally, as the Sylvian fossa will then be closed up and the rhinal fissure would extend to the surface as in fig. 1. How-

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1. Fisiologia der Centri Nervosi Encefalici, Vol. I, p. 150.

3. The Convolutions of the Brain, p. 35, Fig. 29.

ever, in fig. 2, it will be noted that the lateral surface of the insula is exposed in two areas which although connected are quite distinct. The intervening space in which the insula is exposed can be no less than the Sylvian fossa. In brains having more highly developed frontal lobes, this fossa is limited, in the adult, by the development of the pre-and sub-operculum, to a small portion cephalad of the temporal lobe. The width of the fissure which Turner calls rhinal, cephalad of its junction with the Sylvian fissure, is always greater than its width caudad of the Sylvian or cephalad of the fissure P. (fig. 2) where it is the true rhinal fissure. This increase in width is probably due in most cases to the entering of numerous blood-vessels which transverse the insular area and these go mainly to its dorsal surface. I think therefore that Professor Turner erred in naming this the rhinal fissure instead of Sylvian fossa, as the rhinal fissure extends ventrad of the insula and the crus is not connected with the insula at its lateral surface.

Huxley (*Anatomy of the Vertebrated Animals*, p. 61, Fig. 21) figures (see Fig. 3) the left half-brain of a pig and represents the insula as normally exposed in the Sylvian fossa. Krueg¹ says "the so-called insula, as in the carnivora as well as in the pig (presumably all Suillidae), lies concealed in the depth of a fissure, while in the remaining ungulates it is exposed."

In sixteen brains of pigs ranging one year and under, nearly three-fifths of the insulas were entirely concealed, while in the remaining two-fifths the areas of exposure differed greatly, the extreme being shown in Fig. 2. In five brains of pigs between one and two and a half years, all insulas were entirely concealed and the conclusion reached was that the insula is not normally exposed in the pig. There is considerable variation in the insulas of the same brain.

In No. 9, Left exposed, Right concealed.

In No. 13, Left scarcely exposed (?) Right exposed in two places, Fig. 2.

In No. 17, Left exposed, Right concealed.

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1. Ueber die Furchung der Grosshirnrinde der Ungulaten, in *Zeitschrift für Wissenschaftliche Zoologie*, Vol. 31, p. 313.

The plane of the insula is perpendicular to the lateral aspect of the brain, as is the case in the sheep and calf. This position of the plane, as well as the location of the insula in the Sylvian fossa, is probably due to the undeveloped state of the frontal lobes and the unusual development of the olfactory crus. For in the horse, whose frontal lobes are more highly developed and whose crus is much smaller, the insula stands at an angle of about 45° to the lateral surface and the larger part of the insula is located in the Sylvian fissure. Moreover in one brain (pig) (No. 4) this plane makes an angle of not more than 60° - 65° with the lateral aspect. This being the case in but one brain, it naturally suggests an individual peculiarity.

The area which represents the insula in the pig is quite large and generally well defined except at its junction with the temporal lobe. In but three instances was there any distinct line of demarcation. In one of these the depression was slight, about like the average fissure upon the insular area and might have been caused by pressure of an artery. In the second insula this depression was at least twice as deep as the first and easily recognizable as a true fissure. In still another, Fig. 7, this depression reached a depth of nearly four mm. completely separating the insular area from the temporal lobe. In the last mentioned brain the fissure in question was visible upon the lateral aspect of the brain while in the two preceding it was not.

The cephalic boundary of the insula is unusually sharply defined by the circuminsular fissure in pigs of one year and over, as shown in Figs. 6, 7, 8, 9 and 10, while in those of 6-10 months the insula is so narrow cephalad that it may graduate insensibly into the frontal lobe without the formation of a fissure. This is shown in Fig. 5. The area becomes suddenly much thicker dorso-ventrally near the temporal lobe. Upon this area one fissure (t, Fig. 5) at least, appears to be constant. It seems to originate upon the lateral surface of the insula nearly opposite the mouth of the Sylvian fissure. It sometimes extends scarcely to the dorsal surface while in others (those of one year and over) it may extend dorso-caudally almost across the insular area as in Figs. 6, 8 and 10.

Other fissures are nearly always found upon this area. The cephalic portion of the insula is divided sometimes into as many as three gyres but these divisions are not believed to be constant, and in the pig, as in the sheep, owing to its comparatively simple character, these individual differences are very striking. The fissures as a rule grow deeper as they approach the meson and the cephalic portion of the insula does not extend as far as laterad as the rest.

DESCRIPTION OF PLATE I.

Fig. 1. Lateral aspect of the Left Hemicerebrum of a Pig, (after Turner). r, rhinal fissure; s, Sylvian fissure.

Fig. 2. Right Hemicerebrum of Pig. No. 13; $\times \frac{2}{3}$. In, Insula; Sy, Sylvian Fissure; Rh, Rhinal Fissure; Olf, Olfactory Tract.

Fig. 3. Lateral aspect of Left Half Brain of Pig (after Huxley). Sy, Sylvian Fissure; In, Insula.

Fig. 4. Lateral Aspect of Right Half of Brain of Pig. No. 17; $\times \frac{2}{3}$ Rh, Rhinal Fissure; Sy, Sylvian Fissure; Olf, Olfactory Tract; Op, Optic Nerve.

Fig. 5. Left Hemicerebrum of Pig. No. 12; $\times \frac{2}{3}$. Olfactory bulb removed. Olf, Olfactory Tract; In, Insula.

Fig. 6. Left Hemicerebrum of Pig, showing Insula as seen when the Dorso-lateral overlapping portions are removed. Olfactory Bulb removed. No. 13; $\times \frac{2}{3}$. In, Insula; T, Union of Insula with Temporal Lobe; Olf, Olfactory Tract.

Fig. 7. Right Hemicerebrum of Pig. No. 9; $\times \frac{2}{3}$. In, Insula; C, Circuminsular Fissure; R, Rhinal Fissure.

Fig. 8. Left Hemicerebrum of Pig, showing Insula as viewed from dorso-lateral aspect. No. 9; $\times \frac{2}{3}$. In, Insula; Olf, Olfactory Tract.

Fig. 9. Right Hemicerebrum of Brain of Pig. No. 9; $\times \frac{2}{3}$. In, Insula.

Fig. 10. Left Hemicerebrum of Pig. No. 17; $\times \frac{2}{3}$. In, Insula; Olf, Olfactory Tract.

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