Descriptions of three Chinese brains presented by Dr F.W. Mott, F.R.S., to the museum of the Royal College of Surgeons / by E.H.J. Schuster.

DESCRIPTIONS OF THREE CHINESE BRAINS PRESENTED BY DR F. W. MOTT, F.R.S., TO THE MUSEUM OF THE ROYAL COLLEGE OF SURGEONS.[1]

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Part I.

I. Material.

Case No. I.—Male Chinese, aged 40; occupation, coolie; weight about 8 stone; body well developed; previous illness, chronic bronchitis. P.M.: Right lung consolidated; liver markedly diminished in size, several small cavities in substance all containing liver flukes; Distoma Sinensis? Cause of death, pneumonia.

Case No. II.—Male Chinese, aged 40; occupation, coolie; weight about 9 stone; previous illness, nil. P.M.: Spleen much enlarged; liver do. Cause of death, malaria.

Case No. III.—Male Chinese, aged about 40; occupation, coolie; body development fair; died day of admission. P.M.: Old pleurisy; spleen enlarged; kidneys enlarged and congested, capsule strips readily; 6 oz. of semi-purulent fluid in pericardial sac; pericardium thickened, vascular, shaggy; here and there spots of pus. Cause of death, pericarditis.

II. Dimensions of Brains.

(1) *Weight after hardening in 5 per cent. formalin, Membranes removed.*

	Medulla, pons, and cerebellum.	Right hemisphere.	Left hemisphere.
Case No. I.	156 grammes	510 grammes	490 grammes
„ No. II.	194 „	648 „	659 „
„ No. III.	172 „	633 „	631 „

[1] The Council of the Royal College of Surgeons kindly contributed ten pounds towards defraying the expenses of the illustration of this paper.

Total weight.	Pons and cerebellum.	Total weight.	Pons and cerebellum.	Total weight.	Pons and cerebellum.
No. 1 = 1156	: 156.	No. 2 = 1501	: 194.	No. 3 = 1426	: 172.
Ratio 7·4	: 1.	7·7	: 1.	8·3	: 1.

(2) *Sylvian Angle.*

In estimating the angle which the Sylvian fissure makes with the horizontal plane, it is necessary to have some convention by which that plane can be determined. The plane suggested by Cunningham ("Surface Anatomy of the Cerebral Hemispheres," *Cunningham Memoirs*, No. 7, 1892) is that which lies at right angles to the median plane and passes through the most projecting points at the frontal and occipital poles.

Cunningham's Sylvian angle is the angle made by the Sylvian fissure with a transverse plane lying at right angles to the horizontal. For the brains under consideration it is as follows:—

	Right hemisphere.	Left hemisphere.
Brain No. I.	Too much distorted for measurement.	
„ No. II.	64°	70°
„ No. III.	63°	63°

If the plane touching the two lowest points of the temporal lobe is taken as the horizontal plane, then the angle made within by the Sylvian fissure is as follows:—

	Right hemisphere.	Left hemisphere.
Brain No. II.	8°	7°
„ No. III.	11°	12°

It will be noted that the more the Sylvian fissure slopes upwards the smaller will be Cunningham's Sylvian angle and the larger the angle measured in the last-mentioned manner.

(3) *Linear Measurements.*

Three series of linear measurements have been made:

I. *Length of Fissures, Breadth of Gyri, etc.*—These were made with callipers, and consequently represent the shortest distance between the two points named in each case. They will be found scattered through the text.

II. *Depth of Fissures.*—This was ascertained by pulling apart the walls of the fissures and inserting gently the ivory handle of a scalpel on which a scale had been engraved, so that its bluntly rounded end rested on the bottom of the fissure. The distance of the latter from the general surface of the brain could then be read off from the scale. It must, however, be

understood that no great accuracy is claimed for these or indeed for any of the measurements.

These measurements are recorded only on the outline figures, which are intended to act as explanations of the photographs. The numbers which will be found scattered over these drawings give in millimetres the depth of the fissure at the point against which each number stands. It was thought better to record the distances and the depths in different ways, since if both sets had been recorded in the same way, either the text would have become more clumsy, involved, and obscure than it is at present, or the figures would have lost their comparative lucidity.

III. The third series of measurements give the general dimensions of the brains and are recorded in tabular form below. Brain No. I. was considered to be too distorted to be worth measuring.

Greatest Length of Hemisphere projected on Median Plane.

	Right hemisphere.	Left hemisphere.
Brain No. II.	186 mm.	189 mm.
„ No. III.	173 „	173 „

Distance of Sylvian Fissure from Supero-mesial Border.

Distance measured with tape over the surface of the hemisphere from (*a*) the anterior end of the fissure, where the ramus anterior is given off; (*b*) the point at which it branches into the two rami posteriores. In each case the tape was passed over the surface in a transverse plane at right angles to the horizontal (*vide supra*, second definition of horizontal plane, under heading Sylvian angle). The upper point taken was not actually the border, which is difficult to define, but the horizontal surface on which the brain was allowed to rest with its mesial aspect downwards.

	Right hemisphere.	Left hemisphere.
Brain No. II. (*a*)	101 mm.	105 mm.
(*b*)	102 „	103 „
Brain No. III. (*a*)	102 „	101 „
(*b*)	103 „	102 „

Distance measured with a tape along the supero-mesial border from the most projecting point at the frontal pole to (*a*) the place at which the sulcus centralis cuts the border, or, if it fails to cut it, where a line carried along the general direction of the fissure would cut the border; (*b*) the point at which the fossa parieto-occipitalis cuts the border; (*c*) the most projecting point at the occipital pole.

	Right hemisphere.	Left hemisphere.
Brain No. II. (*a*)	142 mm.	139 mm.
(*b*)	212 „	207 „
(*c*)	265 „	252 „
Brain No. III. (*a*)	132 „	149 „
(*b*)	201 „	222 „
(*c*)	248 „	265 „

Distance measured over the lateral surface with a tape from the most projecting point at the frontal pole to (*a*) the point at which the sulcus centralis would, if produced along the line of its general direction, cut the Sylvian fissure; (*b*) the most projecting point at the occipital pole.

	Right hemisphere.	Left hemisphere.
Brain No. II. (*a*)	111 mm.	103 mm.
(*b*)	240 „	253 „
Brain No. III. (*a*)	105 „	103 „
(*b*)	132 „	229 „

III. Nomenclature.

The nomenclature of Gustav Retzius, used in his work *Das Menschenhirn*, has been adopted throughout in the following descriptions except in dealing with the occipital region. Here the names proposed by Elliot Smith (*Anat. Anz.*, Bd. xxiv., p. 436) have been used, since it is usually easier to bring the occipital region into line with his system than with any other.

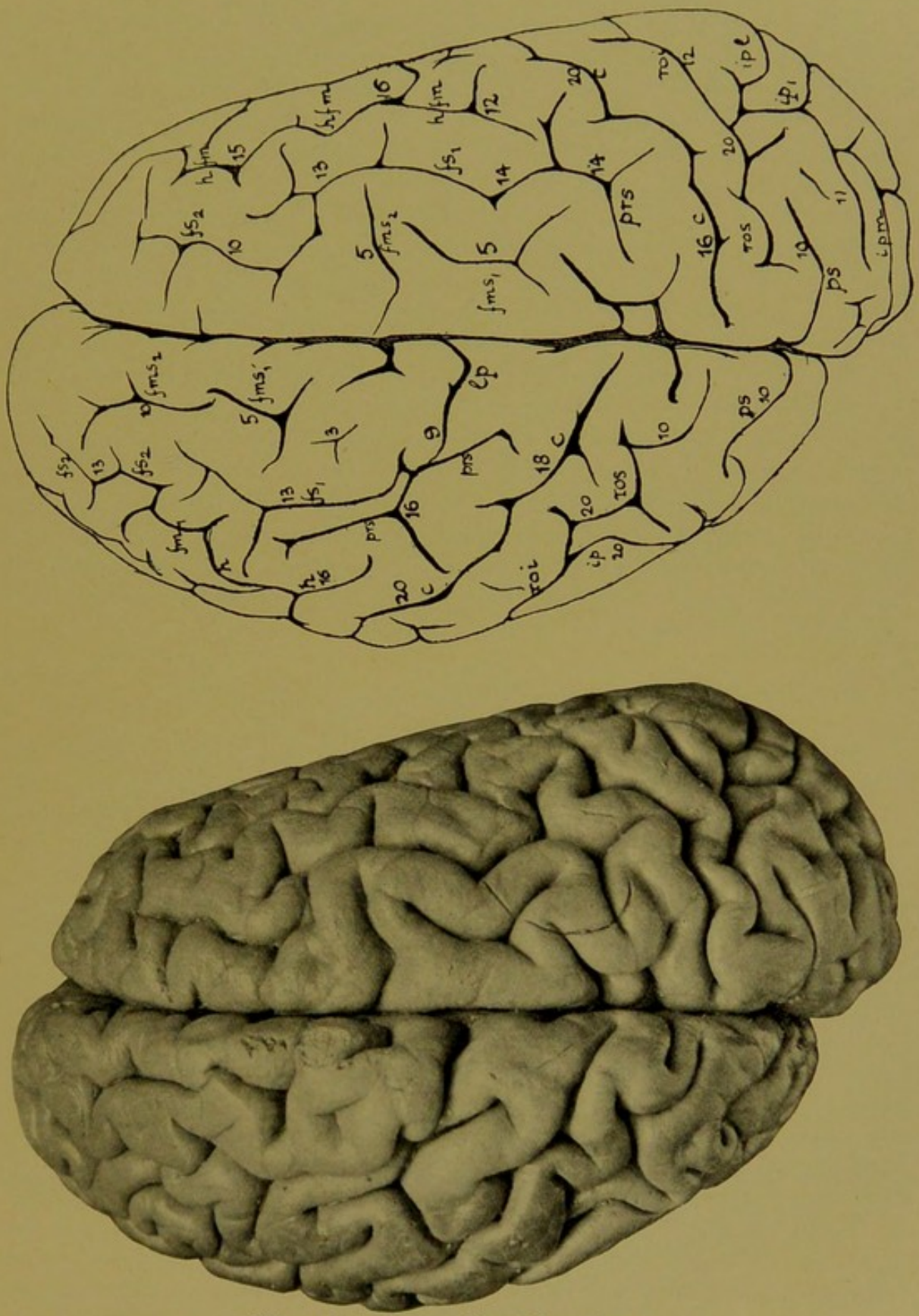
IV. Detailed Descriptions of Fissures and Convolutions.

CHINESE BRAIN No. I.

Right Hemisphere.

Fissures separating Lobes of the Hemisphere.

The *Sylvian fissure* is provided with one anterior ramus (*ra*), 9 mm. in length, which runs upwards and opens below together with the sulcus diagonalis (*d*) into a small lacuna in the upper operculum, through which a portion of the insula may be seen. Occupying the position of a ramus anterior horizontalis is a superficial fissure, which cannot be regarded as the homologue of this ramus, since it does not cut through the operculum. From the posterior wall of the gap in the operculum referred to above, the main stem of the Sylvian fissure (*Fsy*) runs backwards for 50 mm. and



Chinese Brain No. 1. Viewed from above.

(For explanation of figures see p. 374.)

then divides into two rami posteriores, ascendens and descendens; the former (*rpa*), which is 18 mm. in length, lies almost in the same straight line as the main stem; the latter (*rpd*) runs downwards and forwards for 9 mm. The *Sulci subcentrales, anterior* (*sca*) and *posterior* (*scp*), join the main stem of the fissure (*Fsy*), the former midway along its course, the latter just in front of its posterior point of bifurcation.

The *Sulcus centralis* (*c*).—The upper end of this sulcus cuts the supero-mesial border; its lower end reaches to within 5 mm. of the Sylvian fissure. The superior and inferior genua are not conspicuous. The anterior wall is raised up into two well-marked gyri which project backwards and interdigitate with three smaller elevations on the posterior wall.

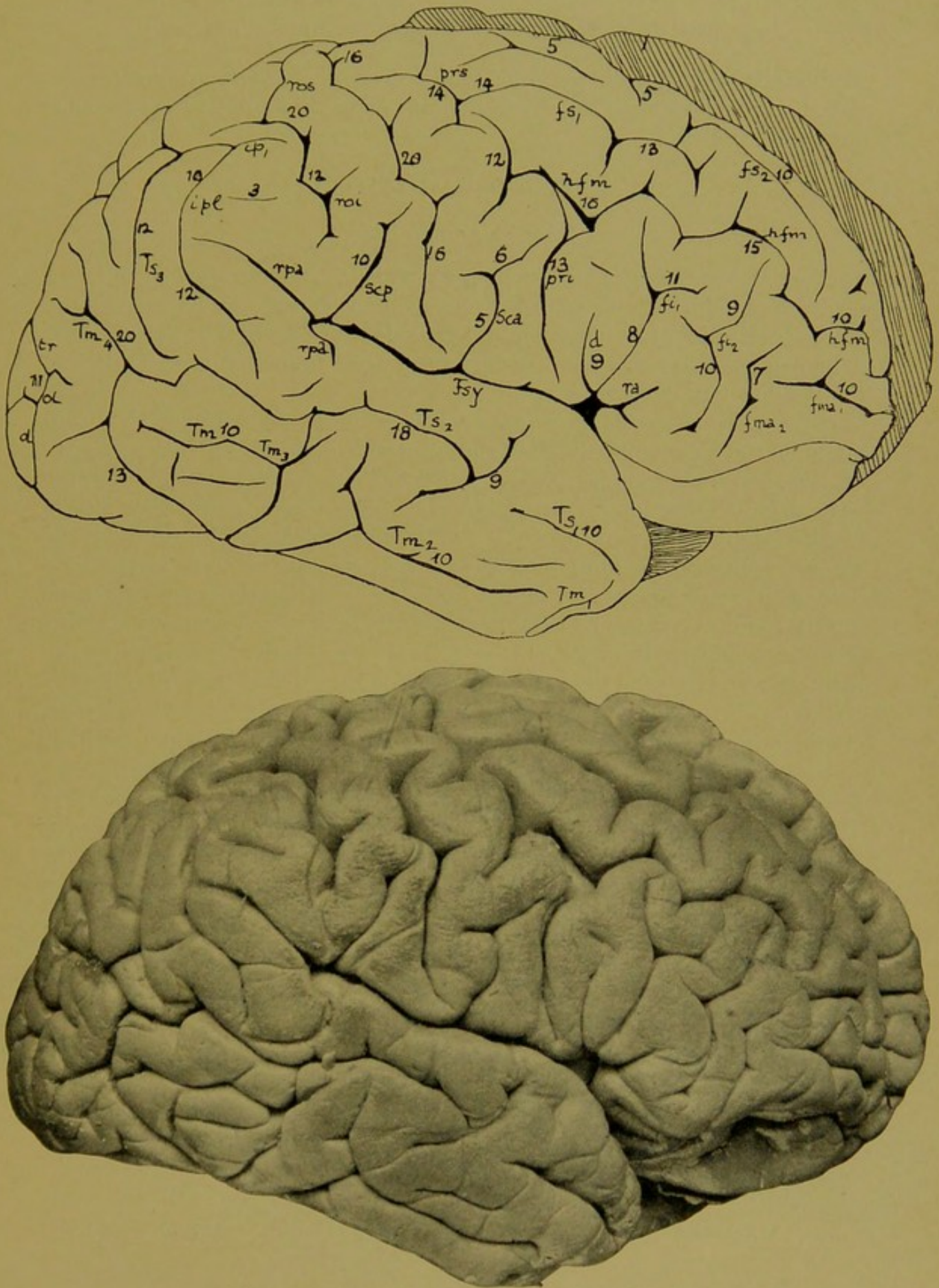
The *Sulcus cinguli* (*sc*) originates immediately below the genu of the corpus callosum, and runs first round its anterior end and then more or less parallel to its upper border till it reaches a point above the splenium, where it turns upwards to end at the supero-mesial border. Close to its posterior extremity it is superficially connected with the sulcus parietalis superior (*ps*), which runs on to the mesial surface of the hemisphere. It is traversed by two deep annectant gyri (an_1 and an_2), the points at which these occur being each marked by a double bend. It gives off one or two insignificant branches towards the border of the hemisphere.

The Calcarine System of Fissures.

The *Arcus intercuneatus,* although almost completely sunk into the fossa parieto-occipitalis (*fpo*), is just visible from the surface, and the *Incisura parieto-occipitalis* extends on to the outer face of the hemisphere for 23 mm., ending within 5 mm. of the sulcus interparietalis (*ip*). The *Sulcus paracalcarinus* is hidden in the fossa, but the *Sulcus limitans præcunei* may be seen forming the anterior boundary of the arcus intercuneatus; it ends in a bifurcation, the outer limb of which runs outwards parallel to the incisura 3–6 mm. in front of it. The superficial extent of the fossa parieto-occipitalis on the median surface is about 33 mm.

The *Sulci calcarinus* (*cal*) and *intrastriatus mesialis* (*im*) form a continuous fissure, which is joined by the fossa parieto-occipitalis 36 mm. from its anterior end and is crossed at two points (an_1 and an_2) by the two deep gyri cuneo-linguales; it ends posteriorly near the occipital pole in a widespread bifurcation measuring 22 mm. between the ends of the two limbs.

The *Sulcus collateralis* (*col*) is an unbroken fissure which runs at first upwards to a point immediately below the anterior end of the sulcus calcarinus and then turns downwards, ending in a bifurcation 23 mm. from



Chinese Brain No. 1. Outer aspect. Right hemisphere.

the occipital pole. In its posterior half it gives off a short upward branch which anastomoses with the sulcus limitans areæ striatæ inferior (*lsi*) and a downward branch.

THE FRONTAL LOBE.

The Principal Sulci.

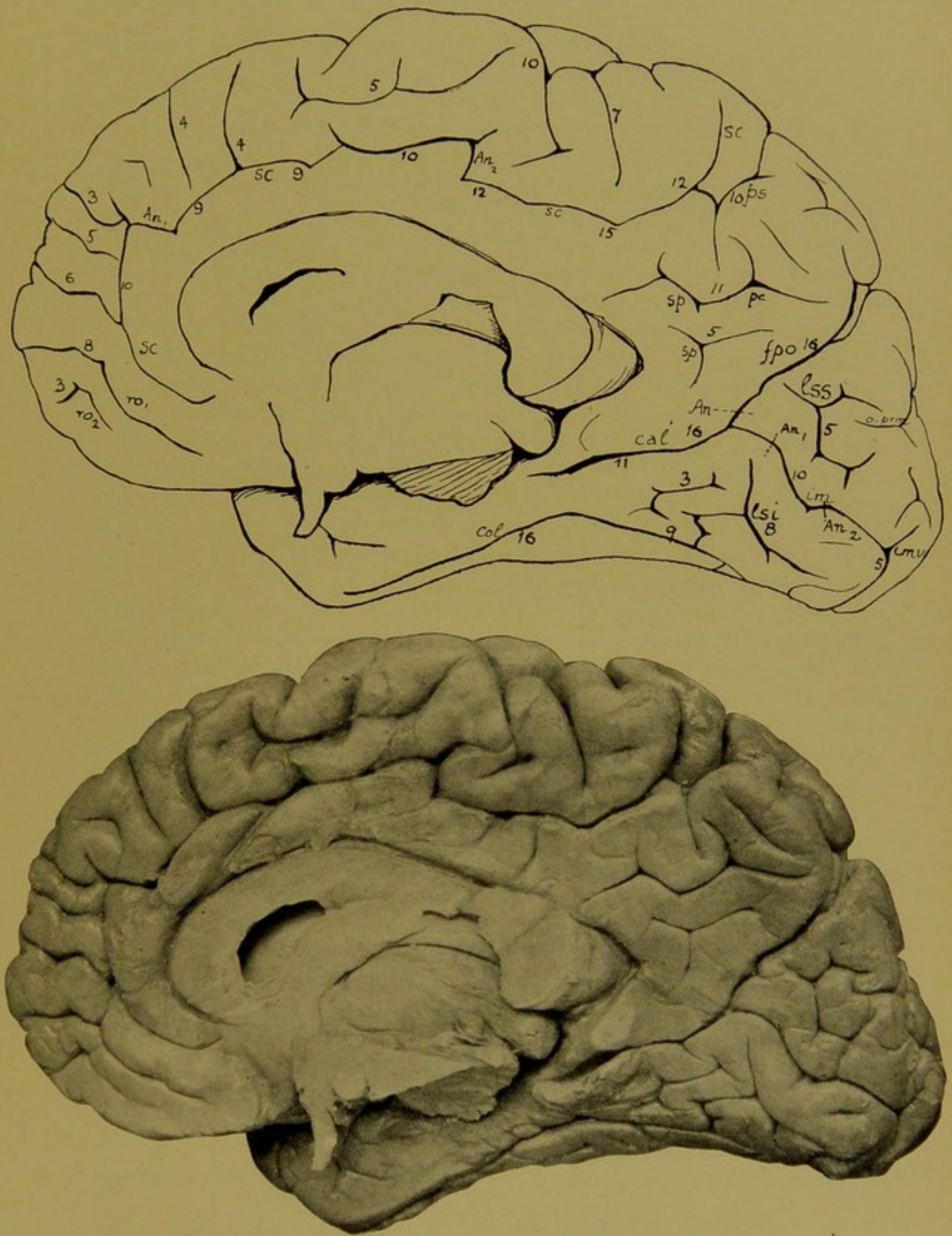
Sulcus præcentralis superior (*prs*), which is 36 mm. in length, from about the middle of its course sends a branch backwards towards the sulcus centralis. Its inner end is bounded by a curved gyrus, itself delimited by a fissure which sends two vertical branches downwards into the lobulus paracentralis.

Sulcus præcentralis inferior (*pri*) at its lower end reaches to within 5 mm. of the Sylvian fissure. It runs upwards and slightly backwards for 35 mm., and near its upper end is connected over a deep annectant gyrus with a long and sinuous fissure (*hfm*) which almost completely bisects longitudinally that part of the frontal lobe which lies in front of the anterior central convolution. The posterior part of this fissure may perhaps be regarded as the ramus horizontalis of the sulcus præcentralis inferior, and its anterior part as an exceedingly well-developed sulcus frontalis medius. It is 76 mm. long from its anterior extremity to the point at which it joins the vertical crosspiece in which it ends behind.

Sulcus frontalis superior (*fs*) is divided into two considerable segments, of which the posterior (fs_1) is the more important; this is 46 mm. long; it ends behind in the sulcus præcentralis superior and in front in a cross-piece, 16 mm. behind which it gives off a short, downwardly directed branch. The posterior end of the anterior segment (fs_2) is superficially connected with the portion of the fissure lying behind it, and its total length is some 35 mm.

Sulcus frontalis inferior (*fi*).—As if to compensate for the high state of development reached by the sulcus frontalis medius (*hfm*), the sulcus frontalis inferior is somewhat reduced, consisting only of two completely separated triradiate segments. The posterior of these (fi_1) is made up of two upper limbs, measuring respectively 12 and 9 mm. in length, and a lower limb 16 mm. long, which stretches downwards between the sulcus diagonalis (*d*) and the ramus anterior ascendens (*ra*) of the Sylvian fissure. The anterior segment (fi_2) has a posterior limb 6 mm. in length and two anterior limbs, measuring 19 mm. and 16 mm. respectively. The upper of these is connected by a superficial groove with the fissure *hfm*.

Sulcus fronto-marginalis is divided into two segments: the inner one (fma_1), which lies just above the superciliary margin, is 30 mm. long; the



Chinese Brain No. 1. Right hemisphere. Inner aspect.

outer one (fma_2) is 26 mm. long, and runs parallel to the anterior segment (fi_2) of the sulcus frontalis inferior, about 7 mm. in front of it.

Gyri and Smaller Sulci.

Gyrus centralis anterior is very well developed. In its upper region its average width is about 15 mm.; in its lower region, where its anterior boundary is formed by the sulcus præcentralis inferior (*pri*), it forms a rectangular piece about 35 mm. in length and 20 mm. in breadth. A large portion of this area is subdivided longitudinally by the sulcus subcentralis anterior (*sca*), which runs upwards and slightly forwards from the Sylvian fissure for 17 mm. and there ends in a crosspiece. The anterior central convolution is connected by narrow, superficial gyri with each of the three horizontal convolutions of the frontal lobe, and beneath the lower end of the sulcus centralis with the posterior central convolution.

Lobulus paracentralis, which is of an average breadth of 27 mm., is incompletely separated from the mesial surface of the gyrus frontalis superior. It is cut into by two fissures which run downwards and slightly backwards from a previously described sulcus which curves round the upper end of the sulcus præcentralis superior (*prs*).

Gyrus frontalis superior on its mesial aspect has an average breadth of 21 mm., and its surface is marked with many shallow and irregular fissures, two of which, lying in the neighbourhood of the frontal pole, may be classed as sulci rostrales (ro_1 and ro_2); of these the upper one is 36 mm. in length and is connected superficially with the sulcus cinguli. On the lateral aspect two regions may be distinguished bounded below by the two segments of the sulcus frontalis superior (fs_1 and fs_2). The posterior of these has an average width of about 25 mm., and is infolded by two segments of the *Sulcus frontalis mesialis* (fms_1 and fms_2); the one, a slightly curved sagittal fissure 29 mm. long giving off a short, inwardly directed branch, and the other, 23 mm. long, and placed transversely. The anterior region measures only about 13 mm. in breadth.

Gyri frontalis medius and *frontalis inferior* are very incompletely divided from one another and will be considered together. The long fissure (*hfm*), which has been identified as the sulcus frontalis medius, combined with the ramus horizontalis of the sulcus præcentralis inferior, completely separates off on the upper side a strip of cortex, measuring 11–15 mm. in breadth, except at the point immediately in front of the sulcus præcentralis superior (*prs*), where it bulges out to a breadth of about 30 mm. This strip is cut into from above by the two downward branches of the sulcus frontalis superior (*fs*), and is connected by a narrow gyrus lying just

below the sulcus præcentralis superior with the gyrus centralis anterior. The remainder of the middle frontal, together with the whole of the inferior frontal convolution, form an area 35–40 mm. broad posteriorly, which is continued forwards as a much narrower strip, lying just above the superciliary margin. The broad portion contains, in addition to the fissures already described, a *Sulcus diagonalis* (*d*) 15 mm. long, which lies 5–10 mm. in front of the lower end of the sulcus præcentralis inferior (*pri*), and opens into the same gap in the operculum as the ramus anterior ascendens (*ra*) of the Sylvian fissure.

The Orbital Surface.

Sulcus olfactorius is 39 mm. in length.

Sulcus orbitalis consists of an outer limb 32 mm. in length and slightly curved, which gives off near the middle of its course an inwardly and backwardly directed branch 23 mm. long. To the inner side of the outer limb are three irregularly placed fissures, of which the middle one lies more or less sagittally and is the largest, being 28 mm. long.

THE PARIETAL, OCCIPITAL, AND TEMPORAL LOBES.

The Principal Sulci.

Sulci retrocentrales (*roi* and *ros*) are united to form a continuous fissure 54 mm. long, the bifid inner end of which lies 11 mm. distant from the supero-mesial border, while its outer extremity reaches to within 13 mm. of the Sylvian fissure. Twenty mm. from the former a short, backwardly directed branch is given off, and 10 mm. from the latter another which points upwards and forwards. Well-marked interdigitating gyri lie in the lower half of the fissure, of which one may possibly be regarded as an annectant.

Sulcus interparietalis (*ip*) is not connected with the sulcus retrocentralis. Almost immediately behind its anterior termination it gives off a long, downwardly directed branch (*ipl*), which passes within 7 mm. of the ramus posterior ascendens of the Sylvian fissure (*rpa*) and ends 40 mm. from its starting point, and 4 mm. short of the sulcus temporalis superior (*Ts*). Twelve mm. behind the point at which this branch is given off the sulcus interparietalis is connected with the ramus ascendens (Ts_3) of the last-named fissure, and 10 mm. behind this again it bifurcates, sending one branch inwards for 21 mm. and forming, by means of the other, which is traversed by a deep annectant gyrus, a junction with its own posterior or occipital segment. The latter is quite conventional in form, consisting of a straight sagittal fissure 33 mm. long, which ends behind in the *Sulcus transversus* of Ecker (*tr*), and in front sends its ramus mesialis (*ipm*)

inwards for 17 mm. and a shorter branch outwards to join the anterior segment (ip_1).

Sulcus transversus (*tr*) runs inwards from the point of junction for 11 mm. and outwards for the same distance. At its outer extremity it joins a fissure which may be called the *Sulcus occipitalis lateralis* (*ol*). The latter consists of a curved anterior limb 15 mm. long, which branches posteriorly, the upper branch being also curved and measuring 20 mm. from end to end, and the lower branch straight and 12 mm. long.

There is no distinct *Sulcus lunatus*, and the stria of Gennari stops at the occipital pole.

Sulcus temporalis superior (*Ts*) is divided into three segments: the anterior (Ts_1), which lies near the temporal pole, is 34 mm. long; the middle segment (Ts_2) starts in front in an oblique crosspiece, with which, however it is only in superficial connection, and runs almost straight backwards for 52 mm., where it unites with the fourth segment of the sulcus temporalis medius (Tm_4); the third segment (Ts_3) consists of a ramus ascendens which is 37 mm. long and united above with the anterior portion (ip_1) of the sulcus interparietalis.

Sulcus temporalis medius (*Tm*) is divided into four irregular segments, of which the third and fourth anastomose with the middle segment of the sulcus temporalis superior (Ts_2).

Sulcus temporalis inferior consists of three obliquely placed portions, of which the two anterior lie almost entirely on the tentorial aspect. They are both bifid in front, and measure from the point at which they fork to their posterior ends approximately 25 mm. The posterior piece situated on the tentorio-lateral margin is 22 mm. long.

Gyri and Smaller Sulci.

Gyrus centralis posterior for the upper part of its length is somewhat convoluted and measures only 6 mm. across, but as one passes towards the Sylvian fissure it gradually widens out to about three times this breadth. It is cut into from below by the *Sulcus subcentralis posterior* (*scp*), which runs upwards for 18 mm. from the Sylvian fissure, and ends in an oblique crosspiece. This divides the lower portion of the gyrus into two longitudinal strips, of which the anterior is continuous beneath the sulcus centralis (*c*) with the gyrus centralis anterior, and the posterior beneath the sulcus retrocentralis inferior (*roi*) with the gyrus marginalis. The upper end is continuous with the lobulus paracentralis and the gyrus arcuatus anterior.

Præcuneus measures approximately 37 mm. in length by 27 mm. in

breadth; it is somewhat irregularly fissured. The most anterior of its fissures, which stretches into it for 22 mm. from the lateral surface and makes a superficial connection with the sulcus cinguli, is the sulcus parietalis superior (*ps*). The larger irregular and smaller triradiate fissures, which lie behind this, represent together the *Sulcus præcunei* (*pc*) and the *Sulcus subparietalis* (*sp*), while in addition to these there is a smaller, straight cleft lying near to the superior border.

Lobulus Parietalis Superior.

Since the sulcus cinguli fails to reach the lateral surface, the *Gyrus arcuatus anterior* is represented only by a strip of cortex about 13 mm. broad, which connects the gyrus centralis posterior with the *Gyrus arcuatus medius*. The latter is large and well developed, stretching outwards for 37 mm. and measuring approximately 35 mm. in a sagittal direction. It is marked with the following fissures:—(1) *Sulcus parietalis superior* (*ps*). This lies near the anterior boundary, and is 22 mm. long from its outer extremity to the point at which it turns over the supero-mesial border on to the præcuneus. (2) A small H-shaped fissure lying on that border immediately behind this point. (3) The inwardly directed branch from the anterior portion of the sulcus interparietalis. (4) A shallow depression lying between (1) and (3).

The apex of the gyrus arcuatus medius is continuous with the gyrus marginalis between the anterior end of the sulcus interparietalis and the sulcus retrocentralis.

Gyrus arcuatus posterior forms a rectangular figure measuring 36 mm. in length and 22 mm. in breadth. Its anterior and posterior and external boundaries are formed as usual by the sulcus interparietalis and the sulcus transversus of Ecker. The incisura parieto-occipitalis almost completely separates from it an anterior strip about 12 mm. broad, into which the sulcus limitans præcunei runs. In its posterior division lie a small sagittal fissure 10 mm. long and the bifid anterior end of the *Sulcus occipitalis paramesialis*. The last-named fissure starts near the occipital pole, and runs forwards by a somewhat irregular course along the supero-mesial border; it sends a short branch downwards into the cuneus and ends in front as described.

Lobulus Parietalis Inferior.

Gyrus marginalis measures some 27 mm. across at its broadest point, and its apex lies 35 mm. from the junction of the two posterior rami of the Sylvian fissure. Its posterior boundary is formed by the branch (*ipl*) of

the sulcus interparietalis, which completely separates it from the gyrus angularis. Lying on its upper half is a short, straight fissure 12 mm. long.

Gyrus angularis.—Since the ramus ascendens (Ts_3) of the sulcus temporalis superior is separated from the main fissure, but joins the sulcus interparietalis above, the usual arrangement of this gyrus is reversed, in that its two limbs are continuous at its lower and not at its upper extremity. The upper 30 mm. of the anterior limb have a uniform width of 10 mm., but at its lower end it opens out to a breadth of 18 mm. The posterior limb is roughly triangular in form, and the greater part of its posterior boundary is formed by a straight fissure, 20 mm. long, lying somewhat obliquely and superficially connected above with the posterior segment of the sulcus interparietalis (ip_2).

Cuneus is triangular, its two anterior sides measuring 33 mm. (upper side) and 42 mm. (lower side), while its posterior side is 46 mm. long. An irregular-shaped *Sulcus limitans areæ striatæ superior* (*lss*) is present, and in addition to this a branch runs down on to the surface of the cuneus from the *Sulcus occipitalis paramesialis* (*o.prm*).

Gyrus temporalis superior is narrowest in the neighbourhood of its middle point, where it measures only 9 mm. across; both in front of and behind this it increases gradually in breadth, reaching 18 mm. in front and 20 mm. behind. It is cut into by the tranverse fissure which lies at the anterior end of the second segment of the sulcus temporalis superior (Ts_2), immediately in front of which it communicates with the gyrus temporalis medius. The ramus posterior descendens (*rpd*) of the Sylvian fissure also runs downwards and forwards into it.

Gyrus temporalis medius, the lower boundary of which is somewhat fragmentary, attains its maximum breadth of 22 mm. at a distance of 54 mm. from the temporal pole. The upper posterior branch of Tm_2 almost traverses it at this point, and immediately behind it communicates with the gyrus temporalis inferior. The region behind this point of communication, which is 7–14 mm. wide, is completely separated from all that lies in front of it by the anastomosis which the third segment of the sulcus temporalis medius (Tm_3) establishes with the second segment of the sulcus temporalis superior (Ts_2).

Gyrus temporalis inferior and *Gyrus fusiformis* form a very irregularly fissured region on either side of the tentorio-lateral margin.

Gyrus lingualis is of the typical shape. It is 11 mm. wide where it communicates with the gyrus hippocampi and gradually attains a breadth of 28 mm., which it reaches immediately behind the point of junction of the fossa parieto-occipitalis (*fpo*) and the sulcus calcarinus (*cal*); at this breadth approximately it remains in its posterior region. In its anterior

half is an insignificant fissure of about 18 mm. in length, and in its posterior half there is a well-developed *Sulcus limitans areæ striatæ inferior* (*lsi*), which runs more or less parallel to the sulcus intrastriatus mesialis (*im*), at a distance of 7–10 mm. from it, and anastomoses with the sulcus collateralis (*col*).

Left Hemisphere.

Fissures separating Lobes of the Hemisphere.

Sylvian fissure.—As in the right hemisphere, there is a ramus anterior ascendens (*ra*) which stretches upwards for 17 mm. from its point of junction with the main stem, while the position of the ramus horizontalis is occupied by a shallow fissure which does not cut through the operculum. The main stem (*Fsy*) itself stretches backwards from the opening of the ramus anterior for 63 mm., and then forks into the ramus posterior ascendens (*rpa*) and the ramus posterior descendens (*rpd*), each 10 mm. long, which point sharply upwards and downwards.

Sulcus centralis (*c*) at its inner end cuts the supero-mesial border, while its outer end reaches to within 5 mm. of the Sylvian fissure. The genua are only very slightly marked. The anterior wall of the fissure is raised up into three broad gyri of which the middle one is the most strongly developed, and these interlock with the two small gyri on the posterior wall.

Sulcus cinguli (*sc*) starts 8 mm. in front of the genu of the corpus callosum. It diverges from the upper border of the latter till it reaches a point 44 mm. from its anterior end, where it is separated from it by a distance of 20 mm.; then, as it runs backwards, after approaching to within 13 mm. of it, it again gradually diverges, till it cuts the supero-mesial border 10 mm. behind the sulcus centralis, giving off one short, backwardly directed branch just before doing so. Ten mm. from this branch a superficial connection is established with one of the fissures of the præcuneus. Another fissure, which curves round the anterior end of the sulcus cinguli and sends off five branches towards the border, may possibly be regarded as an anterior segment.

Calcarine System of Fissures.

The *Arcus intercuneatus* and its limiting sulci cannot be identified with certainty. The *Fossa parieto-occipitalis* (*fpo*) stretches for only 12 mm. on the lateral surface, but is continued outwards for another 10 mm. by a superficial groove; it gives off, on the mesial surface, close to its anterior end, a very short, forwardly directed branch, and is joined from behind by

a shallow sulcus 14 mm. long near to the supero-mesial border. From this border to its point of union with the sulcus calcarinus (*cal*) it measures 33 mm. Its lower end is crossed by the gyrus cunei.

Sulcus calcarinus (*cal*) itself appears to be very short, but this may be due principally to the distortion of the hemisphere. It makes a very well-marked angle with the *Sulcus intrastriatus mesialis* (*im*), from which it is separated by the deep *Gyrus cuneo-lingualis anterior*. From this point the sulcus intrastriatus mesialis (*im*) runs downwards and backwards to the occipital pole in a line which is almost mathematically straight, and then, 35 mm. from its anterior end, joins its ramus verticalis (*imv*). Immediately before this point it is crossed by the deep *Gyrus cuneo-lingualis posterior*. The ramus verticalis has an upper limb 10 mm. long and a lower limb 14 mm. long.

Sulcus collateralis (*col*) forms a continuous fissure which is joined in front by the *Sulcus rhinencephali inferior* (*sri*) and behind by one of the segments of the sulcus temporalis inferior. Furthermore, it is connected by a straight shallow fissure joining it 52 mm. from its anterior end with the sulcus limitans areæ striatæ inferior (*lsi*).

FRONTAL LOBE.

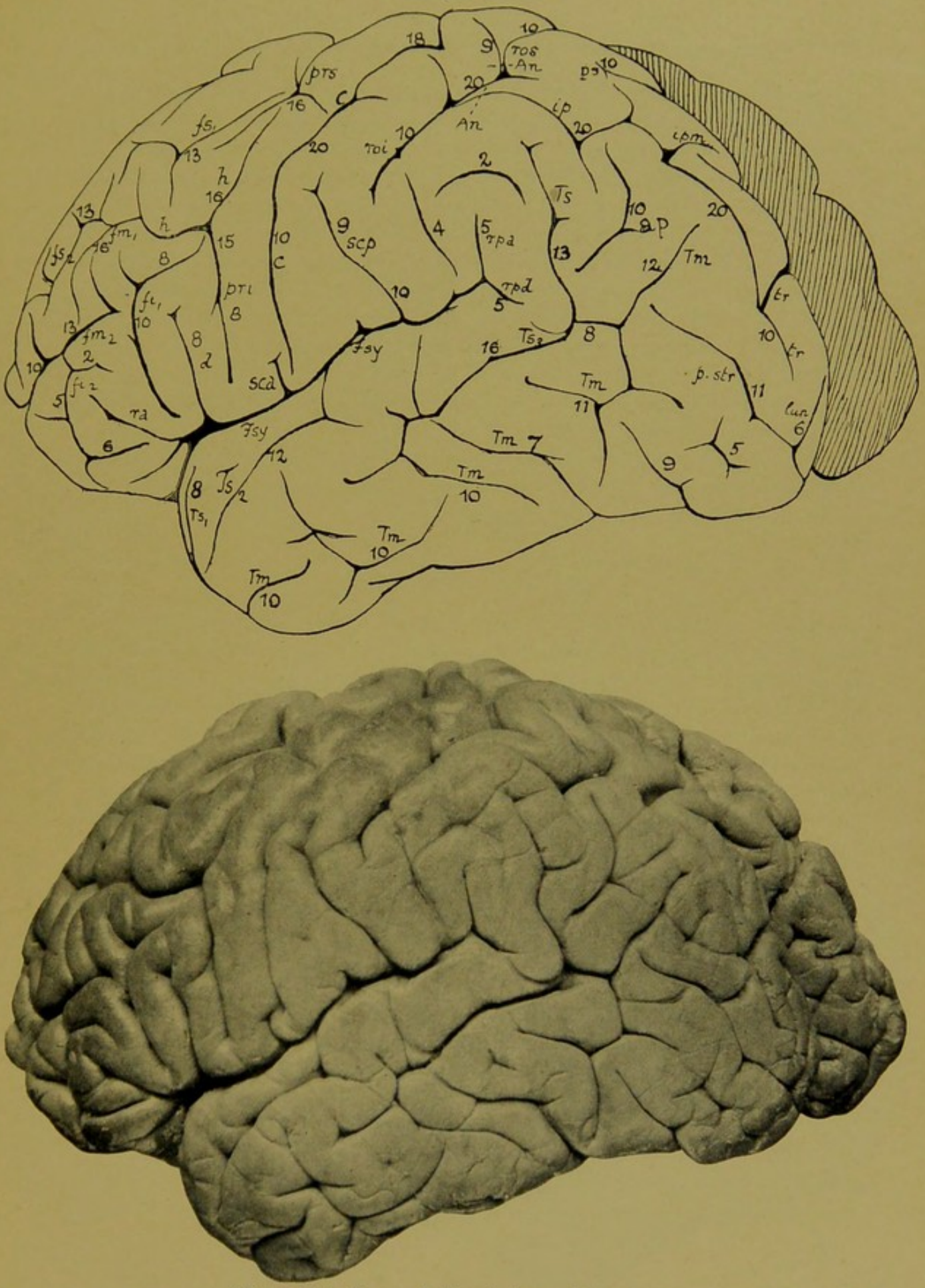
The Principal Sulci.

Sulcus præcentralis superior (*prs*) is a curved fissure with its lower extremity bifid. Its upper end lies 14 mm. from the supero-mesial border and 25 mm. from its point of bifurcation. The posterior of its two lower branches is superficially connected with the sulcus centralis.

Sulcus præcentralis inferior (*pri*).—The lower end of this fissure lies 6 mm. from the Sylvian fissure (*Fsy*). From this point it runs straight upwards for 30 mm. and there joins a curved fissure (*h*), which may be regarded as its ramus horizontalis.

Sulcus frontalis superior is divided into two segments. The posterior (fs_1) is superficially connected at its posterior extremity with the sulcus præcentralis superior (*prs*), and 35 mm. in front of this point ends by dividing into two small branches; another branch, 13 mm. long, is given off in a downward direction, 11 mm. behind this. The anterior segment (fs_2) is exceedingly irregular in shape, sending off several short branches both upwards and downwards; its length, measured between its two extreme points, is 49 mm.; the most posterior of its downward branches is connected with the sulcus frontalis medius (*fm*).

Sulcus frontalis medius (*fm*) is divided into two segments. The posterior (fm_1) is continuous behind with the ramus horizontalis (*h*) of the



Chinese Brain No. 1. Left hemisphere. Outer aspect.

sulcus præcentralis inferior. The anterior (fm_2) is a straight fissure 35 mm. long, which ends behind in a short crosspiece and in front joins the sulcus fronto-marginalis. It sends off two short upward branches.

Sulcus frontalis inferior (*fi*) is somewhat reduced, as in the right hemisphere; it consists of two triradiate pieces of which the posterior (fi_1) is the larger. This sends off one arm to terminate close to the junction of the vertical and horizontal portions of the sulcus præcentralis inferior, and another downwards in front of the sulcus diagonalis (*d*), while the third is directed upwards and lies parallel to and 7 mm. behind the terminal crosspiece of the anterior segment of the sulcus frontalis medius (fm_2). The anterior segment (fi_2) consists of a short upward limb connected with the latter, and two longer downwardly directed limbs of which the anterior joins the sulcus fronto-marginalis.

Sulcus fronto-marginalis is divided into two segments of which the inner one lies along the superciliary margin and is 29 mm. in length; the outer one is 27 mm. long.

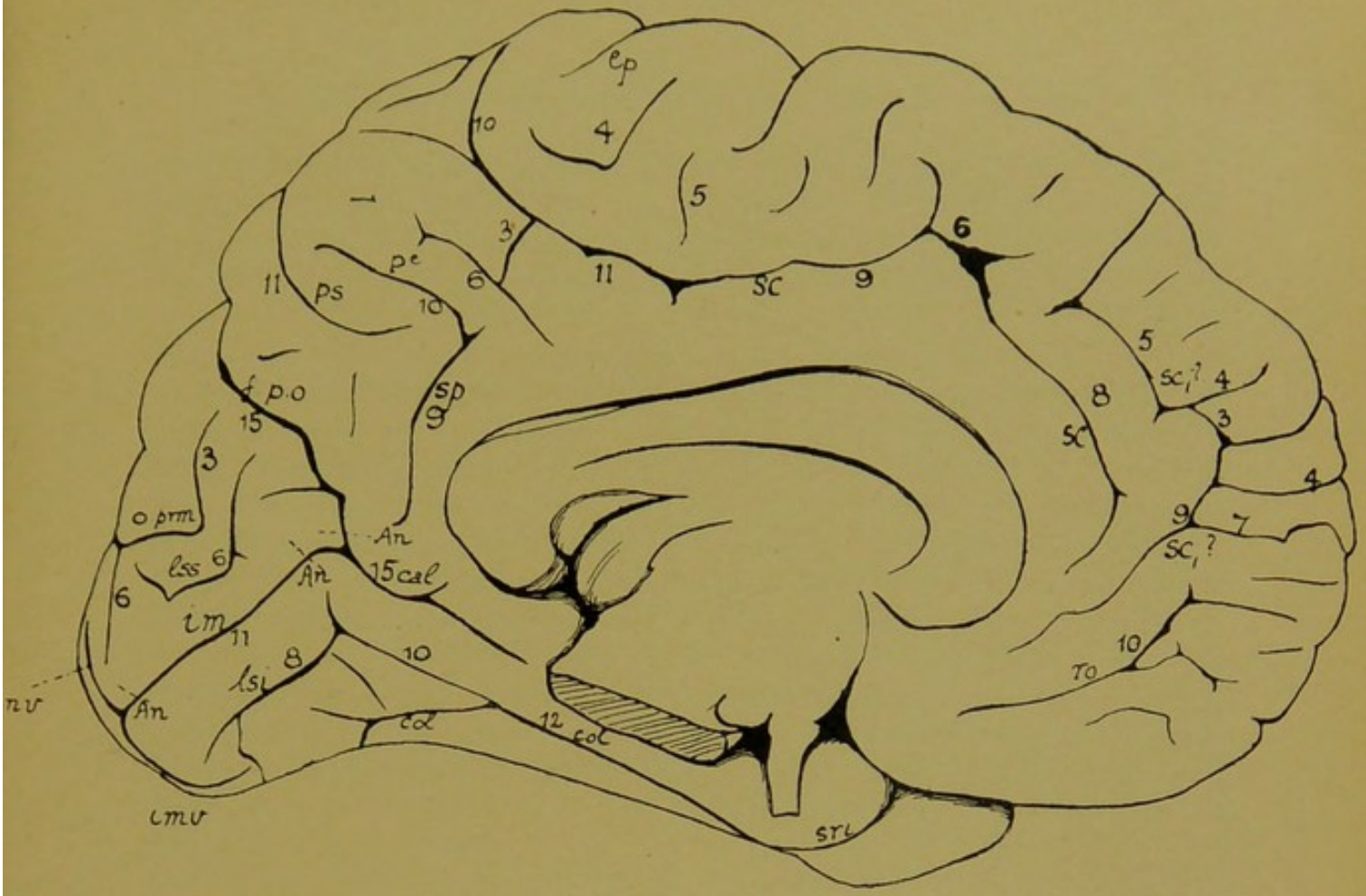
Gyri and Smaller Sulci.

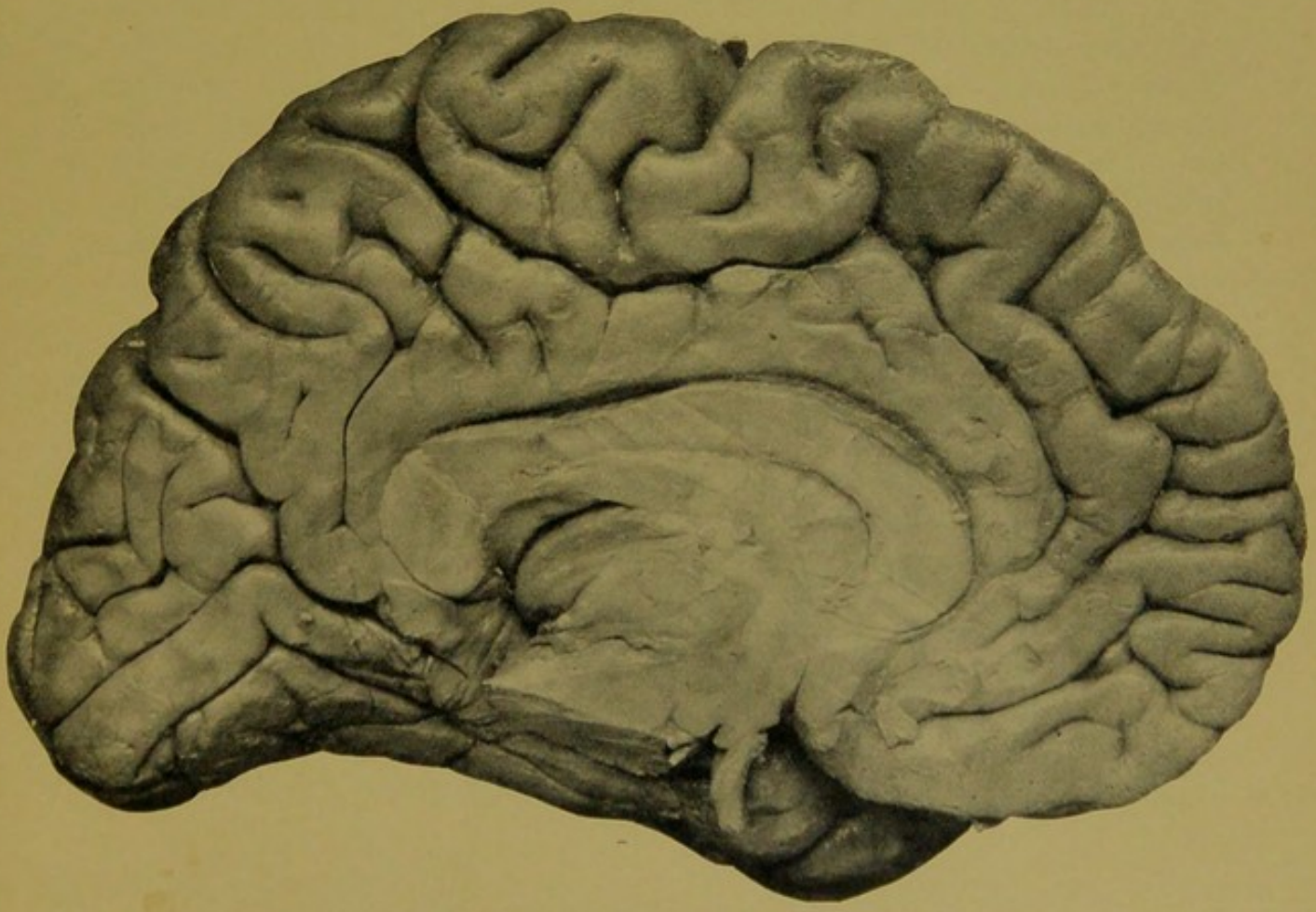
Gyrus centralis anterior is more or less regular in form and measures from 10 to 17 mm. in breadth; its broadest region is situated some 45 mm. from its upper end, and it is here cut across by the lower posterior branch of the sulcus præcentralis superior (*prs*) On the inner side of that fissure it communicates with the gyrus frontalis superior, and on the outer side of it with the gyrus frontalis medius; beneath the sulcus præcentralis inferior (*pri*) it is continuous with the gyrus frontalis inferior. A *Sulus subcentralis anterior* (*sca*), 6 mm. long, runs up into it just in front of the lower end of the sulcus centralis.

Lobulus paracentralis is not definitely bounded in front. It is marked by two or three shallow fissures and one deeper one (*lp*) which cuts through the supero-mesial border and stretches for 15 mm. on to the lateral surface immediately in front of the upper end of the sulcus præcentralis superior.

Gyrus frontalis superior on the mesial aspect measures 19–30 mm. in breadth. The principal fissure (sc_1?) occurring in it has been described in the account of the sulcus cinguli. In addition to this there is a *Sulcus rostralis* 32 mm. long, which sends two branches forwards in the neighbourhood of the anterior end.

On the lateral aspect the average width of the gyrus is about 25 mm. Near its posterior end it is almost completely cut across by the fissure (*lp*), and in front of this lie the segments of the *Sulcus frontalis mesialis* (*fms*). Of the latter two are of considerable size, the posterior (fms_1) being





Chinese Brain No. 1. Left hemisphere. Inner aspect.

triradiate, and the anterior (*fms*$_2$), a straight sagittal sulcus 27 mm. in length, which ends in front in a crosspiece, and sends off one small, inwardly directed branch. The gyrus frontalis superior communicates with the gyrus frontalis medius between the two segments of the sulcus frontalis superior.

Gyrus frontalis medius.—Although, owing to the poor development of the sulcus frontalis inferior, its lower boundary is somewhat indeterminate, it would not be incorrect to say that the breadth of the gyrus is about 25 mm. Its surface is much fissured, since the ramus horizontalis of the sulcus præcentralis inferior (*h*) and the sulcus frontalis medius (*fm*) are very well developed, and, in addition to these, three well-marked branches stretch downwards from the sulcus frontalis superior.

Gyrus frontalis inferior is about 30 mm. broad posteriorly, but becomes narrower towards its anterior end. The arrangement of the fissures which lie in it is very similar in plan to that which obtains in the corresponding part of the right hemisphere. Besides those fissures which have already been described there is a *Sulcus diagonalis* (*d*), which runs upwards from the Sylvian fissure for a distance of 21 mm.

Orbital Surface.

Sulcus olfactorius is 30 mm. long.

Sulcus orbitalis consists of a curved outer portion 16 mm. long, from the middle of which a branch 23 mm. long runs inwards and backwards. Eleven mm. from its inner end this branch is connected with a sigmoidally curved groove running inwards and forwards, and lying in front of it between the groove and the outer curved limb are two straight fissures, obliquely disposed, 28 and 11 mm. in length.

PARIETAL, OCCIPITAL, AND TEMPORAL LOBES.

The Principal Sulci.

Sulci retrocentrales (*ros* and *roi*) form a continuous fissure stretching from the supero-mesial border to a point 22 mm. distant from the Sylvian fissure. This is traversed 20 mm. from its inner end by a deep annectant gyrus, and sends off a short forwardly directed branch above this and one backwardly directed below it.

Sulcus interparietalis (*ip*) joins the sulcus retrocentralis 22 mm. above the lower extremity of the latter, but complete continuity is prevented by an annectant gyrus sunk only very slightly below the surface, which crosses it at its posterior extremity; from this point it runs an uninterrupted

course backwards to end by joining the sulcus transversus of Ecker (*tr*); 34 mm. from its posterior end it gives off its ramus mesialis (*ipm*), which runs inwards for 14 mm., and a short way in front of this another inwardly directed branch 10 mm. in length; 25 mm. from the anterior end of the fissure a branch, 10 mm. long, is sent off in an outward and backward direction.

Sulcus transversus of Ecker (*tr*)—The inner and outer lines of this fissure are joined together in the form of a rather sharp curve, so that while the former runs inwards for 15 mm., the latter runs almost directly backwards for about the same distance.

Sulcus lunatus (*lun*) is a very slightly curved transverse fissure, 23 mm. long, which lies about 10 mm. in front of the occipital pole. The stria of Gennari extends to within 4 mm of its lip.

Sulcus præstriatus (*p.str*) runs forwards and upwards for 43 mm. from the sulcus lunatus, which it joins posteriorly.

Sulcus temporalis superior (*Ts*) is divided into three segments. The anterior (Ts_1) is a slightly curved fissure 17 mm. long, lying in the neighbourhood of the temporal pole. The middle one (Ts_2) runs backwards in a gentle curve for 35 mm., it then turns abruptly upwards after sending off a shallow backward branch, and its posterior extremity is superficially connected with the Sylvian fissure. The posterior segment (Ts_3) is by far the largest of the three; it first runs backwards for 52 mm. and then turns upwards almost at right angles to its previous course to form a ramus ascendens 36 mm. long. It is connected at its bend with the posterior segment of the sulcus temporalis medius (*Tm*).

Sulcus temporalis medius (*Tm*) is split up into five irregularly placed segments.

Sulcus temporalis inferior consists of one principal segment, 50 mm. long, the anterior end of which lies some distance from the temporal pole, and of four smaller and more irregular portions lying to the outer side of and behind this.

Gyri and Smaller Sulci.

Gyrus centralis posterior, in the region bounded in front by the sulcus retrocentralis, measures not more than 15 mm. across; below this it is continuous behind with the gyrus marginalis, so its breadth cannot be determined. At its upper end it joins the lobulus paracentralis and the gyrus arcuatus anterior. The *Sulcus subcentralis posterior* (*scp*) stretches up into it from the Sylvian fissure for 29 mm.

Præcuneus measures about 40 mm. from back to front. Lying near its

anterior border, 8 mm. from the sulcus cinguli (*sc*) and connected with that fissure by a superficial furrow, is a straight sulcus, 21 mm. long. Behind this is another shaped like an inverted L, the vertical limb being 21 mm. long and the horizontal limb 22 mm. long. Together these two fissures may represent the *Sulcus subparietalis* (*sp*) and the *Sulcus præcunei* (*pc*). The *Sulcus parietalis superior* (*ps*) also stretches on to the præcuneus for 25 mm., lying behind the last described sulcus, and in addition to these there are present three insignificant depressions.

Lobulus Parietalis Superior.

Lobulus parietalis superior is divided into three *gyri arcuati*. The anterior of these is imperfectly separated from the gyrus centralis posterior, but its posterior boundary is clearly defined by the upper end of the sulcus retrocentralis superior (*ros*). It surrounds the incisura cinguli and stretches inwards from the supero-mesial border for 15 mm.

Gyrus arcuatus medius has an average breadth of about 25 mm. and stretches inwards and forward for 37 mm. In addition to this its apex is prolonged into a narrow convolution which traverses the posterior end of the sulcus interparietalis (*ip*) slightly below the surface, and thus connects it with the gyrus marginalis. Its fissures consist of (1) the *Sulcus parietalis superior* (*ps*), which runs for 24 mm. on the lateral surface. (2) A short forwardly directed branch from the sulcus interparietalis. (3) A sagittal groove lying to the outer end of the sulcus parietalis superior. The sulcus retrocentralis superior (*ros*) in front, and the ramus mesialis (*ipm*) of the sulcus interparietalis behind, leave in each case only narrow passages along the median border, by which it communicates on the one hand with the gyrus arcuatus anterior and on the other with the gyrus arcuatus posterior.

Gyrus arcuatus posterior forms a fairly regular rectangular figure, measuring 33 mm. in length and 18 mm. in breadth. The arrangement of its boundaries is quite conventional.

Lobulus Parietalis Inferior.

Gyrus marginalis is confluent with the *Gyrus angularis*. The ramus ascendens of the sulcus temporalis superior runs parallel to the ramus posterior ascendens of the Sylvian fissure (*rpa*), at a distance of about 14 mm. behind it. A curved sulcus 15 mm. long lies transversely above the end of the latter; while behind the former, forming the posterior boundary of the gyrus angularis, is another curved fissure (*ap*), 23 mm. long.

Cuneus is triangular, its upper, lower, and posterior boundaries being respectively 33, 40, and 49 mm. long. Two fissures mark its surface. The *Sulcus occipitalis paramesialis* (*o.prm*) consists of a V-shaped anterior portion measuring 23 mm. from end to end, which joins posteriorly a straight piece 24 mm. long. The latter lies obliquely across the supero-mesial border, its anterior half running on to the lateral surface and terminating a short way behind the sulcus transversus of Ecker, while its posterior half runs downwards on the mesial surface towards the occipital pole. The apex of the anterior V-shaped portion lies 12 mm. from the sulcus instrastriatus mesialis (*im*).

The *Sulcus limitans areæ striatæ superior* (*lss*) lies half-way between this and the sulcus intrastriatus mesialis (*im*). It is 22 mm. long and ends behind in a short crosspiece.

Gyrus lingualis is shaped as the right hemisphere. The principal sulcus lying in it is the *Sulcus limitans areæ striatæ inferior* (*lsi*). This is a straight fissure 24 mm. long, lying parallel to the sulcus intrastriatus mesialis (*im*), at a distance of 11 mm. from it; its anterior end is connected with the sulcus collateralis (*col*) by another straight fissure. In the posterior region of the gyrus there is present a small sulcus bifurcated at either end; and there is, in the anterior half, a small simple fissure 10 mm. long.

Gyrus temporalis superior on its upper surface is raised up into one large "transverse gyrus of Heschl." On its lateral surface in its anterior region it is imperfectly bounded below by the two anterior segments of the sulcus temporalis superior (*Ts*); behind these its breadth varies from 13 to 19 mm.

The remaining gyri of the temporal lobe are almost impossible to describe, since their boundaries are so uncertain, owing to the fact that the inferior and middle temporal sulci are broken up into so many and such irregular segments.

EXPLANATION OF FIGURES.

Brain I.

Both hemispheres from above	Fig. 1
Right hemisphere, lateral aspect	,, 2
,, ,, mesial aspect	,, 3
Left hemisphere, lateral aspect	,, 4
,, ,, mesial aspect	,, 5

ABBREVIATIONS USED IN FIGURES.

Frontal Lobe with its Bounding Fissures.

Sylvian fissure—main stem, *fsy.*
,, ,, ramus posterior ascendens, *rpa.*
,, ,, ramus posterior descendens, *rpd.*
,, ,, ramus anterior ascendens, *ra.*
,, ,, ramus anterior horizontalis, *rh.*
Sulcus centralis, *c.*
Sulcus præcentralis superior, *prs.*
Sulcus præcentralis inferior, *pri.*
Sulcus præcentralis inferior, ramus horizontalis, *h.*
Sulcus frontalis superior, *fs.*
Sulcus frontalis medialis, *fms.*
Sulcus frontalis medius, *fm.*
Sulcus frontalis inferior, *fi.*
Sulcus frontomarginalis, *fma.*
Sulcus radiatus, *r.*
Sulcus diagonalis, *d.*
Sulcus cinguli, *sc.*
Sulci rostrales, *ro.*
Sulcus subcentralis anterior, *sca.*

Parietal Lobe.

Sulcus retrocentralis superior, *ros.*
Sulcus retrocentralis inferior, *roi.*
Sulcus subcentralis posterior, *scp.*
Sulcus interparietalis, *ip.*
Sulcus interparietalis, ramus mesialis, *ipm.*
Sulcus interparietalis, lateral branches, *ipl.*
Sulcus transversus of Ecker, *tr.*
Sulcus parietalis superior, *ps.*
Sulcus subparietalis, *sp.*
Sulcus præcunei, *pc.*

Occipital Lobe.

Sulcus lunatus ("Affenspalte"), *lun.*
Sulcus occipitalis paramesialis, *o.prm.*
Sulcus intrastriatus lateralis (occipitalis superior), *il.*
Sulcus præstriatus (prælunatus), *p.str.*
Fossa parieto-occipitalis, *fpo.*
Sulcus limitans præcunei, *l.pr.*
Incisura parieto-occipitalis, *ipo.*
Sulcus calcarinus, *cal.*
Sulcus intrastriatus medialis (retrocalcarinus), *im.*
Sulcus intrastriatus medialis, ramus verticalis, *imv.*
Sulcus limitans areæ striatæ superior, *lss.*
Sulcus limitans areæ striatæ inferior, *lsi.*
Arcus intercuneatus, *arc.int.*

Temporal Lobe.

Sulcus collateralis, *col.*
Sulcus temporalis superior, *Ts.*
Sulcus temporalis medius, *Tm.*
Sulcus temporalis inferior, *Ti.*

DESCRIPTIONS OF THREE CHINESE BRAINS PRESENTED BY DR F. W. MOTT, F.R.S., TO THE MUSEUM OF THE ROYAL COLLEGE OF SURGEONS.[1]

By E. H. J. Schuster, M.A., D.Sc., *Fellow of New College, Oxford.* (*From the Pathological Laboratory, Claybury Asylum, Essex, and the Department of Comparative Anatomy, University Museum, Oxford.*)

Part II.

CHINESE BRAIN No. II.

Right Hemisphere.

Principal Fissures separating Lobes of the Hemisphere.

Sylvian Fissure.—There are two anterior rami present which join the main stem about 8 mm. apart; the ramus anterior ascendens (*ra*) is 23 mm. long, and the ramus anterior horizontalis (*rh*) 13 mm. From the base of the former the main stem (*Fsy*) runs backwards for 42 mm., and there divides in ramus posterior ascendens (*rpa*), which leaves it almost at right angles, and a ramus posterior descendens (*rpd*). The former measures 25 mm. to its extreme end and is joined by the sulcus retrocentralis inferior (*roi*), and the latter, which sends off a short posterior branch, is 11 mm. long.

Sulcus centralis (*c*) at its upper end lies 4 mm. from the supero-mesial border, and at its lower end 7 mm. from the Sylvian fissure; between these two points it runs a zigzag course, having a forwardly directed convexity in three places, at 14, 45, and 70 mm. from the lower end. The two upper ones are angular and the lower one rounded. The middle angle is caused by the presence of interlocking gyri, of which there is one on the posterior and two on the anterior wall, separated from one another by a short, forwardly directed branch of the fissure.

Sulcus cinguli (*sc*).—Owing to a shifting of the lower part of the right hemisphere towards the left-hand side, in separating it from the left, a slice was accidentally removed from its surface, which makes it impossible

[1] The Council of the Royal College of Surgeons kindly contributed ten pounds towards defraying the expenses of the illustration of this paper.

to describe that part of the sulcus lying below the corpus callosum. The greater part of it, which lies in front of and above this structure, forms a continuous fissure, running more or less parallel to its boundary at a distance of about 15 mm. from it. Towards its posterior end the sulcus runs upwards, without making any well-marked bend, towards the supero-mesial border; this it cuts, and turning slightly forwards, proceeds for 23 mm. in the lateral surface, where it terminates. It is crossed by a deep annectant gyrus 44 mm. in front of the point at which it leaves the median surface.

Calcarine System of Fissures.

Fossa parieto-occipitalis (*fpo*) extends for 18 mm. on the lateral and 31 mm. on the median surface. The *Arcus intercuneatus* and its limiting sulci are, with the exception of the extremity of the *Sulcus paracalcarinus*, which appears in the lateral surface, sunk within the fossa.

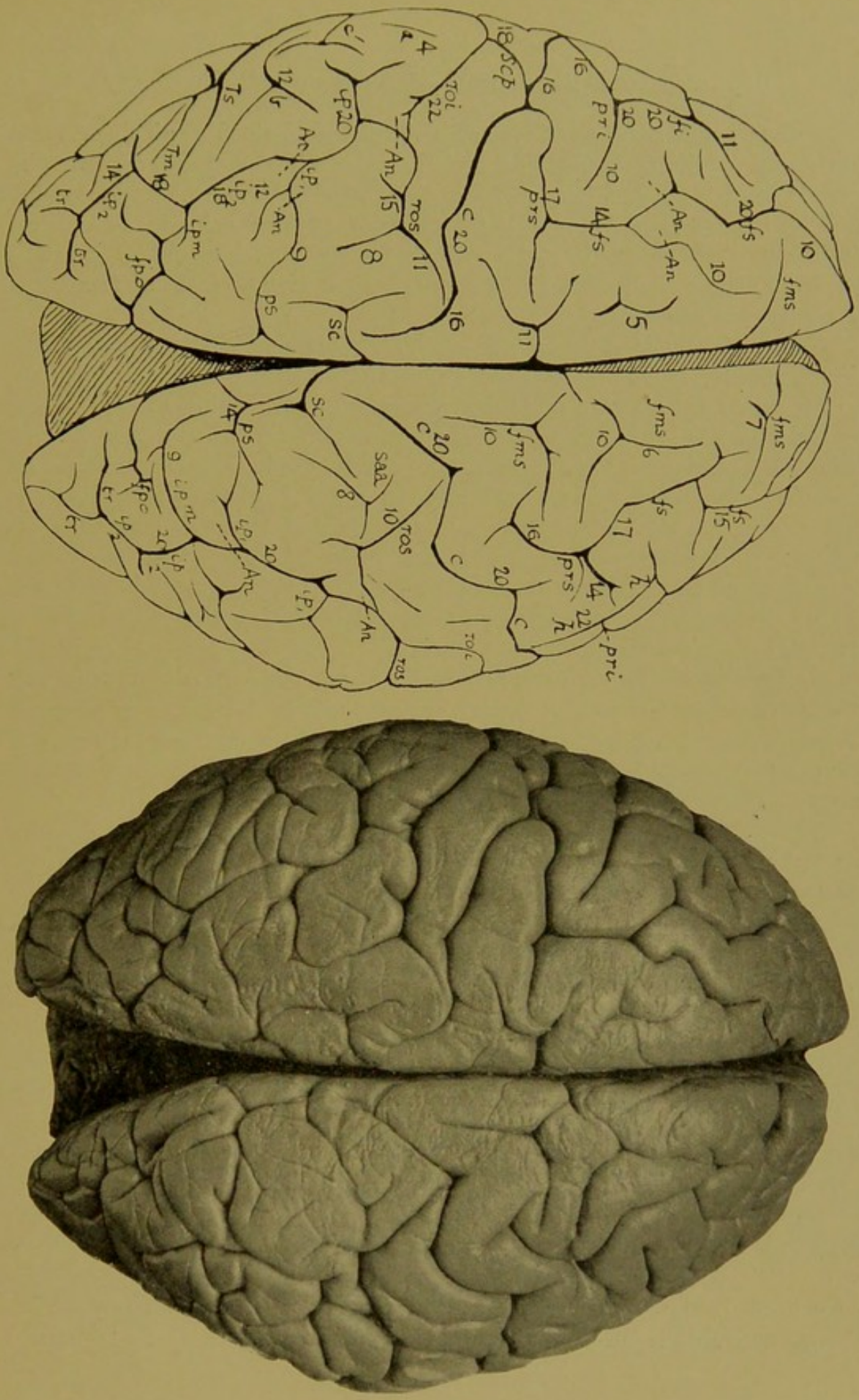
Sulcus calcarinus (*cal*) is 43 mm. long from its anterior end, where it almost cuts across the gyrus hippocampi, to the point at which the deep anterior cuneo-lingual gyrus (*an*) separates it from the sulcus intrastriatus mesialis (*im*). It lies almost in a straight line between its two extremities, and is joined by the fossa (*fpo*) 32 mm. from its anterior end. The gyrus cuneo-lingualis posterior lies on the surface, and thus divides the sulcus intrastriatus mesialis (*im*) completely into two segments. The anterior of these is about 31 mm. long, and from its middle point sends off a shallow, upwardly directed branch. The posterior segment (*im*) overlaps the anterior segment for 8 mm. in front, and curves round the caudal end of the hemisphere a little below the occipital pole; its length is 23 mm.

Sulcus collateralis (*col*) is a simple continuous fissure which runs an undulating course of 83 mm. and ends behind in the sulcus limitans areæ striatæ inferior (*lsi*).

FRONTAL LOBE.

Principal Sulci.

Sulcus præcentralis superior (*prs*) is a fairly straight fissure 35 mm. long, which runs obliquely upwards and backwards; it ends above in a crosspiece, which reaches to within 22 mm. of the supero-mesial border. Eighteen mm. from its lower end it is joined by the sulcus frontalis superior (*fs*); a deep annectant gyrus traverses it obliquely to join the anterior wall just above this point. The upper boundary of the posterior end of this gyrus is indicated externally by a short, backwardly directed branch from the fissure.



Chinese Brain No. 2. Viewed from above.

(For explanation of figures see p. 79.)

Sulcus præcentralis inferior consists of well-defined vertical (*pri*) and horizontal (*h*) limbs arranged in the characteristic T-shaped manner. The vertical limb is 32 mm. long and joins the Sylvian fissure at its lower end. The horizontal limb extends backwards for 12 mm. behind the vertical limb, and bends upwards and forwards for 30 mm. in front of it; it is joined half-way along this portion by the posterior segment of the sulcus frontalis medius (*fm*).

Sulcus frontalis superior (*fs*), although forming an apparently continuous fissure, is divided by deep annectant gyri into three main regions, which, taken in order from behind forwards, are as follows:—(1) At its posterior end, where it joins the sulcus præcentralis superior, lies 37 mm. from the supero-mesial border; anteriorly it divides into two short branches, its point of bifurcation lying 17 mm. from the border, 35 mm. from its posterior end, and 6 mm. in front of the place at which it joins the next region; (2) is about 50 mm. long and sends off three short downward branches, and one longer upward branch which should perhaps be reckoned as a portion of the sulcus frontalis mesialis; (3) is the shallow and rather irregular anterior portion of the fissure.

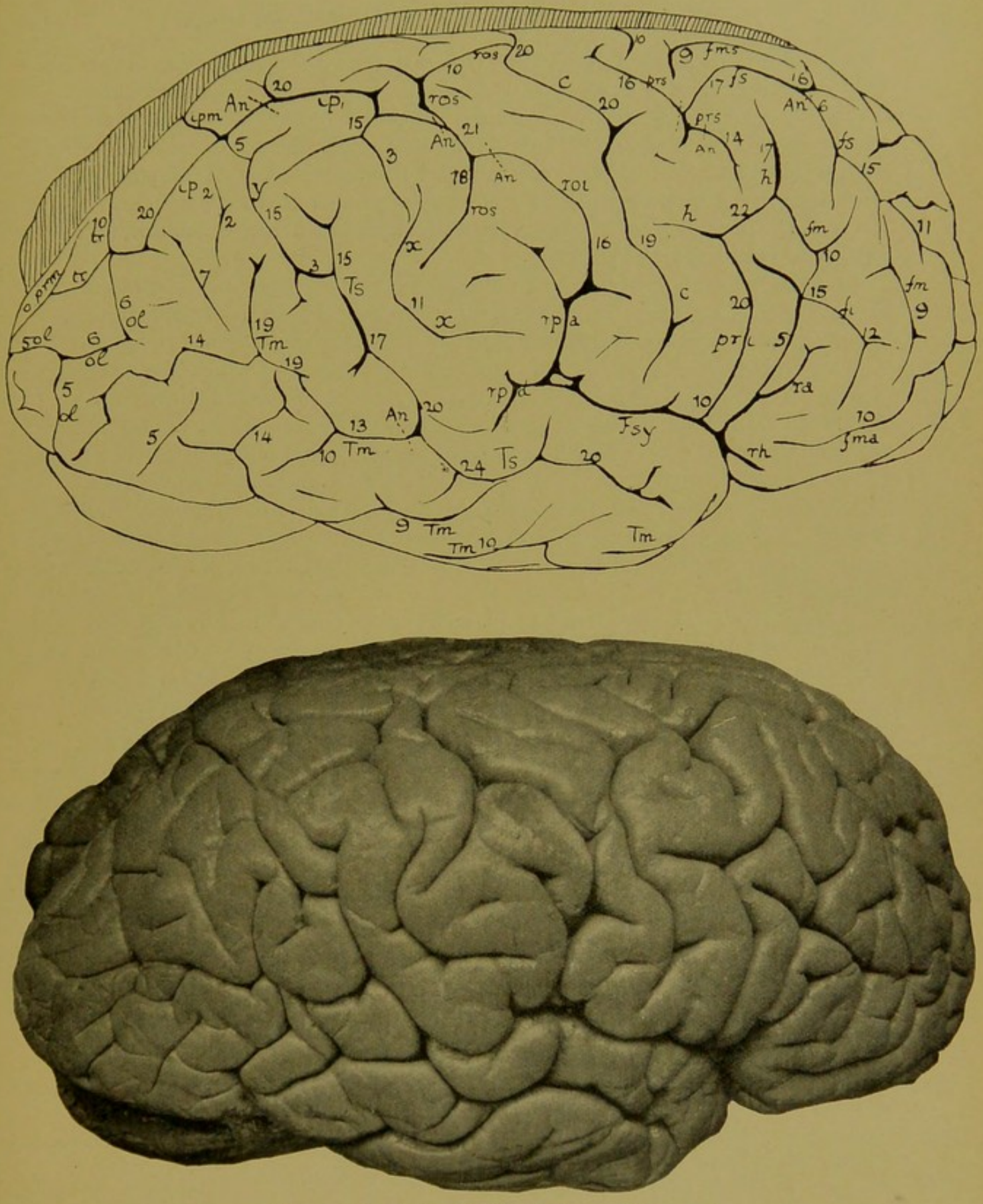
Sulcus frontalis medius (*fm*) is only somewhat poorly represented; it consists of a Y-shaped posterior segment (*fm*), of which the posterior limb joins the ramus horizontalis (*h*) of the sulcus præcentralis inferior, and the tail is connected with the sulcus frontalis inferior (*fi*), and of a straight anterior portion 15 mm. long with both ends bifid.

Sulcus frontalis inferior (*fi*) is a straight horizontal fissure, 35 mm. long, the posterior end of which lies 6 mm. in front of the angle formed by the vertical and horizontal limbs of the sulcus præcentralis inferior; it sends off at right angles two downwardly directed branches, the posterior of which establishes a superficial connection with the ramus anterior ascendens (*ra*) of the Sylvian fissure.

Sulcus fronto-marginalis (*fma*) is a long, continuous fissure, running just above the superciliary margin, the inner end of which lies 5 mm. from the median edge of the hemisphere, while its outer end runs downwards on to the pars triangularis of the gyrus frontalis inferior, terminating some 8 mm. from the apex.

Gyri and Remaining Sulci.

Gyrus centralis anterior is, on the whole, broad, but varies considerably in breadth from region to region. Towards the middle of its length, where it is bounded in front by the lower end of the sulcus præcentralis superior, it is 25 mm. in breadth, and just below this it communicates with the gyrus frontalis medius. This region, the surface of which is marked



Chinese Brain No. 2. Right hemisphere. Outer aspect.

by a shallow depression, is partially divided from that which lies below it by the backwardly extending posterior part of the ramus horizontalis (*h*) of the sulcus præcentralis inferior. The lower portion thus marked off averages 15 mm. in breadth; it communicates round the lower end of the sulcus centralis with the gyrus centralis posterior, but is shut off completely from the gyrus frontalis inferior. The upper portion of the convolution is imperfectly divided from the gyrus frontalis superior and also communicates with the gyrus centralis posterior.

Gyrus frontalis superior on its median surface is not properly separated from the *Lobulus paracentralis*; together they form a band varying from 18–27 mm. in breadth, into which run five branches of the sulcus cinguli. There are also present five or six independent fissures, of which the most noticeable are two *sulci rostrales* (ro_1 and ro_2). On the lateral surface the gyrus is 37 mm. broad at its posterior end, but 30 mm. in front of this it has narrowed to 20 mm., while in front of this again it broadens out to 30 mm. The *Sulcus frontalis mesialis* (*fms*) is well developed, and consists of four or possibly five segments. fms_1 and fms_2 are triradiate; the former with a sagittal limb pointing backwards, and the latter with a sagittal limb pointing forwards. fms_3 is Y-shaped, and fms_4 curved, with bifid ends.

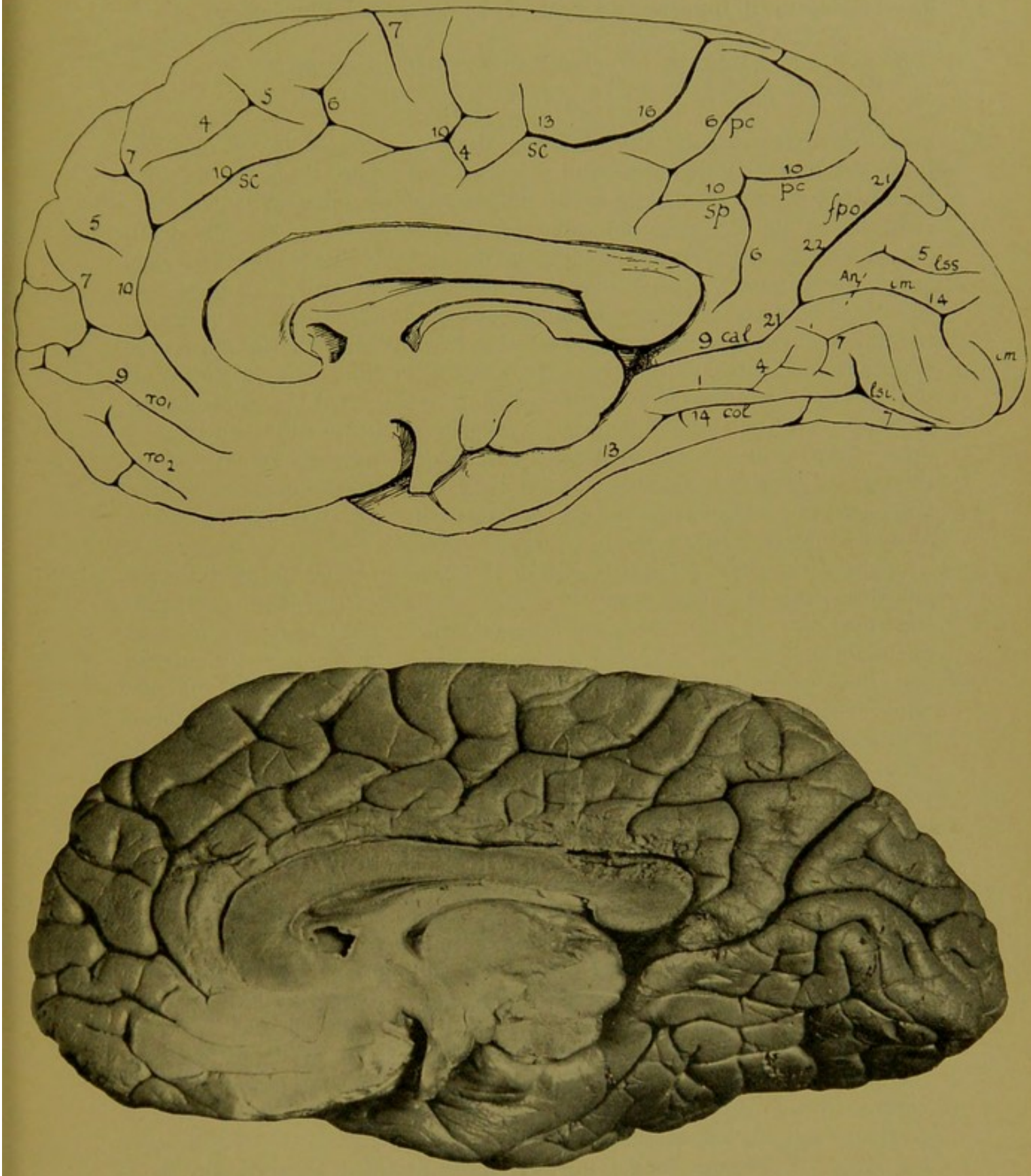
Gyrus frontalis medius is 40 mm. wide at its posterior end, which lies opposite the narrow part of the gyrus frontalis superior; in the region above the anterior end of the sulcus frontalis inferior (*fi*) it is 23 mm. broad, but in front of this its breadth cannot be measured, as it is not separated in any way from the gyrus frontalis inferior. The sulcus frontalis medius and the other fissures contained in it have already been described.

Gyrus frontalis inferior measures 28 mm. in breadth in the only region in which its upper boundary is clearly defined. The pars basilaris is relatively small, and the pars triangularis relatively large. The fissures have already been described.

Orbital Surface.

Sulcus olfactorius is 42 mm. long.

Sulcus orbitalis consists of an H-shaped portion, the outer limb of which lies very close to the border of the orbital surface, and in front actually runs over on to the lateral surface. This figure is complicated by the presence of a backwardly directed branch from the transverse limb. Between the inner limb and the sulcus olfactorius lie two other sulci, the outer and larger of which is more or less L-shaped and is superficially connected in front with the sulcus fronto-marginalis.



Chinese Brain No. 2. Right hemisphere. Inner aspect.

PARIETAL, OCCIPITAL, AND TEMPORAL LOBES.

Principal Sulci.

Sulcus retrocentralis superior (*ros*) divides, at a distance of 35 mm. from the supero-mesial border, into two branches; of these the anterior runs forwards and inwards for 23 mm. and almost unites with the sulcus centralis, while the posterior runs backwards for 12 mm. The main fissure runs downwards and slightly forwards from this point for 25 mm., and is there joined by the sulcus retrocentralis inferior (*roi*); complete continuity is, however, prevented by a deep annectant gyrus (*an*) which crosses the upper end of the latter. The sulcus retrocentralis superior appears to extend beyond this point of union for another 23 mm., its direction in this part of its course being more towards the posterior end of the hemisphere.

Sulcus retrocentralis inferior (*roi*) is a curved fissure with its convexity directed forwards; it measures 28 mm. from its upper end, where, as has been stated, it joins the sulcus retrocentralis superior, to its lower extremity, where the same degree of connection is established with the ramus posterior ascendens of the Sylvian fissure (*rpa*).

Sulcus interparietalis (*ip*) is divided into two segments, of which the anterior (ip_1) is apparently united both with the sulcus retrocentralis superior (*ros*) and the posterior segment (ip_2); in reality an annectant gyrus, lying only a very short way below the surface, crosses its anterior end, thus partially separating it from the sulcus retrocentralis superior, while a similar gyrus crossing the anterior end of the posterior segment prevents its complete continuity with that portion of the fissure. The general direction of ip_1 is inwards and backwards, its length is 45 mm., and it sends off a downward branch near its anterior end. The posterior segment (ip_2) at first runs straight backwards for 35 mm., then, after sending off a short outward branch, turns inwards and runs for another 13, then joins the sulcus transversus of Ecker (*tr*). The ramus mesialis (*ipm*), which leaves it 14 mm. from its anterior end, runs straight inwards for 22 mm. and there terminates in a crosspiece.

Sulcus transversus of Ecker (*tr*) is a curved fissure, 23 mm. long, placed somewhat obliquely, and joining the sulcus occipitalis paramesialis (*o.prm*) at its posterior and outer end.

Sulcus occipitalis lateralis (*ol*).—The stria of Gennari fails to reach the occipital pole by about 7 mm., and no sulcus lunatus can be detected. A fissure, which may be called the sulcus occipitalis lateralis (*ol*), is present on the lateral surface of the occipital region, which consists of a straight transverse piece 18 mm. long, lying in front, from which a branch is given off running sagittally backwards for 20 mm. and then branching.

Sulcus occipitalis paramesialis (*o.prm*) lies on the lateral surface near to the upper border; it is a slightly curved, unbranched fissure, 29 mm. long.

Sulcus temporalis superior (*Ts*).—By far the greater part of this sulcus is made up of a continuous fissure, the anterior end of which lies about 35 mm. from the temporal pole. This is connected near its posterior end, which is situated some 78 mm. distant from its anterior end, by a shallow groove, with a fissure (*y*) running upwards towards the posterior segment (ip_2) of the sulcus interparietalis. Between the main portion of the sulcus temporalis superior (*Ts*) and the temporal pole lies a curved transverse sulcus, the inner end of which is bifid, while its outer end is connected, over a deep annectant gyrus, with one of the segments of the sulcus temporalis medius (*Tm*).

Sulcus temporalis medius (*Tm*).—The numerous segments into which this fissure is divided are shown in the figures.

Sulcus temporalis inferior (*Ti*).—Three segments may be recognised:—(1) Slightly curved fissure lying near the temporal pole, which measures 27 mm. in length and has its posterior end bifid; (2) a straight sagittal fissure of the same length, with both ends bifid, connected at its posterior extremity with sulcus temporalis medius; (3) an irregular-shaped fissure connected with the sulcus collateralis.

Gyri and Remaining Sulci.

Gyrus centralis posterior. — Two regions with fairly well-defined boundaries can be distinguished, of which the upper one is the larger. It is almost completely delimited above by the upper anterior branch of the sulcus retrocentralis superior (*ros*), which runs towards the sulcus centralis (*c*), making an acute angle with it; its average breadth is about 17 mm., and it is marked by two small fissures; it is connected by an isthmus 7 mm. broad with the smaller lower region. The latter attains a breadth of 17 mm. at its lower end; it joins the gyrus centralis anterior below the sulcus centralis, but is separated by the lower end of the sulcus retrocentralis inferior (*roi*) from the gyrus marginalis. That part of the gyrus centralis posterior which lies above the upper region is not marked off in any way from the gyrus arcuatus anterior.

Præcuneus measures 42 mm. from its upper anterior to its upper posterior angle, and its smallest antero-posterior measurement is 37 mm. The *Sulcus præcunei* (*pc*) and the *Sulcus subparietalis* (*sp*) together make an H-shaped figure, the lower ends of which reach almost to the border of the corpus callosum.

Lobulus Parietalis Superior.

Gyrus arcuatus anterior is well developed, since the sulcus cinguli is carried for 23 mm. on to the lateral surface. Lying rather to the outer side of this is an obliquely-placed fissure (*saa*), the outer and anterior end of which is bifid; its posterior end lies 16 mm. from the supero-mesial border and 20 mm. from its anterior point of bifurcation.

Gyrus arcuatus medius is very large, though, owing to the uncertainty of its anterior boundary, its actual dimensions are difficult to give. Along its outer border the posterior end lies 32 mm. from the median plane, while its anterior corner is produced into a narrow gyrus, which sinks below the surface 50 mm. from the median plane, crosses the sulcus interparietalis at its anterior end, and thus establishes a connection with the gyrus marginalis.

Sulcus parietalis superior (*ps*) is quadriradiate.

Gyrus arcuatus posterior along its inner margin is 19 mm. long, and along its outer margin 30 mm.; its breadth is about 30 mm. The only sulci which appear on its surface are the fossa parieto-occipitalis (*fpo*) and the sulcus paracalcarinus, which appears as a small, backwardly directed branch of the fossa. A short, shallow anterior branch is also present.

Lobulus Parietalis Inferior.

The anterior limb of the *Gyrus marginalis* is separated from the gyrus centralis posterior by the lower end of the sulcus retrocentralis inferior (*roi*); the boundary of the posterior limb is formed by the outer prolongation of the sulcus retrocentralis superior (*ros*), and by a V-shaped fissure (*x*) which lies below it and measures 30 mm. from end to end.

The various fissures connected with the gyrus angularis have already been mentioned, but the gyrus itself, owing to the uncertainty of its limits, is almost impossible to describe.

Cuneus is somewhat elongated; its anterior margin measures 31 mm.; from the lower end of this to the occipital pole measures 52 mm., and from the upper end 50 mm. It contains the following fissures:—(1) *Sulcus limitans areæ striatæ superior* (*lss*), which is 29 mm. long, is in its anterior half parallel to the sulcus intrastriatus mesialis (*im*), but bends upwards somewhat posteriorly; (2) a shallow branch, 16 mm. long, given off from the sulcus intrastriatus mesialis (*im*) immediately in front of the gyrus cuneo-lingualis posterior; (3) a shallow, bent sulcus enclosing the upper anterior corner.

Gyrus lingualis is of somewhat unusual shape, maintaining a breadth of 18–20 mm. for the greater part of its length, but tapering off somewhat in the neighbourhood of its posterior end. Owing to the fact that the sulcus

collateralis (*col*) runs straight forwards to join the *Sulcus limitans areæ striatæ inferior* (*lsi*), the latter fissure forms the lower boundary of the posterior part of the gyrus; it is 30 mm. long and slightly curved and at its posterior end joins one of the segments of the sulcus temporalis inferior. Lying in the middle of the gyrus are two slightly curved obliquely-placed sulci, connected with one another by a shallow groove, and sending off in addition other shallow grooves.

Gyrus fusiformis has an average breadth of about 24 mm. for the greater part of its length. It is produced somewhat far backwards, owing to the reduction in breadth of the latter part of the gyrus lingualis.

Gyrus temporalis superior on its upper surface is raised up into one broad "transverse gyrus" of Heschl, partially subdivided into two. On its lateral surface its breadth is 10–17 mm. in that region in which it is bounded above by the Sylvian fissure and below by the sulcus temporalis superior (Ts_2). In front of this it communicates with the gyrus temporalis medius.

Left Hemisphere.

The Principal Fissures separating Lobes of the Hemisphere.

Sylvian fissure.—As in the right hemisphere, both anterior rami are present, the ramus anterior ascendens (*ra*) opening into the main stem some 14 mm. behind the ramus horizontalis (*rh*). The former is developed to a very remarkable extent, stretching straight upwards for 29 mm., while the latter extends forwards for 15 mm. Near their points of union with the main stem the walls of each ramus diverge so as to leave in each case a space through which the insula may be seen. From the lower end of the anterior wall of the ramus ascendens anterior (*ra*) the main stem (*Fsy*) stretches backwards for 34 mm. and there divides into a ramus posterior descendens (*rpd*) which runs straight downwards for 9 mm., and a ramus posterior ascendens (*rpa*). The latter extends upwards and backwards for 27 mm. to end in a short transverse member, but a short distance below this point it communicates by means of a shallow fissure with the lower (c^1) of the two sulci which lie in front of the ramus ascendens of the sulcus temporalis superior.

Sulcus centralis (*c*) at its inner extremity reaches to within 5 mm. of the supero-mesial border, while its outer end lies 4 mm. distant from the Sylvian fissure. From its inner extremity it runs at first forwards for 15 mm., then, making its only well-marked bend, it turns downwards. Its appearance is rendered somewhat unusual by the fact that it is joined by both the præcentral sulci, by the sulcus subcentralis posterior (*scp*), while the sulcus retrocentralis superior (*ros*) at its upper end only just falls short

of it. The usual interlocking gyri are present, of which one on the anterior wall is the largest.

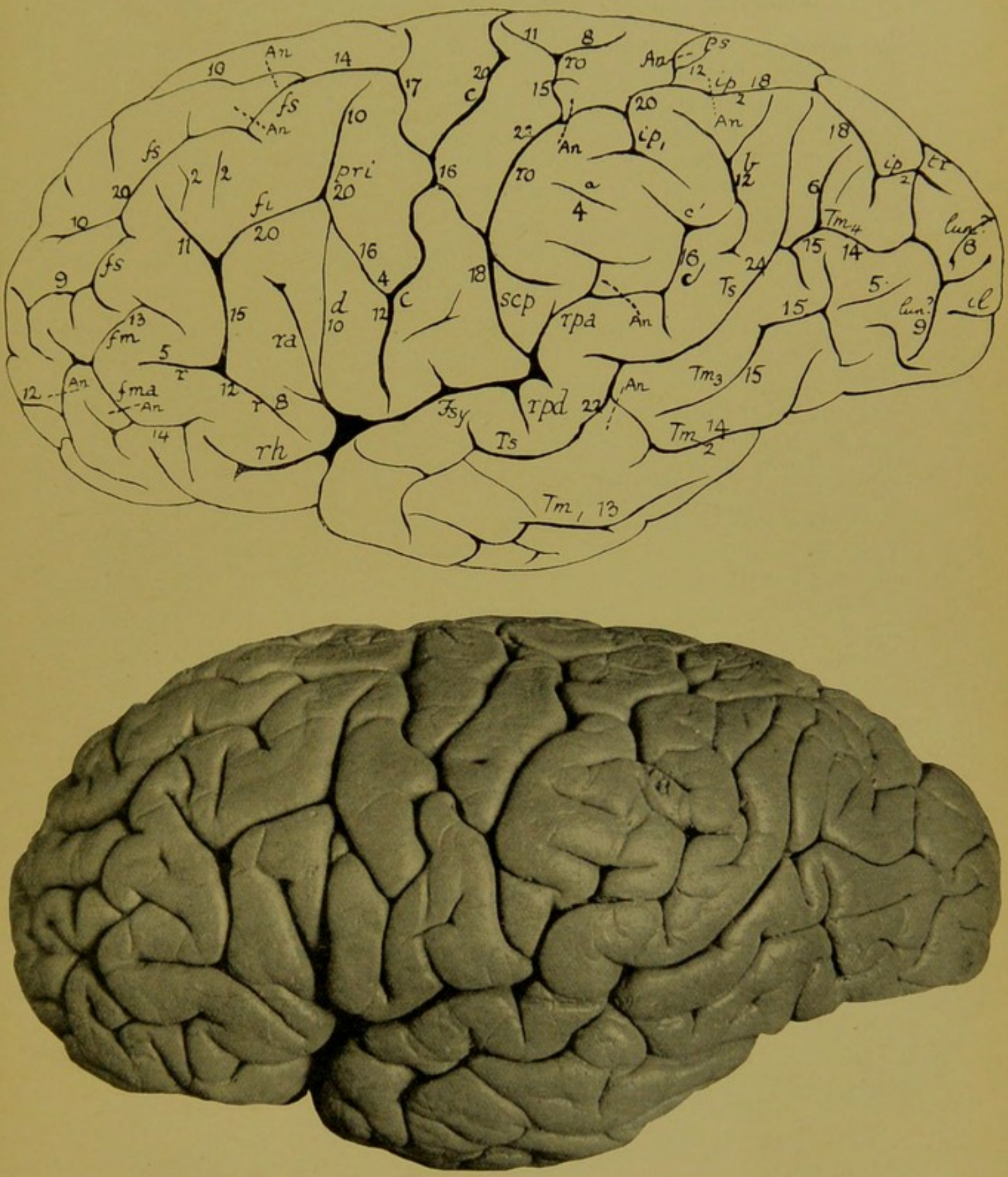
Sulcus cinguli (*sc*) is divided into two segments, of which the anterior (sc_1) forms a roughly semicircular curve round the genu of the corpus callosum, lying at its middle point about 19 mm. in front of it. Near its lower end it is joined by the sulcus rostralis (*ro*), and at its upper end it joins a crosspiece 24 mm. long. Between these two points it sends off two branches, one of which cuts the fronto-mesial border, while the other just falls short of it. The anterior moiety of the posterior division (sc_2) lies between sc_1 and the corpus callosum. Starting below the latter, 4 mm. from its edge, it bends round it, diverging very slightly till it reaches the point marked B in the diagram, where a short upward branch is given off. At this point it lies 12 mm. from the corpus callosum. Posteriorly it bends gently upwards, cuts the supero-mesial border, and ends in a bifurcation on the lateral surface. Twenty-two mm. behind B it sends off two other branches, one upwards and the other downwards.

Calcarine System of Fissures.

The *Fossa parieto-occipitalis* (*fpo*) measures 33 mm. in length on the median surface; on the lateral surface it runs outwards for 14 mm., then divides into two branches, one running forwards for 12 mm. and the other outwards and backwards for 17 mm. The latter is sigmoidally curved and its posterior half is very shallow. The *Arcus intercuneatus* is sunk into the fossa together with the *Sulcus paracalcarinus*; the sulcus limitans præcunei (*lpr*) is represented by a short fissure which runs forward into the præcuneus from the lower part of the fossa.

The *Sulcus calcarinus* (*cal*), together with the *Sulcus intrastriatus mesialis* (*im*), form a continuous fissure, which is joined by the fossa parieto-occipitalis (*fpo*) 24 mm. from its anterior end; behind this the deep gyrus cuneo-lingualis anterior traverses it obliquely. The posterior limit of the gyrus is marked by a short fissure which runs upwards into the cuneus and lies 19 mm. behind the point of junction of the fossa parieto-occipitalis and the sulcus calcarinus, and the same distance in front of the gyrus cuneo-lingualis posterior. The latter lies almost on the surface; behind it the fissure is continued backwards for another 15 mm. and then divides into two short branches.

Sulcus collateralis (*col*) is a continuous fissure measuring 103 mm. from end to end. It consists of four distinct portions making angles with one another. Starting from the anterior end the first and third run outwards and backwards, while the second and fourth run inwards and backwards; at



Chinese Brain No. 2. Left hemisphere. Outer aspect.

the anterior and posterior angles the sulcus is connected by transverse fissures with the sulcus temporalis inferior (*Ti*); the anterior of these is 9 mm. long and relatively deep, the posterior 20 mm. long and quite shallow. The posterior limb of the sulcus collateralis is partially separated by a deep annectant gyrus from the rest of the fissure, and it reaches to within 2 mm. of the sulcus limitans areæ striatæ inferior (*lsi*).

FRONTAL LOBE.

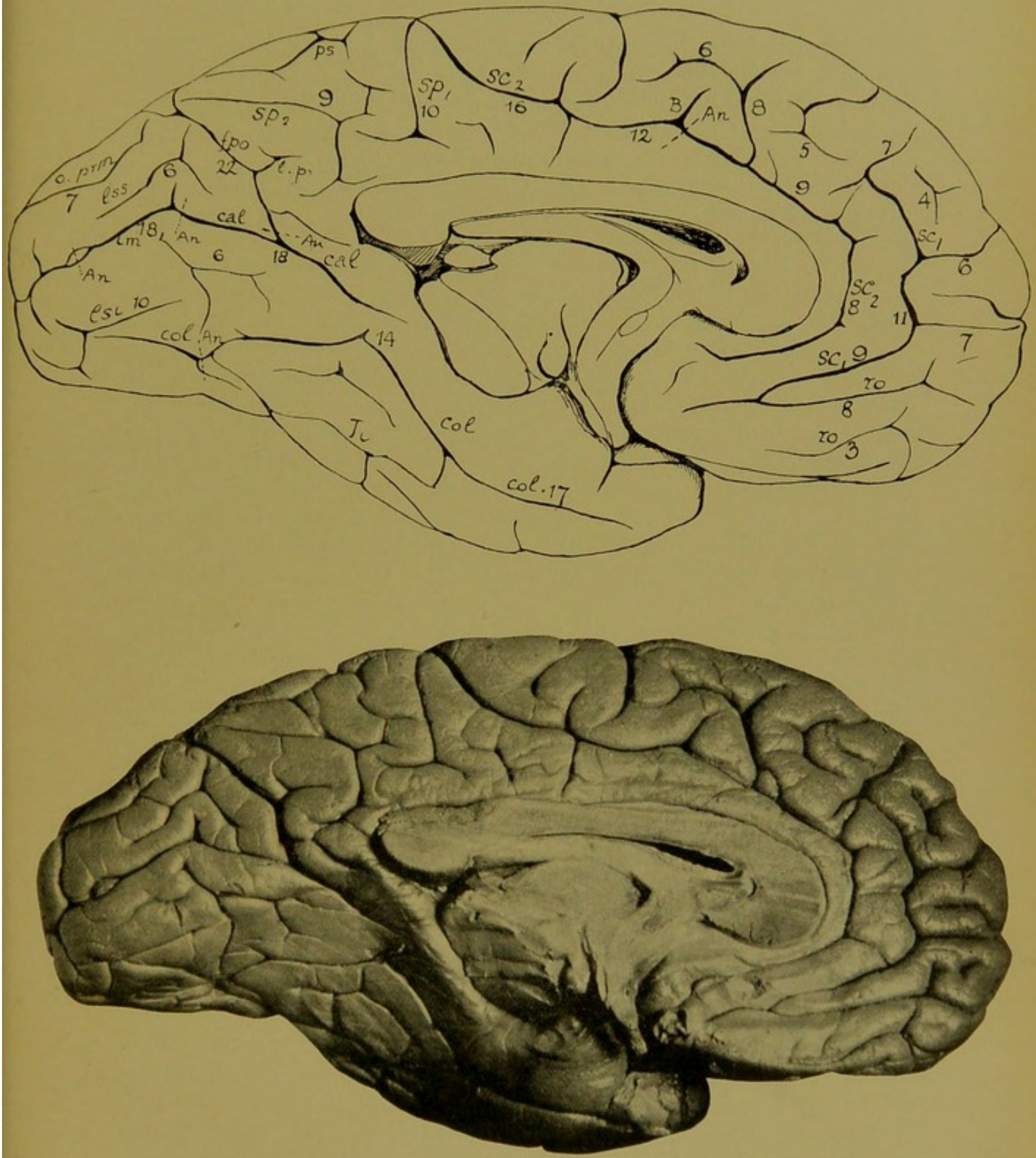
Principal Sulci.

Sulcus præcentralis superior (*prs*) is 41 mm. long; its inner end lies 11 mm. from the supero-mesial border, while at its outer end, near which it becomes very shallow, it joins the sulcus centralis (*c*). The sulcus frontalis superior (*fs*) is contiuuous with it 25 mm. from this point. The two limbs of a small V-shaped fissure lie one on either side of the inner end, and from their point of union near the supero-mesial border a slightly curved branch is sent down on to the mesial surface.

Sulcus præcentralis inferior (*pri*) is a slightly curved fissure 44 mm. long; at its upper end it reaches to within 7 mm. of the sulcus frontalis superior, while at its lower end, near to which it becomes very shallow, it is continuous with the sulcus centralis (*c*) at a point 27 mm. below the sulcus præcentralis superior (*prs*). The sulcus frontalis inferior (*fi*) joins it 23 mm. from its lower end; just below this point of junction it is almost reached by a straight fissure (*d*), 29 mm. long, which runs upwards from the lower end of the ramus anterior ascendens of the Sylvian fissure, and is probably to be regarded as the *Sulcus diagonalis*. It might, however, be held that this fissure is in reality the vertical portion of the sulcus præcentralis inferior, while the longer fissure previously described is in reality the ramus horizontalis, which has been twisted round so as to occupy an almost vertical position.

Sulcus frontalis superior (*fs*) is in the form of a continuous fissure, joining the sulcus præcentralis superior (*prs*) behind and ending in a bifurcation near the frontal pole; it is crossed by a deep annectant gyrus 24 mm. from its posterior end, and sends obliquely inwards and forwards two branches, of which the posterior measures 30 mm. in length and arises just behind the deep annectant gyrus, and the anterior is 22 mm. long and is given off 41 mm. in front of the other branch. These may perhaps be reckoned as segments of the sulcus frontalis mesialis.

Sulcus frontalis medius (*fm*) is very much reduced, and has the appearance of a backwardly directed branch, 23 mm. long, of the sulcus fronto-marginalis (*fma*).



Chinese Brain No. 2. Left hemisphere. Inner aspect.

Sulcus frontalis inferior (*fi*) is well developed; it consists of a straight horizontal portion 24 mm. long, which ends behind in the sulcus præcentralis inferior (*pri*), and in front at the middle point of a slightly curved vertical limb 34 mm. long; the latter at its lower end joins the sulcus radiatus (*r*).

Sulcus radiatus (*r*) is an oblique fissure 34 mm. long.

Sulcus fronto-marginalis (*fma*) is in one continuous piece, which, however, branches in a most irregular manner, and is crossed by two deep annectant gyri.

Gyri and Remaining Sulci.

Gyrus centralis anterior is completely divided into three regions by the junction of the two præcentral fissures with the sulcus centralis. The uppermost of these is widest near its upper end, where it measures 18 mm. across; it communicates with the gyrus frontalis superior and the gyrus arcuatus anterior. The middle region is widest in the middle, where its breadth is 20 mm.; it becomes narrower at either end, where it overlaps the two other parts of the gyrus; it communicates with the gyrus frontalis medius. The lower region, which is bounded in front by the sulcus diagonalis (*d*), has a fairly uniform width of 11 mm., except that it tapers off to a point at its upper end.

Lobulus paracentralis is not clearly separated from the median surface of the *gyrus frontalis superior*, and together they form a band which gradually becomes broader as one passes forwards along it, till a width of 34 mm. is reached in the region of the frontal pole. Owing to the reduplication of the sulcus cinguli to the presence of two *sulci rostrales* (ro_1 and ro_2) and one or two other independent sulci, the anterior region of the gyrus is much cut up by fissures.

Gyrus frontalis superior on its lateral aspect is 24–31 mm. broad for the greater part of its length. The *Sulcus frontalis mesialis* (*fms*) is represented by four small independent fissures, and in addition the two branches of the sulcus frontalis superior, which were mentioned in the description of that fissure, may possibly be said to belong to it.

Gyrus frontalis medius measures 20–25 mm. in breadth. Owing to the poor development of the sulcus frontalis medius, which is restricted to its anterior extremity, its surface conformation is fairly simple. The other fissures present are the upper half of the anterior vertical limb of the sulcus frontalis inferior (*fi*) and two small straight grooves which lie behind it.

Gyrus frontalis inferior.—The pars basilaris is reduced to a small triangular portion with its apex directed downwards, lying at the posterior

end of the posterior end of the gyrus. The pars triangularis is exceedingly large, and is bisected by the sulcus radiatus (*r*).

The *orbital surface* resembles very closely that of the right hemisphere.

PARIETAL, OCCIPITAL, AND TEMPORAL LOBES.

Principal Sulci.

The two *Sulci retrocentrales* form a continuous fissure (*ro*) ending below in the sulcus subcentralis posterior (*scp*). Forty-eight mm. above this point, and 26 mm. from the supero-mesial border, it divides into two branches; one of these runs forwards and ends about 2 mm. from the sulcus centralis; the other runs backwards. Thirty mm. from its lower extremity it receives the anterior end of the sulcus interparietalis (*ip*). The *Sulcus subcentralis posterior* (*scp*) is an oblique fissure, 34 mm. long, continuous at its upper anterior end with the sulcus centralis (*c*), and at its lower posterior end with the ramus posterior ascendens (*rpa*) of the Sylvian fissure; this continuity is, however, in each case quite superficial, as the fissure becomes shallow as it reaches either extremity.

Sulcus interparietalis (*ip*) consists of an anterior portion (ip_1) and a posterior portion (ip_2). The former is apparently in continuity with the latter, with the sulcus retrocentralis, and with the sulcus parietalis superior (*ps*); deep annectant gyri, however, partially separate it from each of these three fissures. In form it is somewhat curved, its lower half running upwards and downwards, and its upper half pointing backwards; at a point 36 mm. distant from its upper end it terminates in a bifurcation; 8 mm. above this it communicates, by means of a forwardly directed branch, 12 mm. long, with the sulcus retrocentralis; 14 mm. above this again it is joined by the posterior portion (ip_2). The latter runs upwards and backwards for 27 mm., and there sends off a very short ramus mesialis (*ipm*), 7 mm. long, which is connected by a shallow groove with the fossa parieto-occipitalis; it then turns slightly downwards and runs backwards in a straight line for 21 mm., where it sends off a short downward branch; subsequently, turning upwards again, it proceeds for another 16 mm. before joining the sulcus transversus of Ecker (*tr*).

Sulcus transversus of Ecker consists of an inwardly directed limb 10 mm. long, with a bifid extremity, and a backwardly directed limb of the same length.

There is no fissure present which bears much resemblance to a *Sulcus lunatus*, but an insignificant-looking vertical cleft, 15 mm. long, which lies 13 mm. in front of the occipital pole, forms the anterior boundary of the striate area. Below this lies a horizontal fissure (*il*) 24 mm. long, which

continues the line of the sulcus intrastriatus mesialis (*im*) on to the lateral surface. Partially bounding the area in which these two fissures lie are two other sulci (*lun ?*), which might possibly be taken to represent the sulcus lunatus.

Sulcus temporalis superior (*Ts*) consists of a short anterior segment, the posterior end of which is bifurcated, and a long continuous fissure, which originates in front 7 mm. from the anterior segment and runs backwards, curving gradually upwards to end 9 mm. from the sulcus interparietalis (ip_2).

Sulcus temporalis medius (*Tm*) consists of four principal segments of which the anterior (Tm_1) is of somewhat irregular shape; it measures 50 mm. from end to end and is superficially connected with the anterior segment (Ts_1) of the sulcus temporalis superior. The second segment (Tm_2) cuts obliquely across the gyrus temporalis medius, its upper end joining the posterior segment of the sulcus temporalis superior (Ts_2); its length is 37 mm. The third segment (Tm_3) consists of an anterior portion 30 mm. long, which runs parallel to the sulcus temporalis superior (Ts_2) at a distance of 8–14 mm. from it, and ends behind in a vertical limb. The fourth segment (Tm_4) anastomoses with the sulcus temporalis superior; it sends a ramus ascendens upwards and backwards to end in a bifurcation of which the lower limb joins the anterior of the two fissures (*lun ?*), which it has been suggested might possibly represent the sulcus lunatus.

Sulcus temporalis inferior consists of one principal horizontal segment, 50 mm. long, lying on the tentorial surface. Near its anterior end it anastomoses with the sulcus collateralis, and at its posterior end it sends off a branch which bends over on to the lateral surface. Two or three comparatively insignificant fissures are present in addition to this.

Gyri and Remaining Sulci.

Gyrus centralis posterior is completely divided into two regions by the union of the sulcus subcentralis posterior (*scp*) with the sulcus centralis. The upper region is 11–14 mm. broad for the greater part of its length, but at its upper end it narrows to about 2 mm. The lower region is roughly triangular; its rounded apex lies above, in front of the lower extremity of the upper region, and its base, which abuts on the Sylvian fissure, is 28 mm. long; its lower margin is cut into by a short branch of the latter, and its surface is infolded by an oblique fissure 12 mm. long.

Præcuneus measures 49 mm. in length from its anterior to its posterior upper angle. It contains two main fissures: the one (sp_1) runs downwards for 23 mm. from the anterior upper angle, and the other (sp_2) forwards for

27 mm. from the posterior upper angle; each ends in a bifurcation; a short curved fissure lies between them.

Lobulus parietalis superior is a well-defined tract 75 mm. long, measuring 50 mm. in breadth at its anterior end and narrowing gradually to a breadth of 32 mm. at its posterior end; the three gyri arcuati are not clearly separated from one another, but the whole lobule is divided into two parts by the union of the sulcus parietalis superior (*ps*) with the anterior segment (*ip*) of the sulcus interparietalis. The anterior part, which is short and broad, corresponds to the gyrus arcuatus anterior and one limb of the gyrus arcuatus medius; while the posterior part, which is longer and relatively narrow, is formed of the other limb together with the gyrus arcuatus posterior.

The *Sulcus parietalis superior* (*ps*) is a slightly curved fissure which runs inwards for 29 mm. from its union with the sulcus interparietalis; it just crosses the supero-mesial border and then divides into a forwardly directed branch 5 mm. long, and a backwardly directed branch 22 mm. long. In the region of the lobulus parietalis superior which lies in front of it are the following fissures:—(1) the bifurcated incisura cinguli, (2) the upper posterior branch of the sulcus retrocentralis superior, (3) a short straight fissure 10 mm. long. Behind lie a straight, transversely placed fissure 18 mm. long, the previously described lateral end of the fossa parieto-occipitalis, and the short ramus mesialis of the sulcus interparietalis.

Lobulus parietalis inferior.—The gyri which compose this portion of the hemisphere are also difficult to separate from one another. There is a large, pear-shaped region which lies in front of and above the ramus ascendens of the sulcus temporalis superior (*Ts*), the greatest length of which is 77 mm., while its greatest breadth is 47 mm. In it lie the ramus posterior ascendens (*rpa*) of the Sylvian fissure, the lower extremity of the sulcus interparietalis (ip_1), and three other fissures (a, b, c^1). a lies horizontally between the two first named, b and c^1 are placed more or less vertically behind them; b is the curved sulcus, measuring 27 mm. from end to end, which lies above and sends off a straight, shallow branch obliquely upwards and backwards for 22 mm.; c^1 is 22 mm. long; it ends above in a bifurcation and is connected by a straight, forwardly directed branch with the ramus posterior ascendens (*rpa*) of the Sylvian fissure. In the region which lies behind the ramus ascendens of the sulcus temporalis superior lies the upper segment of the sulcus temporalis medius.

Cuneus is somewhat elongated; its anterior margin measures 33 mm.; from the upper and lower ends of this the distances to the posterior angle, which lies at the occipital pole, are respectively 45 and 49 mm. The *Sulcus occipitalis paramesialis* (*o.prm*) lies near the upper boundary of the cuneus,

and measures 29 mm. from end to end. The *Sulcus limitans areæ striatæ superior* (*lss*) is a slightly curved fissure measuring 17 mm. from its bifid anterior extremity to its posterior end.

Gyrus lingualis measures 32 mm. across at its broadest point, which lies near the middle of its length, but it narrows to about one-half of this at either end. It contains two fissures. The *Sulcus limitans areæ striatæ inferior* (*lsi*), which lies in its posterior half, consists of a straight portion 20 mm. long, which runs parallel to the *Sulcus intrastriatus mesialis* (*im*), at a distance of 15 mm. from it, and divides into two branches posteriorly. In front of this is another fairly straight fissure which sends two branches downwards towards the sulcus collateralis (*col*).

Gyrus temporalis superior measures 12–15 mm. in breadth in its lateral surface; it communicates with the gyrus temporalis medius between the two segments of the sulcus temporalis superior, and is indented by one or two shallow markings and cut into by the ramus posterior descendens (*rpd*) of the Sylvian fissure. On its upper surface is one large transverse gyrus of Heschl.

Gyrus temporalis medius consists of an anterior region measuring 17–20 mm. in breadth and bounded below by the anterior segment (Tm_1) of the sulcus temporalis medius, and of a posterior portion of about half this width, the lower limit of which is the third segment (Tm_3) of that fissure; between these two regions it opens freely into the gyrus temporalis inferior, but is cut obliquely across by the second segment (Tm_2). Its surface is marked by superficial indentations.

EXPLANATION OF FIGURES.

Brain II.

Both hemispheres from above	Fig. 6
Right hemisphere, lateral aspect	„ 7
„ „ mesial aspect	„ 8
Left hemisphere, lateral aspect	„ 9
„ „ mesial aspect	„ 10

ABBREVIATIONS USED IN FIGURES.

Frontal Lobe with its Bounding Fissures.

Sylvian fissure—main stem, *fsy.*
„ „ ramus posterior ascendens, *rpa.*
„ „ ramus posterior descendens, *rpd.*
„ „ ramus anterior ascendens, *ra.*
„ „ ramus anterior horizontalis, *rh.*
Sulcus centralis, *c.*
Sulcus præcentralis superior, *prs.*
Sulcus præcentralis inferior, *pri.*
Sulcus præcentralis inferior, ramus horizontalis, *h.*
Sulcus frontalis superior, *fs.*
Sulcus frontalis medialis, *fms.*
Sulcus frontalis medius, *fm.*
Sulcus frontalis inferior, *fi.*
Sulcus frontomarginalis, *fma.*
Sulcus radiatus, *r.*
Sulcus diagonalis, *d.*
Sulcus cinguli, *sc.*
Sulci rostrales, *ro.*
Sulcus subcentralis anterior, *sca.*

Parietal Lobe.

Sulcus retrocentralis superior, *ros.*
Sulcus retrocentralis inferior, *roi.*
Sulcus subcentralis posterior, *scp.*
Sulcus interparietalis, *ip.*
Sulcus interparietalis, ramus mesialis, *ipm.*
Sulcus interparietalis, lateral branches, *ipl.*
Sulcus transversus of Ecker, *tr.*
Sulcus parietalis superior, *ps.*
Sulcus subparietalis, *sp.*
Sulcus præcunei, *pc.*

Occipital Lobe.

Sulcus lunatus (" Affenspalte "), *lun.*
Sulcus occipitalis paramesialis, *o.prm.*
Sulcus intrastriatus lateralis (occipitalis superior), *il.*
Sulcus præstriatus (prælunatus), *p.str.*
Fossa parieto-occipitalis, *fpo.*
Sulcus limitans præcunei, *l.pr.*
Incisura parieto-occipitalis, *ipo.*
Sulcus calcarinus, *cal.*
Sulcus intrastriatus medialis (retrocalcarinus), *im.*
Sulcus intrastriatus medialis, ramus verticalis, *imv.*
Sulcus limitans areæ striatæ superior, *lss.*
Sulcus limitans areæ striatæ inferior, *lsi.*
Arcus intercuneatus, *arc.int.*

Temporal Lobe.

Sulcus collateralis, *col.*
Sulcus temporalis superior, *Ts.*
Sulcus temporalis medius, *Tm.*
Sulcus temporalis inferior, *Ti.*

DESCRIPTIONS OF THREE CHINESE BRAINS PRESENTED BY DR F. W. MOTT, F.R.S., TO THE MUSEUM OF THE ROYAL COLLEGE OF SURGEONS.[1]

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Part III.

CHINESE BRAIN No. III.

Right Hemisphere.

The Principal Fissures separating Lobes of the Hemisphere.

The Sylvian fissure.—Both anterior rami are present and join the main stem at about the same point. The ramus anterior ascendens (*ra*) is a straight fissure 20 mm. long, running vertically upwards; the ramus horizontalis (*rh*) runs horizontally forwards for 24 mm. and then joins a vertical fissure 20 mm. long. The main stem (*fsy*) runs backwards for 29 mm. from the lower end of the ramus anterior ascendens (*ra*) and then divides into a ramus posterior ascendens (*rpa*) and a ramus posterior descendens (*rpd*). The former slopes upwards, making an angle of 120–130° with the main stem, for a distance of 37 mm. The latter runs directly downwards for 13 mm.

Sulcus centralis (*c*) just fails to reach to supero-mesial border at its upper end, while its lower end lies 8 mm. from the Sylvian fissure. Its most noticeable feature is a forwardly-directed bay situated near the middle of its course. This marks the position of a well-developed gyrus on the posterior wall, which forms, together with two other fair-sized gyri on the anterior wall, the usual interlocking arrangement. Between this system and the lower end of the fissure lie other but more faintly-marked interdigitating gyri.

Sulcus cinguli (*sc*).—The anterior portion of the sulcus cinguli is reduplicated; the main fissure is carried round the genu of the corpus

[1] The Council of the Royal College of Surgeons kindly contributed ten pounds towards defraying the expenses of the illustration of this paper.

callosum, gradually approaching its margin, and ends below it, 2 mm. from it. The additional segment lies 8 mm. in front of the anterior portion of the main fissure. It is a crescent-shaped sulcus measuring 39 mm. from end to end, and sending off three branches towards the anterior margin of the hemisphere; at its upper end it is connected by a shallow groove with the main fissure. The latter runs backwards from the point of connection, keeping from 10–19 mm. from the border of the corpus callosum, till it lies above the posterior end of the latter, where it bends upwards and cuts the supero-mesial border 9 mm. behind the upper end of the sulcus centralis. It sends off two branches into the gyrus frontalis superior, of which the posterior marks the boundary between that gyrus and the lobulus paracentralis.

Calcarine System of Fissures.

The *arcus intercuneatus* and its limiting sulci are sunk in the *fossa parieto-occipitalis* (*fpo*). The latter has a superficial length of 35 mm. on the median surface and 22 mm. on the lateral surface.

Sulcus calcarinus (*cal*) measures 25 mm. to its junction with the fossa parieto-occipitalis, and 12 mm. behind this point the deep gyrus cuneo-lingualis anterior (*an*) separates it from the *Sulcus intrastriatus mesialis* (*im*). The latter runs backwards for another 20 mm. and then gives off the short downward branch which marks the anterior boundary of the deep gyrus cuneo-lingualis posterior (*an*). Behind this lies the ramus verticalis (*imv*), a sigmoidally curved fissure 25 mm. in length running obliquely over the occipital pole.

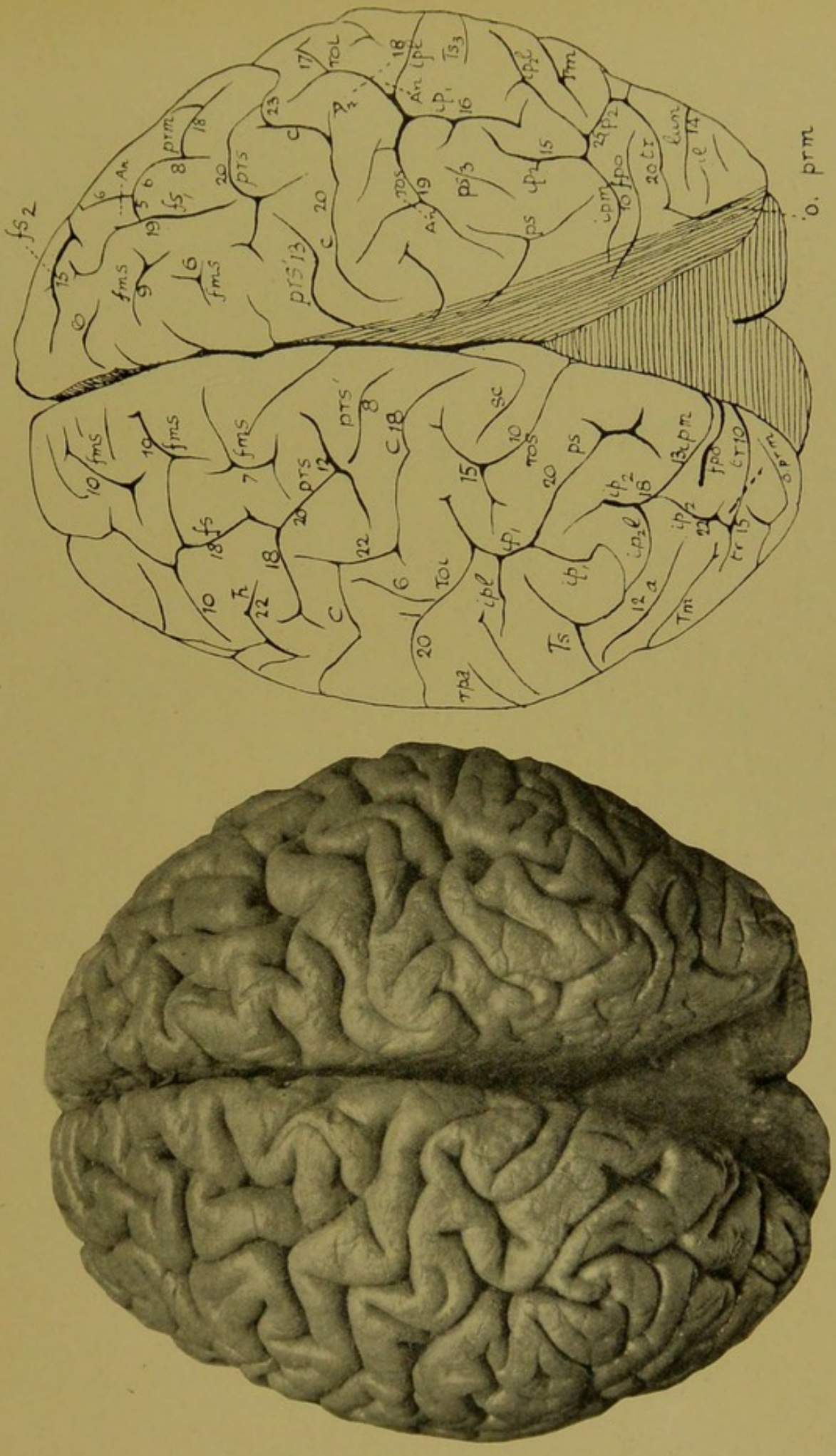
Sulcus collateralis (*col*) arises in front in the neighbourhood of the temporal pole and runs backwards for 64 mm., where it branches. One branch continues the main direction of the fissure backwards into the gyrus lingualis for another 26 mm., the other runs downwards and outwards for 18 mm. and ends in a bifurcation.

FRONTAL LOBE.

Principal Sulci.

The whole surface of the brain is much convoluted and rich in secondary markings. In the frontal lobe the fissures form numerous anastomoses with one another and are very difficult to bring into line with those of the schematic system. In the following description the names are applied to the fissures only in order to indicate roughly their position on the brain, and the homologies implied in the names are not insisted on.

Sulcus præcentralis superior (*prs*).—The inner end lies 12 mm. from the



Chinese Brain No. 3. From above.

(For explanation of figures see p. 181.)

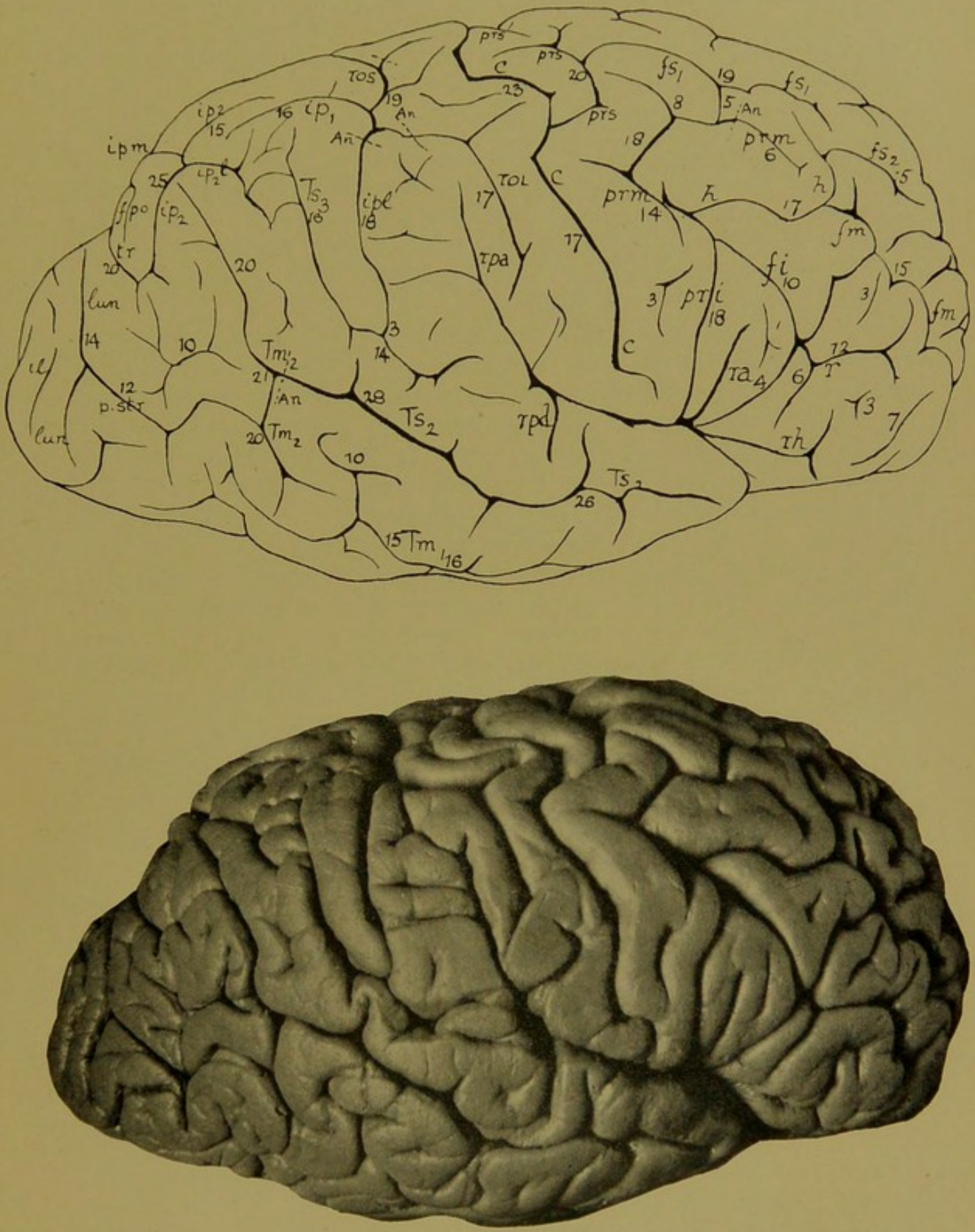
supero-mesial border, and the outer end, which is superficially connected with the sulcus centralis, lies 41 mm. distant from the inner end; a short, backwardly-directed branch is given off opposite the posterior end of the sulcus frontalis superior (*fs*). Lying behind the inner end of the fissure is another sulcus (prs^1) which cuts through the border and is continued for some distance on to the lobulus paracentralis.

Sulcus præcentralis inferior consists of a vertical portion (*pri*), 33 mm. in length, and of a horizontal portion (*h*) which is continued backwards for 7 mm. behind the vertical portion. In front it runs forwards for 27 mm., then, after sending a short branch forwards, turns upwards and ends after proceeding for another 22 mm. Shortly before its termination it is joined by the anterior segment (fs_2) of the sulcus frontalis superior. Lying between the two sulci præcentrales is an irregular-shaped fissure (*prm*) which is connected above with the sulcus frontalis superior and below with the posterior end of the ramus horizontalis (*h*); both connections are quite superficial.

Sulcus frontalis superior (*fs*) consists of two segments. The posterior (fs_1) is 41 mm. in length and runs sagittally. It is separated from the sulcus præcentralis superior (*prs*) at its posterior end by a slightly sunk gyrus. The anterior segment (fs_2) is somewhat oblique in direction, measures 24 mm. from end to end, and is connected superficially at its posterior extremity with the ramus horizontalis (*h*) of the sulcus præcentralis inferior.

Sulcus frontalis medius (*fm*) might perhaps be regarded as an additional segment of the sulcus frontalis superior. Its posterior end lies 7 mm. in front of the junction of the anterior segment (fs_2) of that fissure with the ramus horizontalis (*h*) of the sulcus præcentralis inferior, and shortly in front of this point the fissure is connected with the short anterior branch of the latter; immediately in front of this again a vertical cleft 24 mm. long brings it into communication with the sulcus frontalis inferior. From this point the fissure runs forward to the superciliary margin; then, turning inwards, runs along it to within 9 mm. of the median border, where it ends. The latter portion might be called a segment of the sulcus fronto-marginalis.

Sulcus frontalis inferior (*fi*) at its posterior end joins the sulcus præcentralis inferior (*pri*) 5 mm. below the junction of the latter with its ramus horizontalis (*h*); it then runs forwards and downwards for 23 mm.: here on its upper side it is connected by means of the vertical cleft described above with the sulcus frontalis medius (*fm*), while on its lower side it sends off a branch 20 mm. in length into the pars triangularis of the inferior frontal convolution; 4 mm. in front of this point it joins the *Sulcus radiatus*



Chinese Brain No. 3. Right hemisphere. Outer aspect

(*r*). The latter is an oblique fissure 36 mm. long which ends above in a bifurcation.

Gyri and Remaining Sulci.

Gyrus centralis anterior is divided into two regions through the junction of the lower end of the sulcus præcentralis superior (*prs*) with the sulcus centralis. The breadth of each region is about 13–17 mm., and each is connected with the gyrus centralis posterior. The upper region is also in communication with the gyrus frontalis superior, and the lower one with the gyrus frontalis medius.

Lobulus paracentralis, which is only incompletely separated from the median surface of the gyrus frontalis superior, is 27 mm. broad at its broadest point. It contains the inner end of the sulcus described as prs^1, the length of which, on this aspect of the hemisphere, is about 20 mm., and in addition to this another sulcus about 18 mm. long, and two shallow pits.

Gyrus frontalis superior on its median surface is 20–29 mm. in breadth; it contains one long sulcus rostralis (ro_1) and two shorter ones (ro_2 and ro_3), the various branches from the sulcus cinguli, and one or two other independent fissures. On the lateral surface it contains numerous segments of the *Sulcus frontalis mesialis* (*fms*), which are all arranged transversely.

Gyrus frontalis medius is almost impossible to describe.

Gyrus frontalis inferior forms only a somewhat insignificant part of the frontal lobe, measuring 22–30 mm. in breadth; the pars basilaris is relatively small and the pars triangularis relatively large.

Orbital Surface.

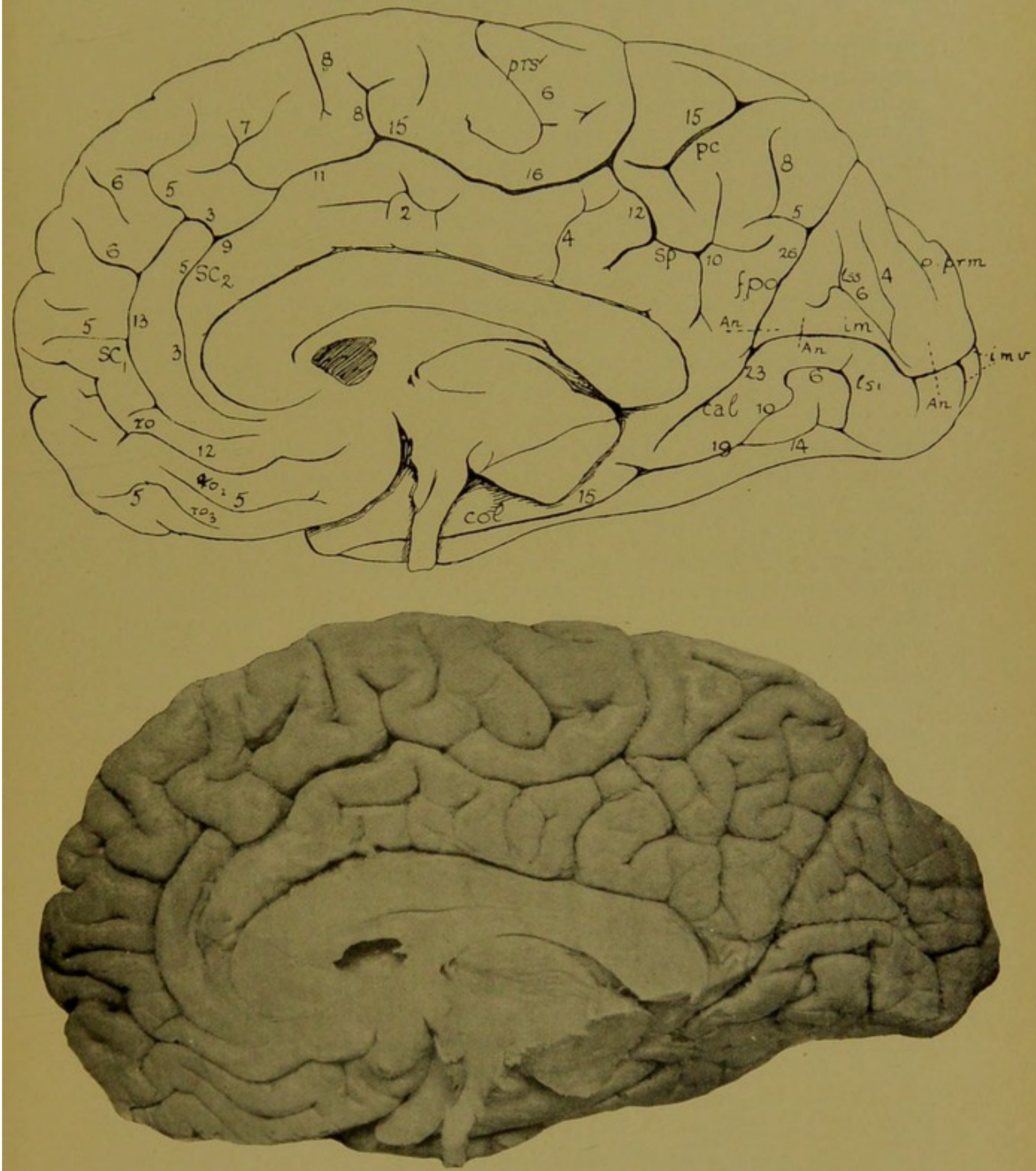
The *Sulcus olfactorius* at its anterior end bends inwards, cuts the median border, and terminates on the median surface.

The *Sulcus orbitalis* is H-shaped. The inner limb runs over the superciliary margin and joins the sulcus frontalis medius; it sends off two branches towards the sulcus olfactorious. The outer limb, at its anterior end, also crosses the superciliary margin. The crosspiece connecting the two limbs is 7 mm. in length; in front of it they keep about this distance apart, but behind it they diverge rapidly.

PARIETAL, OCCIPITAL, AND TEMPORAL LOBES.

Principal Sulci.

The two *Sulci retrocentrales* are separated by a deep annectant gyrus, but superficially they form together a continuous fissure which divides into two branches at its upper end, each about 18 mm. in length; one of



Chinese Brain No. 3. Right hemisphere. Inner aspect.

these runs inwards and backwards and ends close to the supero-mesial border and just in front of the sulcus præcunei, the other runs forwards and inwards towards the sulcus centralis (*c*). The lower extremity of the sulcus retrocentralis inferior (*roi*) lies 2 mm. from the ramus posterior ascendens (*rpa*) of the Sylvian fissure and 62 mm. from the point of bifurcation referred to above. The deep annectant gyrus crosses it 34 mm. above its lower extremity, and just below this it sends off a branch, 12 mm. long, which runs almost three-quarters of the way across the gyrus centralis posterior. The sulcus retrocentralis superior (*ros*) is superficially connected with a straight cleft 18 mm. in length, which lies in the upper part of the gyrus centralis posterior, and in complete continuity at its lower end with the anterior segment of the sulcus interparietalis (ip_1).

Sulcus interparietalis (*ip*) is divided into two segments completely separated from one another, of which the anterior (ip_1) is continuous at its anterior end with the sulcus retrocentralis superior (*ros*); from that point it sends downwards a straight branch (*ipl*) 38 mm. long, the lower end of which is connected by a short shallow groove with the ramus ascendens of the sulcus temporalis superior (Ts_3). The main stem of the segment runs backwards and very slightly inwards for 22 mm., sending off a short inward branch from the neighbourhood of its anterior end. The posterior segment (ip_2) consists of a sagittal portion 21 mm. long, which overlaps the anterior segment in front and behind, after sending off the ramus mesialis (*ipm*), turns outwards, runs in that direction for another 25 mm., and then joins the sulcus transversus of Ecker (*tr*). It gives off two lateral branches, one (ip_2l), just behind the ramus mesialis (*ipm*), which runs downwards and outwards for 18 mm. and then bifurcates, and a short straight branch just in front of the sulcus transversus of Ecker (*tr*). The latter fissure consists of an outer limb 7 mm. long and an inner limb 25 mm. long, which joins the sulcus occipitalis paramesialis (*o.prm*).

Sulcus lunatus (*lun*) is very conspicuous, and forms the anterior boundary of the striate area; it is a very slightly curved vertical fissure, measuring 40 mm. from end to end, and its most anterior point is 24 mm. distant from the occipital pole. Three shorter fissures (*il*) form a series lying parallel to the sulcus lunatus about 6 mm. behind it. Seventeen mm. from its lower end a straight sulcus præstriatus (*p.str*) leaves it and runs forward to join one of the segments of the sulcus temporalis medius (Tm_2).

Sulcus temporalis superior (*Ts*) is divided into three segments. The anterior lies obliquely near the temporal pole; it is 20 mm. long, and anastomoses at its posterior end with the sulcus temporalis medius. The middle segment (Ts_2) measures 81 mm. from end to end; at its posterior end it joins the posterior segment of the sulcus temporalis medius (Tm_2), though

complete continuity is prevented by the deep annectant gyrus (*an*), which traverses it; it sends off five short branches, three in an upward, and two in a downward direction. The posterior segment (Ts_3) is practically the ramus ascendens of the fissure; it measures 52 mm. from end to end; at its lower end it turns forward towards the ramus posterior ascendens (*rpa*) of the Sylvian fissure.

Sulcus temporalis medius is divided into two segments. The anterior (Tm_1) is a long horizontal fissure sending off numerous branches; the posterior (Tm_2) consists of a ramifying lower portion and a straight ramus ascendens which runs upwards for 40 mm. from the point at which it is joined by the second segment (Ts_2) of the sulcus temporalis superior. Between the ramus ascendens of the sulcus temporalis medius and the sulcus lunatus (*lun*) lies a shallow, much-branched fissure shown in the figure.

Sulcus temporalis inferior consists of a number of small, irregular segments.

Gyri and Remaining Sulci.

Gyrus centralis posterior.—Two regions can be distinguished partially separated by the forwardly-directed branch from the sulcus retrocentralis inferior (*roi*). The upper region measures about 17 mm. across, except near the inner extremity, where it tapers off so that there is only a narrow isthmus left through which it communicates with the gyrus arcuatus anterior. It is divided longitudinally into two ridges by a vertical fissure in connection with the sulcus retrocentralis superior (*ros*) and by a shallow groove lying below this. The lower region consists of an upper portion 8–10 mm. broad, which opens out considerably at its lower end, where its surface is infolded by a small curved fissure; it communicates with the gyrus marginalis and the gyrus centralis anterior.

Præcuneus (*lobulus quadratus*) from the upper extremity of its anterior to the corresponding point of its posterior boundary, measures 46 mm. A short way below this line its length is 38 mm. In its anterior upper region it is marked by the *Sulcus præcunei* (*pc*), a straight fissure 18 mm. long, which ends both below and above in a bifurcation. The two upper branches are long, and lie on the lateral surface of the hemisphere. Lying below and somewhat posterior to this is the *Sulcus subparietalis* (*sp*), which is shaped like the letter H. The upper end of its anterior limb bends forward and comes into communication with the sulcus cinguli (sc_2), while its posterior limb sends off a short, backwardly-directed branch. Lying above the sulcus subparietalis and behind the sulcus præcunei is an L-shaped fissure.

Lobulus Parietalis Superior.

The three *gyri arcuati* can be distinguished, of which the *anterior*, bounded by the bifid upper extremity of the sulcus retrocentralis superior (*ros*), extends inwards for about 17 mm. The *gyrus arcuatus medius* is the largest of the three; it stretches somewhat obliquely inwards and forwards and communicates with the gyrus angularis between the two segments of the sulcus interparietalis; its length from its posterior inner to its outer anterior corner is 46 mm. It contains, lying near its mesial border, the upper bifurcated end of the sulcus præcunei (*pr*), and situated on the outer side of this the sulcus parietalis superior, a straight, shallow groove 16 mm. long.

The *Gyrus arcuatus posterior* is a simple V-shaped gyrus bounding the external portion of the fossa parieto-occipitalis (*fpo*); it stretches inwards for 32 mm.

Lobulus Parietalis Inferior.

Gyrus marginalis has an anterior limb measuring 8 mm. across, which communicates at its lower end by a narrow opening with the gyrus centralis posterior. The posterior limb, which is bounded behind by the branch (*ipl*) of the sulcus interparietalis, is 17 mm. broad, and its surface is marked by a small cruciform depression which lies above two parallel shallow horizontal grooves; at its lower extremity it is continuous with the gyrus temporalis superior.

Gyrus angularis has an anterior limb 48 mm. in length; it measures 12 mm. in breadth at its upper end, but becomes gradually narrower towards its lower extremity; its surface is perfectly smooth, and it is marked off from all surrounding gyri except its own posterior limb. The dimensions of the latter are uncertain; near its upper end, where it is bounded posteriorly by the branch (ip_2l) of the sulcus interparietalis, its breadth is about 11 mm., and its surface is infolded by three horizontal grooves, from the upper of which a short vertical groove is given off. It is produced backwards into a convolution which bends forwards and communicates with the gyrus arcuatus medius between the two segments of the sulcus interparietalis.

The *Cuneus* is triangular in form, the dimensions of its sides being:—anterior, 35 mm.; posterior, 38 mm.; base, 47 mm. *Sulcus occipitalis paramesialis* (*o.prm*), the anterior end of which is in continuity with the inner extremity of the sulcus transversus of Ecker (*tr*) on the lateral surface of the hemisphere, runs over on to the median surface shortly behind this, so that the greater part of its length appears in the cuneus. *Sulcus*

limitans areæ striatæ superior (*lss*) is an almost straight fissure, 19 mm. long, ending anteriorly in a shallow bifurcation which lies 8 mm. above the junction of the sulcus calcarinus (*cal*) with the sulcus intrastriatus mesialis (*im*); behind this it approaches the latter fissure, and its posterior extremity is only separated from it by a distance of 3 mm. Between the two sulci already described lies a third, which is very shallow, and joins the sulcus limitans areæ striatæ superior (*lss*) behind.

Gyrus lingualis has an average breadth of 26 mm. for the greater part of its length, narrowing slightly at its anterior end. *Sulcus limitans areæ striatæ inferior* (*lsi*) is represented by a fissure 11 mm. long, running parallel to the lower boundary of the cuneus at a distance of about 6 mm. from it. This is joined superficially at its anterior end to the upper of the two terminal branches of the sulcus collateralis (*col*), while posteriorly it is connected with the lower branch.

Gyrus temporalis superior on its upper surface is raised up into one large transverse gyrus of Heschl, which is separated by the ramus posterior descendens of the Sylvian fissure from a smaller one lying behind it. On its lateral surface its breadth is 8 mm. above the anterior end of the second segment (Ts_2) of the sulcus temporalis superior, and it gradually broadens towards its posterior end, so that just behind the ramus posterior descendens (*rpd*) it measures 18 mm. across. It is cut into by that ramus and shortly in front of it by an upwardly-directed branch of the sulcus temporalis superior.

Gyrus temporalis medius has a fairly uniform breadth of about 20 mm.

Gyrus temporalis inferior and *Gyrus fusiformis* form together a broad strip of surface lying on both sides of the tentorio-lateral margin. This is broken by one or two small irregular fissures, which represent the sulcus temporalis inferior but fail to form anything like a distinct boundary between the two gyri.

Left Hemisphere.

Principal Fissures separating Lobes of the Hemisphere.

Sylvian fissure.—There are two anterior limbs present; the ramus horizontalis (*rh*) measures 11 mm. in length; the ramus anterior ascendens (*ra*) runs upwards for 10 mm. and then branches, the anterior branch measuring 10 mm. in length and the posterior 17 mm. From the lower end of the ramus anterior ascendens the main stem (*fsy*) runs backwards, making a gentle upward curve, for 62 mm., and there divides into two branches. The upper branch proceeds upwards for 16 mm. and the lower

branch downwards for 12 mm. The latter does not appear to be homologous with the fissure in the right hemisphere described as the ramus posterior descendens (*rpd*), which is represented in the left by a short downward branch given off 28 mm. in front of this.

Sulcus centralis (*c*) cuts the supero-mesial border at its inner end. It resembles the corresponding fissure of the right hemisphere both in the presence of a forwardly-directed bay near the middle of its course and in the internal arrangement of interlocking gyri.

Sulcus cinguli (*sc*).—The anterior portion of the fissure is reduplicated in the left hemisphere as it is in the right, but the posterior segment (sc_2), instead of being prolonged right round the anterior end of the corpus collosum, terminates in front opposite the upper part of the genu, 7 mm. from it; from this point it runs almost straight upwards and backwards for 41 mm. and there establishes a connection with the anterior portion (sc_1); it is continued backwards for another 47 mm., giving off in this region three short downward branches, and then turns sharply upwards and cuts the supero-mesial border. The anterior segment (sc_1), from its point of connection with the posterior segment (sc_2), is carried right round the genu of the corpus callosum, lying 15 mm. from it, to end below in a bifurcation; it gives off three forwardly-directed branches.

Calcarine system of fissures.—The general arrangement of the fissures and annectant gyri of this system is precisely the same as in the right hemisphere.

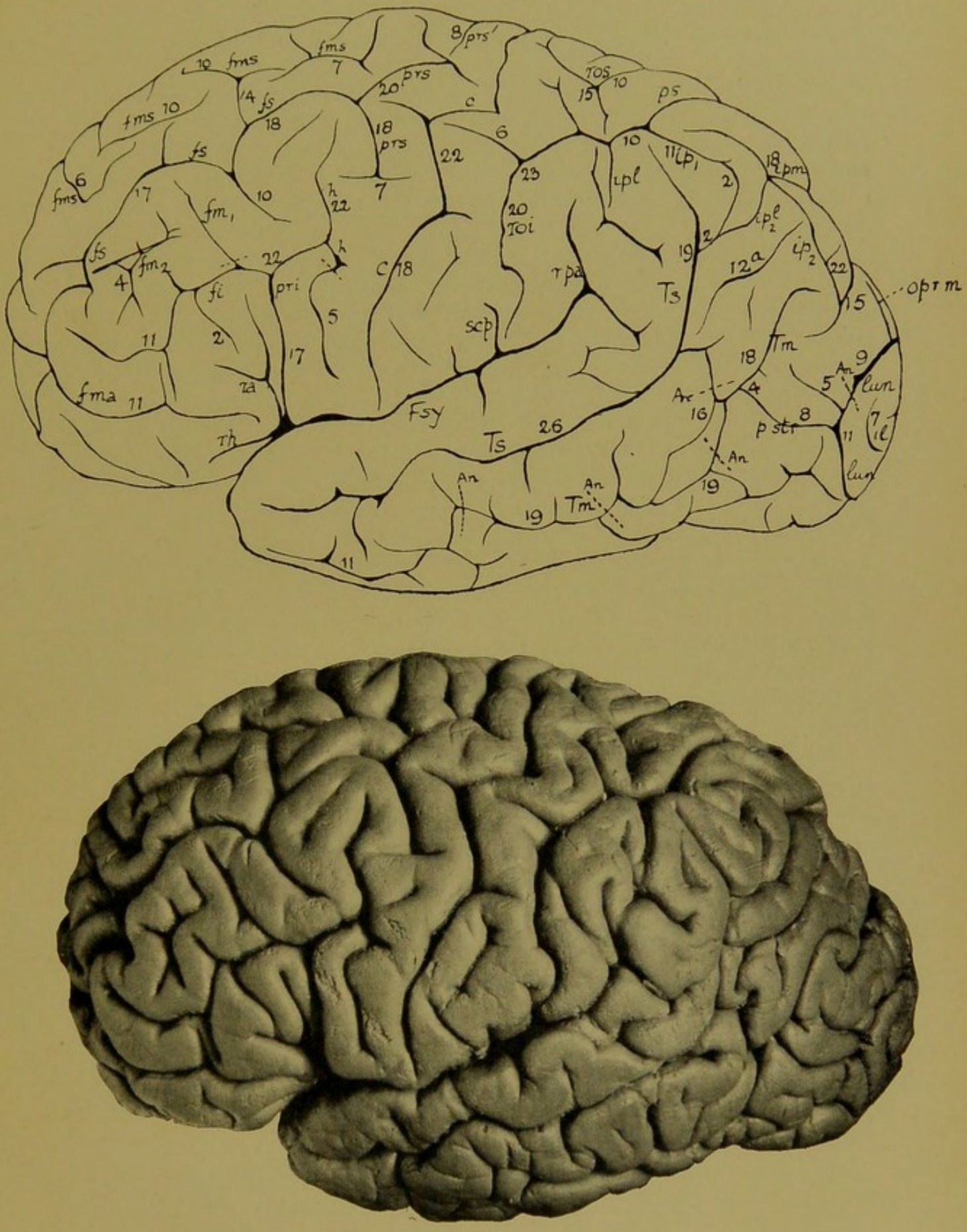
Sulcus collateralis (*col*) at its anterior end lies 30 mm. distant from the temporal pole; at this point it is connected by a downward branch with the anterior segment of the sulcus temporalis inferior. From here it runs backwards for 47 mm., then, after sending off an upward branch 28 mm. long into the gyrus lingualis, it turns outwards and, proceeding in a straight line for another 33 mm., ends in a bifurcation.

FRONTAL LOBE.

Principal Sulci.

Sulcus præcentralis superior (*prs*) is in the form of a broadly open V, of which the apex is directed forwards and forms the point of union with the sulcus frontalis superior (*fs*). The extremities of the two limbs are bifid, and lie 34 mm. distant from one another. Lying in the same direction as the sulcus præcentralis superior, between it and the supero-mesial border, is another fissure (prs^1) 18 mm. long.

Sulcus præcentralis inferior (*pri*) at its lower end joins the Sylvian fissure; it runs upwards for 25 mm., and then receives the posterior end



Chinese Brain No. 3. Left hemisphere. Outer aspect.

of the sulcus frontalis inferior (*fi*); above this it turns backwards and, after proceeding for another 12 mm., joins a vertical fissure (*h*) which may possibly be regarded as its ramus horizontalis. The latter is 28 mm. long, and is continuous below by means of a superficial groove with a straight cleft, subdividing longitudinally the lower region of the gyrus centralis anterior.

Sulcus frontalis superior (*fs*) has the appearance of a continuous fissure running from its posterior point of attachment with the sulcus præcentralis superior towards the superciliary margin, where it joins the sulcus fronto-marginalis (*fma*). Sixteen mm. from its posterior end it is crossed by a deep annectant gyrus, and in front of this it sends off two branches, one into the gyrus frontalis superior and the other into the gyrus frontalis medius; each of these is 19 mm. long, and the former joins one of the segments of the sulcus frontalis mesialis (*fms*). Thirty-three mm. in front of this, and 23 mm. from the anterior extremity of the fissure, another branch, 16 mm. in length, is given off in an inward direction.

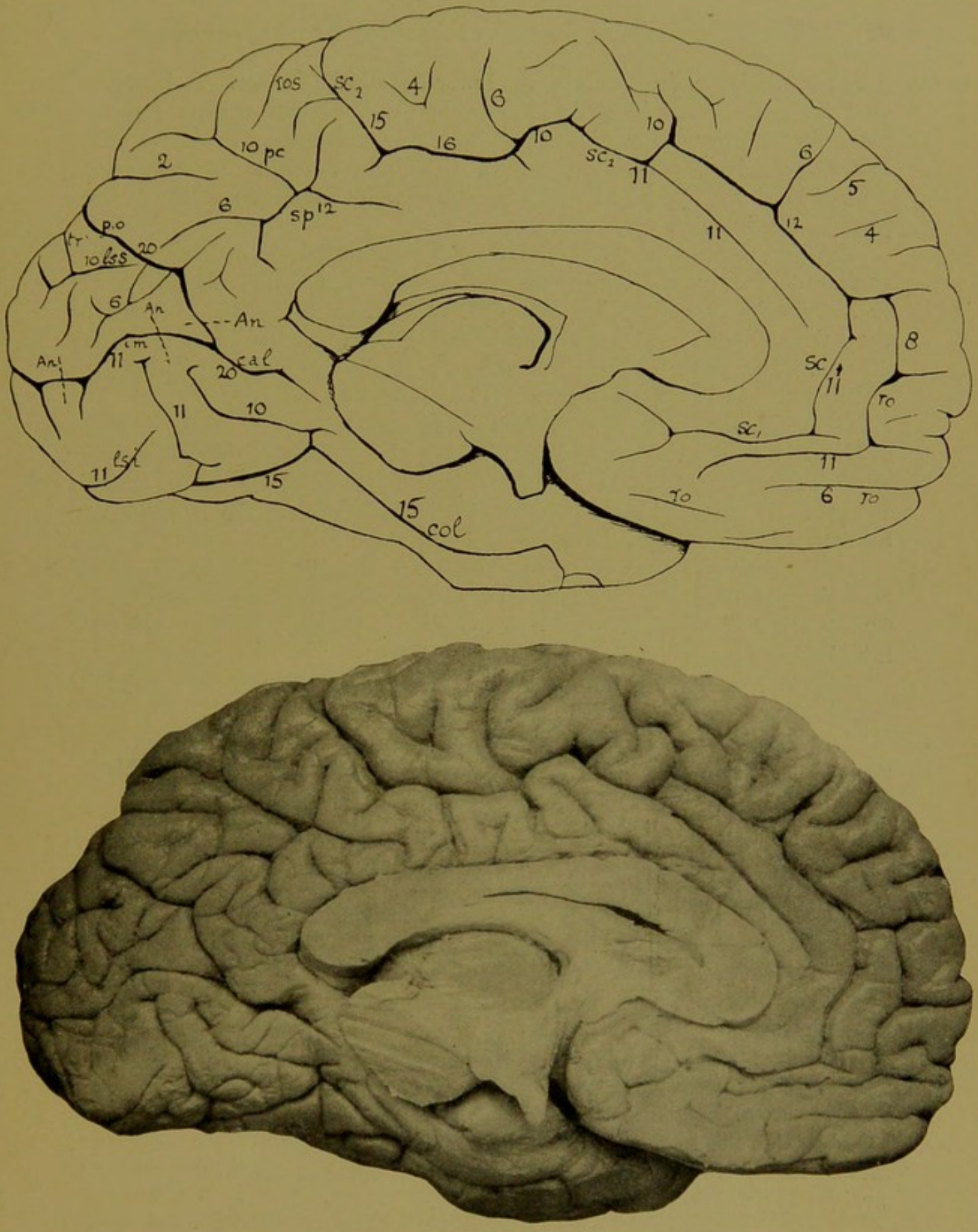
Sulcus frontalis medius (*fm*).—If it be correct to identify the whole of the fissure just described with the sulcus frontalis superior, then the sulcus frontalis medius is very much reduced, and consists only of a straight cleft (fm_1) 20 mm. long, lying vertically about 10 mm. in front of the downward branch of the sulcus frontalis superior and superficially connected at its lower end with the sulcus frontalis inferior, and a shallow irregular depression (fm_2) lying in front of this.

Sulcus frontalis inferior runs forwards for 25 mm. from its point of union with the sulcus præcentralis inferior and then divides into two branches, of which one runs upwards into the gyrus frontalis medius for 22 mm., and the other downwards for 8 mm. Seven mm. from its posterior end the sulcus frontalis inferior sends off a short upward branch which connects it with the posterior segment of the sulcus frontalis medius, and 10 mm. in front of this another short upward branch and a longer one downwards into the pars triangularis.

Sulcus fronto-marginalis (*fma*) forms a continuous fissure running from the median border just above the superciliary margin and ending near the apex of the pars triangularis.

Gyri and Remaining Sulci.

Gyrus centralis anterior has an average width of about 15 mm.; it communicates with the gyrus frontalis superior between the upper end of the sulcus præcentralis superior (*prs*) and the fissure prs^1, and with the



Chinese Brain No. 3. Left hemisphere. Inner aspect.

gyrus frontalis medius beneath the lower end of the former. It is separated from the gyrus frontalis inferior, but is continuous with the gyrus centralis posterior below the extremity of the sulcus centralis (*c*). Its lower extremity is subdivided longitudinally by a fissure 22 mm. long, connected at its upper end with the ramus horizontalis (*h*) of the sulcus præcentralis inferior.

Lobulus paracentralis is incompletely separated from the median surface of the gyrus frontalis superior by a curved fissure, disposed more or less vertically, which lies some 30 mm. in front of the point at which the sulcus cinguli cuts the supero-mesial border. Its breadth is about 28 mm. The upper end of the sulcus centralis just reaches it, and, in addition to this, it is marked by a straight fissure 8 mm. long.

Gyrus frontalis superior on its median aspect has an average breadth of about 22 mm. There is one well-developed *Sulcus rostralis* (*ro*) present which bends upwards in front of the anterior segment of the sulcus cinguli and gives off three branches towards the frontal border of the hemisphere; beneath this there are two smaller sulci rostrales.

On its lateral aspect the gyrus reaches a breadth of 38 mm. near its posterior end, decreasing gradually to 30 mm. near its anterior end. The *Sulcus frontalis mesialis* (*fms*) is exceedingly well developed, at least five fair-sized segments being present.

Gyrus frontalis medius is about 27 mm. broad; the fissures which it contains have already been described.

Gyrus frontalis inferior has approximately the same breadth as the gyrus frontalis medius. As in the right hemisphere, the pars triangularis is very large and the pars basilaris correspondingly small.

Orbital Surface.

Sulcus olfactorius is 50 mm. long. Starting at its posterior end, 7 mm. from the median border, it converges with it as it runs forwards and terminates about 1 mm. from it.

Sulcus orbitalis is H-shaped. The outer limb measures 25 mm. in length and receives the crosspiece 11 mm. from its anterior end. In front of it lies a straight fissure, 17 mm. long, running in the same direction, and continued over on to the lateral surface. The crosspiece is 14 mm. long, and is connected superficially with the posterior limb of a triradiate fissure which lies in front of it. The inner limb is a slightly curved sulcus measuring 40 mm. from end to end, and joining at its posterior end a straight sagittal fissure 15 mm. long.

PARIETAL, OCCIPITAL, AND TEMPORAL LOBES.

Principal Sulci.

Sulcus retrocentralis superior (*ros*) is T-shaped; it consists of a straight limb, 25 mm. long, placed obliquely in such a position that its anterior end lies 10 mm. from the supero-mesial border and its posterior end 25 mm ; from the middle of this, at right angles to it, another straight limb runs inwards and backwards, cuts the border, and is continued for a short distance on the median surface.

Sulcus retrocentralis inferior (*roi*), which is unconnected with the sulcus retrocentralis superior, is a much longer fissure, measuring 53 mm. from end to end. Fourteen mm. from its upper extremity it is joined by the anterior segment (ip_1) of the sulcus interparietalis, and 14 mm. below this gives off a shallow branch forwards into the gyrus centralis posterior. Its lower end lies 5 mm. distant from the Sylvian fissure (*Fsy*), and immediately in front of it a short sulcus subcentralis posterior (*scp*) joins the latter.

Sulcus interparietalis (*ip*) is divided into two segments, of which the anterior (ip^1) joins the sulcus retrocentralis inferior (*roi*) in front; it runs backwards for 25 mm. in a sagittal direction from this point, but before reaching its posterior extremity gives off two branches; of these the more anterior (*ipl*) runs outwards for 16 mm., while the other (*ps*), a conspicuous fissure 32 mm. long, occupies the position in which the sulcus parietalis superior may usually be found, and may possibly be regarded as a well-developed example of that sulcus, which has become connected with the sulcus interparietalis. The posterior segment (ip_2) overlaps the anterior, lying on the inner side of it; from its anterior end it runs backwards for 17 mm., then gives off an outward branch (ip_2l) 16 mm. long. Immediately behind this the ramus mesialis (*ipm*) leaves it, running inwards for 23 mm. to cut the supero-mesial border. The main stem of the fissure is continued backwards in a sagittal direction for another 28 mm., and then joins the *Sulcus transversus* of *Ecker* (*tr*). The latter consists of one limb, 26 mm. long, which runs inwards and ends on the surface of the cuneus, and another which runs outwards for 13 mm.

Sulcus lunatus (*lun*) is a well-developed, crescent-shaped fissure which forms the anterior boundary of the striate area. It measures 25 mm. between its two extremities, and its most anterior point lies 24 mm. from the occipital pole. At its upper end it joins the *Sulcus occipitalis paramesialis* (*o.prm*), which runs forwards for 14 mm., and it gives off two sulci præstriati (*p.str*), of which the upper is 7 mm. long and the lower one 24

mm. The latter joins the sulcus temporalis medius (*Tm*) at its anterior end. In the region behind the sulcus lunatus is visible the posterior extremity of the upper limb of the ramus verticalis (*imv*) of the sulcus intrastriatus mesialis and a curved sulcus intrastriatus lateralis (*il*).

Sulcus temporalis superior (*Ts*) at its anterior end lies 17 mm. from the temporal pole; from this point it runs obliquely upwards and backwards for 82 mm.; then, making a fairly well-marked upward bend, it is continued in an almost vertical direction for another 37 mm. and ends 5 mm. below the anterior segment (ip_1) of the sulcus interparietalis. At its bend it gives off a backward branch which brings it into communication with the sulcus temporalis medius (*Tm*). Three short downward branches arise from it at points 10, 37, and 68 mm. in front of this.

Sulcus temporalis medius (*Tm*) is also an apparently continuous fissure, but in reality its continuity is interrupted by deep annectant gyri at the points indicated in the diagram. It runs a rather irregular course, sending off a number of branches on either side. These establish anastomoses with the sulcus temporalis superior (*Ts*) and with three of the segments of the sulcus temporalis inferior (*Ti*).

Sulcus temporalis inferior (*Ti*) consists of five rather irregular segments placed obliquely across the tentorio-lateral margin.

Gyri and Remaining Sulci.

Gyrus centralis posterior near its upper extremity communicates with both the anterior and middle arcuate gyri. Below this, in the region bounded by the sulcus retrocentralis inferior, which constitutes the greater part of its length, it varies considerably in breadth, its widest point being near the Sylvian fissure, where it measures 28 mm. across. As one passes up it, it narrows gradually to 11 mm., then broadens out again to 19 mm. Here lies a shallow, forward branch from the sulcus retrocentralis inferior (*roi*). In the narrow region which lies below it is cut into by a short backward branch from the sulcus centralis, while in the lower broad region are situated four small fissures. Of these two join the Sylvian fissure, namely, the sulcus subcentralis posterior (*scp*) and another short fissure lying 9 mm. in front of it. The remaining two consist of a straight sulcus, 14 mm. long, lying parallel to the sulcus centralis, about 7 mm. behind it, and a shallow, oblique cleft lying below this. The gyrus centralis posterior communicates at its lower end with the gyrus centralis anterior and the gyrus marginalis.

Præcuneus measures 50 mm. from its upper anterior to its upper posterior corner; its smallest antero-posterior measurement, which lies some

23 mm. below this, is 42 mm. The *Sulcus subparietalis* (*sp*) consists of a straight portion 10 mm. long, which divides both in front and behind into two branches, the length of the long branch being in each case 18 mm. The *Sulcus præcunei* (*pc*) joins the middle portion of the sulcus subparietalis below and runs upward and slightly backwards from this for 20 mm., where it bifurcates. Besides these two fissures the præcuneus contains in its anterior division the inner end of the sulcus retrocentralis superior (*ros*), a shallow, curved groove lying just below this, and a short backward branch from the sulcus cinguli; in its posterior division is a straight fissure, 21 mm. long, which runs forwards from its upper posterior corner.

Lobulus Parietalis Superior.

The three *Gyri arcuati* are completely separated from one another. Of these the anterior, which stretches inwards for 19 mm., is bounded behind, on its inner side, and, to a certain extent, in front, by the sulcus retrocentralis superior (*ros*). The incisura cinguli, which divides it into two limbs, is situated 7 mm. from its posterior boundary, and runs for 15 mm. on the lateral surface.

The *Gyrus arcuatus medius*, which is the largest of the three, stretches inwards for 37 mm.; it is a V-shaped convolution with its open end directed outwards. The anterior limb, the breadth of which is about 11 mm., communicates with the gyrus centralis posterior, and the posterior limb, which measures 15 mm. across at its broadest point with the gyrus angularis.

The *Gyrus arcuatus posterior* measures 18 mm. along its inner, and 28 mm. along its outer, margin; it stretches inwards for 25 mm. Besides the outer end of the fossa parieto-occipitalis it contains an inward branch of the sulcus interparietalis, 10 mm. long., lying 8 mm. in front of the sulcus transversus of Ecker (*tr*).

Lobulus Parietalis Inferior.

Gyrus marginalis.—The anterior limb measures at its broadest point 13 mm. across. The posterior limb is incompletely separated from the gyrus angularis by the branch (*ipl*) of the sulcus interparietalis and by an oblique fissure, 23 mm. long, which lies between this and the ramus posterior ascendens (*rpa*) of the Sylvian fissure. Together with the anterior limb of the gyrus angularis, it forms a strip about 20 mm. in breadth. The posterior limb of the latter is bounded behind by an independent fissure (*a*), the length of which is 38 mm.; it measures 5 mm. across at its lower end, but opens out to 34 mm. at its upper end. It contains the branch (ip_2l) of the sulcus interparietalis, the lower end of

which joins a shallow, curved groove connecting it on the one hand with the anterior division of that fissure (ip_1) and on the other with the sulcus temporalis superior (*ts*).

The *Cuneus* measures 43 mm. along its lower border, 37 mm. along its posterior border, and 33 mm. along its anterior border. The *Sulcus limitans areæ striatæ superior* (*lss*), which is 16 mm. in length, lies almost parallel to the sulcus intrastriatus mesialis (*im*), at a distance of about 15 mm. from it; it is joined from above by the inner limb of the sulcus transversus of Ecker (*tr*), which runs over, as has been described, on to the median surface. In addition to this there are present in the lower part of the cuneus two shallow independent fissures.

The *Gyrus lingualis* is 30 mm. broad posteriorly, but narrows anteriorly to 14 mm., when it joins the gyrus hippocampi. In its posterior half lies the sulcus limitans areæ striatæ inferior (*lsi*), a curved fissure measuring 23 mm. from end to end, which is 20 mm. distant from the sulcus intrastriatus mesialis (*im*) at its lowest point. In front of this lies a transverse fissure, 30 mm. long, connected superficially with the sulcus collateralis (*col*) at its lower end; the gyrus is thus divided into anterior and posterior halves. In front of this again lies a branch of the sulcus collateralis, which for the greater part of its length runs parallel to the sulcus calcarinus, at a distance of 10 mm. from it.

Gyrus temporalis superior on its upper surface is raised into two transverse gyri of Heschl, which diverge as they reach the outer surface, enclosing between them a small triangular elevation. On its lateral surface the breadth of the gyrus varies from 10–18 mm., and its surface is marked with one or two shallow grooves.

Gyrus temporalis medius varies in breadth from 13–23 mm.; its surface is somewhat cut up by downward branches from the sulcus temporalis superior and upward branches of the sulcus temporalis medius.

Gyrus temporalis inferior and *Gyrus fusiformis* form an area which is about 30 mm. broad at either end and opens out to about 45 mm. in the middle. It contains the numerous segments of the sulcus temporalis inferior.

EXPLANATION OF FIGURES.

Brain III.

Both hemispheres from above	Fig. 11
Right hemisphere, lateral aspect	,, 12
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Left hemisphere, lateral aspect	,, 14
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ABBREVIATIONS USED IN FIGURES.

Frontal Lobe with its Bounding Fissures.

Sylvian fissure—main stem, *fsy.*
,, ,, ramus posterior ascendens, *rpa.*
,, ,, ramus posterior descendens, *rpd.*
,, ,, ramus anterior ascendens, *ra.*
,, ,, ramus anterior horizontalis, *rh.*
Sulcus centralis, *c.*
Sulcus præcentralis superior, *prs.*
Sulcus præcentralis inferior, *pri.*
Sulcus præcentralis inferior, ramus horizontalis, *h.*
Sulcus frontalis superior, *fs.*
Sulcus frontalis medialis, *fms.*
Sulcus frontalis medius, *fm.*
Sulcus frontalis inferior, *fi.*
Sulcus frontomarginalis, *fma.*
Sulcus radiatus, *r.*
Sulcus diagonalis, *d.*
Sulcus cinguli, *sc.*
Sulci rostrales, *ro.*
Sulcus subcentralis anterior, *sca.*

Parietal Lobe.

Sulcus retrocentralis superior, *ros.*
Sulcus retrocentralis inferior, *roi.*
Sulcus subcentralis posterior, *scp.*
Sulcus interparietalis, *ip.*
Sulcus interparietalis, ramus mesialis, *ipm.*
Sulcus interparietalis, lateral branches, *ipl.*
Sulcus transversus of Ecker, *tr.*
Sulcus parietalis superior, *ps.*
Sulcus subparietalis, *sp.*
Sulcus præcunei, *pc.*

Occipital Lobe.

Sulcus lunatus ("Affenspalte"), *lun.*
Sulcus occipitalis paramesialis, *o.prm.*
Sulcus intrastriatus lateralis (occipitalis superior), *il.*
Sulcus præstriatus (prælunatus), *p.str.*
Fossa parieto-occipitalis, *fpo.*
Sulcus limitans præcunei, *l.pr.*
Incisura parieto-occipitalis, *ipo.*
Sulcus calcarinus, *cal.*
Sulcus intrastriatus medialis (retrocalcarinus), *im.*
Sulcus intrastriatus medialis, ramus verticalis, *imv.*
Sulcus limitans areæ striatæ superior, *lss.*
Sulcus limitans areæ striatæ inferior, *lsi.*
Arcus intercuneatus, *arc.int.*

Temporal Lobe.

Sulcus collateralis, *col.*
Sulcus temporalis superior, *Ts.*
Sulcus temporalis medius, *Tm.*
Sulcus temporalis inferior, *Ti.*