

A CONTRIBUTION TO THE STUDY OF THE CEREBRAL CORTEX IN MAN

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EIGHT FIGURES

As one progresses in the study of the histology of the cortex cerebri, the subject, instead of becoming simpler and more easily understood, becomes more and more complex and difficult to arrange in conformity with present ideas and theories.

An exact knowledge of cerebral localization is desirable from every point of view, but in the opinion of many thoughtful investigators the tendency to localize function in the various cortical areas has gone much farther than is warranted.

The location of the speech function is still a matter of active controversy, although most clinicians are content to accept a centre for motor speech, and a series of centres, more or less indefinite it is true, for sensory speech—or more exactly, for the reception and elaboration of sensory impressions which make speech possible. The location of these centres in the left hemisphere, except in the case of left-handed individuals, is generally conceded, though there is still an occasional objection that the influence of the right hemisphere has been too much overlooked. In this connection the comparative study, here presented, of the cortex of the posterior portion of the third frontal convolution in the two hemispheres seems to have a special significance.

A comparative study of the cell lamination of this area in three brains shows a remarkable excess in favor of the left hemisphere. In the accompanying illustrations the percentage by which the left side exceeds the right is shown in the first, second

and third layers as well as in the total depth of cortex. Two of these brains—nos. 3339 and 3491—were obtained at the autopsy of patients who died in the Johns Hopkins Hospital. Each of these was the brain of an adult white woman with no history of mental disease, while the third, no. 250, was taken from the Anatomical Collection, and no history of either age, sex or race could be obtained.

In each case careful drawings were made of the convolutions and sulci of the two hemispheres upon which were recorded the exact location of the portions of cortex examined. Care was taken to have each segment cut at a right angle to the surface and to embrace as nearly as possible the entire convolution. The tissue was imbedded in paraffin, cut in sections 20 microns in thickness and stained with Thionin. Camera lucida drawings were then made of the cortex under a magnification of 225 diameters at points corresponding in the two hemispheres.

A reference to the illustrations will show the usual variation in the configuration of the external surface of the right and left hemispheres as well as in different brains. The percentage of excess was reckoned from measurements of the drawings, and the illustrations show the area occupied by the cortex which was developed on the left side in excess of the right in each case. The increased depth of the three external layers is not quite symmetrical in the several cases, but the increase is certainly remarkable and significant. The boundary line between the fourth and fifth layers was too indefinite to give satisfactory measurements, and they were therefore confined to the three outside layers and to the entire depth of the cortex.

Other areas of the cortex have not yet been carefully compared, but a superficial study of the posterior portions of the first and second temporal convolutions in one brain shows practically the same excess in depth of the cell-layers of the left hemisphere over the right as above noted in the third frontal. A comparative study of the cortex of the two hemispheres in the brains of individuals of known mental ability should furnish a key to a much more precise science of localization than we yet possess.

In this connection the study of the brains of children and young adults should furnish much valuable data for the study of the development of special areas. The time and labor necessary for the prosecution of such an investigation is so great that it would appear to be a most promising field for a number of workers whose results might be correlated by a central committee, as has already been attempted in other lines of neurological investigation.

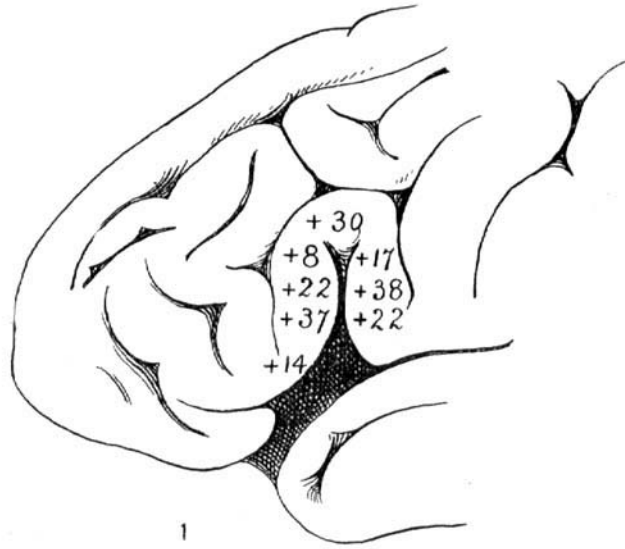


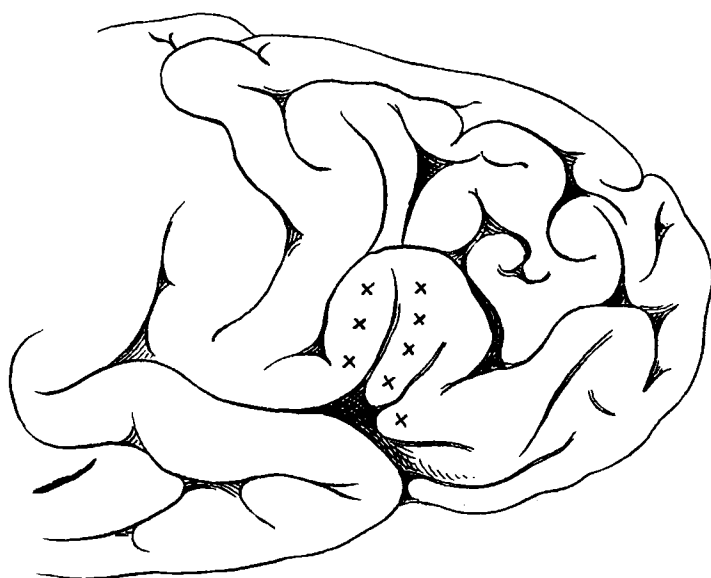
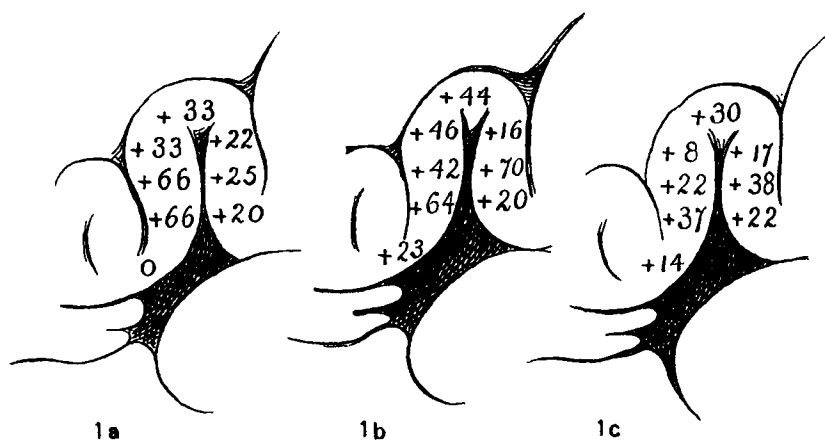
Fig. 1 Anterior portion external surface of left hemisphere, Brain 3339. The figures placed around the ascending ramus of the Sylvian fissure indicate the percentage of excess of the total depth of cortex upon the left side over corresponding points upon the right side. Thus, + 30 means that the total depth of cortex at that point in the left hemisphere is as 130 to 100 at the corresponding point in the right hemisphere (figs. 7 and 8).

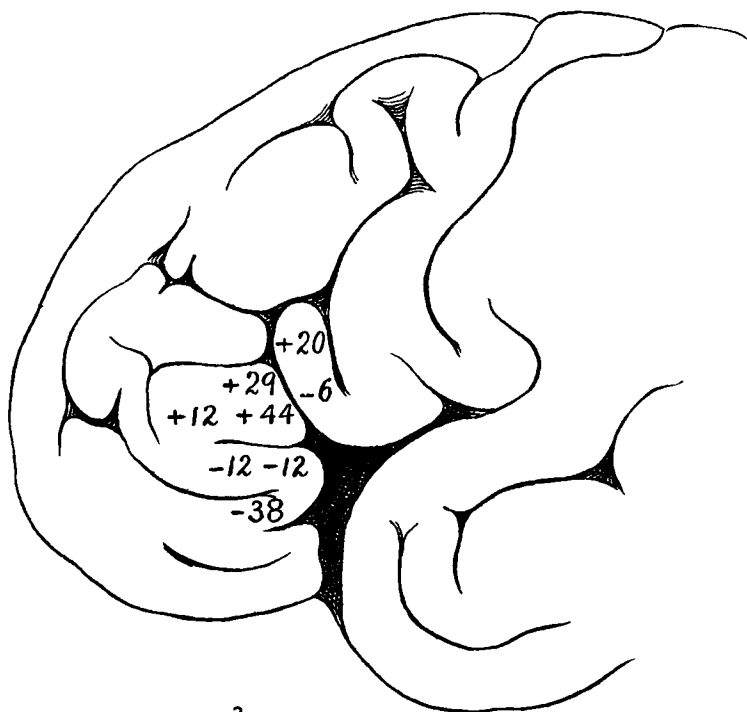
Fig. 1a Represents the excess in depth of the external or first layer in the left hemisphere over corresponding points in the right hemisphere. 0, means that the two sides were equal at that point.

Fig. 1b The excess in depth of the outer pyramidal or second layer in the left hemisphere over the right.

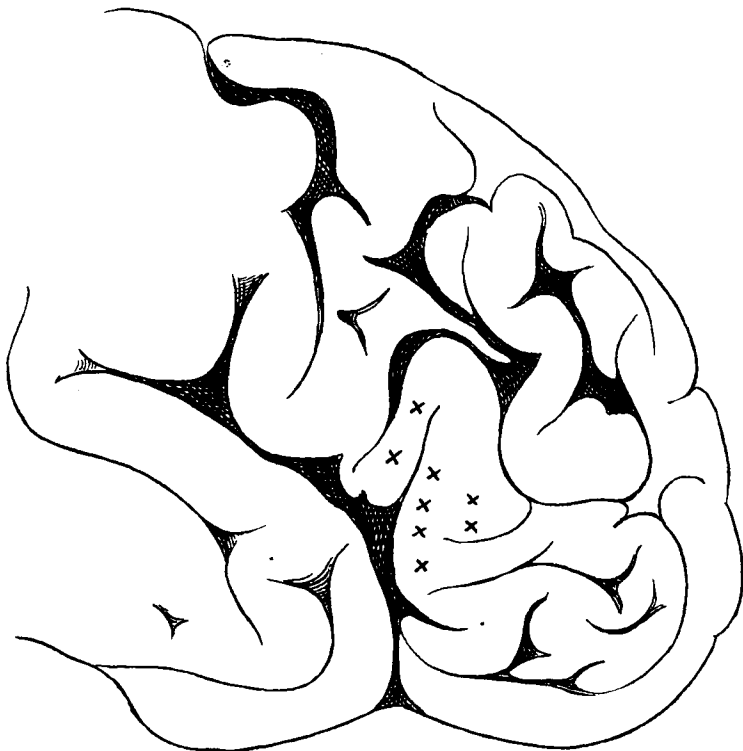
Fig. 1c The excess in depth of the granular or third layer in the left hemisphere over the right.

Fig. 2 Anterior portion external surface of the right hemisphere, Brain 3339. The crosses are placed at points assumed to correspond to the points represented in fig. 1.





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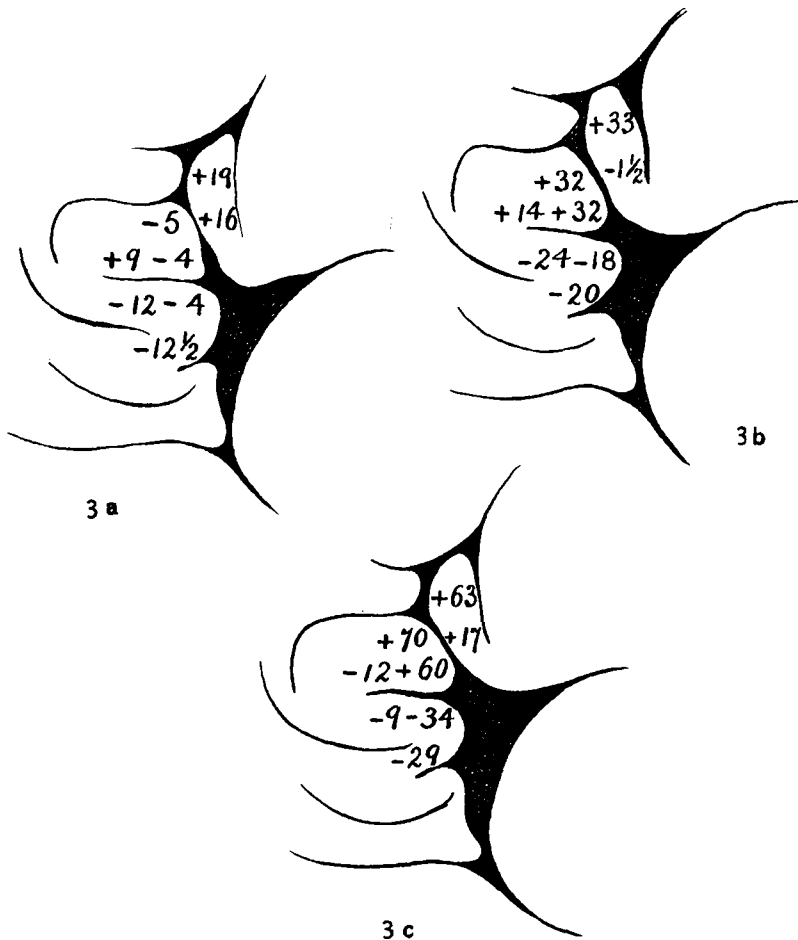


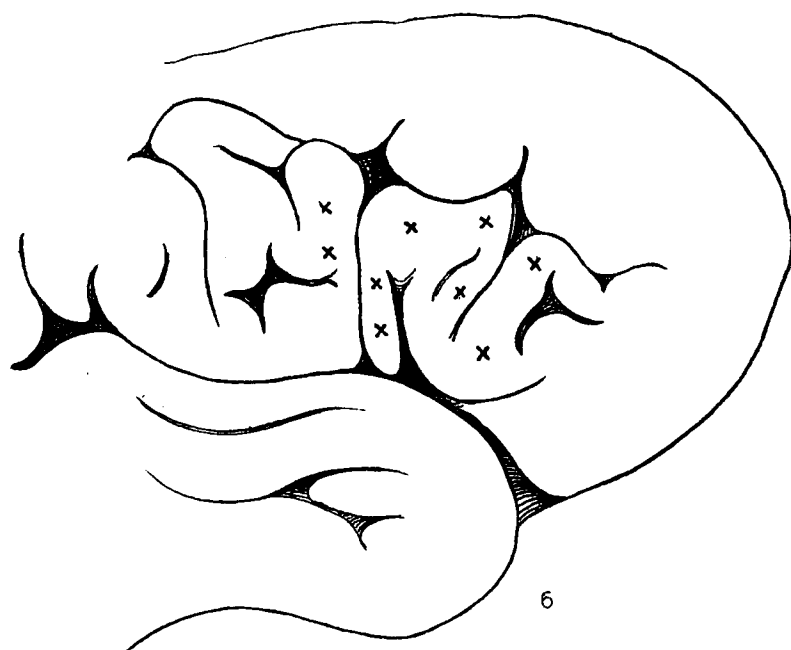
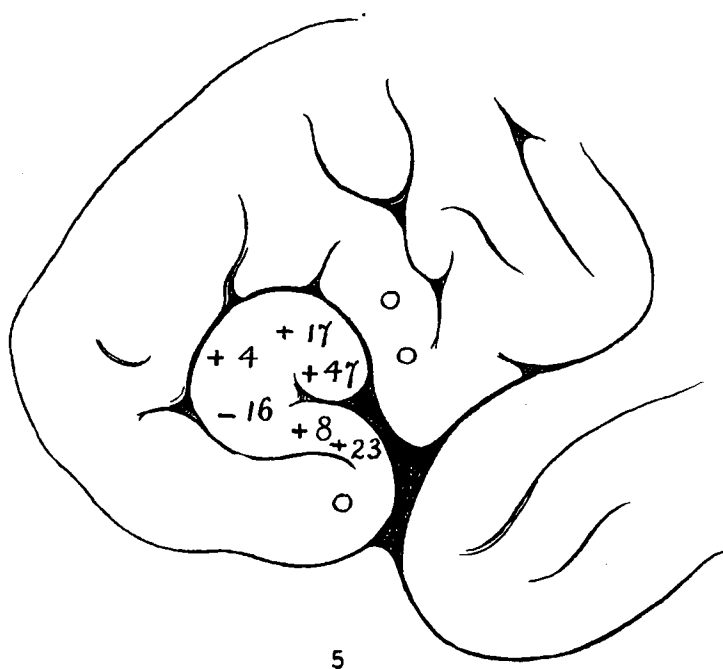
Fig. 3 Anterior portion external surface of left hemisphere, Brain 3491. The numerals represent the comparative depth of the entire cortex at points indicated. The plus sign means percentage of excess in the left hemisphere; the minus sign the excess in the right.

Fig. 3a The percentages in the depth of the first or external layer.

Fig. 3b The percentages in the depth of the outer pyramidal or second layer.

Fig. 3c The percentages in the depth of the third or granular layer.

Fig. 4 Anterior portion external surface of right hemisphere, Brain 3491, showing points assumed to correspond to points indicated in fig. 3.



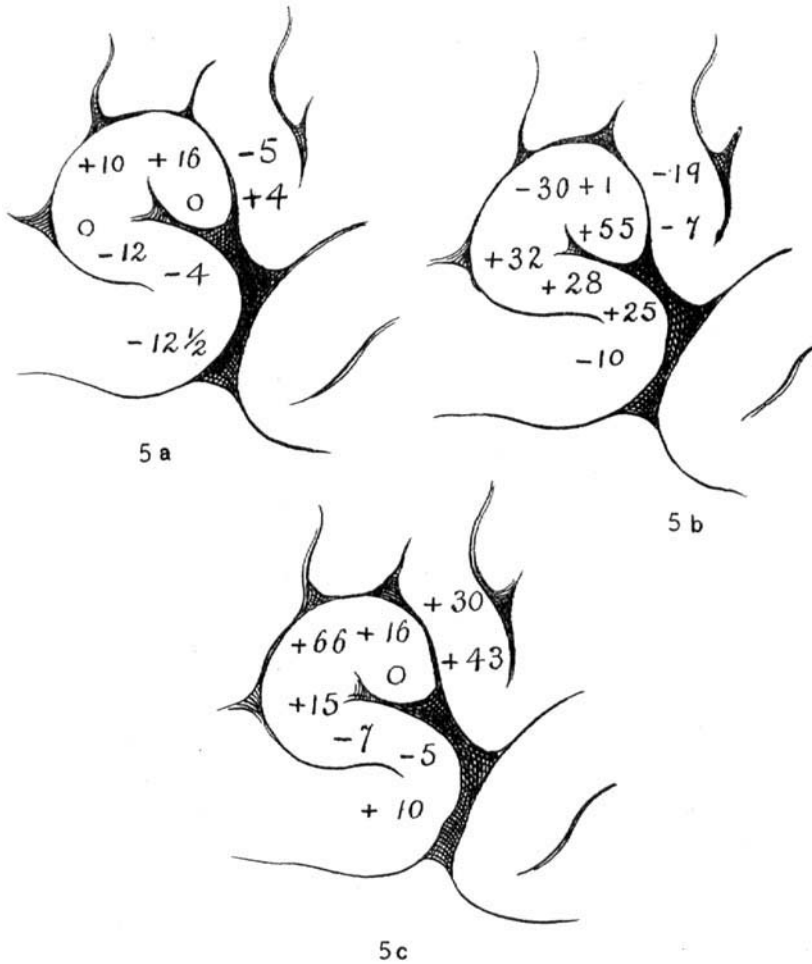


Fig. 5 Anterior portion external surface of the left hemisphere; Brain 250 showing the percentage of excess in the depth of the cortex, in the two hemispheres at points indicated.

Fig. 5a The percentages in the depth of the first or external layer.

Fig. 5b The percentages in the depth of the second or outer pyramidal layer.

Fig. 5c The percentages in the depth of the third or granular layer.

Fig. 6 Anterior portion external surface right hemisphere, Brain 250, showing points assumed to correspond to those indicated in fig. 5.

Fig. 7 Camera lucida drawing of the cortex at the highest point represented in fig. 1, Brain 3339. Drawing made at magnification of 225 diameters; reduced to $\frac{1}{4}$. (Figs. 7 and 8 on following page.)

Fig. 8 Camera lucida drawing of the cortex at the point in the right hemisphere, Brain 3339. Assumed to correspond to the drawing from the left (fig. 7). Magnification and reduction same as fig. 7.

