

A STUDY OF THE LOCATION AND ARRANGEMENT OF THE  
GIANT CELLS IN THE CORTEX OF THE RIGHT HEMI-  
SPHERE OF THE BONNET MONKEY (*MACACUS SINI-  
CUS*).

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WITH 3 FIGURES.

In view of the recent experimental results regarding the representation of movements in the cerebral cortex, a more exact study of the distribution of the large pyramidal cells as seen in microscopic sections has seemed to me desirable. The following paper deals with the distribution in the bonnet monkey.

The right hemisphere of a healthy adult monkey (*Macacus sinicus*) hardened in Müller's fluid, dehydrated and imbedded in celloidin, was cut in horizontal sections 50 microns thick. The sections were numbered from below upward, and stained first by Pal's modification of Weigert's hæmatoxylin method, counter-stained with carmine and mounted in balsam. This double stain has the advantage of accentuating the contrast between cells and fibers and facilitating the study of the relation of the cells to the various fiber tracts.

A careful study of these serial sections reveals the following arrangement of the Betz (giant) cells in the motor cortex and, if confirmed by the study of their disposition in other specimens, may lead to some modification of the present ideas in relation to the extent of the so-called "motor areas of the cortex.

On the external surface of the hemisphere the lowest point at which any giant cells are found corresponds to the lower extremity of the fissure of Rolando. A few scattered cells are found here upon the anterior lip, but quite in the depth of the fissure. From this point upward they gradually increase in number and at a point about 0.5 mm. higher up there is a small group of giant cells between the corona radiata of the ascending frontal convolution and the surface, but the majority of these cells is still within the fissure contiguous to what may be called the posterior aspect of the corona radiata of the ascending frontal con-

volution. Another small group of giant cells appears in a corresponding position, after an interval of 10 sections (0.5 mm. higher on the surface) contiguous to the external aspect of the corona radiata of the ascending frontal convolution. This arrangement of the giant cells in groups does not obtain within the fissure of Rolando, but they appear here as a continuous layer in gradually increasing numbers from below upward. Nor is there any further appearance of grouping of the giant cells on the external aspect of the corona radiata of the ascending frontal convolution, but from this point upward they extend farther and farther forward until in the level of the anterior limb of the frontal sulcus they cover the entire antero-posterior extent of the external aspect of the corona radiata of the ascending frontal convolution. At a slightly higher level the giant cells entirely envelope this process of the corona radiata; that is, they are present upon its posterior, external and anterior aspects, and as we reach still higher levels extend a short distance forward in contiguity with the external surface of the corona radiata of the frontal lobe (Fig. 3).

This arrangement is maintained throughout the remainder of the upward extension of the corona radiata, which, in the monkey, corresponds to the cortex of the ascending frontal and the posterior portion of the superior frontal convolution (Fig. 1).

This distribution of the giant cells upon the external surface of the brain is by no means uniform. They are most numerous within the sulcus of Rolando and in that portion of the cortex covering the ascending frontal convolution, while in the cortex of the superior frontal they are more scattered. Within the sulcus of Rolando they extend to the base of the sulcus, but are confined entirely to the anterior lip; that is, they nowhere pass beneath the base of the fissure to the parietal lip.

There are two small groups of large cells in the cortex of the ascending parietal convolution: one just above the lower extremity of the intra-parietal fissure appearing in fourteen consecutive sections, the cells diminishing in number and size from below upward. These cells extend into the intra-parietal fissure but not into the fissure of Rolando. There is another small group of large cells in the cortex of the upper extremity of the ascending parietal convolution, only present in four sections. With the exception of a few very large cells within the intra-parietal fissure, the cells described in the cortex of the ascending parietal convolution are much smaller than the majority of the giant cells anterior to the fissure of Rolando. Those anterior to Rolando measure from 20 to 60 microns in length by from 10 to 40 microns in

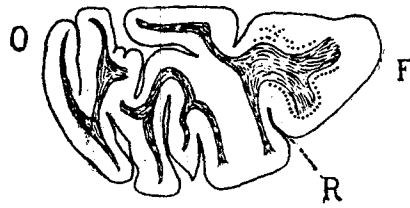


Fig. 3.

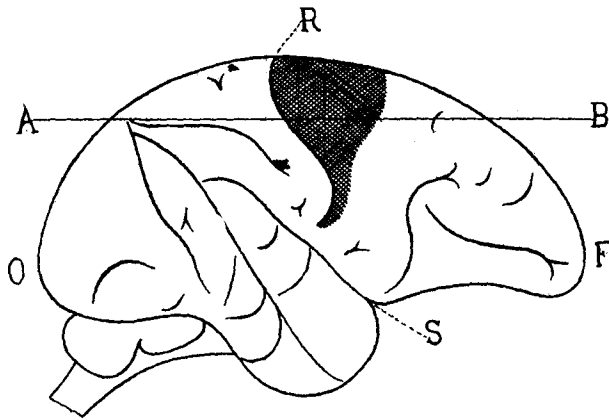


Fig. 1.

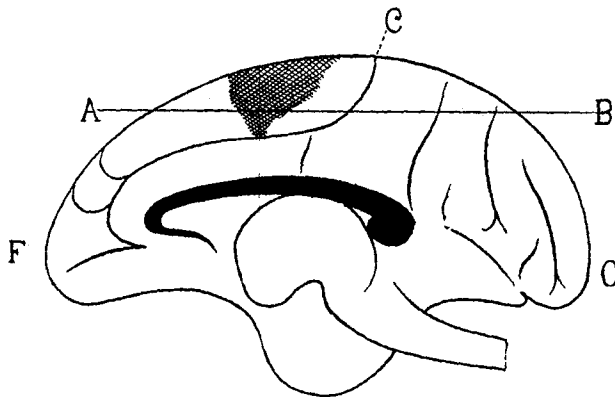


Fig. 2.

DISTRIBUTION OF GIANT CELLS (BETZ) IN CORTEX OF BRAIN (MELLUS).

breadth, while those in the cortex of the ascending parietal convolution, with the exception noted, are from 15 to 22 microns long by 12 to 18 microns wide.

On the mesial surface of the brain the superior border of the cortical area in which the giant cells are found corresponds exactly with the superior border of that upon the external surface; that is, the anterior and posterior borders of this area may be followed directly over from the external convex surface of the brain upon the mesial surface. The area occupied on the mesial surface is a somewhat irregular triangle with its apex corresponding to the upper extremity of the fissure of Rolando and its base directed toward the frontal pole. The giant cells are relatively more numerous upon the mesial surface. Instead of being arranged in a single layer, as upon the external surface, they are more irregularly scattered about in groups of several superimposed layers. Cells of the larger diameters are also relatively more numerous on the mesial than on the external surface. The area extends downward to the calloso-marginal sulcus about 8 mm. below the crest of the hemisphere. The cells in the lower portion of this area are less numerous and rather smaller than elsewhere on the mesial surface.

#### EXPLANATION OF FIGURES.

*Note that, for the sake of comparison, Fig. 3 is placed above Fig. 1.*

FIG. 1. External surface of right hemisphere; *R.* Fissure of Rolando; *S.* Fissure of Sylvius; *F.* Frontal pole; *O.* Occipital pole; *AB.* Plane of section of Fig. 3. Area of distribution of giant cells is striated.

FIG. 2. Mesial surface of right hemisphere. *C.* Calloso-Marginal sulcus; *F.* Frontal pole; *O.* Occipital pole; *AB.* Plane of section of Fig. 3. Area of distribution of giant cells is striated.

FIG. 3. Horizontal section at line *AB*, Figs. 1 and 2, showing arrangement of giant cells at that level. *R.* Fissure of Rolando; *F.* Frontal pole; *O.* Occipital pole.