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ANDRÉ THOMAS & W. CONYERS HERRING

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NERVOUS AND MENTAL DISEASE MONOGRAPH SERIES NO. 12

Cerebellar Functions

BY

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FIRST PART

EXPOSITION OF FACTS

CHAPTER I

ANATOMY OF THE CEREBELLUM

I. The Architecture of the Cerebellum

The cerebellum is an unpaired median symmetrical organ, situated, in man, below the *cerebral hemispheres* which cover it entirely, behind the *corpora quadrigemini*, and above the *pons Varolii* and the *medulla oblongata* in which it makes a deep groove or concavity and which it overlaps largely on the sides.

With its furrowed and lamellated appearance it is related to all the other parts of the central nervous system in which, by volume, it occupies the second place; it is but a misnomer to call it the "little brain" or "Kleinhirn" as do the Germans as this name is neither justified by morphology, histology nor physiology.

The cortex of the cerebellum or the cerebellar mantle, which is demonstrated by a simple macroscopic examination, constitutes but one portion of the organ; a series of longitudinal or sagittal sections gives immediately an important idea of its architecture. From the surface towards the interior one can distinguish: (1) the cerebellar cortex; (2) a thick layer of white matter; (3) collections of gray matter or central gray nuclei. In man there are four of these nuclei for each half of the organ, the *corpus rhomboideum* or cerebellar olive also called the *corpus dentatum*, the *nucleus fastigii*, the *nucleus globulosus* and the *nucleus em-*

boliformis (Fig. 3). Certainly the cortex and the nuclei have, as we shall see further on, very intimate relations with one another, but their configuration and their structure is so dissimilar that they must be looked upon as distinct organs. This should be the same with the cerebellum as with the cerebrum. In each cerebral hemisphere does not one distinguish—as well from the point of view of structure as of function—the cortex and the central nuclei? All the more reason to do the same for the cerebellum in which the cortex is so distinctly differentiated from the rest by its external appearance as well as by its histological structure.

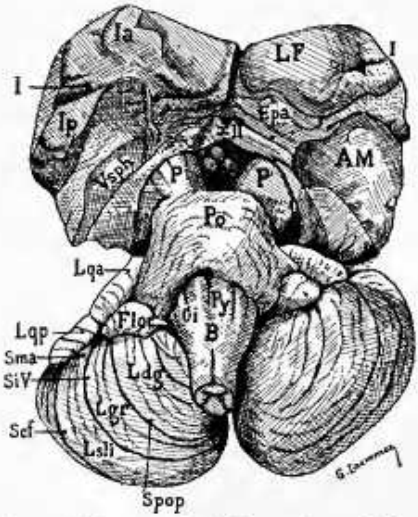

FIG. 1. Section of Meynert. Inferior surface of the cerebellum. (After a photograph.)

AM, anterior wall; *B*, medulla; *Cv*, hemispheres of the cerebellum; *Epa*, anterior perforated space; *Fe* bundle of Férré; *Floc*, flocculus; *I*, insula; *i*, fissure of the insula; *Ia*, anterior convolutions of the insula; *Ip*, posterior convolution of the insula; *LF*, frontal lobe; *LT*, temporal lobe; *Lc*, central lobe; *Ldg*, digastric lobe; *Lgr*, lobus gracilis.

This conception is however not only anatomical but physiological as well; there will be occasion to investigate whether there are differences observed between the symptoms which are produced by the simple destruction of the cortex in animals and

man, and those produced by the total destruction of the organ (both cortex and central gray nuclei), between the phenomena produced by the excitation of the cortex and of those which follow the irritation of the central nuclei. To sum up, the cerebellar cortex is an organ and the central gray nuclei are other organs; there exist relations, both anatomical and physiological, between the two, but nevertheless they enjoy an independence sufficiently marked to consider them as distinct organs.

The cerebellum is formed of a median or central part, the vermis or median lobe, and of two lateral parts, the lateral lobes or hemispheres.

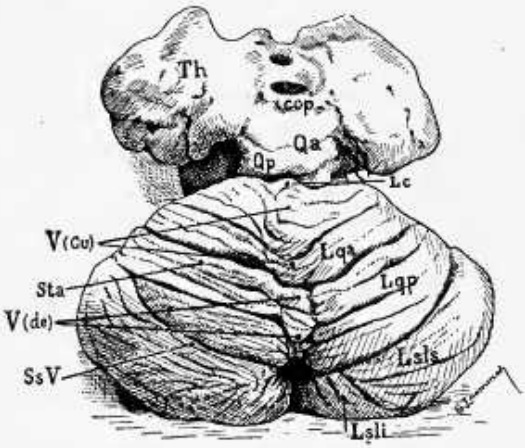

FIG. 2. Section of Meynert. Superior surface of the cerebellum.

Lqa, anterior quadrilateral lobe; *Lqp*, posterior quadrilateral lobe; *Lsli*, inferior semi-lunar lobe; *Lsls*, superior semi-lunar lobe; *NA*, nucleus amygdalus; *P*, foot of the peduncle; *pFL*, falciform fold of Broca; *Scf*, circumferential fissure of Vicq d'Azyr; *SiV*, inferior fissure; *Sma*, anterior marginal groove; *SsV*, superior fissure; *Sta*, anterior transverse fissure; *Vcu*, culmen; *Vde*, declive; *Vsph*, sphenoidal ventricle; *XII*, optic chasm.

The vermis in the animal series is the most constant part of the cerebellum; it alone exists in the inferior vertebrates (fishes, reptiles), and also in the great majority of birds. It is only in the mammalia that the lateral lobes, rudimentary in certain types of birds, compare in their development with the vermis. Edinger, from the point of view of phylogenetic evolu-