THE CORTICAL LOCALIZATION OF THE AUDITORY AREA.¹

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For several years I have been engaged in a systematic examination of the cortex cerebri, in order to ascertain whether the areas which dominate the better-known physiological functions can be proved to possess a distinctive histological structure.

The results hitherto have been encouraging, for both the motor and visual area have been defined with almost perfect accuracy; and it affords me great pleasure to now place before the Otological Society a brief outline of the results of my researches in so far as the auditory centre is concerned. These results have been obtained from an examination in strict serial section of several human and three anthropoid brains, and the amount of labour involved in the research may be gauged from the fact that the examination of one brain occupies at least six months.

To illustrate the method of procedure, I may say that if a section taken from the middle of the temporal lobe be stained for nerve fibres or nerve cells and examined, three types of cortical structure may be observed—one special type, characterized by an abundance of large medullated nerve fibres and large nerve cells, coats the Sylvian side of the superior temporal gyrus; a second special type covers the crown and lower side of the same gyrus; and a third type, which we may call a general one, is found over the remaining convolutions. Now, on analyzing the distribution of these types of structure in a successive series of sections, it becomes possible to define with absolute exactitude two definite areas. The extent of these areas is indicated in the diagrams and casts shown, and I need only say here that one covers the transverse temporal gyri of Heschl, and is almost concealed within the Sylvian fissure, while the other occupies the posterior three-fifths of the superior temporal convolution.

It is impossible for me to discuss fully the functions of these areas, but I would mention that the conclusions which I have arrived at, after a careful consideration of most of the anatomical, embryological, experimental, and clinico-pathological data which have been adduced on this subject, are that the first area represents the exact limits of the field which we are to regard as the arrival

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platform for the primary reception of auditory stimuli, while the second represents the extent of cortex which deals with the interpretation and further elaboration of these stimuli. The first, therefore, is a sensory area, while the second has a psychic function.

As to the grounds which can be advanced for this belief, in support of the assumption that area No. 1 is the arrival platform of auditory stimuli, it may be pointed out, firstly, that histologically it possesses an analogous structure to other purely sensory regions—for instance, the visuo-sensory area; secondly, the embryological researches of Flechsig prove that it is the terminus of the central auditory tract—a tract which shows distinct developmental peculiarities; and, thirdly, that in all the recorded cases of complete cortical deafness established on an anatomical basis by the results of an autopsy the bilateral lesions have been centred on this area.

Next, concerning the assumption that area No. 2 has a psychic function, again its structure is analogous to other psychic areas, and again Flechsig's developmental studies prove that it stands in relation with a distinct set of fibres; further, we know from experimental and clinical investigation that slight lesions of this field give rise to slight degrees of psychic disability, best expressed by the term "mind-deafness"; and, lastly, we can point to the limitation to this part of the lesion producing the well-known condition "word-deafness."

These seem to be sufficiently strong reasons for believing that separate sensory and psychic centres exist. And now a word as to the unilaterality of the "word-hearing" centre. Clinically, there is not the smallest doubt that this function is dominated by the left hemisphere, but, at the same time, reasons exist for thinking that the right hemisphere shares the function, although to a very much less extent; and these reasons are that in none of the many recorded cases of "word-deafness" resulting from a lesion in the left hemisphere has the disability been complete, uncomplicated, or altogether irrecoverable; and, further, in all the recorded cases—they are but five—of "pure and complete word-deafness" the lesion has been bilateral. This seems to point to the fact that the right hemisphere shares the special education needed for the interpretation of spoken language.

Lastly, I would say that my histological researches show no differences between the auditory areas in the two hemispheres—hence I can say nothing about the exact localization of a "word-hearing" centre; nor does histology give any information con-

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cerning special centres for the recognition of tones of high and low pitch and of musical sounds.

Some casts and drawings exhibited give an idea of the distribution of these areas; some low-power photographs of sections stained for nerve fibres show the variations in fibre-wealth by which the different areas can be identified; and other drawings show the nerve fibre and nerve cell structure of these parts at a higher magnification. And it may be mentioned that the microscopic drawings have been carefully drawn to scale with a camera lucida, and belong to a large series executed with infinite care by my colleague, Dr. A. C. Wilson.

A CASE OF THROMBOSIS OF THE CAVERNOUS SINUSES.¹

BY SAMUEL LODGE, M.D.,

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THE patient, a married woman, aged forty-one years, was seen in consultation with Dr. Thomson of Shelf on December 13, 1902. Dr. Thomson gave me the following history:

"He saw the patient on November 9, 1902. She complained of neuralgia, most acute, confined to the left supra-orbital, temporal, and malar regions. She also had a dull aching pain at the back of the left eye. There was nothing to be seen at this time externally, but there was a distinct fulness between the left alveolar margin and the cheek. The teeth were very bad: no tenderness over the swelling, which was, however, incised freely, but no pus found. Temperature, normal. The family history was good, and there was no history of syphilis. The excruciating pain continued for the next ten days, when at the end of this period she described it as throbbing in character. Temperature, 99.5°.

"On November 28, 1902, a swelling was noticed extending almost from the base of the left tonsil to the second or third molar. This was incised, and a quantity of thick creamy pus evacuated. Patient obtained relief from pain for twenty-four hours, and enjoyed a little natural sleep for the first time since the onset of symptoms. A week later a further incision was made as there seemed to be a collection of pus below the former opening; a small amount of pus escaped. On the following morning there was some œdema of the

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