

The Electrode, the Brain and the Mind*

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Key words: Brain — Mind — Electrode — Neurophysiology — Neurology, History — History of Neurology — Medizingeschichte.

Fritsch u. Hitzig haben mit ihrer Veröffentlichung „Über die elektrische Erregbarkeit des Großhirns“ einen neuen Anfang zum Verständnis der Gehirnfunktionen gefunden¹.

Sie entdeckten für die neurologischen Forscher eine neue experimentelle Methode und zeigten zugleich, daß das Gehirn nicht als Ganzes funktioniert, sondern mittels vielfältiger intracerebraler Mechanismen, die durch elektrische Ströme aktiviert werden. Ich spreche im Namen aller Neurologen der ganzen akademischen Welt, wenn ich diese deutschen Neurologen würdige.

Ich persönlich empfinde tiefe Dankbarkeit für die deutsche Neurologie. Im Jahre 1928 habe ich 6 Monate lang in Breslau mit dem hervorragenden Neurologen, Forscher und Neurochirurgen Otfried Foerster gearbeitet. Er war mir ein Lehrer, Freund und guter Gefährte.

Il convient tout à fait que les neurologues français se joignent ici, à Munich, à leurs collègues allemands à l'occasion de ce centenaire. De 1800 à 1870, Paris fut le centre mondial de la neurologie et les travaux de pionnier de Flourens et des cliniciens français attirèrent les savants du monde entier. Ils attirèrent aussi les phrénologistes de tous les coins de l'Europe et de l'Amérique, et Paris ne récompensa que trop généreusement ces pseudoscientists. En effet, grâce à leurs sociétés secrètes, ils purent mettre sur pied leur monumentale comédie des bosses du crâne, fumisterie maintenant d'intérêt purement historique.

Quant à moi, en tant qu'ancien étudiant américain à Paris et maintenant citoyen du Canada et de Montréal, une des plus grandes villes françaises du monde, je sais toute l'importance des brillantes leçons que nous ont données les neurologues de langue française d'Europe aussi bien que du Canada français, et je tiens à rendre hommage à ceux qui perpétuent encore ces illustres traditions.

Hélas! Vous vous serez sans doute aperçus que je n'ai ni la bosse du Français ni celle de l'Allemand, mais je veux me joindre à vous de tout cœur pour l'avancement de notre cause commune, la Neurologie.

“How is the mind attached to the body?” It was Aristotle, in the Fourth Century B.C., who asked this question². Hippocrates gave a

* The Fritsch and Hitzig Centennial Lecture, Deutsche Gesellschaft für Neurologie and La Société Neurologique de France, München, October 8, 1970.

1 Arch. Anat. Physiol. wiss. Med. 37, 300—332 (1870).

2 Laslett, P. (Ed.): The Physical Basis of the Mind. Oxford: Blackwell 1950. Quoted by C. S. Sherrington in the Introduction.

partial answer. He had addressed himself to the problem a few years earlier. He had been discussing epilepsy, that ancient explosive disturbance of the brain, when he spoke to his students as follows: "Men ought to know that . . . through [the brain] in particular, we think, see, hear and distinguish the ugly from the good . . . To consciousness," he continued, "the brain is messenger." Epilepsy was ready, even then, to teach the physician who could observe with an open mind.

Five centuries after Hippocrates, another Greek physician, Galen, voiced the common opinion that spirits within the body conveyed messages out to arms and legs to make them carry out the decisions of the will. This served the average man as an adequate explanation through the middle ages until, at last, the experimental method was introduced into science.

Then — it was in 1792 — the Professor of Anatomy at Bologna, Luigi Galvani, first, and the Professor of Physics at Pavia, Alessandro Volta, second, discovered a strange new form of energy. They recognized it in the muscle and the attached nerve of the leg of a frog. This new form of energy which caused the muscle to contract came, in time, to be called electricity. It had now become evident that electric currents moved along the spinal cord and nerves out to the muscles. Galen's theory of the spirit-messengers was suddenly out of date.

Physiologists wondered about the function of the brain. They had no obvious method of approach. Hughlings Jackson was not yet born and Hippocrates's conclusions, drawn from study of epileptics, had been forgotten. They used strong electric currents to stimulate nerves and spinal cord, and they produced convulsions by applying such currents to the brain. But the thoughtful use of the experimental method waited from 1792 until 1870 for Fritsch and Hitzig to apply it to the brain.

In their paper, they summarize existing opinion in regard to brain function. Curiously enough, they do not refer to the paper of a French surgeon, Paul Broca, published 9 years earlier, a paper that seems to us so important in retrospect³. But Fritsch and Hitzig refer, instead, to the 1825 publication of Bouillaud, stating that it is well known that the symptom complex now called "*aphasie*" can be produced by a lesion in an excentric portion of the brain.

They state, also, that paralysis of arm or leg has been described by numerous authors and they quote Gabriel Andral who had written, in 1834, that there must be, somewhere in the brain, a distinct localization (*siège distinct*) for movements of the upper and lower extremity. They speak further of the existence of two pathways through brain-stem and spinal cord — one from without inward, which they describe as "The

3 Broca, P.: Sur la siège de la faculté du langage articulé. Bull. Soc. Anat. (Paris), 2 Série, 6, 355 (1861).