Francis Joseph Gall (1758–1828): false prophet of cerebral localization

The localization of function to different parts of the CNS has a long and fascinating history which, with modern radionucleotide techniques, is continuing to this day and which is still incomplete. For example, little is still known of the central connections of the olfactory tract. Thomas Willis (1621–75), in his *Cerebri anatome* published in 1664, suggested that the cerebrum controls voluntary, and the cerebellum involuntary movements, in what was probably an inspired guess. It was not until 1809 that Luigi Rolando (1773–1831) of Sardinia showed, by animal experiments in which he ablated one or other of these structures, that Willis's conjecture was correct.

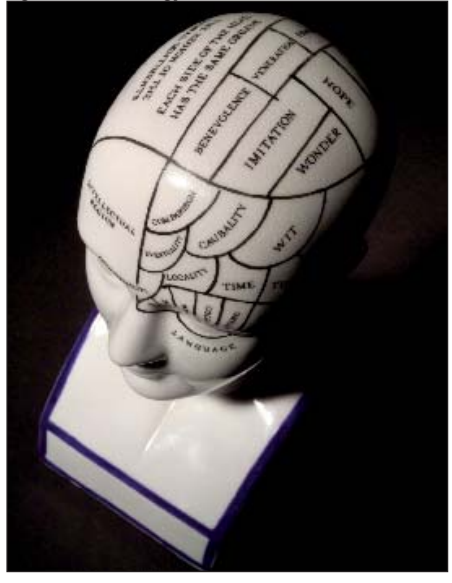
An important worker in this field, whose studies in this subject led him to wrong and now discredited views, was Franz Joseph Gall, born 250 years ago in Tiefenbronn, Baden, Germany on 9 March 1758. Gall was the son of a wealthy Italian merchant. He began his medical studies in Strasbourg, completed his degree in Vienna, and settled in that city. His interests were in the anatomy and functions of the brain.

He soon made the important observation that the cranial nerves emerged from the brainstem and not, as had been previously thought, from the cerebrum. Gall became convinced that the mental functions and personality traits of the individual were localized to specific areas of the brain. This was based on studies of the cranium, both by palpation of the living subject and by inspection and measurement of human skulls. His collection of skulls is preserved today in the Rollet museum in Baden bei Wien in Austria.

Gall came to believe that each mental function and personality trait is localized to a specific area of the brain and that each particular faculty – such as constancy, perseverance, obstinacy, kindness, affection, sense of colour and of sound – over 30 in all, was represented by a particular 'organ' of the cerebrum. The size of each of these organs was proportional to how well these features were developed in the individual's personality and character. Gall postulated that the different sizes of the various organs were reflected by similar changes in the overlying cranium – bumps where these were well developed, depressions where their function was poor. Of course, this is nonsense.

Originally, Gall used the term 'cranioscopy' to describe this study, but the name 'phrenology' was devised by his pupil and loyal assistant, Johann Caspar Spurzheim (1776–1832). This title, derived from the Greek 'phreno' = mind and 'gnosis' = knowledge of, remains to this day. The practitioner would take measurements of the subject's skull, using a pair of calipers, then he would note each bump and depression by running his fingers over the the scalp. An enlarged bump would represent a well-developed organ, which would be identified by reference to a chart or a model (in porcelain or ivory) of the head (*Figure 1*). These models were often to be seen in chemist shops and in herbalists. Today they can be found in most museums of medical history.

Figure 1. Phrenology model.



Gall's lectures and demonstrations in Vienna proved to be highly popular, but were condemned by Catholic religious leaders as heretical. The concept that the mind, created by God, should have a physical seat in the brain matter was an anathema to them. Gall therefore left Vienna in 1805, made a triumphant and no doubt lucrative journey through the major centres in Europe, and settled in the congenial atmosphere of revolutionary and atheistic Paris in 1807. His ideas became very popular, especially in the UK and the USA in the first half of the 19th century. Phrenologists were consulted on all sorts of topics, from the future prospects of young children, to finding a congenial partner in matrimony or the selection of a suitable employee.

By the early part of the 20th century the 'science' of phrenology became more and more discredited. Advances in cerebral localization showed absolutely no correlation between any of Gall's organs and the functional areas of the brain. Indeed, there were too many examples of, let us say, a clearly aggressive subject being found to have a particularly well-developed bump over his 'benevolent organ' on cranial palpation. The fact that the Nazis in the 1930s used skull measurements to define 'Aryan' and 'non-Aryan' subjects further disgraced any final shreds of faith in phrenology.

Today, Gall and Spurzheim are discredited. However, we should remember that they were serious investigators and did make some real contributions to the study of the nervous system. In their four-volume textbook on *Anatomy and physiology of the nervous system in general and of the brain in particular*, published in French between 1810 and 1819, they demonstrated that the white matter of the brain was made up of nerve fibres and also showed that there is partial crossing of the fibres of the pyramidal tract in the brain stem. How they would have enjoyed seeing today's positron emission tomography scans of the brain. BJHM

Conflict of interest: none.

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