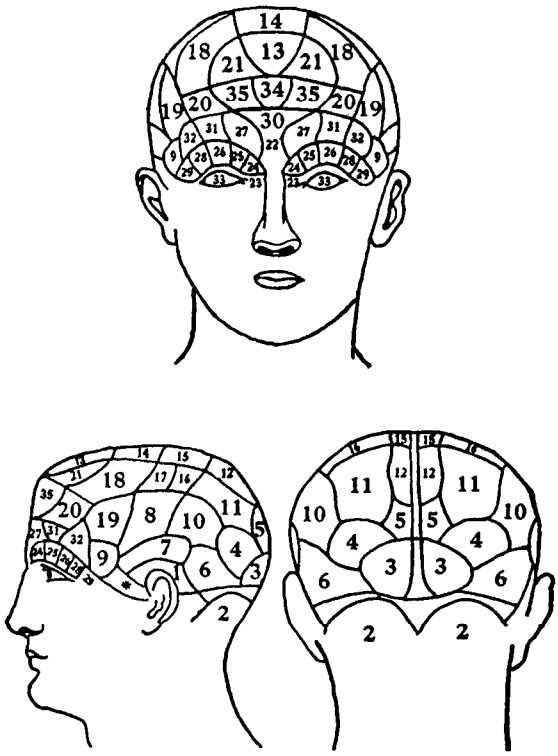
Phrenology

Charles G. Gross

The central tenet of phrenology is that intellectual abilities and personality traits are correlated with cranial morphology—with bumps on the head. Although considered quackery today, in the 19th century phrenology was both a widespread medical movement and a major influence in the development of ideas on the cerebral localization of psychological function.

Phrenology was founded by Franz Joseph Gall (1758–1828) although he accepted the term reluctantly, preferring to view himself as a student of the anatomy and physiology of brain. Gall had already achieved eminence as a cerebral neuroanatomist: He had distinguished cortical gray and white matter, differentiated projection, association, and commissural fibers, and established the pyramidal decussation. He viewed the brain as an elaborately wired machine for producing behaviour, thought, and emotion and the cerebral cortex as a set of organs with different functions. These ideas were a substantial departure from prevailing notions about the brain. The Aristotelian stress on the unity of the mind, the attribution of emotions to the viscera, and the dismissal of the cortex as an unimportant rind were all still widely accepted beliefs.

In the development of phrenology, and particularly in its spread, Gall was aided by his anatomical colleague J.C. Spurz-



AFFECTIVE FACULTIES

PROPENSITIES

? Desire to live
* Alimentiveness
1 Destructiveness
2 Amativeness
3 Philoprogenitiveness
4 Adhesiveness
5 Inhabitiveness
6 Combativeness
7 Secretiveness
8 Acquisitiveness
9 Constructiveness

SENTIMENTS

10 Cautiousness
11 Approbativeness
12 Self-Esteem
13 Benevolence
14 Reverence
15 Firmness
16 Conscientiousness
17 Hope
18 Marvelousness
19 Ideality
20 Mirthfulness
21 Imitation

INTELLECTUAL FACULTIES

PERCEPTIVE

22 Individuality
23 Configuration
24 Size
25 Weight and Resistance
26 Coloring
27 Locality
28 Order
29 Calculation
30 Eventuality
31 Time
32 Tune
33 Language

REFLECTIVE

34 Comparison
35 Causality

Figure 1. Original Frontispiece and its legend from J.G. Spurzheim (1834) (as redrawn in EG Boring (1950): *A History of Experimental Psychology*, New York: Appleton-Century-Crofts). Reprinted by permission.

heim (1776–1852). Their phrenological system was based on several assumptions. (1) Intellectual abilities and personality traits are differentially developed in each individual. (2) These abilities and traits reflect innate faculties that are localized in specific organs of the cerebral cortex. (3) The development or prominence of these faculties is a function of the activity and therefore the size of the cortical organs. (4) The size of each cortical organ is reflected in the prominence of the overlying skull, i.e., in cranial bumps.

The primary method of data collection by Gall and Spurzheim was to examine the skulls of a great variety of people, from lunatics and criminals to the eminent and accomplished.

Correlations between brain structure and behavior in animals and between brain damage and mental dysfunction in humans were used to supplement their cranial examinations. They summarized their results in phrenological busts and charts such as the one illustrated in Figure 1.

Two errors transformed Gall and Spurzheim's reasonable goals into patent nonsense. The first was the assumption that the morphology of the skull was similar to that of the underlying brain. The second was their uncritical methodology, which relied almost entirely on confirmatory anecdotes. For example, the organ of destructiveness was placed above the ear because a protuberance was found there in a medical student who was so fond of testing animals that he became a surgeon; the organ of amativeness was placed in the cerebellum because Gall had noticed that a passionate widow's neck was hot to his touch. Gall's localization of language in the lower part of the frontal lobe derived from an observation of a fellow medical student who had both a prodigious verbal memory and bulging eyes. The bulging eyes were supposed to reflect a well-developed frontal lobe. Gall supported this view with several case descriptions of aphasia after specific damage to the frontal lobe. These descriptions are among the earliest detailed accounts of motor aphasia.

Phrenology met with considerable opposition from political, religious, and medical authorities, particularly on the Continent, largely because it was viewed as implying materialism and determinism and denying the unity of the mind (and soul) and the existence of free will. On the other hand, phrenology generated widespread interest both among the general populace and among such writers and savants as Honoré de Balzac, Charles Baudelaire, George Eliot, August Comte, Horace Mann, Alfred Russell Wallace, and George Henry Lewis. In fact it rapidly became a popular fad and drawing room amusement, particularly in Great Britain and the United States. Phrenological societies and journals continued to flourish in both countries well into the 20th century.

Phrenology had important effects on the development of modern neuroscience. At least in the scientific community, the supposed correlation between skull and brain morphology was soon recognized as erroneous. By contrast, Gall's ideas on the localization of mental function had a deep and lasting influence. Indeed, Broca's demonstration of an association between damage to the third frontal convolution and aphasia in 1861 was viewed at the time as a direct confirmation of both Gall's specific localization of language and his more general belief in the localization of psychological function in the cerebral cortex.

In spite of its absurdities and excesses, phrenology facilitated the development of the study of the brain and behavior in several ways: by stressing that the human mind could be subdivided into specific functions and that specific brain mechanisms underly specific mental abilities and traits, by emphasizing the importance of the cerebral cortex in mental activity, and by stimulating a great surge of research on the psychological effects of human brain damage and of experimental lesions in animals. After Gall, less radical divisions of brain function, such as those of Flourons, were much more readily accepted. The cytoarchitectonic and functional maps of the cerebral cortex that are now ubiquitous in neuroanatomy, neurophysiology, and neuropsychology textbooks bear more than a coincidental resemblance to phrenological charts. They are the direct descendants of the ambitious, albeit heavily flawed, program of phrenology.

Reference

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See also Brodmann's areas; Visual development; Neuroscience, early history of; Appendix: Concise biographies of contributors to progress in neuroscience

Pineal gland

Russel J. Reiter

The pineal gland is an outgrowth of the diencephalic roof which comes to reside, in mammals, either directly on the posterodorsal aspect of the third ventricle in a subcallosal position or immediately under the junction of the superior sagittal and transverse sinuses. It has a profuse blood supply, typical of endocrine glands; its veins draining directly into the surrounding large cerebral sinuses.

The synthetic and secretory activity of the mammalian pineal gland is determined primarily by photic information perceived by the lateral eyes. In general, light is considered to be inhibitory to pineal activity, whereas darkness is stimulatory. A light irradiance of 0.0005 $\mu W/cm^2$ is adequate to inhibit the synthetic activity of the pineal gland of the nocturnal albino rat; by comparison, in the diurnally active Richardson's