

science historian Peter Galison recounts the story of Europe's attempts to solve a practical turn-of-the-century problem, namely, the normalization and synchronization of clocks. By alternately reviewing the progress of this effort with the temporally concurrent progression of young Albert Einstein's career as a Swiss patent-office clerk, Galison implicitly reminds the reader of the degree to which science and scientists are influenced by and develop within the context of those seemingly unrelated events unfolding around them.

In yet another historical revisit, "A division of worms", Stephen Jay Gould corrects the record of a man whose legacy has long been associated with a discredited theory of evolution. The reader learns that Jean-Baptiste Lamarck's contributions to biology (the name that he, incidentally, gave to the field) have profoundly influenced the structure of the modern-day evolutionary tree. But more importantly, Gould's sleuthing reveals a man who, late in his career, had the courage to abandon the guiding theory of his life's work to accommodate the underlying order suggested by a new set of observations.

A few selections disappoint. The offering from the satirical newspaper *The Onion* is "Revolutionary new insoles combine five forms of pseudoscience". Although a clever and well-written parody of science news reporting, its composition did not require any particular deftness for science writing *per se*, which brings into question its inclusion in this collection. In the case of writer Susan McCarthy's "Must dog eat dog?", an awkward mix of facts and facetiousness result in an unbalanced pop-science style that seems out of place alongside smooth-flowing selections by such notable science popularizers as Oliver Sacks and Timothy Ferris.

An additional criticism of this collection lies with what appears to be a bias in the process of selecting the works: four of the 19 selections were originally published by *The New York Times*. This would not be an issue were it not for the fact that editor James Gleick was formerly an employee of that newspaper, and that no other newspaper, aside from *The Onion*, has work represented. With all due respect to the extraordinary talent at *The New York Times*, reporters from, for example, the *Chicago Tribune* have this past decade had a more successful record of Pulitzer prizes for explanatory (science) journalism.

These criticisms may warrant the dismissal of the superlative "Best" from the book's title. But the volume itself should not be dismissed. It is rare to be offered such a diverse collection of science writing, even more, one that can be enjoyed by laymen, scientists and writers alike. ■

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Science in culture

Localized lumps

Phrenology as serious science.

Martin Kemp

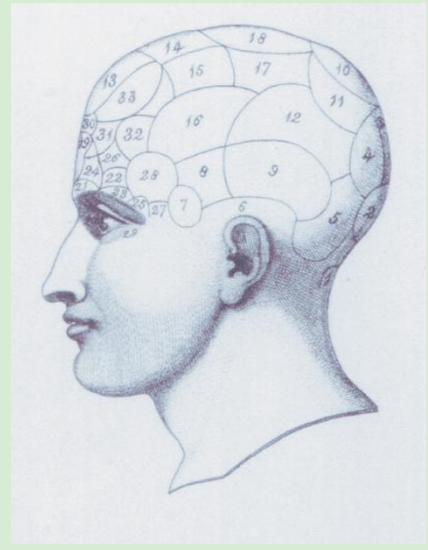
Localization is all the rage in brain science. Driven by vivid and often colourful imaging technologies, modern neurology is progressively disclosing the 'hot' areas of local activity associated with particular mental processes.

The quest to identify which centres in the brain are responsible for particular functions dates back at least to classical antiquity, most notably to Aristotle's highly influential *De anima*. In the Middle Ages, Aristotle's speculations were codified in terms of faculty psychology, in which imagination, common sense, voluntary and involuntary action, intellect and memory were assigned locations in progressively deeper ventricles of the brain.

The most substantial later initiative to place faculty psychology on an empirical basis was forged during the Enlightenment by the science of phrenology. Now commonly stigmatized as a pseudo-science, akin to physiognomics and chiromancy and worth at most a few humorous side-swipes in modern texts on neuropsychology, phrenology was founded on logical extrapolations from the most advanced research into brain structure.

Phrenology was created by Franz Joseph Gall, an Austrian physician, and promoted in a series of heavy-duty publications written with his follower, Johann Gaspar Spurzheim. The most famous of these was *Anatomie et physiologie du système nerveux général*, published in four substantial volumes with an "Atlas" in 1810–1819. Opening with a massively comprehensive review of the science and philosophy of brain and mind, Gall and Spurzheim subsequently provided extensive data on the relationship between cranial shape and mental faculties in the human and animal kingdoms. Studies of developing brains and crania encouraged them to believe that the cranium was specifically shaped to accommodate the variously configured brains in different species, and even in individuals of the same species. Gall declared, not unreasonably, that "the form and size of the brain regulate the form and size of the skull".

Drawing on the "general law" that "throughout all nature, the properties of bodies act with an energy proportional to their size", Gall searched for any prominences in the globe of the cranium that might betray highly developed features housed within. The problem was that he had no direct access to the brain activity, and his only recourse was to correlate data on people possessing special attributes with unusually prominent 'bumps'. Spurzheim recalled that "if the head of any individual presented any protuberance, which was evidently the result of cerebral development, Gall endeavoured to be acquainted with the talents or dominant



Mapping the mind: a phrenological head with localization as devised by Gall and Spurzheim.

character of the person". The method was, therefore, impeccably empirical in the eighteenth-century sense, and the anatomical premises were far from daft.

The misfortune of Gall and Spurzheim was not just to be wrong in their detailed explanations — which is the historical fate of much science in the long term — but to be taken up in the public domain in a form that laid their ideas open to ridicule. The reading of the 'bumps' of the brain to diagnose people's characters became the speciality of ill-informed opportunists. The founders were appalled that their serious science had been adopted as an "art of prognostication".

"We consider only the faculties man is endowed with, the organic parts, by means of which these faculties are manifested, and the general indications which they present. The object of this new psychological system is to examine the structures, the functions and the external indications of the nervous system in general, and of the brain in particular. Thus does this science especially contribute to the knowledge of human nature."

The only fundamental difference between this declaration and principles of modern neurology is their emphasis on "external indications" — but when it came to processes in the living brain, external signs were all that phrenologists could reliably access.

From this historical perspective, one might wonder whether the large claims that are being made for modern neurology are not in some danger of suffering from the kind of skewed public reception that so distorted the foundational ideas of phrenology. ■

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