Papers and Originals

Neurology's Debt to F. J. Gall (1758—1828)*

MACDONALD CRITCHLEY,† C.B.E., M.D., F.R.C.P.

Brit. med. J., 1965, 2, 775—781

Definition and Nature of Phrenology

Phrenology, a theory of brain-function promulgated by Gall, began, like Truth, as a heresy which ended as a superstition. His followers elaborated and later debased his doctrines. As originally put forward there were four cardinal premises—namely, that: (1) the brain is the material instrument through which the mind holds intercourse with the outer world; (2) the mind entails a congeries of discrete mental faculties, each with its own specific cerebral centre or organ; (3) the size of each organ corresponds with the functional efficiency of each faculty; and (4) the development of these organs is reflected in the shape, size, and irregularities of the encompassing cranium.

Inevitably this theory of neurophysiology expanded so as to constitute an aspect of moral philosophy. It differed from most other schools of metaphysics in that it was derived from direct observation of Nature rather than introspective reflection. Gall's slogan, "God and the Brain, nothing but God and the Brain," symbolized the almost religious nature of his thinking. One follower spoke of it as a system of theology devoid of fraud and imposition, being furnished by Nature itself. But eventually phrenology deteriorated from a claim to establish the physiology of the brain into a technique of prognostication, allegedly divining personality and intelligence. Thus philosophy and pseudo-science became intermingled, the latter finally acquiring dominion.

Predecessors of Gall

Gall's first dogma, equating the brain and the organ of the mind, was already more or less established at the end of the eighteenth century, the earliest thinkers to single out the cerebrum rather than any other viscus as the seat of the personality or the soul being Pythagoras and Plato. Hippocrates had regarded the brain as the "messenger and interpreter of intelligence and wisdom." Much later the idea gradually grew up that there was some rough distribution of function within the brain, and also of some relationship between the dimensions of the head and the intellect. More specifically, Albertus Magnus divided the brain from before backwards into three regions subserving judgment, imagination, and memory respectively; or, to use the terminology of Bernard Gordon in 1296, common sense, phantasie, and memory. Indeed, pre-phrenological cranial models had been designed by the Bishop of Ratisbon in the thirteenth century, by Petrus Montagnana in 1491, and by Lodovico Dolce in 1562 (Fig. 1). Most mediaeval and later anatomists played down the role of the cortex and localized vital functions of the soul within such unlikely parts of the nervous system as the meninges

(Schabtai-Donolo), pons (Lotze), ventricles (Gordon), nerve roots (Meyer), corpus callosum (Lancisi), cerebellum (Dorincourt), or the pineal (Descartes). Though Thomas Willis was inclined to upgrade the importance of the corpus striatum, he also submitted that sensory impressions might be stored in the brain "as in tiny chambers or storerooms" (*cellulae aut apothecae*).

FIG. 1.—Map of the brain according to L. Dolce (1562).

These then were the remote ancestors of phrenology. Of more immediate significance was Lavater. His system of physiognomy (1777) claimed to divine temperament ("inner powers") by a shrewd appraisal of physical characteristics including stature, stance, attitude, and facial delineaments. Another immediate antecedent of Gall was Prochaska, and according to Professor Gordon, the Edinburgh anatomist, Gall owed much to Reil. These were important works of anticipation, because the climate of opinion at the end of the eighteenth century was more inclined to a holistic view of brain-function. Thus we find Cullen in his *Practice of Physic* (1776–1784) asserting "nor have we been able to perceive that any particular part of the brain has more concern in the operations of our intellect than any other. Nor have we attained any knowledge of what share the several parts of the brain have in that operation."

Gall, however, would never acknowledge these influences. It was always claimed that his system was born out of original inspiration nurtured by way of observation, experience, and

* Based on the Schorstein Lecture delivered at the London Hospital on 2 December 1964.

† Physician, The National Hospital, Queen Square, London.

induction. In more modest vein Gall wrote in 1796: "... they call me craniologist, and the science which I have discovered, craniology. I rather think that the wise men have baptized the child before it was born. The object of my researches is the brain . . ."

"Phrenology," be it noted, was not an expression used by Gall, who always spoke merely of the "functions of the brain." In the earliest literature we meet with terms such as zoonomy, cranioscopy, organology, and craniology. According to Professor Hufeland (1828) the Germans commonly spoke of the "skull-doctrine." The term phrenology was first employed by Forster, and thereafter adopted.

Origins and Nature of Phrenology

Whoever the antecedents, it cannot be denied that the all-important empiricist in this field was Franz Josef Gall (Fig. 2). Born in the South German town of Tiefenbronn in 1758, he had been intrigued as a boy by the differing talents and traits of his fellow scholars and by their facial and cranial peculiarities. The large, prominent, cow-like eyes of two youngsters who excelled by dint of their ability to commit to memory long texts constituted the first clue to this correlation. Later he extended his observations more widely. The game became an obsession which he endeavoured to control within scientific channels. He studied medicine in Strasbourg and Vienna, and afterwards he worked in a Viennese asylum. His researches now became twofold in their scope. He went to great lengths to scrutinize the cranio-facial morphology of persons belonging to every possible class and character—idiots, the insane, criminals, peasants, intellectuals, and artists. In

FIG. 2.—F. J. Gall as a young man.

addition he scrupulously dissected brains in a manner which was all his own. Unlike traditional brain-anatomists, who applied the techniques of a grocer slicing ham, Gall teased out the medullated fibre-tracts and traced their course by means of blunt dissection. Thus he followed the visual fibres back beyond the thalamus to the quadrigeminal body. He made every endeavour to study at necropsy the heads of individuals whose characters and habits he had previously documented. Indeed, a visitor to his laboratory has left on record the note, "I found people when dying were afraid

lest Gall should obtain their skulls, and some left orders in their wills that means should be taken to prevent him."

At first Gall wrote little, but often lectured. He attracted the interest of a student from Treves, Johann Gaspar Spurzheim (Fig. 3), who became his fervent disciple, his collaborator, and later his evangelist. But Gall's expositions eventually earned the disapproval of the Church and the interdiction of the Emperor Francis I. In disgust Gall left Vienna, travelled for some years through Europe, fell out with Ackermann, and finally settled in Paris in the rue Massillon.

FIG. 3.—J. G. Spurzheim.

His teaching continued at such places as the Athénée Royal, the Hospice de Perfectionnement, and later at the Institution des Jeunes Aveugles. At the same time he acquired a lucrative and fashionable medical practice. It is said that years later the Emperor Francis sought him out in Paris and requested him to return to Austria, but in vain. Between 1810 and 1819 he issued his monograph *Anatomie et Physiologie du Système nerveux en général, et du Cerveau en particulier*, together with an Atlas.

Gall by now had isolated 26 organs which purported to correspond with a like number of mental attributes, or "group factors" as we would now say. These he divided into propensities, sentiments, and intellectual faculties (see Table).

Gall's Classification of the Mental Faculties			
Animal Faculties		Moral Faculties	
1. Amativeness		11. Self-esteem	
2. Philoprogenitiveness		12. Love of approbation	
3. Inhabitiveness or concentrativeness		13. Caution	
4. Adhesiveness		14. Sympathy	
5. Combativeness		15. Veneration	
6. Destructiveness		16. Firmness	
7. Secretiveness		17. Conscientiousness	
8. Acquisitiveness		18. Hope	
9. Constructiveness		19. Faith	
10. Alimentiveness		20. Ideality	
		21. Imitation	
Intellectual Faculties			
Perceptive		Reflective	
22. Individuality		34. Comparison	
23. Form		35. Causality	
24. Size		36. Congruity	
25. Weight			
26. Colour			
27. Order			
28. Number			
29. Locality			
30. Eventuality			
31. Time			
32. Tune			
33. Language			

Note that the faculties have a curious nomenclature, out of tune with modern thinking. Indeed, according to the phrenological creed, consciousness, will, perception, conception, memory, abstraction, imagination, and reason were expressly excluded, and intellect was not regarded as a special entity at all. These organs were localized to certain regions of the brain which were demarcated on the skull rather than the cortex. When speaking of an underlying "organ" Gall referred to a nervous apparatus or cerebral region made up both of pulpy and fibrous material, or, as we would say, both grey and white matter. No recognizable macroscopic features demarcated them. The first to be isolated was the organ of language. As he put it, the manifestation of verbal language depends on a cerebral organ lying on the posterior part of the superior orbital plate. When it was hypertrophic, the eyeballs were rendered prominent and the lower lids baggy.

The various cranial areas, as first identified by Gall, were not necessarily contiguous. Here and there were gaps, and indeed only about two-thirds of the cerebrum was accounted for in this manner. Later phrenologists described and located other faculties—for example, bibitiveness, conjugality, vitativeness, sublimity, concentrativeness, suavitiveness, and human nature. Spurzheim thus increased Gall's original 26 organs to 35, while the Fowler brothers in the States delineated as many as 43. It was always admitted that the catalogue of faculties and organs was probably incomplete. Gall realized that the development of basal portions of the brain could not be determined from cranial inspection, and he suspected that the organs of hunger, thirst, heat, and cold were probably represented here. Forty years later the Fowlers were discussing the problem of "unascertained organs" and they agreed that certain regions of the brain still constituted a *terra incognita*.

Phrenologists were soon forced to defend their belief that bone structure correlated with underlying cerebral centres. It was objected, for instance, that the cranium might actually conceal hollow structures of great diversity in size and shape—namely, the frontal sinus. This structure, dubbed the *opprobrium phrenologicum*, may as a matter of fact overlie no fewer than five of Gall's organs. Phrenologists, however, insisted that they could ascertain the relative development of all the other organs despite the obstacle of the frontal sinuses. As Combe wrote: "It would be quite as logical to speak of a snow-storm in Norway obstructing the highway from Edinburgh to London, as of a small sinus at the top of the nose concealing the development of Benevolence, Firmness, or Veneration, on the crown of the head."

Though phrenologists occasionally alluded to the problem of cranial deformities, they never really faced the objections put forward by such pathological conditions as acrocephaly, *Turmschädel*, and scaphocephaly. Nor did they do more than brush aside the question of artificial deformities of the head.

Another argument which phrenology had to parry at an early date was the objection that mere size of cerebral development did not necessarily indicate functional superiority. The evidence of physiognomy could not be gainsaid—namely, that the differing temperaments—sanguine, nervous, bilious, lymphatic—must surely play an important role. This was conceded, and phrenologists inserted a *caeteris paribus* clause into the third article of their dogma, to the effect that "other circumstances besides magnitude being equal—size and vigour of function are in direct correspondence."

In retrospect we may consider it odd that Gall, like all his contemporaries, of course, had absolutely no conception of asymmetrical brain function. The idea of cerebral dominance did not arise until later, and subsequent phrenologists neglected to incorporate this viewpoint within their own doctrines. To them the cerebral organs were double, situated in corresponding areas in the two hemispheres. Destruction of an organ on one side would not ablate function provided the opposite organ was preserved. This question was explicitly

discussed by Hewett Watson in the ninth volume of the *Phrenological Journal*, in a paper entitled "What is the use of the double brain?" He asserted that perception constituted the active state of either hemisphere, but that the combined activity of the two halves resulted in attention. As he put it, "We see with either eye but we look with both."

Rise and Fall of Phrenology

The importance of the contributions to anatomy, together with the exciting promise of the philosophical ideas, led to a boom in phrenological doctrines. Perhaps too the personality of the protagonists played a part. Gall attracted an enormous clientele, for he was a superb anatomist and demonstrator, devoted to research, dedicated to a search for Truth. Spurzheim meanwhile carried the banner abroad and achieved a considerable following in Scotland. At Abernethy's invitation he even lectured at Bart's. He visited Harvard, but died two months after reaching America. Many brain anatomists and physicians were at first attracted to the novel ideas, though later developments, especially in the direction of prognostics, altered the climate of opinion, and caused offence.

At its heyday the cult of phrenology was represented by no fewer than 29 societies. The London Phrenological Society was founded in 1825, met in Buckingham Street, off the Strand, and dined at Barry's Hotel in Princes Street. The conversion of two distinguished professional men in Edinburgh, the brothers Combe, proved an important achievement. While the *Transactions of the Edinburgh Phrenological Society* amounted to but a single volume, the *Phrenological Journal and Miscellany* ran uninterruptedly from 1823 to 1847. In Great Britain other influential men, not all of them medically qualified, joined the ranks of avowed phrenologists. There was Dr. Elliotson, of St. Thomas's Hospital, and later of University College Hospital, Editor of the *Zoist*, eventually discredited because of his manifold unorthodoxies; he was the first president of the London society. Other important adherents included Sir George Mackenzie; Macnish, of Glasgow; Archbishop Watley; Wakley, the uncompromising editor of the *Lancet*; and Dr. Chevenix. Robert Bentley Todd and John Abernethy gave cautious and qualified approval. Herbert Spencer, who had been present as a boy at Spurzheim's lectures, in his early 20's evinced an interest, contributed papers to the *Zoist*, had his own bumps read, and devised a "cephalograph."

Gradually the art of divining character and aptitude came to the fore, and George Combe (Fig. 4) was summoned to Windsor in 1846 to advise on the educational retardation of the Prince of Wales, and incidentally to examine the heads of his sister and brother, Alice and Alfred. Extravagant appraisals were made. Phrenology was seriously advocated as a system for the proper segregation of convicts—and also as a rational method for the better selection of members of Parliament. But phrenology also excited criticism most acrimonious in character. Attacks did not for a moment go unanswered and the controversy was kept up with bitterness. Phrenology became the topic, or target, of very many ballads, broadsides, cartoons, and farces.

In time phrenology found its own level in the scheme of things, less as the result of frontal assault than from the gradual alteration in physiological thinking. Much of Gall's philosophy ceased to shock, for it was no longer at serious variance with current opinion. As G. H. Lewes put it, "Instead of surviving opposition, phrenology has decayed with the declining opposition. It has ceased to be ridiculed, and it has ceased to be declaimed against as immoral and it has ceased to occupy attention." But the antic activities of some of the peripatetic practitioners and delineators could not be overlooked. Like so many other eccentric cults, it lingered on in the States long after it had ceased in Great Britain to be

much more than a vaudeville or seaside memory. But in passing judgment we must make a clear distinction between the attainments of Gall and the record of phrenology. Even such an avowed disciple as Elliotson long ago made this contrast, saying that the works of Gall were clear, flowing, full, rigidly philosophical, and rich with profound thoughts and

FIG. 4.—George Combe.

glowing illustrations. They spoke for themselves and differed entirely from the writings of Spurzheim, which were far better known. But it was Gall's facts that had made Spurzheim a phrenologist. Combe and the Edinburgh clique were followers of Spurzheim rather than of Gall.

Enduring Contributions of Phrenology

We now approach the essential topic of our address. Let us admit at once that the phrenological interlude in the history of science was far from being a sterile one. For many reasons the work of Gall, when stripped of its excrescences, constituted an important landmark in the history of neurology.

Let us, to begin with, recall Gall's immediate neuro-anatomical contributions which have been insensibly absorbed into the corpus of our knowledge. He was one of the first to show that the development of the nervous system was uneven. The cervical and lumbar spinal enlargements were allegedly his discovery. Gall called attention to the essential differences between the grey and the white matter of the nervous system in structure and in function. Gall was the first to describe the origins of the 2nd, 3rd, 5th, and 6th cranial nerves. He was also the pioneer demonstrator of the converging and diverging fibres in the white matter, and he also drew attention to the corpus callosum and to that region which we now speak of as the Island of Reil. Such a record of achievement is impressive indeed. Some of these accomplishments have been queried, it is true. Be that as it may, Gall was certainly a pioneer exponent of many new and exciting theories in neuro-anatomy.

As a result of his researches, it could no longer be maintained that the brain functioned as a whole, like the liver or spleen. The doctrine of holism, or what we now term the field theory, became seriously disturbed for the first time by Gall's teachings, which led on naturally to the more precise methods of determining local function promulgated by Munk, Hitzig, Fritsch, and Ferrier. That these later studies gave birth to what might be dubbed a "new phrenology" cannot be denied, and some of their more extravagant claims still survive. But

already we can see to-day, in rebuttal as it were, a swing back to a modified holism of a thoughtful and scientific sort, attuned to modern ideas of brain-function. To say this does not of course deny some measure of cerebral specialization.

Towards the experimental neurophysiologists of the mid-nineteenth century, contemporary phrenologists became highly critical. They tilted at "systems based on . . . muscular convulsions of galvanized monkeys," and in anticipatory vein spoke of "the inability of modern mechanical mutilators and galvanizers to distinguish between the actual motor centres and the mental organs that make use of these centres." Gall had always held in contempt the role of experiment, for he preferred to rely upon observation alone.

Anatomy of the Brain

Another of Gall's major contributions concerns the more precise anatomy of the brain. Even the highly critical Reil confessed that he had seen in Gall's anatomical demonstrations of the brain more than he had thought that a man could ever discover in his whole life. Flourens, too, who was one of Gall's greatest antagonists, was impelled to speak of him as "the profound observer whose genius has opened for us the study of the anatomy and physiology of the brain. I shall never forget the impression I received the first time I saw Gall dissect a brain. It seemed to me as if I had never seen this organ before." His demonstration of the projectional and associational fibres has already been mentioned, and his work led directly to the techniques of micro-dissection at the hands of Weigert and Marchi.

Though Gall, like his contemporaries and those before him, was unaware that the convolutions of the brain possessed not only meaning but also morphological precision, the situation soon began to change. Hitherto the gyri had been regarded as haphazard in their arrangement, rather like the serpentine and random curlicues of a dish of macaroni. A more common analogy was that of coils of intestine, as shown by the term "enteroid processes" which Willis had applied to the cortex. Early in the nineteenth century anatomists were speaking of the grey and white matter of the brain as "cineritious and medullary neurine" and of the fissures as "anfractuosities." George Combe in 1836 was still describing the brain as a mass of "curiously convoluted" matter. Ecker (1869) was probably the first adequately to survey and map out the convolitional pattern, facilitated by the earlier observations of Rolando (1830), Huschke (1856), and Gratiolet (1856). But the seeds of research had been sown by Gall.

Another logical outcome of these doctrines has been the modern science of craniometry. Physical anthropology has

FIG. 5 (a) and (b).—(a) William Palmer, the poisoner, phreno-metrical angle 35°. (b) George Combe, the Edinburgh lawyer and pioneer of phrenology, phreno-metrical angle 25°. (From Morgan's *Phrenology*, 1871).

profited from the researches of Gall and his fellows. One of the pioneers in this field was Straton, who, in his *Contributions to the Mathematics of Phrenology*, drew attention to certain cranial markers which became known as Straton's points. Arising therefrom, Morgan (1871) utilized his phreno-metrical angle, which afforded a ready index of the intellectual development in a particular skull. A wide phreno-metrical angle was found in murderers and violent criminals, being much narrower in those of the highest moral type (Fig. 5a and b).

About the same time came Dr. Cox's measurements based on the backward projection of the lateral convolutions beyond a plane passing through the organ of Causality. F. Bridges invented, and Morgan modified, an instrument for measuring the head in profile, called the *Phreno-physiometric Calliper* (Fig. 6). This instrument foreshadows many of the devices of the future, including even the Horsley-Clarke instrument. Such anthropometric constants as the cephalic index, the "German horizontal," Reid's base-line, the linear index, and the facial angle came later. Thus phrenology may be looked upon as an important anticipation of our current use of stereotaxy in neurosurgery.

FIG. 6.—"Calliper Phreno-physiometre," designed by A. Morgan as an improvement on the instrument originally invented by F. Bridges. (From Morgan's *Phrenology*, 1871.)

Beginnings of Cerebral Localization

Perhaps, however, the most obvious accomplishment of phrenology has been in the domain of neurological practice. It afforded an important stimulus to the intimate recording and correlation of anatomic-clinical data. The pages of the *Phrenological Journal* contain many case reports where a careful study of signs and symptoms is aligned with a precise description of the nature and extent of the cerebral lesion in a manner unusual for the time.

Here we may trace the beginnings of our views on cerebral localization. That our opinions have since then expanded and then later retracted somewhat does not matter. These were necessary steps in knowledge, and we owe much to Gall in setting us off on this adventure.

In this context the subject of aphasia stands in the forefront. Earlier writers had identified speech with activity of the olivary bodies. Without doubt it was Gall who first focused attention on the correlation between the prefrontal lobes and language, as well as between loss of speech and disease of the foremost regions of the brain. Broca has been given too much credit for determining the morbid anatomy of speech-loss, and we are apt to forget the role played by Gall and his followers in the first 60 years of the nineteenth century. The steady stream of Scottish case reports in the *Phrenological Journal*; the fervent championship by Dean Bouillaud of Gall and his ideas about language; the masterly contribution of his son-in-law Auburtin—all these led up to Broca's shrewd utilization of a lucky accident of surgical

practice. Bouillaud was none too impressed by Broca's good fortune, as is shown by his description of him as the St. Paul of the new doctrine, and "one of the organisers, subinventors, augmenters, revisers, and correctors" of Gall's pioneer and magnificent discoveries.

Later phrenologists were jealous of the credit which had accrued to Broca and to his area, which they believed had been discovered and demonstrated 60 years beforehand by Gall. This is perhaps going too far. Gall's organ of language was located more rostrally than the foot of F.3, and moreover it was bilaterally represented. For that matter so was Broca's area to begin with, for he did not realize the greater importance of the left hemisphere until four years later. But nowadays much of this is *vieux jeu*, for a modern aphasiologist cares but little for either Broca's area or that of Gall, and over-precise attempts to localize language are deemed by most of us a rather vain pursuit.

Though the organ of language was the first one to be identified by Gall, and was the initial step leading to the doctrine of phrenology, he was never completely satisfied with it. His followers did not disagree, and Morgan pointed out the inherent complexity of this faculty of language. We too may think it odd that Gall should have relegated the accomplishments of reading and writing to the nominative arts, located well away from the organ of language.

Cerebellum as Sex-organ

If phrenologists were near the target in cases of aphasia, they were sadly off the beam when it came to the cerebellum. Impressed by the shape of the head of a nymphomaniacal widow of his acquaintance, Gall designated the cerebellum as the seat of the generative instinct, later renamed the organ of amativeness. Here he was not original, for the idea had been put forward a few years previously by Swedenborg. Clinical cases were found which seemed to bear out such a relationship, and a monograph on this subject was published by Gall in collaboration with Vimont and Broussais.

Let us examine the data a little more closely. Gall and his followers believed that disease of this region would bring about an unbridled eroticism, or, less often, an antithetic state of sexual apathy and impotency. Chronic lust was linked with cerebellar dysfunction, as evidenced either by an over-development of what we would now call the posterior fossa or by an objective feeling of heat over the nape of the neck and the occiput. Some of their case-reports may be quoted:

A woman of ardent temperament with imperious sexual desires had often supported, not to say provoked, the embraces of 10, 12, or 15 men in one day. During her stay in the Salpêtrière she frequently experienced severe pain in the neck, being then seized by violent sexual desires which she satisfied by masturbation 10 or 12 times a day.

A robust man of 42, greatly addicted to eating, drinking, and womanizing, lost consciousness during a fit of rage when unbribeed for passing the night in a house of ill-fame. While still in coma he showed a continual chordee. Necropsy revealed an intracerebellar haemorrhage.

A sempstress of 33 had been very early addicted to venery. In a brothel she had given herself up to every excess of debauchery. Up to the age of 30 she had been fatigued with sexual pleasure but never satisfied. Finding cohabitation with men failing to assuage her desires, she gave herself passionately to the transports of self-abuse. She sought treatment by cauterization of the clitoris, and later died of phthisis. Examination showed a tuberculous meningitis in the posterior fossa with cerebellar softenings.

Soon after experimental physiologists like Flourens and Carpenter demonstrated the functions of the cerebellum as we conceive them to-day. Phrenologists were nevertheless unwilling to abandon their concept of the cerebellum as a sex-organ and only grudgingly would they admit an additional concern with muscular movement; even here they could not

avoid a compromise, and tried to trace an intimate bond between eroticism and motility. "If it were by now discovered for the first time, that the tongue is sensible to bitters, *that* should not shut out the fact that it is the function of the tongue to taste sweets also. That the amative propensity and muscular motion are as much related to each other as sweet and bitter may be known from the fact that all lithesome exercise ends when or soon after copulation begins. The natural inactivity of the Turk is undoubtedly a consequence of the seraglio." (Vago).

Returning to the credit side of the balance-sheet we may pay tribute to the pioneer contributions of Gall to our ideas about the subtle psychological changes which may follow brain lesions in the absence of an intellectual impairment.

Eloquent "Silent" Areas

The notorious crowbar case of 1848 (Fig. 7) had indicated that extensive destruction of the brain could occur without any obvious loss of mental capacity. But phrenologists hastened to point out the profound change in personality

FIG. 7.—The crowbar in its relation to the patient's skull (from a contemporary print).

which the victim had undergone, an alteration which accorded well with the doctrines of Gall. Orthodox medicine still nursed the idea that great expanses of the brain were silent areas. Phrenologists would never agree for a moment and rightly asserted that appropriate testing and inquiry would always uncover considerable modifications in character and comportment. Herein we can trace the beginnings of our current notions of organic brain-change, of highest nervous activity, and of what the Russians term the cerebroasthenic syndrome.

To-day we neurologists know all too well that extended test-procedures at the hands of an expert will always bring to light convincing evidence of altered function. Nowadays the so-called silent areas of the brain are eloquent to those who know how to listen. Let us not forget that such doctrines were actually stated first by phrenologists.

Another anticipation of cerebral pathology, and one of the most startling ones, can also be laid to the credit of phrenology. As long ago as 1810 Gall asserted that it was quite possible to determine the sex of any given cerebrum even without inspecting the overlying skull. Such a claim has been beyond the competency of every orthodox morphologist up to the very recent nucleo-cytological researches. I cannot trace, however, whether this *experimentum crucis*, mooted 150 years ago, was ever specifically substantiated.

The doctrine that the growth and conformation of the brain determine the size and shape of the encompassing cranial box became accepted in the course of time as orthodox teaching. Moreover the belief grew that individual convolitional patterns could be determined by studying the ridges on the inner table of the skull, and this became employed as a clue to the morphology of prehistoric cerebra.

Professor Ackerknecht asked why posterity has not displayed the same indulgence towards Gall that it showed with regard to the errors and eccentricities of Boerhaave, Haller, Laennec, and Bichat. Doubtless it is because these others never aspired to a scientific philosophy and never became wilfully the founders of a cult. Perhaps it is because his anatomical discoveries and his ideas of brain function were keys which unlocked treasuries of vast endeavour that Gall's anatomy still stands secure, even though his physiology is discredited when it is not forgotten.

Gall as Philosopher

Finally, we might refer to Gall as the exponent of a school of philosophy, one which stimulated Spencer and which anticipated the Positivism of Auguste Comte. At first Gall's teachings proved embarrassing, and were deemed materialistic and opposed to the romantic *Naturphilosophie* of the day, a type of metaphysics which Gall regarded as speculative. He can moreover be numbered among the earliest of scientific criminologists, for to him the offender was a medical problem, a victim of his innate disposition. Gall furthermore was a forerunner of the evolutionary philosophy of mid-Victorian biology. He taught that the differences between the brains of animals and man were merely matters of degree. He was a pioneer of comparative anatomy and pointed out the preponderant role of the anterior lobes of the brain, the upper portions being peculiar to man, while the lower parts were but feebly represented in the animal brain. Within these critical regions were represented those noble faculties individual to the human species.

Gall's philosophy was materialistic but humane. Based upon the inherent inequality of man, it was sometimes rated as excessively materialistic. Though in tune with the emancipation of the lower orders, with free-thought and the education of the masses, it was none the less out of harmony with what we to-day would call democracy. As he himself wrote . . . "The study of the physiology of the brain shows us the limits and the extent of the moral and intellectual domain of man. It shows us an immense disproportion between the mediocre faculties and the eminent faculties, and it leads us to the conclusion that wherever regulations, decisions and laws are the work of the majority of votes, mediocrity triumphs over genius." As he also asserted . . . "The great majority is formed everywhere by mediocre men who by themselves invent nothing and create nothing."

Conclusion

The science, art, or philosophy of phrenology started its existence from observation and induction. As Prochaska had already written . . . "The way to truth through hypotheses and conjectures is tedious and altogether uncertain, but far more certain, more excellent, and sure, through the inductive method." It is a philosophy founded on the conception of the disparity of man, promulgated however by pioneers who were endowed with an exalted humanitarian outlook quite foreign to their time. Enthusiastically acclaimed and also bitterly attacked, it flourished for some decades and then gradually lost ground, so that nowadays it is little more than an interesting memory.

Its ugly side as a system of character-delineation did harm to its prestige. This was scarcely the fault of Gall. Its debasement has been largely responsible for the fact that its very real contributions to medicine have been overlooked.

Even in modern times there have appeared now and again signs of what we may term contemporary phrenology. Throughout the centuries brain maps and blue-prints have exercised a curious fascination. From time to time they gate-

crash into our textbooks of physiology and of information theory. But most thinking neurologists look askance at all cerebral diagram-makers and cartographers, whether they tell of cortical architectonics, motor homunculi, suppressor bands, or linguistic schemata. Mindful of the fate of phrenology, modern neurology has but little respect for cerebral mosaics.

How then should we judge Gall to-day, after we have divorced the accomplishments of the man from the record of his phrenological votaries? Gall represents a "great though misguided, and perhaps even slightly ridiculous, figure in the rise of a progressive science." This, according to Temkin, was the verdict of the historians of philosophy, Littré and Lewes. Perhaps they were a little too hard. To contemporary neurologists Gall was a great man.

May I, in conclusion, quote that inspiring anatomist, the mentor of so many of us older medical scientists? "The time has come," he wrote, "for a juster appreciation of the important part played by Gall, and a more adequate recognition of his achievements than has been made in the past. If he was responsible for certain speculations, which in the hands of irresponsible followers have been used for meretricious purposes, it must not be forgotten that Gall's work brought to an end a barren system of philosophy which seriously impeded progress. His contributions to the anatomy of the central nervous system are of far-reaching importance, and to the physiology of the brain and to psychological theory he gave a new orientation and a new inspiration." These were the words of Elliot Grafton Smith, with which you and I might perhaps agree.

Bleeding Peptic Ulcer

ANNE BANNING,* M.B., M.R.C.P.; ANTHONY BARON,† M.CHIR., F.R.C.S.; HARRY KOPELMAN,‡ M.D., F.R.C.P.
K. L. LAM,§ M.B., M.R.C.P.GLASG.; PELHAM WARREN,† M.B., F.R.C.S.

Brit. med. J., 1965, 2, 781-784

In the past 30 years few conditions have provoked wider divergence of opinion upon treatment than bleeding from peptic ulcer. Before the last war the tendency was to follow the practice of Meulengracht (1935) and to treat this condition conservatively. However, some surgeons, notably Finsterer, were reporting good results from the early employment of surgical treatment. In the years that followed the war certain indications for surgical treatment came to be fairly generally accepted (Gordon-Taylor, 1946). These indications form the basis of treatment in most centres to-day and are: (1) severe pain preceding or persisting after the haemorrhage, (2) recurrent bleeding, and (3) an age of over 50, particularly should there be obvious evidence of arteriosclerosis. To this list to-day one would add continued bleeding and the coexistence of haemorrhage and perforation. There has been an underlying assumption that these indications apply only in cases of chronic peptic ulcer, and a good deal of attention has been directed to distinguishing acute from chronic ulcer. Since the history is often misleading, resort has been made in some centres to special investigations such as gastroscopy and barium examination in the bed (Chandler *et al.*, 1960). Surgical treatment has been by partial gastrectomy, whether the source of bleeding is demonstrated at the operation or not.

We have for some years accepted the usual criteria for intervention—that is to say, severe repeated or continuous bleeding—but have, as a result of experience over 10 years or so, learned to regard the chronicity or otherwise of the ulcer as irrelevant and have adapted the surgical procedure to the condition found at operation. In the past five years 223 patients with haematemesis and melaena thought to be due to peptic ulceration have been treated, and in this paper the results of treatment are analysed.

Material and Management

All of the patients in this series were admitted to hospital in one five-year period, and are those in whom there was direct evidence of haematemesis or melaena, sufficient to cause a moderate-to-severe fall in haemoglobin at some time, either immediately before or after admission. We have included all

cases of bleeding from peptic ulcer and also from carcinoma of the stomach and hiatus hernia when these were admitted for bleeding and when the diagnosis was not already known. We have excluded cases of haematemesis and melaena from other causes such as oesophageal varices, bleeding diathesis, uraemia, and severe blood disorders. Patients with anaemia from gastrointestinal bleeding of a chronic nature have not been included, nor have those admitted with a history of haematemesis who showed no evidence of significant haemorrhage.

All the patients admitted were kept under close observation. If restless or anxious they were given phenobarbitone by injection. Adequate hydration was assured and the diet was of milk or of a semi-solid nature. Routine investigation on admission included the examination of a direct blood smear, grouping and cross-matching of blood, and the estimation of serum electrolytes and blood urea. The haemoglobin level was estimated on admission and again after some hours. Half-hourly pulse rate and blood-pressure recordings were taken. In the earlier days hourly aspirations of stomach contents were carried out, but many patients became restless during this procedure and in recent years it has been discontinued. Observation was kept for any rise in pulse rate or fall in blood-pressure, but earlier indications of further bleeding were often given by subjective complaint of nausea or of a feeling of faintness, accompanied by sweating. In some cases the first evidence of further bleeding was a large vomit of bright blood without any warning.

There was no standard level of haemoglobin at which blood transfusion was started, as it was often difficult to establish the amount of haemoconcentration present, but, generally speaking, blood was given if the haemoglobin was below 60% on admission. If a further severe haemorrhage occurred after admission—as evidenced by direct observation of fresh blood vomited or fresh bright melaena, or by a rise in pulse rate and fall in blood-pressure, or in some cases by a falling haemoglobin level despite repeated blood transfusion—this was taken as an

* Former Medical Registrar, St. Margaret's Hospital, Epping, Essex.

† Surgeon, St. Margaret's Hospital, Epping, Essex.

‡ Physician, St. Margaret's Hospital, Epping, Essex.

§ Former House-physician, St. Margaret's Hospital, Epping, Essex.