
Arguably, the study of aphasia defined modern neurology. It was the correlation of disturbances in speech with focal brain lesions that seemed to settle the debate on localization of cerebral function. And with that doctrine firmly in place, the richness of material from pathological processes that rampaged through the nervous systems of people living in the late 19th century provided an adventure playground for neurologists to use clinical phenomena as the basis for developing ideas on cerebral physiology. From their analyses emerged new concepts on the organization of the CNS. For some, the debate remained clinical and focused on nomenclature and classification. But wrestling with these descriptive issues necessarily led to secondary considerations on the nature of speech, ideation, thought and symbolism. And, in turn, this aligned with a philosophy of the nervous system that resonated with the emerging concepts of evolution and the structure of social systems. Silently, aphasia had come a long way. It followed that no serious neurologist who wished to influence the subject could afford not to have views on aphasia. But it was a topic that only the elite thinkers of the age could elevate to the highest level of intellectual range. One person towers above all others in using clinical cases of aphasia, inter alia, to understand the workings of the nervous system. Through his observations on speech, John Hughlings Jackson (1835–1911: Fig. 1A) developed the concept of evolution and dissolution of the nervous system. An awkward writer, whose contorted prose, replete with repeti
tion, required many explanatory footnotes in which are embedded much that needs to be read in order to understand his ideas, Jackson influenced a school of thought that can loosely be summarized: clinical syndromes are localized but cerebral function is not.

Later, this doctrine can be traced through the writings and teachings, especially, of Sigmund Freud (1856–1939: Fig. 1B) and (Sir) Henry Head (1861–1940: Fig. 1C). But it was the firework that went off when Paul Broca (1824–1880: Fig. 1D) reported two cases of altered speech that made aphasia so influential. We have previously rehearsed the run-up to that event; Jackson’s involvement; and the evanescent systems of classification that preceded and followed Broca’s presentation. In summary:

‘Being well educated in the classics, neurologists coined names for these disorders: aphasia, aphrasia, aphemia, alalia, alexia, agraphia, agnosia, asymboly, amnesia and apraxia, to name but a few. Paul Broca (1824–80) distinguished articulation from language. He coined the term aphemia, preferring this to alalia. But (Armand) Trousseau (1801–67) quickly substituted aphasia after consultation with a Greek physician, who pointed out that, in later Greek usage, aphemia means “infamy”. Broca argued for retaining aphemia or, perhaps, aphrasia. Aphemia—loss of utterance for the spoken word, but with perfect understanding and retained ability to write and communicate by gesture, and distinct from anarthria—was also preferred by (Charlton) Bastian (1837–1915). This parcellation of the faculty of speech accorded well with the materialism of the 19th century but sat awkwardly with the ideas of Hughlings Jackson (1835–1911) who disliked the concept of human speech as the arithmetic sum of individual psychophysical activities, reading, writing, talking and listening . . .[Henry] Head concluded that aphasia, amnesia, apraxia and agnosia are names for forms of abnormal behaviour; they are descriptive with no validity for the anatomy of normal function. There are no centres, merely certain places where a lesion can disturb speech in some specific manner. It was Jackson who first articulated this psychological formulation for disorders of speech, a doctrine to which some opinion leaders such as Goldstein expressed much sympathy when Head reprinted Jackson’s papers on speech in 1915 . . .’ (Brain 2013; 136: 2327–30).

For some, Henry Head brought the study of aphasia into disrepute in the late 1920s. Certainly this journal goes quiet after publishing his series of papers and reviews between 1915 and 1923 [‘Hughlings Jackson on aphasia and kindred disorders of speech; together with a complete bibliography of Dr Jackson’s publications on speech, and a reprint of some of the most important papers’ Brain 1915; 38: 1–190; Aphasia and kindred disorders of speech. (The Linacre lecture for 1920) Brain 1920; 43: 87–165; ‘Aphasia:
Figure 1 (A) John Hughlings Jackson (1835–1911); (B) Sigmund Freud (1856–1939), Science Source/Science Photo Library; (C) Henry Head (1861–1940); (D) Paul Broca (1824–1880), Science Photo Library; (E) Luigi Bianchi (1848–1927), Images from the History of Medicine (NLM); (F) Kurt Goldstein (1878–1965), Images from the History of Medicine (NLM); (G) Alexander Luria (1902–1977), Ria Novosti/Science Photo Library; (H) Carl Wernicke (1848–1905); (I) Karl Popper (1902–1994), ©Lucinda Douglas-Menzies/National Portrait Gallery, London; (J) Jean Piaget (1896–1980); Bill Anderson/Science Photo Library; (K) Roman Jakobsen (1896–1982), Unknown artist; (L) Herbert Spencer (1820–1903), ©National Portrait Gallery, London; (M) John Locke (1632–1704), ©National Portrait Gallery, London; and (N) David Hume (1711–1776), ©National Portrait Gallery, London.
an historical review. (The Hughlings Jackson lecture for 1920)'

Brain 1920; 43: 390–411; ‘Discussion on aphasia’ Brain 1920; 
43: 412–3 and 447–50; and ‘Speech and cerebral localization’ 

The reception of his monograph on Aphasia and kindred disorders 
of speech (1926) in this journal by (Sir Frederic) Bartlett (1886– 
1969), one of the foremost psychologists of his generation and 
foundation professor of experimental psychology in the University 
of Cambridge (an appointment that he held from 1931 to 1951), 
was measured but supportive. Bartlett summarizes Head’s views as 
consistent with the notion that:

‘No reaction of a living organism, however simple and immediate it may 
appear to be, can be satisfactorily studied in isolation…[but] Head 
maintains with perfect justice, as it appears to me, [ideas that] are revo-
lutionary in so far as the study of aphasia is concerned. The bulk of past 
work on aphasia has had a definite anatomical bias…[assuming] that a 
specific language defect…can be properly studied for itself, in itself, and 
by itself…[but Head argues that] the activity of any “centre” in the 
central nervous system is inevitably bound up with that of innumerable 
other parts, cortical and subcortical, which have all been brought to-
gether in the course of development, and which somehow have to be 
regarded as functioning together in normal daily behaviour. For when, 
by anatomical lesion…the possibility of a specific element of response is 
removed, the whole pattern has to undergo reorganization. Thus the 
new response is not the old one simply minus one of its elements. It 
is genuinely a novel response’.

Admiring the ingenuity of Head’s methods for testing people 
with aphasia, Bartlett anticipates much criticism of his classification 
and we sense the verdict that Head’s ideas are nothing more than 
the aphasic Emperor’s new clothes. But Bartlett has sympathy for 
Head’s exposition of symbols and schemata that depend upon 
organized responses to serial stimuli; and his concept of ‘vigilance’ 
even if this is ‘attention’ by another name:

‘Under certain specific conditions certain types of organized response will 
appear and be in control of behaviour…language defects are defects of 
symbolic formulation, but as this has grown out of and been made 
possible by the simpler and earlier use of sensory symbols and imagina-
tion, the latter may also be specifically affected as a result of derange-
ments of speech…Head makes many illuminating and brilliant 
suggestions towards a solution of his concepts…he would, I am sure, 
be the first to agree that much yet remains to be discovered. The whole 
discussion is stimulating and attractive to the last degree. It goes without 
saying that it would be neither were it not highly provocative of criticism 
and also a long way short of complete finality’.

In his treatment of schemata Bartlett concedes that Head 
achieved ‘his most original and profoundly important results’. 
However, on the concept of nervous and mental energy, Bartlett 
is unambiguously dismissive:

‘For my part, I am quite convinced that the notion…is one with which 
both physiologist and psychologist had much better have nothing what-
ever to do’.

Acknowledging the immense literature that must be covered, 
and the many existing reviews, Alfred Meyer (1895–1990: see 
Brain 2014; 137: 1266–71) considers that one more synthesis is 
justified. He draws particular attention to the contributions of 
those who wrote on aphasia beyond the 1920s; and he reviews 
a literature with which the predominantly Anglophone readership 
of the mid-20th century might have been unfamiliar. Dr Meyer 
shows how neuropsychology and linguistics were introduced into 
the debate; and he highlights the contributions of anatomists to 
the study of cerebral dominance. Starting with (Franz Joseph) Gall 
(1758–1928), Meyer has sympathy for the view of (Edwin) Clarke 
(1919–96) and (Charles) O’Malley (1907–70):

‘The war between “localizers” or “mosaicists” and “holists” is unreal 
since both principles…exist side by side, complementing each 
other…[but] Hughlings Jackson’s famous dictum that destructive lesions 
ever cause positive effects, but induce a negative condition which per-
mits positive symptoms to appear, may reconcile the opposing stand-
points; it became in Henry Head’s (1926) opinion, one of the hall-marks 
of English neurology’.

First, Meyer traces ideas on the function of the frontal lobe from 
(John Martyn) Harlow’s (1819–1907) description of Phineas Gage 
(1823–60) and the (un)fortunate trajectory of his tampering iron; 
the little recognized paper of (Leonore) Welt (nd: Über 
Charakterveränderungen des Menschen infolge von Läsionen des 
90) who emphasizes the importance of medial frontal orbital 
damage for the loss of self-control seen in frontal lesions; the 
experimental studies of (Sir David) Ferrier (1843–1928) demon-
strating loss of attention (vide supra) and intelligent observation 
with frontal lobe damage; the work of (Paul) Flechsig (1847–
1929); and the synthesis offered by (Luigi) Bianchi (1848–1927: 
Fig. 1E) in his monograph on the frontal lobes (La meccanica del 
cervello e la funzione dei lobi frontali, 1920 (translated by James 
MacDonald as The mechanism of the function of the frontal 
lobes, 1922); and see Brain 2012; 135: 1995–97) that frontal 
lesions disrupt the association of succeeding perceptions into a 
narrative whole free from the distraction of background cerebral 
noise. For Dr Meyer, these contributions to frontal lobe function in 
the mid-20th century form the basis for subsequent analyses by 
those who studied aphasia in injuries occurring during World 
War II. They provide increasingly detailed anatomical listings of 
the components of language affected in lesions at different sites 
whilst just about managing to avoid the claim that these places are 
the seat of those functions. A notable exception is the work of 
(Karl) Kleist (1879–1960) and his unashamedly retro-19th century 
espousal of phrenology and bumpy heads. Meyer rehearses 
Kleist’s position:

‘Personal and social ego function [are localised] to the orbital 
(Brodmann’s area 11) region, initiative to area 9, motor skill to area 
10, constructive thought to area 46 and sentiment to area 
47…[but] although Kleist’s general influence on cerebral localisation 
should not be underestimated, few have accepted his rigid parcellation’.

With the introduction of disrupting frontal connections in treat-
ment of various neuropsychiatric disorders (see Brain 2014; 137: 
1262–65 and 1266–71), Welt’s work steered psychosurgeons to 
the medial aspect of the orbital region. And (Richard) Brickner
(1896–1959), (Kurt) Goldstein (1878–1965: Fig. 1F) and (Derek) Denny-Brown (1901–81) each adopted Bianchi’s advance on Ferrier’s concept of attention in agreeing that the frontal lobes time the behavioural response to visual events. Especially useful are Meyer’s syntheses from the Russian literature of (Karl) Pribram (born 1919: see Volume 3 of Brain and behaviour, 1969) and Alexander Luria (1902–77: Fig. 1G) who, in The working brain (1973), identifies in the ‘orientating reflex’ of (Ivan) Pavlov (1849–1936) an anatomical basis, located in the ascending reticular formation, for cortical tone and, hence, attention. Rehearsing the well-known 18th century commentators before Broca and (Carl) Wernicke (1848–1905: Fig. 1H), and the ambiguities of their descriptions and the work of their contemporaries whose insights are less well recognized, Dr Meyer traces the history of aphasia back to Sextus Empiricus [160–210 (AD)] and the contributions of (Giovanni Battista) Morgagni (1682–1781: see De sedibus, 1761). Meyer illustrates ways in which new terminologies introduced in the golden age of aphasiology seemed merely to redefine conditions and concepts with which others had previously struggled:

‘These syndromes, created by great masters and confirmed by generations of neurologists, have made localisation great’.

Head seems to lose authority in the 1920s around his insistence on a classification of verbal (Broca-type), syntactic (Wernicke-type), semantic and amnesic aphasias. However, (Russell) Brain (1895–1966) considers Head’s views to be ‘empirical’, i.e. factual, defending the concept of semantic aphasia by claiming that others had misinterpreted this as a feature of dementia in which aphasia also occurs, rather than recognizing a specific disorder of symbolic formulation. In this, Brain was supported by Luria and (Theophile) Alajouanine (1890–1980); but it was Goldstein who, in the mid-20th century, took up cudgels on behalf of the doctrine developed by Jackson and Freud arguing for a central field of associations on which language depends, and above which lies a secondary apparatus allowing specific contributions of vision, hearing and the motor system that influence the language domain:

‘What is really established of the localisation of aphasia is not much more than that anterior lesions produce predominantly motor disturbances, whereas posterior lesions result in sensory symptoms – i.e. crude localisations which in no way contradict [the concept of central aphasia]’.

But still the localizationists worried away at this distributed view of aphasia and argued for central aphasia being nothing more that Wernicke’s aphasia by another name; and a disorder that arose from restricted damage to the temporal lobes insufficient to abolish comprehension but leading to impairment of the appreciation of word sounds produced by others. In his last synthesis, Language and language disturbances (1948), Goldstein just about holds his ground on the relative contributions to speech of ‘background’ cortical activity and the local excitation that constitutes the ‘figure’. Thus:

‘A particular locality in the brain matter is characterised by the influence which the structure of this locality exercises on the total process…To different localisations of lesions correspond different symptom complexes because the different performance fields are affected in a different way by the process of dedifferentiation…this is what we should term localisation’.

Luria is more consistent in retaining the Pavlovian view of the cerebral cortex as a central juncture (or, perhaps, juggler) of discrete sensory and motor analysers onto which are layered local secondary signal systems—a functional mosaic. In the Jacksonian tradition, he assigns hierarchial properties to the main divisions of the cortex and defines six types of aphasia: expressive (Broca-type), apraxic, amnesic and sensory (Wernicke-type), semantic and dynamic.

From the 1930s, the growth of neuropsychology started to identify other aspects of cognitive function on which the person with aphasia fails adequately to perform:

‘Concepts such as Conrad’s “Vorgestalt”, Brain’s “schema” or Critchley’s “preverbatim” represent groping attempts to understand this process… but the real clarification [came] from the application of proper linguistic methods’.

For (Karl) Popper (1902–94: Fig. 1I), it is the element of ‘argument’ that distinguishes human language from the communication of animal species, not altogether explained by simple learning through stimulus and response. (Noam) Chomsky proposes the existence of an ‘innate idea’ for language that hints at Cartesian dualism. In turn, this leads to reconsideration not only of altered shape and growth of the human cerebrum, but also differences in the architectonics of those parts of the cortex that relate to language. Whilst the majority view is that language is a secondary accessory cerebral function grafted onto an already designed brain, this analysis has its dissenters. Of particular importance is the opportunity provided by the prolonged infancy and childhood of the human species allowing much plasticity which, for (Jean) Piaget (1896–1980: Fig. 1J), encompasses four stages: sensorimotor (up to aged 2 years: ‘representation of things and events’); pre-operational (aged 2–8 years: ‘still unable to distinguish the general and particular’); concrete-operational (to aged 11 years: ‘the emergence of concrete thought’); and formal-operational (thereafter: ‘the acquisition of abstract thought’). Matters come together at a conference held in 1963 at which Roman Jakobsen (1896–1982: Fig. 1K) argues that syndromes of aphasia can be understood in terms of differential disturbance of selection versus combination; similarity versus contiguity; and encoding versus decoding. These components are conditioned by timing: when sequential processes are disordered, the brain simply cannot keep pace with verbal stimulation and the ability to encode and construct internal speech from the flood of available syllables. Decoding is a process that uses cues to guess retrospectively the content of the message. In aphasia, the usual process of predicting probability is lost. Again, we hear the voice of Jackson:

‘[in aphasia] there is internally…a reduction…in relations of sequence to relations of co-existence, (ie alternate sequence) in the two terms of a proposition’.
The struggle to localize function within one hemisphere fuelled the related debate on cerebral dominance. Although the existing literature offered plenty of examples, Russell Brain is the first to insist that disorders of visuospatial orientation are a feature of lesions affecting the non-dominant parieto-occipital cortex (Brain 1941; 64: 244–72; and see Brain 2007; 130: 1976–77). On this general topic, Jackson is surprisingly tolerant:

‘The left side of the brain, the leading side, the right the automatic…although the cerebral hemispheres are twins, the left may…be said to be first-born’.

This leads to consideration on whether cerebral dominance is associated with cytoarchitectonic asymmetries. On one side of the debate is (Gerhardt) van Bonin (1890–1979), who concludes that structure in the left side of the brain differs from that on the right; on the other is the work of (J. LeRoy) Coneil’s (1883–1971) eight volume treatise on The postnatal development of the human cerebral cortex, 1939–67 concluding that it does not. Last to appear in Dr Meyer’s pre- and post-Broca survey espousing the original views of Hughlings Jackson is Norman Geschwind (1926–84) who so effectively rehabilitated the diagram makers of the 19th century with his work on disconnection syndromes (see Brain 1965; 88: 237–94 and 585–644), although shifting localization away from particular pieces of cortex:

‘The association of different impressions into a concept, thinking, consciousness, is an achievement of the fibre tracts which connect the different regions of the cortex to each other, the so-called association system of [Theodor] Meynert [1933–92].

Based on the study of 100 normal brains, Geschwind states emphatically that the upper surface of the temporal lobe behind the anterior Heschl convolution is 1 cm larger on the left than the right, allowing others to conclude—in support of the ‘innate idea’ and Cartesian dualism—that ‘the infant is born with a pre-programmed biological capacity to process speech sounds’. And here ends Dr Meyer’s history of cortical localization.

Walther Riese’s (1890–1976) aim is not so much to consider those who Jackson influenced but, rather, the people whose ideas shaped his own thinking. His summary of Jackson’s work is:

‘The liberating and inalienable legacy of Jacksonian neurology is an avenue…to a future classification of language disorders…which cannot be reached by mere motions, sensations, conduction or associations but only by symbolic thought’.

Riese has read Jackson’s footnotes carefully and finds in these much that illuminates his writings. Through the study of aphasia and epilepsy, Jackson develops a materialist philosophy on the physiology of the nervous system in which the concepts of inner and external language, proposition, thought, symbols, and concomitance of mental and physical actions are prominent. From (Herbert) Spencer (1820–1903: Fig. 1L) Jackson borrows the principle of evolution and dissolution in the nervous system. Aphasia is a return to automatic emotional language and loss of its propositional component. On proposition, Aristotle (384–22 BC) concluded:

‘[Not] every sentence is…a proposition; only such are propositions as have in them either truth or falsity…spoken words are the symbols of mental experience and written words are the symbols of spoken words’.

Jackson adopts these in his concept of aphasia as a thought disorder:

‘All the names in a random succession of words may, it is true, one after the other, excite perceptions in us, but not perceptions in any relation to one another deserving the name of thought…written words…are symbols of symbols…speech consists of words referring to one another in a particular manner…a proposition consists of two names each of which…modifies the meaning of the other’.

And this concept of thinking with the help of words is further developed by Head:

‘Words and other symbols knit together and give permanence to non-verbal processes of thought, which would otherwise be fleeting…the use of symbols facilitates action by obviating the necessity of trying several alternatives…and the person with aphasia falls back on the method of trial and error’.

Jackson was also influenced by John Locke (1632–1704: Fig. 1M) who deals with proposition in An essay on human understanding (1690). Ideas are the representation of things to be considered, and words are the signs of those ideas. Both are instruments of knowledge and their joining or separation, things signified being in agreement or disagreement, is the basis of truth. Conjunction of ideas and signs constitutes mental and verbal proposition. This formulation leads Jackson to consider symbolizing, or relating images, as an integral part of mentation: ‘speaking is symbolising, a mental operation’. From here it is a short step to Head’s concept of aphasia as a disorder of symbolic thought and expression. As a materialist, Jackson saw in pantomime and gesture, but not gesticulation, a rehearsal of the ordinary movements of propositional activity; and in language, an expression of the inner spiritual world or thought. It was left to (Sir Francis) Walshe (1885–1973), in Diseases of the nervous system (1945), to summarize this best: ‘a word has no meaning until it is used by a thinker to refer to [or] stand as a sign for something’. Simply stated, aphasia is loss of referential speech. With this idea of the symbol as ‘an attendant physical state, a pantomimic action’ Jackson argues that there is always some loss of pantomime in aphasia. His distinction between loss of symbols and of signs has its origins in the work of (Immanuel) Kant (1724–1804)—symbols being ‘forms of intuition’ and signs ‘custodians of concepts’.

Since Jackson believed that the process that leads to speech (and perception) consists, in order, of automatic revival on the right side of the brain and then voluntary retrieval on the left (vide supra), it follows that these may dissociate and mental processes thereby become marooned as ‘shadowy vision’ or ‘lay figures’. Although not acknowledged by Jackson, this distinction derives from Kant’s concept of ‘schemata’ set out in Kritik der reinen Vernunft [Critique of pure reason], (1781); and, uncharitably, Riese goes further in quoting passages from Kant and Jackson side-by-side that show much similarity of concept and content. Moving on, he
aligns the views of Jackson and Head but sees a difference in that Jackson espoused philosophy whereas Head (encouraged by Brain) regarded his formulation of symbolic thought as factual.

Finally, Riese sees in Jackson’s concept of internal and external speech the influence of David Hume’s (1711–76; Fig. 1N) *A treatise of human nature* (1739). Hume distinguishes impressions as having the highest force of entry upon the mind and into human consciousness, and ideas as fainter images. In Jackson this becomes:

‘The idea is a faint percept, the perception a vivid idea. The image…in ideation is a faint copy of that…in perception’.

Slight and strong nervous discharges, and the unitary concept of physicality lead Jackson to the doctrine of concomitance as a means of reconciling the interaction of mind and body. Jackson even extends this argument to explanations for the phenomenon of phantom limb, first described by Rene Descartes (1596–1650) as ‘pain felt by the mind as if it belonged in the brain not in the former hand’; for Jackson, the movements of the spectral hand are pantomimes initiated by the cerebral cortex acting in ignorance of the absent movements of the lost limb.

Although Riese has to admit that the relationship of mind and body is a topic on which explanation lies beyond the limits of human intelligence, that caution has done nothing to restrict further speculation, and rehearsal of the doctrine of localized function, as recent papers in *Brain* indicate. In this issue Matthew Tate and colleagues derive a probabilistic map of cortical epicentres for specific human brain functions through the opportunity of direct stimulation during surgery for low-grade glioma that do not support a primary role for Broca’s area in speech output (see page….). Recently, Yee-Haur Mah et al. drew attention to the vulnerability of assuming physiological organization from precise maps of lesions that bear no relationship with the function of interest and the improved precision achieved by multivariate pattern analysis (*Brain* 2014; 137: 2522–31; and see *Brain* 2014; 137: 2405–06).

Would the results of either paper have surprised John Hughlings Jackson, Sigmund Freud or Henry Head?

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