JACKSONIAN IDEAS AND THE FUTURE, WITH SPECIAL REFERENCE TO APHASIA*

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The hundred years which have passed since the modest beginnings of the National Hospital have witnessed the emergence of neurology as an independent discipline, the offspring of general medicine and of physiology.

The art and thinking of clinical neurologists in Great Britain to-day stem directly from the teaching of pioneers whom few among us here ever saw. To our cradle of neurology they brought priceless gifts. Here I would like to focus attention upon one of these giants—namely, Hughlings Jackson—to discuss Jacksonian doctrines in their formation, their present status, and their promise for the future, especially in the realm of language.

In this country we often refer to Jacksonian ideas and methods in clinical medicine. We all like to believe that, consciously or unconsciously, we are incorporating his particular mental attitudes into our own workaday practice. By and large, all of us endeavour to emulate his tenets and his methods, even though many of us fail to live up to his model.

Just what is understood by Jacksonian ideas? To unravel the golden threads which run through the texture of his obscure writing is no easy task, but it is a rewarding one.

Observation and Replication

In the first place we owe to Jackson our realization of the need for exactitude in observation coupled with faithfulness in recording. These principles, seemingly banal, are sometimes forgotten. As an observer, Jackson was shrewd, patient, and painstaking. Witness his retracing of the march of a local seizure by dint of untiring study and reportage of fit after fit. Some of this research was tinged with tragedy, as when his beloved wife herself fell a victim to Jacksonian epilepsy. To the acuity of his gaze was added the utter honesty of his documentation. He stressed the necessity for describing exactly what the patient did or said; and he pointed out the dangers of rationalizing or interpreting, which might lead to an inaccurate note that would merely record what the observer deemed should have taken place.

An example may be given. In an early paper, written when he was 29 years of age, Jackson commented on the common failure of a patient to protrude the tongue on request. Asserting that we do no harm to clinical medicine if we simply record all the facts, he stated that the patient when asked to put out the tongue betrayed that he understood the request by putting his fingers into his mouth as if to help it out; and yet nothing would happen. Such would be a true statement of facts, giving the reader a basis from which to speculate. To say "there is total paralysis of the tongue" would be to advance a theory, improbable on

the face of it, and, if wrong, all the more dangerous since it might even pass for a fact. That the tongue actually is not paralysed is revealed by the patient's ability to chew and to swallow. He may lick his lips. As the daughter of one of his patients remarked, her father could protrude the tongue "by accident" as it were. Jackson saw in this paradox a performance reduced to a more automatic condition.

The second splendour of Jackson's neurology lay in his reflective cast of mind. Mere noting of data was not enough. Always he was asking himself "Why?" This imagination, restrained and disciplined, led to creative and original thinking, and marked him out from the company of his talented colleagues. Jackson owed this gift of vision to his philosophic bent, for it had been his early ambition to devote himself to philosophy. A devoted disciple of Herbert Spencer, he was rescued for medicine largely by the encouragement of Jonathan Hutchinson.

An Era of New Ideas

The mid-Victorian period was an era of exciting new ideas that naturally conduced to Spencerian thinking, and thence to Jacksonian hypotheses. Anticipated to some extent by Linnaeus, Buffon, Erasmus Darwin, and Lamarck, the doctrine of evolution came to life in the writings of Russell Wallace and of Charles Darwin. When the *Origin of Species* was first published Spencer was 39 years of age and Jackson was 24. Every branch of science became profoundly influenced in one direction or another by the impact of these stimulating notions.

It is unlikely that Jackson ever met Spencer personally. They corresponded, however, and Jackson sent Spencer a reprint of one of his articles on dissolution within the nervous system. The philosopher was impressed, describing the paper as "clearly and conclusively argued." Spencer had first mooted his evolutionary ideas in his essay in the "Development Hypotheses" (1852), being himself considerably influenced by the "congruous formula" of the zoologist K. E. von Baer, or development from the homogeneous to the heterogeneous. In the "Art of Education" (1854) the proposition was developed that the unfolding of a child's mind repeats the unfolding of the mind of the human race. Spencerian notions reached fruition, so far as Jackson was concerned, in the *Principles of Psychology* (1855).† Spencer had said that progress in mental as in nervous organization is presentable in terms of evolution (and we may interpolate here that it was Spencer who first used the term "evolution"), for in rising to the higher types of mental states characterized by definiteness, coherence, and revivability, progress takes place in integration and heterogeneity.

Jackson's Stages in Motor Evolution

Jackson paraphrased Spencer, and isolated four stages in motor evolution—namely, (1) increasing differentiation (that is, greater complexity); (2) increasing specialization (that is, greater definiteness); (3) increasing integration (that is, greater width of representation); and (4) increasing co-operation (that is, greater association).

Jackson borrowed from Spencer the term "dissolution" to signify the opposite of evolution. By applying

†When, in 1896, Spencer announced that he contemplated a system of synthetic philosophy, Jackson added his name to the list of guarantors.

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it to disease of the nervous system, he explained certain clinical appearances. The conception of evolution and of dissolution in neurology led logically to other bold ideas, such as the notion of levels of function within the nervous system. A contrast between positive and negative manifestations of disease became obvious, and Jackson insisted that positive clinical phenomena could not be directly due to negative lesions. For example, an aphasiac might utter wrong words like "chair" for "table." But while it could be held that softening of the brain was the cause of the distorted speech, it could not have been the cause of wrong utterances. "Softened brain is no brain; so far as function, good or bad, is concerned, it is nothing at all." Wrong utterances occur during activity of healthy parts, not softened. The most that Jackson would concede was that the diseased brain "permitted" wrong words to be used. Jackson would therefore equate positive clinical data with a negative state of the brain only in the legal sense of a *causa causans*, or remote mechanism.

In the same common-sense vein, Jackson stressed the uselessness of medicinal treatment for negative conditions. "What will drugs do towards ridding the patient of his paralysis? Nothing. No drugs can do anything whatever, good or bad, for cerebral softening; softened brain is not brain at all; it is dirt in the brain. . . . He who is treating by drugs hemiplegia owing to softening, or to clot, is treating a hole in the brain."

Another principle formulated by Jackson is often forgotten to-day, though its validity has never been challenged. Jackson stressed the error of trying to localize a cerebral function on the grounds that a focal lesion within the brain was followed by loss of that function. This doctrine was slow in maturation. For example, early in his career Jackson was willing to accept Broca's teaching *in toto*, first regarding the position of the focus in cases of aphasia; and, secondly, that a faculty of language resided within the third frontal gyrus. Later Jackson grew more sceptical. In 1889 he confessed that at one time he had spoken of centres for will, memory, reason, and emotion; he now realized them to be elements of consciousness quite artificially distinguished. To have imagined such centres had been "a mere artifice." He could not now accept any abruptly demarcated centres in the cortex standing for any kind of representation. In another context Jackson admitted that he had now abandoned the words "faculty" and "reside" in the arbitrary manner he had used them in the past. Since speech or words enter into thought, it now seemed to him incredible that "speech" should "reside" in any limited spot. None the less, he believed that *damage* to the brain confined to the region of the corpus striatum would bring about a loss of speech. As Jasper has recently put it, anatomical areas within the brain are not to be rated as anything more than regions which, when ablated, may be followed by disturbances of function. They are to be looked upon as "centres of destruction" rather than centres of function.

Borrowed Terminology

Jackson protested against another example of muddled thinking—namely, the employment within the same context of terminology borrowed from unrelated disciplines—for example, anatomy, metaphysics, and physiology. Thus the word "voluntary" was a psychological term which could not really be used when speaking of physical processes. Classifications which

were partly anatomo-physiological and partly psychological obscured the issues. Such confused sorting would be as scientifically improper as would be a grouping of plants into endogens, *graminaceae*, kitchen herbs, ornamental shrubs, and potatoes. He gave as an example of such mixed taxonomies the common statement that an *idea* of a word would produce an articulatory movement; whereas, he argued, a psychical state, an "idea of a word" (or simply "a word") could not possibly produce an articulatory movement, which is a physical state. "In all our studies of diseases of the nervous system we must be on our guard against the fallacy that what are physical states in lower centres fine away into psychical states in higher centres."

Like Bergson years later, Jackson was critical of the teaching that verbal memory resided within the brain. There is no such thing as memory, but only things remembered. Dealing in this vein with the common employment of the term metaphysics in a pejorative sense, Jackson declared: "It is a mistake to suppose that those who write books on metaphysics are the most metaphysical. They have, at any rate, the knowledge that they are dealing with metaphysics. There was once a man who could conceive an abstract Lord Mayor. The conception he had, so he averred, had neither head, arms, legs, nor corpulence; it was not an image of any particular Lord Mayor nor a fusion of several, but an abstract Lord Mayor. Well, we think this metaphysician was too confident in his powers of conception. But do we not imagine ourselves capable of the same kind of marvellous feats? Let us look at a case of aphasia. A man does not speak and yet can understand what we say to him, and can think, on ordinary things, at any rate. These are the facts; no one disputes them. Now comes the metaphysician, who proffers an explanation that the patient has lost words, but retains the memory or ideas of words. There are, it seems, words, and also memories or ideas of words, which latter somehow are not words. Now what is an idea of a word which is not a word? It is, like the abstract Lord Mayor, simply nothing at all" (1882).

In the mental processes preceding articulation Jackson recognized a twofold manoeuvre. First the mind becomes aroused in propositional form: later comes a fitting of words to the idea. These two stages—namely, subject-proposition and object-proposition—together make up verbalizing. The fitting of words to the idea comprises external speech if it achieves audibility, but if the phase takes place in silence it forms internal speech. Jackson did not believe there was any distinction other than in degree between internal and external speech. The speechless man is not wordless: he can receive propositions: he is not bereft of images. He can think, but he is lame in thinking. But if imperception is added to speechlessness, as is often the case, images will be affected, and there will be inferior comprehension.

Jackson's Early Years

Such were a few of Jackson's ideas relating to language. At this point it might be interesting to pause, and to inquire about the man himself. What were the influences that bore on him and directed the stream of his intellect into the novel discipline of neurology?

John Hughlings Jackson was born in 1835 in a Yorkshire hamlet. He received his schooling first in the village, later still in Tadcaster, and afterwards in a progressive nonconformist school recently opened at

Nailsworth, Gloucestershire. Formal schooling meant but little to Jackson, who always regarded himself—like the Sitwells at Eton—as largely self-taught. All his schools were bad, he said, and much of his later success was due to his not having been overeducated. It is probable that Jackson was never an erudite man or a cognoscente.

At 15 years Jackson became an apprentice to Dr. Anderson of York, where he also joined the local medical school. After qualification he held the post of resident medical officer at the York City Dispensary from 1856 to 1859. There he came in contact with a remarkable physician, Dr. Thomas Laycock, who afterwards occupied the chair of the practice of physic at Edinburgh. Laycock was a scholarly man who had been impressed by the work of Marshall Hall upon nervous reflex action. Jackson was certainly influenced by Laycock, who may well have helped orientate his attention towards the nervous system.

Moving to London in 1859, Jackson lived with his friend Jonathan Hutchinson at No. 4, Finsbury Circus. Thanks to him, Jackson became employed as a fellow reporter for the *Medical Times and Gazette*. Their duties took them to medical meetings and to hospitals, where they selected clinical cases and met the leaders of the medical profession. Among these was that brilliant original, Brown-Séquard, who for a few years was making London his home—the brief sojourn of an unstable eccentric. In 1859 Brown-Séquard had been invited to join J. Z. Ramskill on the staff of the projected National Hospital for the Paralysed and Epileptic, whose first patients were received in the spring of 1860 at No. 24, Queen Square. Friendship with Brown-Séquard determined Jackson's choice of career, and his decision to sublimate his philosophy into the more practical pastures of neurology. When, in 1862, a vacancy occurred at the National Hospital for an assistant physician, Jackson was the successful candidate. Shortly after came further vacancies upon the senior staff. In those days there was no automatic advancement, and it was incumbent upon Jackson formally to apply. Twice in succession he was passed over in favour of others, and it was only when a third vacancy occurred in 1867 that Jackson attained the rank of full physician. It is characteristic of Jackson's easygoing modesty that he wrote that if unsuccessful he would be happy to continue as assistant physician. This makes strange reading when we find him in 1900 seeking to retire from the staff under the age rule, his colleagues, however, persuading him not to do so, but to continue on the active list another 10 years.

Problems of Disordered Speech

From his earliest days in neurology Jackson interested himself in the principles which underlay nervous function in health and in disease. As a corollary he applied his attention to the problems of disordered speech. Here again Brown-Séquard was to prove the instigator. At first Jackson had lightly assigned loss of speech to disease of the olives, a notion which he had derived from Laycock, who in turn had adopted it from van der Kolk. Brown-Séquard, however, showed Jackson that the defect was often not one of talking but of language, and that some of these patients had lost all power of expression, even by way of making signs.

Stirring events had been going on in the medical circles of Paris about the time that Jackson qualified. The opinion of Gall and Spurzheim, so contrary to

those of Flourens, had been received with excitement, and there were strong repercussions of sentiment either for or against. Matters came to a head in March, 1861, when Auburtin delivered his thoughtful address on the relationship between loss of speech and lesions of the frontal lobe. Auburtin's role in the history of aphasia has been neglected: many neurologists to-day do not even know his name. And yet it was he who prompted the surgeon Broca—like himself an amateur anthropologist—to observe with particular interest the case of the speechless patient Laborgne, lately transferred to his care by reason of a septic leg. Hitherto Broca had not been concerned with problems of speech. Fortune ordained that Broca's patient should quickly perish, and that the brain should offer up the eloquent evidence of a superficial lesion of the frontal lobe. All these happenings were topical and familiar to young Jackson, who a few years later was to meet Broca personally at a symposium in Norwich. Jackson had also heard about Broca's second patient, Lelong. He was aware of Trousseau's classic demonstration of speechless patients. He had known him reject in succession the terms "aphrasia," "alalia," "alogia," and "aphemia," and substitute them with the now traditional "aphasia." Jackson, be it noted, used none of these terms in his earlier writings, preferring to speak of "disorders of expression."

Jackson must also have read about the curious intervention of Dr. Gustave Dax, nettled at the fancied slighting by Broca of his late father, who had long realized the greater importance of the left hemisphere in the genesis of aphasia.

Jackson's Interest in Aphasia

These events were like heady wine to the young neurologist, who at Queen Square and elsewhere was now in touch with numerous hemiplegics, many with disorders of expression. One of Jackson's duties as an assistant physician was to visit patients in their own homes. In the drab houses within the mean streets of Holborn, Soho, and St. Pancras, bedridden survivors of an apoplexy became a cornucopia of ideas which fed Jackson's inspiration. His colleagues Brown-Séquard and Victor Bazire had collected many such disabled folk and had permitted Jackson to observe them.

But Jackson's interest in aphasia had been whetted long before he met Brown-Séquard. Boyhood impressions are often so deeply etched that they may determine the careers and vocation of later life. So it was with Jackson. When quite a child on a seaside holiday, he lodged at a house where the landlady—as he discovered to his wonderment and awe—could say nothing but "watty." This unlikely disyllable was articulated with such a wide range of cadence that it could express a variety of emotions. Her laugh was merry and ringing, and when anything amused her she would say: "Watty, watty, watty." Years later we find Jackson making the pioneer descriptions of what he was to call the recurrent utterance of aphasiacs.

A little older, he was driving to school, when his fellow-passenger, a girl of 17, daughter of the coachman, suddenly found she could not reply to a question which was put to her. With great difficulty she got out the words: "I can't talk!" The coach turned back, and Jackson afterwards learned that the girl lost speech altogether for three weeks and became paralysed down the right side. Eventually she improved, but she died

12 years later from eclampsia. She never regained her power of speech completely, and even to the last was apt to call things by wrong names.

These two cases encountered early, in intimate even dramatic circumstances, must surely have stamped an indelible imprint upon his eager intellect, which was to influence the direction of his life's work.

Contemporary Neurologists

Ideas, whether they be true or false, have stupendous potentialities in human affairs. But ideas catch on slowly, as Jackson himself used to remark, especially in medicine, where an innate conservatism obtains. The second half of the nineteenth century was a period in neurology when clinicopathological correlation was winning easy prizes. The work was descriptive in character, not reflective. It was self-evident and easy to comprehend. Much of it was worthy factual bricks-and-mortar stuff. Little wonder Jackson's ideas, especially an aphasia, were temporarily overshadowed by those who made brief clinical studies highlighting the obvious, and who sought by way of morbid anatomy a key to the understanding of the normal faculty of language.

But the seeds had fallen, and in due course they germinated. Other philosophically minded neurologists appeared whose contributions to aphasia, not necessarily deriving from Hughlings Jackson, nevertheless stand alongside Jacksonian ideas in sympathetic comity. We recall the names of Baillarger, Kussmaul, Pick, von Monakow, Freud, and particularly Bergson. The observations of the last-named upon the topic of language have been surprisingly overlooked. Bringing the story into the early twentieth century, we have Pierre Marie, van Woekoem, Goldstein, Weisenberg, and, most significant of all, Henry Head. Of contemporary English-speaking neurologists, we may enumerate Walshe, Russell Brain, and Walter Riese among the most important exponents of Jacksonian ideas.

To-day, forces of neurology are arrayed differently. By far and away the majority of worth-while research work into aphasia is of a dynamic quality, and harks back directly to Jackson's ideas, offering abundant promise for the future.

New Tools for Research in Aphasia

But the mill will not grind with the water that's passed. Let us rather project our imaginations and speculate upon how aphasiology may be expected to develop in the hundred years ahead.

Already we possess important new tools for research. In the first place, we have the advantage of exact *instrumental methods for the study of aphasic utterance*. Now, under scientifically controlled test-circumstances the fragmentary speech can be faithfully recorded: played back as required, at slower or higher speeds if necessary. In this way the clinician no longer has to rely merely upon his sharp ear to interpret the distorted mumblings of the aphasiac. The clues are now caught and preserved, and they can be transcribed and examined over and over again. The utterances can be analysed from the standpoints of phonetics, syntax, and semantics. The recordings can, if required, be translated from acoustic into visual forms by way of spectography or some other technique of visible speech. Modern aphasiology is consequently furnished with evidence

which is scientifically acceptable, and which can be utilized for future research.

Secondly, there now exist *more satisfactory psychological testing procedures*, including the evaluation of non-verbal performance in aphasiacs.

The third asset is a momentous one. *A link-up has taken place between academic linguists and aphasiologists*. To-day, aphasia must be regarded as a problem lying within the province of linguistics. Language in dissolution is obviously an integral part of this stupendous topic, which no neurologist can henceforth afford to neglect. Neither can he longer avoid coming to grips with the essential nature and the purpose of the normal faculty of language. Information theorists overstress the role of communication. Of the many available definitions of language perhaps the most satisfying is that promulgated by Sapir, who said that language is primarily a vocal actualization of the tendency to see realities symbolically, a quality which renders it a fit instrument for communication; in the actual give-and-take of social intercourse it has been complicated and refined into the form which it is known to-day. "Language is a great force of socialization, probably the greatest that exists." Nowadays linguistics forms a broad spectrum of endeavour ranging from philosophy at one extreme to phonetics and communication theory at the other. Here, then, is a vast unexplored territory for the future. Ideas for research crop up in profusion.

Among the present-time neurologists alive to the importance of linguistics in aphasia are Grewel, Bay, Panse, and Leischner. On the other hand, linguists have been rather remiss at recognizing the value of the lessons of aphasia, and such meagre references as they have made are usually quite out of touch with contemporary neurological thought. Ramon Jakobson is a conspicuous exception.

Communication theory includes a statistical study of language. Measurement of vocabulary and frequency of usage of individual words and clusters of words has already been undertaken by Zipf, by Estoup, by Mandelbrot, and by Herdang. It remains for future neurologists to apply these techniques to the writings and utterances of aphasiacs. A similar inquiry into the ratio between the number of different words chosen and the total sum of words employed is likely to be revealing. This is the type/token ratio, which clearly demonstrates that the aphasiac utilizes a very shrunken store of words, while indulging in undue or unnoticed iteration.

The subtopic of contrastive linguistics emphasizes important relationships between the syntax of a particular language and the thought-processes of those that use the language. That the association is integral is the basis of Whorpf's principle of linguistic relativity. Hitherto the great bulk of research into aphasia has been carried out on patients speaking one of the European tongues. Little or nothing is known of the pattern of aphasic dissolution in the case of the African or Asiatic languages, where the orthodox subject-predicate system does not exist. Here, then, is an important subject for the future.

The fourth acquisition to the techniques of aphasia research is an unexpected one—namely, *Pavlovian ideology*. On the face of it, this might appear unpromising, being based upon an utterly materialistic philosophy moored to animal observation. But the enlightened interpretation of such workers as Luria,

Beyn, and others demonstrates that Pavlovian research into the evolution and dissolution of language is possible, and may indeed prove valuable.

Questions in Aphasiology

Equipped with these new weapons of research we can now venture upon a study of many problems in aphasiology which have hitherto been obscure. Some of these questions are even now matters of debate: others have not yet been broached. The future years will surely yield answers to such queries as the following.

1. How Far is Aphasia a Localizable Symptom?

Already there has taken place a shift away from a preoccupation with aphasia as a static outfall-symptom of brain disease, localizable to this or that region within the left hemisphere. Localization is not thrown overboard, however, but it has become demoted in rank of significance. The functional disturbance within the province of symbolic thinking is realized to be more complex and usually more intense than can be ascribed to the negative effect of a circumscribed lesion. Many factors are operative, some of them subtle and intangible. The role of diaschisis, and of demential epiphenomena, deriving from the "momentum" of the causative lesion, must be reckoned with and evaluated.

Even though his name is associated with the events due to a discharging lesion of the motor cortex, Jackson was of course the first among neurologists to adopt a dynamic attitude towards the effects of brain damage. As he himself said, "I am neither a universalizer nor a localizer." Since speech and words enter into thought he deemed it incredible that "speech" could "reside" in any limited spot. So far as aphasia was concerned he rarely tried to track down lesions from the clues offered by the disordered speech. He did not believe in abrupt geographical localizations. Very sudden and very extensive damage to *any part* of the left cerebral hemisphere would produce *some* amount of defect of speech.

In our own time Leischner has stressed, like many others, that speech performance is to be looked upon as an overlaid or parasitic function which utilizes preformed brain mechanisms as well as preformed peripheral instruments. No one can seriously claim that the brains of illiterates who have neglected to learn the arts of reading and writing are in any way deficient in "centres" when compared with the brains of the highly educated. Speech is a secondary and not a primary cerebral function, and therefore has no central executive or receptive apparatus of its own. Rather does it utilize, as it develops, brain mechanisms which are already in existence. Individual dispositions may even determine a shift in the centre of gravity of these secondary cerebral functions. This idea is reminiscent of Weizsäcker's "functional migration." In cases of special sense-deprivation the faculty of speech may be looked upon as metamorphosed or transposed, as in the case of the Braille reading in the blind, the sign languages of deaf-mutes, and, most impressive of all, the tactile system of communication in a Helen Keller or a Laura Bridgman, bereft of hearing, sight, and articulation. In such cases the drive towards expression and communication utilizes whatever means happen to be available.

Riese has said that there never will be a cerebral localization of productive thought, since what is really

productive and creative in the human mind resists even the most generous and universal localization. Since it is a coming-into-being of what did not exist before, it cannot be correlated with existing material. Riese traced an analogy with the heel of Achilles. Although the heel was the most vulnerable region of the hero's body, and although its injury would be fatal to his life, life cannot be said to be localized at the heel; it pervades the whole body.

2. What is the Ideal System of Classification?

Jackson himself rarely tried to group his cases of disordered expression, but contented himself with descriptive labels such as "recurrent utterance," and "occasional utterance." A splitting into "motor" and "sensory" types came later, the work of others. For many years this apparent logicity served a purpose but with ever-increasing inadequacy. Already neurologists are profoundly critical of the classical Lichtheim-Wernicke classification. Head's classification was a very worthy one, based upon observed psychological data, but it was doomed to fail. Ramon Jacobson, one of the few linguists to concern himself with questions of pathology, has attempted an unusual type of distinction which applies both to normal speech and to patterns of aphasia. This is based upon a contrast between metaphor and metonymy, as representing two basic methods of relation: the one is an internal relation of similarity and contrast, the other being an external relation of contiguity or remoteness. An aphasiac shows impairment in either one, but only one, of these modes of verbal behaviour, and for this reason Jacobson visualizes a "contiguity disorder of speech" as opposed to a "similarity disorder of speech."

Classifications of aphasia based upon levels or functions of normal speech are unpromising, for, as Head pointed out, the types of aphasia we meet with clinically are not fragments of normal speech, and they do not directly reveal the elements out of which language is built.

We may perhaps predict that in the future there will emerge another kind of classification, clinico-psychological in nature. Attention may become directed more and more to the "preverbitum"—that is to say, the silent processes of thinking which immediately precede the act of expression in speech or writing. This rapid but all-important fragment of mentation obviously varies widely in the normal subject according to many ever-changing circumstances, as, for instance, the semantic properties of the emerging words. In aphasiacs the errors of difficulties in word-finding may be the product of blockage which may occur at different levels within this preverbitum. Herein we can detect the possibility of erecting a classification based upon some such notion of levels of thought. Thus the patient who is merely at a loss to supply a word at a given moment to an article presented to him might be deemed to have a word-block at a quite superficial level. The patient with a fluent but wellnigh incomprehensible flow of jibberish has a much deeper defect, and if such an aphasiac is also found not to comprehend the statements of others the defect must be even more profound. Work along lines such as these will surely continue.

3. Does Aphasia Necessarily Entail a Disorder of Intellect, whether Quantitative or Qualitative?

Most would expect the eventual answer to be in the affirmative. Goldstein's important dichotomy between

conceptual and concrete attitudes at one time seemed to supply the solution, explaining both mild and severe cases. Latterly, however, the validity of Goldstein's hypothesis has been questioned, as by Isserlin, Beyn, Luria, Bauer and Becka, Kok, and others. Time will show how far these criticisms are justified. It is difficult to deny that eventually there will surely emerge proof of some affection of intellect, or of personality, or both, running like a scarlet thread through the pattern of all the aphasias. As Marcus Victoria said, "aphasic patients do not see or hear the other world like the rest of mankind. Their defects are deeper than the language defects, and comprise functions correlated with the manipulation of symbols." It is with these various non-verbal defects that future aphasiologists will be deeply concerned.

4. Does the Dissolution of Speech in Disease Recapitulate the Stages of Development of Speech in the Child?

A. F. Watts has proclaimed that "... speech development in the child and in the race follows broadly the same lines, and the powers lost as a result of mental derangement disappear in the reverse order of their acquirement, just as in a stricken tree death appears in the newest twigs before it reaches the older branches." I take leave to doubt the validity of this idea, and I believe that aphasiologists of to-morrow will examine with greater care, and more critically, this seductive notion. Here is a facile conception which has appeared in many writings in the past and even at the present time. Some, like Jacobson, have aligned certain types of aphasia with the manner of speaking of a child. Others—like my friend Alajouanine, and also Diamond—have sought to correlate the dysarthric defects in aphasic patients with an infantile fashion of talk. Both are believed to show a similar pattern of phonemic substitutions, the aphasiac stumbling most over consonantal sounds which a child masters comparatively late. This is what has been called the "syndrome of phonetic disintegration." I have never been impressed by this relationship and I am still dubious. Professor Fry, of the London University Department of Phonetics, has subjected one of my aphasic patients, chosen at random, to a most rigorous speech-analysis. His research completely failed to reveal any hint of a reversion to a less mature manner of articulation.

Time will show whether it is logical or appropriate to seek an analogy between the defect of speech from disease in an adult—that is to say, one who had attained linguistic maturity and then lost it—and the ontogeny of speech. At the present time it is safer to assume an attitude of scepticism and to avoid drawing parallels too freely. If we really wish to find a disease state which recapitulates the infancy of speech we are more likely to witness it either in the dilapidated utterances of a dement or, better still, in the baby-talk of a hysteric.

5. What is the Essential Nature of the So-called Congenital Dysphasias, Including Developmental Dyslexia and Congenital Auditory Imperception?

So far we are merely at the stage of observation and recording. But already the available evidence clearly shows that these are not "pure" or delimited defects as was originally imagined. To what extent they depend upon subtle inborn disorders of simple perception is a problem for the future to unravel. Whether in fact there exists any underlying structural defect is uncertain, and would appear to-day to be unlikely. Whether the

dyslexia or dysphasia is merely one aspect of a deeper defect of a spatial or of some other symbolic quality is a matter for future neurologists.

6. How Far is it Correct to Align So-called "Motor" Aphasia with Apraxia, and "Sensory" Aphasia with Agnosia?

Since Liepmann's work in 1900 opinion on this subject has oscillated. To-day we are sceptical of isomorphism of this sort. The conception of any such pure entity as "motor" aphasia is out of favour. Correlation of a cerebral dysarthria—that is, a disorder due to a focal cortico-subcortical lesion, with an articulatory apraxia—is, however, still conceded. Further than that modern neurologists are unwilling to go. We may re-echo the words of Bay, who, concerning apraxia and aphasia, said, "The two have as little in common as the leaping attack of a bird of prey with the strategic planning of the general staff."

7. To what Extent are the Receptive Defects in Aphasia Dependent upon an Impairment in the Perception or Utilization of Simple Sense-data?

It may well be found that the reception of auditory or visual signals is imperfect, or perhaps abnormally delayed, in aphasiacs. Tachistoscopic testing is likely to demonstrate such a state of affairs. Or, on the other hand, the defect may lie at a deeper level—namely, within the patient's frame of expectation—for in normal circumstances an anticipatory state materially assists the correct reception of signals. Sensory aphasia may turn out to entail an impairment of this "prior set." These are straightforward questions which will assuredly be answered in the future.

8. How Far Does the Problem of an Aphasia Depend Upon Individual Pre-morbid Habits of Speech?

Considerably more attention is due to the subject of the aphasic patient's previous educational status, with special reference to his literary attainments, habits, prejudices, and predilections. The performance of an aphasic patient is now looked upon as a variable, based upon a formula entailing not only such obvious factors as the size and locus of the lesion, its nature, its chronogenic properties, and its degree of abruptness, but also the make-up of the victim with particular respect to his pre-morbid literacy. The aphasiac's performance will also depend upon a complexus of immediate circumstances, both extrinsic and intrinsic. As Goldstein has put it, the brain-injured person is struggling to cope with a more or less artificial test-situation by utilizing as best he can the attenuated and reduced mechanisms available to him at that particular moment. And in so far as each one of us possesses his own idiolect, the use of language is ordinarily a very personal mode of behaviour. Aphasia must therefore constitute an aberration in the pattern of total behaviour rather than a scotoma within the field of language-function.

Factors of age are of course of obvious importance. It is still uncertain, however, whether the sex of the patient in itself exercises any influence upon the final picture of an aphasia.

This fascinating idea also ties up with the problem of the earliest appearances of speech in *Homo sapiens*. While some evidence can be adduced to suggest that among our prehistoric forebears speech was a masculine prerogative, equally specious arguments are available to the effect that speech acquisition was mainly due to the enterprise of the female sex.

These considerations were envisaged long ago by Jackson when he spoke of the influence of the "four factors of the insanities." The factors as he originally set them out in 1874 were: (1) the depth of the dissolution or reduction; (2) the rapidity of the reduction; (3) the kind of brain in which the reduction occurs; and (4) the influence of external circumstances and internal bodily states on the patient who is reduced. It is Jackson's third factor which augurs so well for future investigations.

Conclusion

According to Lenin, "one fool can ask more questions in a minute than twelve wise men can answer in an hour." None the less, I believe I am justified in trying to trace some of the steps which aphasiologists will take in the future. The problems I have outlined are all of such a nature as would surely have intrigued Hughlings Jackson were he still with us. These questions of to-day and to-morrow reflect the enduring influence of Jacksonian principles, and the stimulus of his ideas continues to guide our investigations and our thinking. So far as the subject of language and its disorders is concerned, the future of neurological research is most certainly assured for yet another century.

BRAIN, MOVEMENT AND TIME*

BY

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It is one hundred and three years since the auspicious day that Victor Alexander Horsley was born; and forty-four years have passed since he bowed to human frailty in the sixtieth year of his life in the midst of his last inspired and inspiring campaign for his country and for his profession. One hundred years have passed since the founding of the National Hospital that he served so loyally and with such distinction. We meet here in this hall, and under the chairmanship of the President of that professional association in which Sir Victor played so vital a part. We are met here to pay homage to a great man, a distinguished neurologist and a leader in surgery—Sir Victor Horsley.

I am persuaded that Sir Victor is not dead. The knowledge and the impetus that he gave to medical science and technique live on—increasing in significance as following generations build and will continue to build upon them. We may feel the joy that we believe he feels in the centenary celebrations of his hospital, the pride that he has in the magnetic influence of Queen Square, which he helped to increase in his mortal days, and which continues to increase in force and scope to this present. If I read his thoughts aright he views with favour and admiration the achievements of the British Medical Association in these days; and its Royal Presidency must give him the deepest satisfaction.

Sir Victor was a surgical neurologist. I am indebted to his successor at University College—the late Sir Wilfred Trotter—for the phrase. Sir Victor was a devoted clinician. It has been well said that Queen

Square was and is the cradle of neurology. Sir Victor brought the humane grace of surgical therapy to attend the infant in that cradle—the clinical science of neurology. He pioneered surgical neurology as a specialized clinical discipline. He was an experimental physiologist. The clear and purposeful planning of his investigations yielded to him important scientific knowledge in spite of the relatively crude techniques then available.

The living pathology and especially the mechanical pathology of the nervous system also received Sir Victor's attention and interest, as witness his work on the mechanism of papilloedema and on the effects of experimental cerebral compression. It is in this latter field—that of the living and moving pathology of cerebral displacements—that I propose to present some comments that I believe would interest Sir Victor and may, I hope, satisfy the Memorial Trustees.

The title I have chosen—"Brain, movement and time"—is intended to imply simply the effect on the brain of its abnormal movement in relation to its containing coverings; and the differing effects of the varying periods of time in which these movements may take place. In other words, I shall endeavour to survey the vital pathology of the brain under stress of displacement at various time rates, the clinical effects and the principles of their management.

Anatomy, Physiology, and Pathology

The containing coverings of the brain, the skull, the dura mater and its partitions, constitute two forebrain compartments and a hind-brain compartment connected with each other by the "narrows" at the archway under the falx cerebri and at the incisura tentorii. When the brain is displaced the linear displacement is greatest at these "narrows." The anatomical arrangement of the blood supply is such that the arterial circle of Willis is relatively fixed to the skeleton of the head. The perforating arteries of the base cross the subarachnoid spaces in their short course from the fixed arterial circle to the overlying brain; and here they are peculiarly vulnerable. Under certain pathological conditions the brain may move extensively in relation to the fixed circle. The delicate perforating arteries are stretched, attenuated, and their calibre is reduced or occluded. There ensues ischaemia, hypoxia, or infarction in their territory of supply. This includes the diencephalon and mid-brain, containing the reticular formation, the archipallium, and the hypothalamus. Ischaemia in this field finds clinical expression in impairment of consciousness, alterations of emotional state, and derangements of homeostasis in several fields—notably control of body temperature, of respiration, of visceral motor and secretory function, and of pituitary endocrine function. The long tracts traversing this zone may suffer hypoxia.

The time factor is important in relation to brain displacements. If the displacement is slow enough the dural partitions yield considerably and so mitigate the effect; and the arteries adapt themselves to the deformation without loss of calibre until displacement becomes extreme. On the other hand, the more rapid the displacement the severer the effects as regards herniation through rigid apertures at the "narrows" and as regards early arterial occlusion. Abrupt displacement adds another factor. Sudden stretching of an artery causes spasm of its walls, and the occlusion and ischaemia due

*The Victor Horsley Memorial Lecture (slightly abridged), given at B.M.A. House, London, on June 24, 1960.