The First J. C. Richardson Lecture: "That 'I Am' "

DENIS WILLIAMS

The first J. C. Richardson lecture was given by Dr. Denis Williams, Editor of "Brain," and The Senior Physician, The National Hospital, Queen Square, London W.C.1. It was presented in the Medical Sciences Building, University of Toronto on January 28th, 1974 and is printed here in its entirety.

We are gathered here this evening entirely to show our affection and admiration for one of Canada's notable physicians; you to do so without words, and I, perhaps with too many. There cannot be any among us who does not know Dr. Richardson and there is certainly no-one here who is not grateful for his friendship and either for his care and devotion, or for his scholarship, his teaching, or his guidance in professional affairs. This guidance is personal and is also communal, as is epitomised in that tireless but quiet statemanship which caused the University of Toronto to appoint him to its first Chair of Medicine in Neurology. Clearly, like so many better things which you have over here, the adage of the Old World that "a prophet is without honour in his own country" cannot apply to the New.

Who am I to commend Dr. Richardson to you? That you have founded this lecture speaks for itself. I expect I have known him as long as almost anyone here, for we first met at The National Hospital, Queen Square in London just on 40 years ago. Thus, I have the honor to give this first lecture through my long association with him, with neurology in Toronto, and especially through the close links which have been forged between The National Hospital and so many here this evening.

Clearly, you have not come so much to hear me as to make me your voice in this regard. Dr. Richardson has so many friends in every walk of medicine and its related sciences that it would be unseemly for me to confine my address to a special corner of clinical neurology, for there are many here who are not clinical neurologists. I could, for instance, discuss the eponymous disorder to which Richardson has lent his name — a disease more rare than diamonds but to be found for the searching; that would bore you and probably him. I thought that it would be better for me to choose a topic which interests and involves us all, whatever our medical or scientific backgrounds, and what more inclusive than my title, "That 'I am'."

NEUROLOGY

I am, however, only qualified to talk about neurology, but I would like to leave you at the end with a sense of how pleasant and how broad the practice of neurology is. It has been called the Queen of Specialties; if it is, Dr. Richardson is one of her courtiers. It only takes a moment's thought to appreciate that neurology embraces the whole of medicine and much of surgery too, for the nervous system is ubiquitous in its ramifications in the body and in its effects both upon the body and the mind, whether through physical or chemical agents. The neurologist of course cannot be expected to have the special skills of the surgeon, or the special techniques of the endocrinologist, but he does expect to know what the surgeon or the endocrinologist is doing, or trying to do, and why.

NEUROLOGY AND PATHOLOGY

Let me now quickly consider the way in which neurology has evolved in these forty years. When Richardson came to Queen Square, neurology was entirely based upon two sciences, neuroanatomy, a subject to which my equally close friend Dr. Freda Richardson has devoted so much time and skill, and upon neuropathology practiced especially by Dr. Godwin Greenfield and continued here by the other Dr. Richardson. Those were the days of the recognition of syndromes and diseases, when disorder of function had a counterpart in disturbance of the structure of the nervous system, apart from rare exceptions such as hypoglycaemia which had its iatrogenic origins in this city in 1922.

Here, on his return, there was much interest in the causes of intracranial hemorrhage, and when I was here in 1936 Dr. Hannah and Professor Linell were studying the nature of subdural hematomas and later Clifford Richardson and Herbert Highland, the clinical presentation and nature of subarachnoid hemorrhage. The discovery of physical causation was an adequate science in itself, but of necessity it was directed to neursurgical cure. Neurology, so far as treatment went, was then the servant of neurosurgery. It is no longer so, neither is the neurosurgeon dependent upon the physician for his diagnosis. We work as equals with overlapping interests, but often with different attitudes, as friends should.

At that time advances in clinical knowledge were dominated by those who could discern disorders of structure and could rectify them—

Cushing, Jefferson, Dandy, Moniz, Cairns, Penfield and perhaps the greatest *surgeon* of all, Dr. Kenneth McKenzie of Toronto. He wrote so little, but was esteemed by his peers so much. Again the Old World has been proved wrong. "By their works shall ye know them." Unfortunately, often now by the weight of their reprints rather than of their argument.

I recall the time when Dr. Richardson in 1936 showed me a whole cerebral hemisphere in a pot and asked me what I thought about it. I said there had been occlusion of the middle cerebral artery with infarct and then to my astonishment he said that the patient was still alive. I didn't believe him at first, but he brought the patient to see me and she, Betty Cardwell, was able to tell me that since Kenneth McKenzie had operated upon her, she had had no epilepsy, she felt more at peace with her family and the world, and her life had been revolutionised for the better. Even the way that she used her left hemiplegic side had improved. She did not know that Kenneth McKenzie had removed the damaged right hemisphere in one piece leaving only the thalamus and basal ganglia. An account of that pioneer and successful total hemispherectomy, performed many years before any other, was never published by McKenzie, and the only account of it in the world literature is still in a paper on another subject for which we used this patient, written by Professor John Scott and myself in 1939.

BRAIN WAVES

In the thirties, the advance of neurophysiology was determined by refinement in electrical recording, from the string galvanometer onwards. The use of induction coils and then the cathode ray oscilloscope confirmed Caton's (1875) and then Berger's more detailed observation of brain waves. The centenary of Hans Berger's birth has just been celebrated. We know how much the electroencephalogram advanced the understanding of the epileptic event. It gave a dynamic, even living, physical counterpart to the changes in consciousness, of feeling and of behaviour which happen in an attack. It taught us much about normal cerebral activity, especially in natural and drug-induced sleep. It also monitored the neurosurgeon's interruption of cortical and subcortical activity.

Patterns of abnormal electrical activity were quickly recognized in the epilepsies, in structural disease, in metabolic disorders, and in unexplained disturbances such as criminal psychopathy, persistent aggression and schizophrenia. After a third of a century of widespread use, the electroencephalogram still contributes to the routine investigation of patients, but its use as a clinical research tool is declining. I will leave this phase of neurological advance with this brief statement, for I have been identified with it since its beginning.

THE RETICULAR FORMATION

In the early forties the electrophysiological studies of Hess in Zurich and Bremer in Brussels were taken up in man by Magoun, Green, French, Jasper and others over here. The astonishing beginning and growth of our knowledge of the basis of consciousness occupied the literature and our thinking. It brought a new dimension to the philosophy of behaviour. Here in the upper brain stem, associated with phylogenetically simple structures, was a fairly homogenous system of reticular cells which modified the activity of the equally ancient but more organized structures on the medial surface of the temporal lobe. Here was a system which evoked protective responses to environmental changes in creatures so lowly in development that they hardly had any 'brain' at all; and yet the system was much the same in man. These were the structures which obviously altered the electrical activity of the whole brain (as in encephalitis) and which less obviously altered the awareness and responsiveness of the whole creature — hence the name "the activating system." Richardson and I learnt of this early work in England during the war, where we met again from time to time, he in the Canadian Army, I in the Royal Air Force.

STEREOTAXIS

This work led upwards to the thalamus which Earl Walker (1938) had coincidentally been studying morphologically in minute detail. Teams of scientists had been working upon sophisticated improvements to apply to man the stereotactic device for a cat's brain which Clarke from St. George's Hospital and Victor Horsley, the neurosurgeon at the National Hospital and University College Hospital had perfected in 1908, and which is still used by physiologists today. The modifications were needed to accommodate the individual parameters of each patient's skull and brain. Here at last was controlled neurosurgery of deep structures, still rather empirically linked to function, which made possible alleviation of parkinsonism and pain. Deep structures could be explored with the same accuracy as the cortex had been by your colleagues in the Montreal Institute led by Penfield and Jasper. It is historically interesting, though, that for several years before, the technique was being used elsewhere; in 1947 I took a patient with intractable pain over to David and Taliarach in Paris for stereotactic thalamotomy and she came back relieved. Between 1949 and 1953 I was able to publish papers in Brain on the electrical activity of the thalamus in disordered consciousness and in petit mal epilepsy.

CONTRAST NEURO-RADIOLOGY

None of this would have been possible without the consequences of Dandy's ventriculogram, Moniz's air encephalogram which had followed upon Sicard's discovery of the use of Myodil for myelography, and of course, the more recent cerebral application of angiography. Yesterday's magic is now succeeded by the magic of radiological and ultrasonic scanning, culminating in the transverse axial tomography of the EMI scanner which has been evolved by Houndsfield in England and already so successfully tested in St.

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George's Hospital and in The National Hospital. Each new application of basic knowledge to medicine is immediately tried, and in no time at all finds its place in diagnosis and treatment. The new intern takes it all for granted, but when Richardson returned to Toronto from Queen Square, contrast radiology was still in its infancy. Most patients were studied by detailed clinical methods, a straight X-ray, an elementary examination of the cerebrospinal fluid and blood, and little else. There were no antibiotics or steroids.

I must pass over the present fascinating advances in virology, serology, experimental neuropathology, and transmissible diseases to point out that neurochemistry has replaced the neurophysiology of early days as the advancing edge of neurological knowledge. What we observed electrically was actually only one step up from intracellular chemical changes in the complicated path from molecules to behaviour. It has rightly been said that the advance in knowledge in medicine is faster than in any other branch of science, including perhaps nuclear physics. What I have seen in Toronto, as visiting professor, shows the vitality of all aspects of the neurological sciences in this great center with its seven related hospitals.

BEHAVIOUR

We entered a neurology firmly based on pathology, the science of structure; but its practice also depended fundamentally upon Sherrington's reflex arc. In his "Man on his Nature" Sherrington thought away above reflex function, but the working clinician seemed unable to do so, and there were then those who sought to explain all human activity by the application or elaboration of such a physical abstraction as the reflex arc to our thoughts and purposes. I am sorry that my only personal contact with Sherrington was when he examined me as a student.

I suspect that Sherrington supplied the basis for neurological examination for most of us whilst Jackson gave us substance for psychological or philosophical contemplation. There was a gap between our knowledge of the two. Now that has been changed, psychology and its unstable relation, psychiatry, are no longer far removed from neurology. Indeed, neurology, which after all is the study of man and his thoughts, feelings and behaviour, has so much to offer to the study of man's higher functions that I will try to show you through my own experiences how this may be so.

I entered neurology after general medicine, through work upon the anatomy of the innervation of the cerebral circulation. This took me to some work on its physiology, for at that time Penfield and others thought that the epileptic event was determined by local vascular changes. This took me just on 40 years ago to the local electrical changes in epilepsy, and so to the electroencephalogram. Fortunately, I think, I saw this device as a diagnostic or research tool, and not as an instrument for introspective science. My use of this tool lead to fascination with experiential events in epilepsy, and then on to the man himself — to his psyche and to his psychological difficulties — but that is a digression.

The delights of neurology include the fascinating glimpses of cerebral activity, normal and abnormal, which give clues to the interpretation of psychic activity in the whole man. My present interest is in the integration of all the fragments of perception which constitute consciousness into the sense which I have at this moment and which you have, too, that "I Am" which is the title of the lecture and will be the end of this talk.

CONSCIOUSNESS

The state of being conscious in the sense of Herbert Spencer and of Hughlings Jackson was the state which we experience now. I am conscious of you, and being so, I am trying to transmit my ideas to you. You, who are conscious of what I am saying, are turning my words into your inner language and so communicating my spoken thoughts to your ideas. You seem to say "what he means is." This, said Jackson is "the highest level" of cerebral activity, and he postulated that its neural substrate is in the frontal lobe. He has been shown to be right. This is in marked contrast to the other form of being conscious, the lowly brain-stem level of simply being aware and reacting — "vigilant" as Henry Head said. The higher first state needs the lowly second state just as the Beethoven we hear in stereo needs its energized transistor.

Now our relationship at this moment is the unique privilege of man. It consists of your consciousness of me, as I am here, which includes my capacity to communicate abstract ideas and your ability to comprehend them, to select, assimilate, accept or reject my ideas and finally to formulate a notion of your own. This notion is private to you, and cannot be comprehended by anyone else, unless you wish. This is Jackson's highest level. But it is not just of the frontal lobes. The whole brain is involved — sound becomes speech which becomes understanding which is integrated with past experience and past understanding. The sound was accompanied by sight, and notice that the minute amount of light received from my surface by your retina is nothing compared with that from the illumination of the theatre, and yet it involves you so much more. Those units of light must have been especially charged, presumably by attention or by emotion, or both. The first physiological state focuses attention, the second amplifies emotions, and of course the whole is again enhanced by the psychological set of this occasion.

So we have this chain of events, the activity of many lobes of the brain, temporal (sound), parietal (speech), frontal (abstract thinking), occipital (vision), temporal (emotion and past experience) . . . and round and round and in and out in "the enchanted loom" to take Sherrington's phrase. We use much of our cortex all the time — some of us more than others — but in such a complex way that even when James O'Leary put his vast knowledge of electrophysiology together it did not make an analogue of human feeling or behaviour. Here the sum of the product of the parts can never make the whole.

TEMPORAL LOBE EPILEPSY

Let us take an example; let us consider the functions of the temporal lobe reflected through the medium of temporal lobe epilepsy which has taught us so much; for epilepsy is a mirror, though granted a distorting one, of brain function. Granted too, that whilst epilepsy may reflect executive function in the brain, when the epileptic event invades integrative cortex, it disintegrates for it can never integrate. What epilepsy tells us about the working of the temporal lobe is supported by the observation of the effects of injury, whether accidental or caused by surgery, and by experimental stimulation.

The phrase 'temporal lobe epilepsy' which is synonymous with psycho-motor epilepsy, refers to the kind of attack rather than its exact morphological substrate. For the division of the hemisphere into lobes is an artefact of convenience of the morphologist. The temporal lobe merges into the frontal lobe anteriorly, with no exact boundary, and the activity of the orbital surface of the frontal lobe, reflected in such visceral effects as alterations in blood pressure, or of the buried cortex of the insula in gastric and intestinal motility are reflected in examples of temporal lobe epilepsy. Posteriorly the visuo-psychic cortex knows no distinction between occipital and temporal lobes. Indeed, it is the experience of all of us that visual hallucinations, organized and elaborate, which constitute the 'dreamy states' of Gowers, are common in temporal lobe epileptic experiences.

Finally, I emphasize the absence of boundaries on the medial aspect of the temporal lobe, which is so intimately continuous with the limbic lobe that it constitutes a neopallial extension of that structure. It is as intimately continuous with the limbic system, which is as we have seen responsible for the substrate of consciousness in function as in structure. It endows the primitive state of vigilance or awareness, consciousness as a state of being, with the capacity to be 'conscious of' which is an entirely different attribute, in quality as well as kind. The temporal lobe is the head ganglion of consciousness.

Yakovlev has emphasized the holistic character of the cortical layers of the temporal lobes, a character necessary to achieve this extension of function, as I have pressed elsewhere (1968). Consider the gross topography of the lobe in relation to known functional areas of cortex.

Hearing is in the first temporal convolution (Heschl's gyrus) and around and below the auditory integrative cortex. Below that is the 'vestibular' cortex for equilibration. But important to our arguments, contiguous above the Sylvian fissure is the somatic sensory cortex, and posteriorly, continuous with this, visual sensory and its surrounding visual integrative cortex. Deep is the olfactory-gustatory cortex.

The temporal lobes are the integrators of perception. They are surrounded by receptive cortex serving the five senses, the common bodily sensations, and within them is the receptive cortex for those especial sensations which we call emotions and moods, Williams (1956).

Let us now consider some of the perceptual events of temporal lobe epilepsy, bearing in mind that in this form of focal epilepsy, more than in any other, amnesia is likely to supervene and so to cloud the mirror. This is because, I think, the integrative cortex serving consciousness — the consciousness of — is disintegrated in its function by the epileptic events. This is not the time to recite epileptic anecdotes: let me generalize upon temporal lobe epilepsy.

Special Senses

The experiences are nearly always organized. They may involve one or several of the special senses in hallucinations; if the hallucinations are visual they are elaborate, and generally involve the person himself, either in the hallucination or related to it spatially or emotionally; an ictal emotion or mood (often anxiety or fear and generally unpleasant) is common and it invades the hallucinatory experience; senses elide one into the other as "I smelt a smell like the sound of blue thunder."

The Self

The subject may feel himself to be unreal, depersonalized, and even see himself outside himself (autoscopy) or may feel the world unreal (derealized).

Spatial Relationships

Space may recede from the subject or crowd in upon him; it may seem to be minute or huge or vast and empty. It may seem to rush away or rush toward or rush by. The subject himself may seem minute or huge in relation to it, or feel hollow or insubstantial , or two-dimensional, or too tall or too short, or off the ground. "I always go into the top left hand corner" said one patient about his attack, and another described the animated hallucination he experienced "I see him behind me to my left, looking over my shoulder."

Temporal Relationships

Time may stand still or rush along alarmingly; it may be confused. The patient often comes round saying "what time is it?" or looking at his watch. Distortions of temporal recognition give anticipation, familiarity, déjà vu, jamais vu. Past memories seem to be aroused.

Emotions

I have mentioned the experience of emotions as part of these attacks. They are primarily ictal emotions, emotions without a subject or an object, and though intense they are unreal or unnatural. The commonest is fear, but the sort of fear of ghosts or dark graveyards, an unreasonable but inescapable fear.

I could go on at some length with this fascinating topic in clinical neurology. Suffice it to generalize that the epileptic event traversing the cortex in a Jacksonian way activates primary receptive or evocative cortex to induce hallucinations of any of the senses, special or bodily, hallucinations of emotion or mood, arrest of attention, with unusual spatial and temporal attributes. They are the

grotesque mirrors of what must be happening all the time in our own temporal lobes.

THE PRESENT

Our present perceptual experiences of our outside and inside worlds are integrated with our present emotions and moods; are related to our past experience — our knowledge, without which interpretation would be impossible — to comprise our personal present. "Your whole body, from wing tip to wing tip, is nothing more than your thought, itself, in a form you can see," said Jonathan Seagull (Richard Bach).

Put together or integrated into one totality in each of us they comprise the sense that "I Am." Each of us at the moment in relation to the sensations from our feet, our body in the seat, of the distance from each other, feels real with an intact "I Am." In the disintegration of epilepsy, unreality is experienced, either in the self (depersonalisation) or in the environment (derealisation). There is some disintegration of this "I Am," which becomes absolute when there is amnesia. Indeed, the "I Am" becomes the "I Am Not." I use the sentence "I Am," good clear English, in distinction to "the self" or "the ego," for those may have meanings to some of us which are tainted by experience.

It is obvious to all of us that our present world constitutes our own "I Am." But our present perceptual world includes exteroceptions as well as interoception, and at present I constitute a part, and I hope, a major, part, of your present perceptual world, your "I Am."

I would like to leave you with this idea, which is a fact and a fact which is an idea, that in-so-far as at this present, the quite small light and quite small sound which comes from me is dominating your private "I Am." I myself am an essential part of your "I Am." Equally, you in the audience involve me in an intellectual, perceptual and emotional milieu which evokes these ideas, in this present, but based upon the past. Here, my temporal lobes, with the rest of my brain, are integrating you into my perceptual and total "I Am." It is therefore clear that your "I Am" extends far beyond your body. It is an extended "I Am." Your extended "I Am" includes me and mine includes you.

I am part of you in this present. "No man is an island entire to himself" said John Donne in his 'Devotions' and "We are members one of another" said St. Paul. The physician, and especially the neurologist, today has the privilege of seeing something of the scientific bases of these acclamations, using the experience of others, who are patients, to do so. The neurologist has the great privilege of having articulate man as the subject of his researches, a privilege denied most biological scientists.

What of the past, which is essential for the understanding of the present? For obviously your past, in experience and education is essential to your understanding of my talk, for instance. When the past is lost the "I Am," disintegrates, as in some dementias.

This especial occasion is much charged with the past. Professor and Mrs. Richardson and their family are here, and I have shared their past. You are here and I have shared some of the past with you personally and professionally. I have less personally shared the past with others whose writings I have read, or who may have read mine.

It is for these personal and professional reasons that I am more honoured than I can show, and more pleased, to have given the First J. C. Richardson Lecture in Clinical Neurology.

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