DR. DEREK DENNY-BROWN, OBE, MD, DPHIL, FRCP, 1901-1981
An Appreciation

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With the death of Dr. Denny-Brown on April 20th, 1981, many of us in clinical neurology feel that we have lost a father-figure, someone to whom we could bring our professional and scientific problems for an opinion different from other opinions, based on his unique experience of the physiology and pathology of the nervous system as well as of clinical neurology. There can be few people whose influence on the neurology of this century has been greater, or whose pupils can have derived more strongly the feeling of having been changed by their experience.

Derek Ernest Denny-Brown was born in Christchurch, New Zealand on June 1st, 1901. He qualified in medicine from the University of Otago in 1924, and became a demonstrator in anatomy. In 1925 he obtained a Beit Memorial Fellowship to work with Sir Charles Sherrington at Oxford. As a PhD student (albeit a medically-qualified one), it must have been a daunting experience to join Sherrington's group which then included such figures as Sybil Cooper, R.S. Creed, and E.G.T. Liddell. His time at Oxford was in fact an astonishingly productive one, resulting in 14 papers in addition to his D.Phil thesis. These included the classical papers with Cooper and Sherrington on the flexor reflex, analysing fractionation, occlusion and facilitation, and leading to the concept of the subliminal fringe. Equally important was Denny-Brown's work with Liddell on the stretch reflex, and his work on red and white muscle, from which came his view of reflex postural contraction as the result of a slow, repetitive motor-unit discharge

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occurring particularly in red, slowly-contracting muscles, and stabilised by a balance between excitatory and inhibitory afferents. The steps by which this conclusion was reached are clearly summarised in the book entitled 'Reflex Activity of the Spinal Cord' by Creed, Denny-Brown, Eccles, Liddell and Sherrington, published in 1932.

From his experience at Oxford Denny-Brown derived not only his abiding interest in posture and movement but also the Sherringtonian principle that the physiological method is most effective when firmly linked to histological studies of the same system. His friendship with Charles Sherrington was something which remained a source of pleasure and animation throughout his life.

In 1928 Denny-Brown was appointed Resident Medical Officer to the National Hospital for Nervous Diseases at Queen Square. At that time the senior staff of the hospital included Gordon Holmes and Kinnier Wilson; among the junior consultant staff were Walshe, Adie, Riddoch and Symonds. The registrar (a neurologist-in-training responsible for organising the outpatient clinics) was MacDonald Critchley, and the pathologist was Godwin Greenfield. Of all Denny-Brown's teachers at Queen Square, the one who influenced him most was Gordon Holmes. Denny-Brown subsequently wrote, "He (Holmes) had discovered early in his studies that the elicitation of scientific data at the bedside required a discipline of method as rigid as that of the laboratory. This he never tired of demanding of his house officers and clinical clerks. Others would discourse on the scholarly aspects of varieties of disease, to which Holmes would also add pearls from his enormous experience, but what one gained particularly from him was an abiding interest in the *how* of symptomatology, and ways of eliciting physical signs that gave them infallible significance."

For Denny-Brown the years at Queen Square were as important as those at Oxford. With his immense capacity for hard work, he was soon undertaking research (with Graeme Robertson) as well as completing his clinical training. In 1931 he became registrar to outpatients, subsequently moving to Guy's Hospital where he was registrar to Charles Symonds until his appointment to the consultant staff at Queen Square and at St. Bartholomew's Hospital in 1935. In 1936 he gave the Goulstonian Lectures at the Royal College of Physicians and in the same year received a Rockefeller Travelling Fellowship to work with John Fulton at Yale. From this year came his expertise in operating on monkeys, and his interest in primate research as a method of providing a better understanding of human movement disorders.

Returning to England in 1937, Denny-Brown resumed his practice and teaching at Queen Square and embarked on his study of human fibrillation and fasciculation with Pennybacker, followed by his study of myotonia with Nevin. In 1939 he accepted the directorship of the Harvard Neurological Unit at the Boston City Hospital, but the arrangements were disrupted by the outbreak of World War II, and Denny-Brown, together with other Queen Square neurologists, moved to the Military Hospital for Head Injuries at Oxford and then into uniform. This period gave him the opportunity to return briefly to the physiology laboratory at Oxford to work on concussion in experimental animals with Ritchie Russell.

In 1941 Denny-Brown was released from the British Army at the express request of Dr. Conant, the President of Harvard University, in order to take up his appointment in the Medical School. As a wartime project Denny-Brown proceeded to study the effect of trauma of peripheral nerves, collaborating with Charles Brenner, Margaret Doherty and Raymond Adams. In the course of this work Denny-Brown identified segmental demyelination as being the morphological change responsible for conduction block, a concept which was subsequently to prove of great importance to our understanding of generalised peripheral neuropathy and of central demyelination. In 1945 Denny-Brown was given leave from Harvard for further military service in the British Army, during which he acted as consultant neurologist in India and South East Asia. From this period came his interest in nutritional deficiency disorders and in thiamine-deficiency neuropathy in particular.

Returning to Harvard in 1946 he became James Jackson Putman Professor of Neurology, a chair which he held until 1967. These years, during which he directed the Harvard Neurological Unit at the Boston City Hospital, probably represent his greatest contribution to the clinical neurology of our time. First of all, he saw clearly that neurology must be separate not only from internal medicine but also from psychiatry, and that while the neurologist must derive his inspiration and raison d'etre from the patient, skills in neuropathology and physiology were the weapons he needed to make original contributions to the subject. He was one of the first to recognise the importance of neurochemistry, and in his Shattuck Lecture in 1952 he used current work in this field to illustrate his theme that neurology and the neurosciences had grown up, and had become a defined and distinct subject within medicine.

In fact, the neurological unit at the Boston City Hospital at that time attracted some of the most brilliant young men in American medicine, and Denny-Brown's influence on the subsequent development of American neurology was as much through these academic clinicians who had worked with him, as through his own writings. By the early 1960s he could write, "Out of 41 university departments in the United States, 19 (almost half) had departmental chairmen who had the major part of their training in the neurological unit of the Boston City Hospital".

In 1960 Denny-Brown was invited to be the first holder of the new chair of clinical neurology which was to be established by the University of London at Queen Square. Refusing the post with great regret, on grounds of age, he wrote in characteristic fashion to the Dean at Queen Square a long letter which has been preserved, setting out his views on the training of academic neurologists, and asking many shrewd questions. Who would

look after the 30 beds he asked, so that the professor did not spend too much time in the day-to-day care of patients? For whom was the teaching? Was it to train future academics or busy consultant neurologists in the British National Health Service? What, he asked ominously, would be the position with regard to neuropathology? Could he be assured that residents would rotate through neuropathology, and that the new professor would have responsibility for organising their neuropathological teaching? He wrote "Neuropathology is the essential science of neurology, and unless the neuropathology laboratory is the place where everybody works in some degree, no scientific progress can be made...If some doubt my insistence on full-time training in neuropathology, ask them to look up the records of Wilson, Collier, Holmes, Symonds and Adie."

He concluded his letter as follows: "I wish this was all ten years ago, and I would have come like a shot. Now there are many complications, but rest assured that I would *like* to come." Sadly for the staff at Queen Square, Denny-Brown never became their first professor of neurology, but his affection for the hospital remained, and he gave up much time to advise and help in the years that followed.

Meanwhile the output of papers from the Neurological Unit at the Boston City Hospital was astonishing; from this small unit some 230 appeared between 1957 and 1967, of which Denny-Brown himself was the author or joint author of more than 60. Far from stopping his experimental work in 1967 when he retired from the Harvard chair, he moved to the New England Regional Primate Research Centre, from which he continued to publish experimental papers. Some of these were written while he was Fogarty Scholar-in-Residence at the National Institutes of Health in 1972-3, including his last paper in Brain in 1973, in which he and Yanagisawa established that the area and severity of sensory loss after trigeminal tract section in monkeys could be strikingly modified by pharmacological agents such as strychnine or LDopa.

After completing his experimental studies, Denny-Brown accepted the task of editing the official history of the American Neurological Association for the centenary of the Association in 1975. This formidable task, involving collation of the biographies of 100 past-presidents, and detailed accounts of the development of neurology in different regions of the United States, was admirably achieved by Denny-Brown and his assistant editors. The book contains a short biography of Denny-Brown himself by his friend and collaborator Joseph Foley, which lists his many academic honours. These included honorary degrees awarded in America, the United Kingdom and New Zealand, and honorary membership of many foreign medical societies. He served as President of both the American Neurological Association and the American Association of Neuropathologists. In England he gave the Croonian Lectures at the Royal College of Physicians in 1960 and the Sherrington Lectures at Liverpool in 1963. He received the Sherrington medal of the Royal Society of Medicine in London in 1962.

His presentations at meetings continued long after his official retirement, the last one being at the Boston meeting of the American Neurological Association in September, 1980. By this time, however, his health, which had started to deteriorate several years earlier, was such that he needed a stick to stand at the rostrum. In characteristic fashion he was particularly irritated by the way this interfered with his presentation of the slides. His last illness, which was a protracted and painful one, was faced with indomitable courage, and he continued to correspond on scientific matters almost to the end. In a letter written a few weeks before his death, he apologised for the delay in writing, mentioning the difficulty of typing while lying flat.

The loss sustained by his devoted wife, Sylvia, and by his children is one which we all share. For those of us who had the privilege of his friendship there is something missing from our world which cannot easily be replaced.