Neurosciences and History 2015; 3(1):45-48

Walter Russell Brain (1895-1966)

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ABSTRACT

Walter Russell Brain played a central role in the recent history of neurology. A prolific writer, he published articles on such different subjects as epilepsy, aphasia, exophthalmos, cervical spondylotic myelopathy, and carpal tunnel syndrome. He also wrote and edited several books, including *The Remote Effects of Cancer in the Nervous System, Recent Advances in Neurology*, and his most important contribution, *Diseases of the Nervous System*. He even became the editor of the prestigious journal *Brain*. W.R. Brain was the sole author of the first six editions of *Diseases of the Nervous System*, and many other editions have also been published posthumously, the latest in 2009. This monograph includes chapters on a variety of entities including porphyria, altered cognitive development, disorders of muscle, coma, and neurosyphillis, among others. The aim of this article is to pay tribute to the author of what is still regarded as a model neurology treatise.

KEYWORDS
Walter Russell Brain, neurology, porphyria, neurosyphilis, coma, *Diseases of the Nervous System*

The purpose of this article is to analyse *Diseases of the Nervous System* by W. Russell Brain. My reasons for choosing this topic are twofold: firstly, to pay tribute to the author who, without any outside assistance, wrote a model neurology textbook. Secondly, it was with this book that I initiated my studies of clinical neurology.

Walter Russell Brain, First Baron Brain of Eynsham, was born on 23 October 1895 and died on 29 December 1966 at the age of 71 years.[1,2] Russell Brain's parents were Walter John Brain, a Reading solicitor, and Edith Alice Smith. Brain was educated at Mill Hill School and then New College, Oxford, where he first read history.

After the outbreak of the Great War in 1914, he enlisted in the Friends' Ambulance Unit as a volunteer. Since he was a conscientious objector, he was allowed to remain in this non-combat unit, and he would later become head of the X-ray department. With the war over, he returned to New College, Oxford, to study medicine. A brilliant student, his efforts were rewarded with the Theodore Williams Scholarship in Physiology. He was also awarded the Price University Scholarship in Anatomy and Physiology by the London Hospital.

Russell Brain was trained at London Hospital. After becoming a qualified doctor, he joined the staff of what is now the Maida Vale Hospital for Nervous Diseases, and later transferred to the London Hospital.

Brain was soon considered a prestigious clinician and gained widespread recognition for his original and meticulously written articles. Of particular interest are his 1930 review of multiple sclerosis and his studies of epilepsy, aphasia, the relationship between higher functions and nervous system, neuropathy of the median nerve or carpal tunnel syndrome, exophthalmos, and cervical spondylotic myelopathy. In 1965, only a year before his death, he published his last scientific book, this time with F.H. Norris as co-editor. The book was titled *The Remote Effects of Cancer in the Nervous System*, and it was here that he wrote, "it has been on the whole neurologists who have drawn attention to these complications of cancer and not the oncologists".[3]

Russell Brain was a tireless worker, both in the clinical setting and in his endeavours to organise and direct social and professional societies. He presided over both the Royal College of Physicians and the British Neurological

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Figure 1. Walter Russell Brain (1895-1966). SEN historical archive

Association. Brain participated and chaired several committees on drug addiction and family planning in addition to the Royal Commission on Marriage and Divorce. Russell Brain also raised social awareness to promote integration of epileptic patients in society. These social activities were related to the religious beliefs that led him to join the Religious Society of Friends (Quakers) in 1931.

His publications included 141 scientific articles and many others on philosophy, ethics, and sociology. His main works include *Diseases of the Nervous System* (first published in 1933) and *Clinical Neurology* (first published in 1960). He wrote many monographs and published *Recent Advances in Neurology* with E. B. Strauss as co-author. He also served as editor of the prestigious journal *Brain* for many years.

The most influential of his works, and the main focus of this article, is *Diseases of the Nervous System*. He was the sole author of the six editions of this book published between 1933 and 1962.[4] After his death, further editions of the treatise, revised by J.N. Walton, were published in 1969, 1977, and 1985. In 1993, J.N. Walton presented a new edition in collaboration with several other prestigious scholars. More recently, two new editions were published in 2001 and 2009 with M. Donaghy as editor-in-chief and with the collaboration of many other neurologists. The latest edition comprises 1504 pages. Oxford University Press has published all editions of the book.

The 1962 edition, with Brain as its sole author, has 23 chapters. Brain had already been made a baron by that date, and was therefore credited as Lord Brain. The author mentions in his preface that new sections describing advances in clinical neurology had been added to the 1955 edition. Especially valuable and ground-breaking were the sections on porphyria, hepatic encephalopathy, biochemical changes related to metabolic encephalopathies and intellectual disability, muscle disorders related to carcinomas, thyroid disorders, polymyositis and muscular symptoms related to collagen diseases, and disorders of potassium metabolism. The author also highlighted his expanded section on coma aetiology and coma patient examination. Furthermore, Russell Brain mentioned the revisions and updates in the section on extrapyramidal system disorders and the psychological facets of neurology. This edition included new illustrations.

Chapter 15 lists the neurological manifestations of acute porphyria and distinguishes two types: congenital or erythropoietic porphyria and acute intermittent porphyria. The latter causes changes in the liver metabolism of porphyrins, which in turn generate lesions in the neurons of the anterior horn of the spinal cord and produce demyelination of peripheral nerves. The author mentions that brain lesions are difficult to assess. Metabolic disorders with altered acetylcholine synthesis are associated with vascular alterations of unknown origin.

Clinical manifestations appear suddenly and are generally triggered by use of barbiturates or sulphamides, or by alcohol consumption. Patients will present confusional

state, convulsive seizures, stupor, and coma; they also experience predominantly motor polyneuropathy, abdominal pain, nausea, and vomiting. Urine is frequently dark-coloured since it contains porphobilinogen and aminolevulinic acid, both of which are porphyrin precursors.

Neurological manifestations of chronic liver diseases may be triggered by gastrointestinal haemorrhage, barbiturates and morphine use, and by surgical procedures to treat portacaval anastomosis. Clinically, they manifest as psychiatric disorders and somnolence; flapping and rigidity are observed on examination.

The section on abnormal cognitive development includes phenylketonuria (described by Fölling in 1934), an inborn error of metabolism in which the phenylalanine hydroxylase enzyme does not convert phenylalanine to tyrosine. Affected children have a normal appearance but present psychomotor development and convulsions. Almost all these children are blonde with very fair skin. When ferric chloride is added to a patient's urine, it turns a bluish-grey colour. Brain included Hartnup disease in the same group; this disease's clinical characteristics include skin rash (pellagra-like dermatosis), cognitive decline, and episodes of ataxia. Patients tend to improve with age and ataxia will resolve spontaneously.

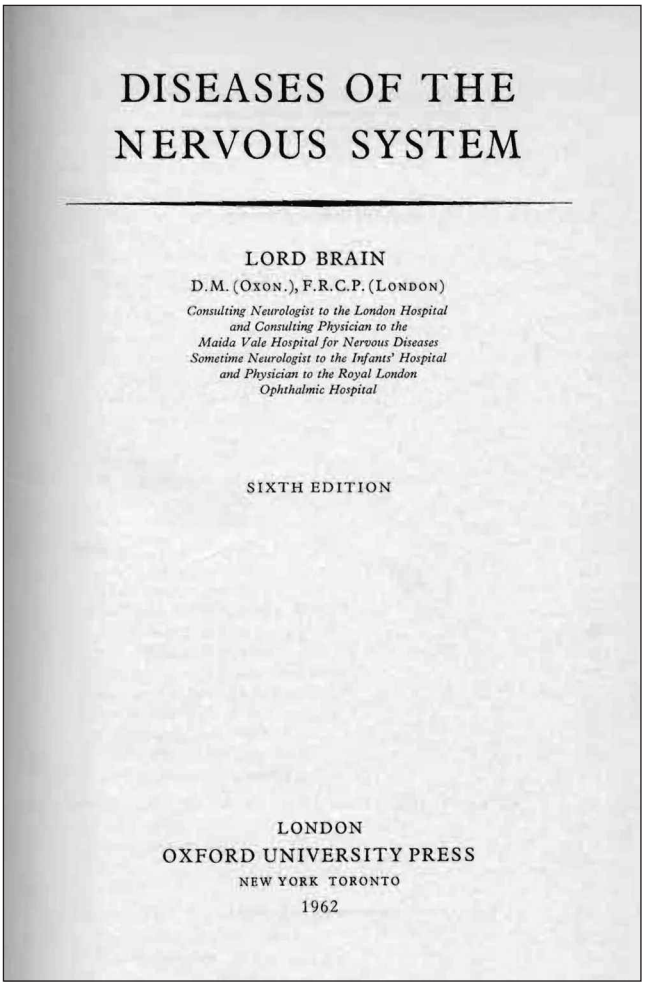
The most groundbreaking contribution in this publication is probably the section titled "Carcinomatous neuropathies and myopathies", excerpted below.

> During recent years abnormalities in various parts of the nervous system and in the muscles have been noticed to occur with increasing frequency in association with neoplasms of the viscera, but unrelated to the presence of metastases.[4(p657)]

The author went on to mention other researchers, including Denny-Brown, who published two cases of carcinomatous neuropathy and myopathy in 1948.

Brain and Henson reported various cases in an article published in *The Lancet* in 1958: 8 cases of cortical cerebellar degeneration, 7 cases of mixed forms, 5 cases of sensory neuropathy, 5 cases of peripheral (sensorimotor) neuropathy, and 17 cases of neuromuscular disorders. The authors stated, "[t]here is at present no explanation of the association between the carcinoma and the changes in the nervous system and muscles".[4(p657)]

In the chapter on muscle disorders, Brain provides the first explanation of the relationship of polymyositis and dermatomyositis with such collagen diseases as lupus and polyarteritis nodosa, rheumatoid arthritis, and ankylosing spondylitis.


DISEASES OF THE NERVOUS SYSTEM

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SIXTH EDITION

LONDON
OXFORD UNIVERSITY PRESS
NEW YORK TORONTO
1962

Figure 2. Cover of *Diseases of the Nervous System* (1962)

One of the sections to have undergone the most expansion focuses on coma. Coma had been addressed in a section covering a single page in the 1955 edition. In W.R. Brain's last edition, in 1962, the section comprised 8 pages. He describes the main aetiologies of that condition, especially hepatic coma and coma secondary to pituitary and thyroid pathology. This section ends with a detailed study of the clinical symptoms.

Russell Brain's opening chapter offers a very clear overview of the invariably complex neurophysiology of the nervous system, as we can see from the following

excerpt:

> The corticospinal tracts are the means by which the nervous impulses which excite voluntary movements pass from the cerebral cortex to the lower motor neurones which arise in the brain stem and spinal cord. The corticospinal fibres or upper motor neurones are the axons of cells of the precentral gyrus. Electrical excitation of these cells causes movements of the opposite side of the body. The movements thus excited are not simply contractions of isolated muscles, but always involve groups of muscles contracting harmoniously, so that an orderly movement results. The upper motor neurones therefore are organized in terms of movements, in contrast to the lower motor neurones, which are distributed to groups of muscle fibres in individual muscles.[4(p1)]

Clinical experiences with classic neurological processes can still be consulted in the oldest chapters. For example, in the chapter on neurosyphillis, which was highly incident during the 1960s, the author states:

> The onset of tabes is usually gradual and insidious, but exceptionally it is rapid and the patient may become grossly ataxic within three months. Usually sensory symptoms, especially pain, precede ataxia by months or years, but ataxia may develop early, and a distinction between pre-ataxic and ataxic stages, though useful, is not universally applicable. Frequently the early sensory symptoms are so slight that the patient does not come for treatment until a more serious symptom develops. Hence the symptom which brings him to the doctor may be pain, ataxia vomiting, impotence, disorders of micturition, failing vision, diplopia, or even arthropathy.[4(p381)]

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