Some Liverpool contributions to neurology and medicine

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Introduction

Liverpool may be synonymous with football and The Beatles, rather than with medical advances, but nonetheless there are some notable contributions which emanate from the city and the surrounding area of North West England. Some examples include:¹,²,³

- Public Health: WH Duncan (1805-1863) was the first appointed Medical Officer of Health in 1847, until 1863; a plaque records his residence at 54 Rodney Street (as currently numbered), a few doors along from the house in which Gladstone was born, and a public house in St John’s Lane bears his name, not to mention a building in the University of Liverpool Medical School;⁴,⁵

- Radiology: Thurstan Holland was the first to set up a radiology department, at the Royal Southern Hospital, in 1896, following the first use of Roentgen’s discovery of X-rays in Liverpool by Jones and Lodge in February 1896;⁶,⁷

- Tropical medicine: Liverpool was the first UK city to open a hospital dedicated to tropical disease, in 1899, beating London by a few months. The Nobel Laureate Ronald Ross was an early appointment;⁸

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⁸ P.J. Miller, ‘Malaria, Liverpool’. *An illustrated history of the Liverpool School of Tropical Medicine 1898-1998* (Liverpool, Liverpool School of Tropical Medicine, 1998).
• Orthopaedics: the work of Hugh Owen Thomas and Robert Jones is well known; in more recent years John Charnley pioneered hip replacement surgery at Wrightington Hospital, Wigan;

• The aetiology and treatment of Rhesus haemolytic disease of the newborn was elucidated by Cyril Clarke and Ronald Finn.

In more recent times, generic instruments bearing the name of the city have been developed, including:

• The Liverpool Care Pathway for the dying, which is widely used in palliative care;

• The Liverpool Adverse Events Profile, a systematic measure of the adverse effects from antiepileptic drugs;

• The Liverpool algorithm for investigation and treatment of suspected viral encephalitis in immunocompetent individuals.⁹

At risk of appearing Whiggish, this article concentrates on a number of individuals who have made contributions to neurology, neuroscience, and related disciplines whilst working in Liverpool and its environs.

Richard Caton (1842-1924)

Brought up in Yorkshire and trained in Edinburgh, Richard Caton came to Liverpool in the late 1860s, and by the 1870s, as a Lecturer in Physiology, had embarked on experimental work recording the electrical currents of the cerebral cortex in dogs and apes using unipolar electrodes and the string galvanometer.¹⁰ On 21 January 1875 he delivered a paper to the Liverpool Medical Society entitled “On the Electrical Relations of Muscle and Nerve” which drew on the work of the celebrated German physiologist Du Bois-Reymond to demonstrate the properties of a frog nerve-muscle preparation.¹¹ This presentation may have been made at the Liverpool Medical Institution (LMI), where, in addition to his other activities related to Liverpool medicine,¹² he was certainly an active

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Caton’s report seems a little incongruous in the proceedings, following as it does an exhibit by Dr Michael Harris of two fetuses completely joined at the thorax and abdomen, an exhibit by Mr AMS Hamilton of a stomach and oesophagus, the latter obstructed by a fibrous stricture, and a case narrated by Dr Glynn of an aneurism [sic] of the second part of the aorta pressing on the left bronchus.

Later in the same year (4 August 1875), Caton presented data at the 43rd British Medical Association meeting, held in Edinburgh, on “The Electric Currents of the Brain”, an entirely more original piece of work. It is probable he would have preferred to present his work at the Royal Society, as a more appropriate forum for such “cutting edge” scientific research, but this did not happen. The choice of Edinburgh may perhaps have been because his funding was a grant from the British Medical Association. His presentation made little impact on his clinical audience: it is all too easy to imagine the bewilderment of clinicians listening to his presentation, and perhaps wondering what electrodes in animal brains had to do with medical practice. Moreover, animal experimentation had caused controversy at the BMA meeting of the previous year when the French neurologist Valentin Magnan showed the effects of absinthe on two dogs, provoking a prosecution.

Caton’s experimental work was subsequently published in the British Medical Journal in 1875, (the Journal of Physiology, an altogether more suitable outlet, was not founded until 1878) in a paper later characterised by Danilevsky as “distinguished by its unwarranted brevity”, and in 1877. These papers mark the beginnings of the study of electroencephalography (EEG), which after many trials and various insights was to reach clinical fruition in 1924 with the first recording of the human EEG by Hans Berger (1873-1941) in Jena, who acknowledged the importance of Caton’s work.

It is perhaps worth quoting from Caton’s 1875 paper to give a flavour of his work, and his discoveries:

In every brain hitherto examined, the galvanometer has indicated the existence of electric currents. The external surface of the grey matter is usually positive in relation to the surface of a section through it.

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Feeble currents of varying direction pass through the multiplier when the electrodes are placed on two points of the external surface, or one electrode on the grey matter, and one on the surface of the skull.

The possible functional significance of these currents was also alluded to. In the 1877 paper, the effects of sleep and death on the currents was also examined. The experimental technique was difficult, with more than half of the animals examined proving to be failures because of factors such as brain swelling and haemorrhage.

Caton was appointed Professor of Physiology in Liverpool in 1884, and in 1887 presented his work at the 9th International Congress of Medicine in Washington, D.C. However, in 1891 he resigned the chair, not before persuading the local magnate George Holt to endow a full-time chair in physiology, and thereafter undertook no further work on the brain. (Holt also endowed a chair in pathology, in 1894. His bronze relief may be seen on the stairs between the 1st and 2nd floors of the Victoria Art Gallery and Museum in Liverpool.)

His clinical interests in later years were more in the realm of cardiology, writing on rheumatic fever and its treatment, as well as in medical history: his Harveian Oration of 1904 combined the two. He also became more involved with medical and local politics, serving as President of the LMI in 1896-7 and as Lord Mayor of Liverpool in 1907-8. A splendid portrait of him in mayoral garb hangs at the LMI. Posthumously a ward was named for him at the Walton Centre for Neurology and Neurosurgery, the regional neuroscience centre in Liverpool. Perhaps surprisingly his various contributions did not merit his inclusion in the Dictionary of National Biography (2004).

Charles Scott Sherrington (1857-1952)

Gotch succeeded Caton as Holt Professor of Physiology in Liverpool before moving on to Oxford in 1895, to be succeeded in Liverpool by Charles Scott Sherrington, who was Holt Professor of Physiology until 1913, when he succeeded Gotch in the Waynflete Chair in Oxford.

The Liverpool years were ones of great endeavour and progress for Sherrington. In 1897 he coined the term “synapse”, meaning a “mode of nexus between neurone and neurone”. In the same year he investigated

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19 R. Caton, ‘Researches on electrical phenomena of cerebral grey matter’, Ninth International Congress Medicine, 3 (1887), 246-249.
reflexes, and formulated his ideas on reciprocal innervation, subsequently known as “Sherrington’s law”. In 1898, he investigated decerebrate rigidity in the cat. In 1904 he was invited to deliver the Silliman Lectures at Yale University, subsequently published in 1906 as *The Integrated Action of the Nervous System*, one of the most celebrated books in the history of neuroscience. Amongst other things, this work coined terms for sensory organs: exteroceptors, interoceptors, proprioceptors; and also the word nociceptive.

Sherrington’s influence continued to be felt long after he left Liverpool. The physician Henry Cohen wrote on him, noting not only his work as a physiologist but also as a philosopher and poet. Like Caton, Sherrington has a ward was named for him at the Walton Centre for Neurology and Neurosurgery, as well as a building at the University Medical School.

**Cecil Gray (1913-2008)**

Although neither a neurologist nor a neurosurgeon, Cecil Gray’s pioneering work on relaxant anaesthesia has had major implications for the management of neurological disorders requiring surgery. Although others had used d-tubocurarine hydrochloride (based on curare) for anaesthetic purposes, specifically Griffith and colleagues use of Intocostrin in Montreal, Gray and Halton used higher doses for greater muscle relaxation. This approach became known as the “Liverpool Technique”, the triad of narcosis, analgesia, and muscle relaxation. Gray and Halton modestly titled their paper describing the use of tubocurarine “A milestone in anaesthesia?”, but posterity has proved them right.

On the subject of anaesthesia, it is of note that it was at ICI in Widnes that the inhalant anaesthetic halothane was developed, although Gray was pessimistic about it.

Gray was President of the LMI in 1974. He remained active into his later years, authoring works on the history of medicine in Liverpool in his late 80s.

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Peter Rickham (1917-2003)

Peter Rickham founded the first neonatal surgical unit in the world, at Alder Hey Children’s Hospital in Liverpool. Among his many contributions to paediatric surgery, and of relevance to neurological disorders, he devised the Rickham reservoir, an integral part of the Holter ventricular drainage system for the treatment of hydrocephalus.29

Harry Angelman (1915-1996)

Harry Angelman worked as a paediatrician at Warrington General Hospital. There he observed three children with developmental delay and other features which led him to coin the term “puppet children”, which was the title of his paper describing these cases published in 1965.30 Although this condition, subsequently renamed Angelman syndrome, remains rare, it has attracted increasing attention, not least because of the genetic mechanisms involved in its pathogenesis.31 Many cases show a 15q11-q13 deletion, and the phenomenon of genomic imprinting: maternal inheritance of the chromosomal abnormality results in Angelman syndrome whereas paternal inheritance results in the Prader-Willi syndrome.

Conclusion

Doctors practising in Liverpool and the North West of England have made some valuable contributions to the clinical and scientific progress of neurology.

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