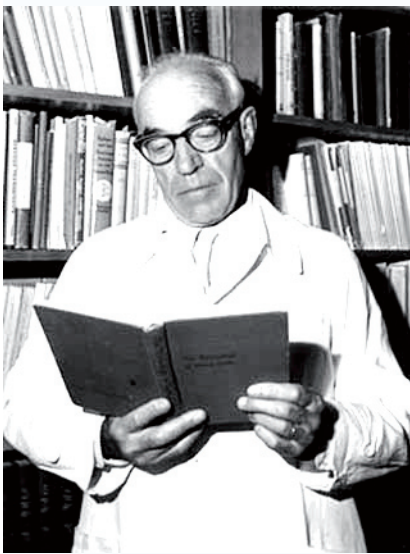


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John Carew Eccles (1903–1997)



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John Carew (Jack) Eccles won the Nobel Prize in Physiology or Medicine in 1963 with Huxley and Hodgkin for his work on the synapse. With a career spanning six decades he established a reputation as one of the leading neuroscientists of the twentieth century. He carried out research at Oxford, Sydney, Dunedin, Canberra, Chicago and Buffalo and his work on synaptic transmission and the organisation of the central nervous system continues to have a major influence on brain science.

John Eccles was born in Melbourne in 1903 and received much of his early education from his school teacher parents. Although deeply interested in mathematics, he chose medicine and graduated with first class honours from Melbourne University in 1925. As a student he was fascinated by the mind-brain problem and recounted how, when 18 years old, he was struck by ‘an awesome feeling of uniqueness.’ His sense of wonder at his own brain and its vast capacity for conscious thought initiated a life-long study for the explanation of human achievement. Throughout his life he was an avowed dualist and searched for mechanisms by which the mind controls the body. In 1925 he travelled to Oxford as a Rhodes Scholar and came under the tutelage of Sir Charles Sherrington [1].

At Oxford Eccles joined Sherrington’s team studying spinal

reflexes in the cat. This work led in 1932 to the publication of the classical monograph *Reflex Activity of the Spinal Cord* by Creed, Denny-Brown, Eccles, Liddell and Sherrington [2]. During his Oxford years he studied synaptic transmission both in the central nervous system and peripherally in sympathetic ganglia, smooth and cardiac muscle, utilising new techniques of electrophysiology – amplifiers and cathode ray oscilloscopes. This was a period of controversy between the proponents of chemical and electrical theories of synaptic transmission. Believing that transmission at synapses was too rapid to be a chemical process, Eccles considered that synaptic excitation was electric in nature. This led to prolonged debate with those, including Henry Dale, who considered that synaptic transmission was a chemical process. Although Eccles’s initial hypothesis was incorrect, his arguments led himself and others to perform experiments which proved chemical transmission.

In 1937 Eccles returned to Australia where his endeavours were focussed on electrophysiological studies of the neuromuscular junction. With a research team that included Bernard Katz and Stephan Kuffler he established that acetylcholine was responsible for end-plate potentials initiated by the motor nerve action potential. Sub-

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sequently as Professor of Physiology at Otago, New Zealand, from 1944–1951, he returned to synaptic transmission in the central nervous system, utilising microelectrodes in nerve cells and recording electrical responses produced by excitatory and inhibitory synapses. This work was later published in the influential monograph *The Neurophysiological Basis of Mind: The Principles of Neurophysiology* [3]. In New Zealand Eccles first met the philosopher Karl Popper with whom he shared a long-term collaboration on the mind-brain interaction. Their dialogues were recorded and broadcast and culminated in the joint publication of *The Self and its Brain* [4].

From 1952 until 1966 Eccles was Professor of Physiology at the Australian National University where his work centred on the biophysical properties of synaptic transmission, which became the research cited in the Nobel award. By means of microelectrode studies, the series of investigations established the conceptual framework for the ionic mechanisms of membrane activity. From his lectures delivered at Johns Hopkins School of Medicine emerged the text *The Physiology of Nerve Cells*, one of the most influential books on neurobiology [5].

Eccles last period of experimental neuroscience followed his official retirement when he moved to the United States, initially in Chi-

cago and then the State University of New York at Buffalo. Over the next decade, with numerous international collaborators, he examined the synaptic organisation and operation of the cerebellum. In these seminal studies he described the essential properties of the major types of cerebellar neurones. In 1975 he retired from laboratory research and settled in Contra, in the Swiss canton Ticino and devoted himself to work on the mind-brain problem. He wrote extensively on the subject and spoke at conferences and meetings until his death. His final book *How the Self Controls its Brain* was published in 1994 [6].

Although Eccles was a theist and practising Catholic, his approach to the mind-brain problem was neither purely religious nor philosophical but rather it was largely neurophysiological with a Cartesian influence. It is likely that he was also influenced by his mentor Charles Sherrington whose own philosophy was expressed in the book *Man on his Nature* [7]. A strong motivating force was also Eccles's scepticism towards materialism expressed in a letter enclosed in his last book. 'A most important program for this book is to challenge this materialism and to re-instate the spiritual self as the controller of the brain.' For many Christians, Eccles is an example of the successful melding of a life in science with one in faith.

Through his life Eccles was widely recognized for his distinction in neuroscience. His enormously productive career included an array of pioneering studies and the publication of 568 papers and 19 books. The hallmark of his endeavours was his immense energy and appetite for new knowledge of the brain but also his deep humanity and ability to develop hypotheses of broad generality. In addition to his purely scientific study he followed Sherrington in formulating a philosophy of the human person that is consonant with brain science.

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