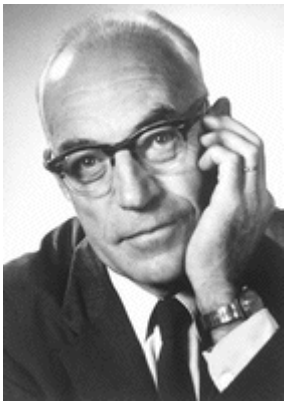
Sir John Eccles – Biography



John Carew Eccles was born in Melbourne, Australia, on January 27th, 1903. He owes much to his early training by his father, William James Eccles, who was a teacher as also was his mother, née Mary Carew. He graduated from Melbourne University in Medicine with first class honours in 1925, and as Victorian Rhodes Scholar for 1925 entered Magdalen College, Oxford, as an undergraduate in order to study under Sir Charles Sherrington.

In 1927, with first class honours in Natural Sciences, the Christopher Welch Scholarship and a Junior Research Fellowship at Exeter College, Oxford, he commenced research on reflexes with Sherrington's colleagues. Later from 1928 to 1931 he was research assistant to Sherrington, there being eight papers published conjointly; and he also collaborated with Ragnar Granit on two research projects. He was awarded an Oxford D. Phil. degree in 1929 for a thesis on Excitation and Inhibition. Later Oxford appointments were to a Staines Medical Fellowship at Exeter College in 1932, a tutorial fellowship of Magdalen College, and a University Demonstratorship in 1934.

During this Oxford period research was largely on synaptic transmission both in the central nervous system and peripherally in sympathetic ganglia, smooth and cardiac muscle. Using the newly developed techniques of electrophysiology - amplifiers and cathode ray oscilloscopes. It was the period of controversy between the exponents of the rival chemical and electrical theories of synaptic transmission with Eccles in particular resisting many aspects of the chemical transmitter story that was being developed so effectively by Dale and his colleagues. In retrospect it can be appreciated that this controversy had the effect of defining problems and stimulating much good experimental work, but the decisive victory of the chemical theory had to await the intracellular recording both from neuromuscular junctions by Fatt and Katz and from nerve cells that was made possible by the technique of the microelectrode with cathode follower amplification. And now, as a final stage of this drama, electrical transmission between nerve cells is being demonstrated in many specialized synapses, not only in the invertebrate, but also in the vertebrate nervous system. These recent developments have served to increase still further the assurance with which we can accept the chemical transmitter hypothesis for an overwhelming majority of both central and peripheral synapses.

In 1937 Eccles left England for Australia to become Director of a small medical research unit in Sydney, where he was fortunate to have the distinguished collaboration of Bernard Katz and Stephen Kuffler. This period from 1937 to 1943 was devoted largely to an electrophysiological analysis of the neuromuscular junctions of cats and frogs, but in the later years his time was

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almost entirely occupied by applied science related to the war effort. Subsequently as Professor of Physiology at the University of Otago, New Zealand, from 1944-1951 he returned to synaptic transmission in the central nervous system; and in 1951 Brock, Coombs and Eccles succeeded for the first time in inserting microelectrodes into nerve cells of the central nervous system and in recording the electrical responses produced by excitatory and inhibitory synapses. This early work was described in the Waynflete Lectures of Magdalen College, Oxford, in 1952, which in 1953 were published as *The Neurophysiological Basis of Mind: The Principles of Neurophysiology*. The New Zealand interlude was also notable because there Eccles met the philosopher, Karl Popper, from whom he learnt the relationship of the scientist to hypotheses; how to be daring in developing hypotheses of the greatest generality, and at the same time how to test them with the utmost rigour with the consequence either of falsification in whole or in part, or at best corroboration; but never confirmation. He feels that this relationship to hypotheses has not only increased his conceptual power, but has also greatly helped emotionally! He can now rejoice even in the falsification of a cherished theory, because even this is a scientific success.

From 1952 until 1966 Eccles was Professor of Physiology of the Australian National University. In the earlier years (1953-1955) in collaboration with Coombs and Fatt, attention was concentrated on the biophysical properties of synaptic transmission, which is the research that has been cited in the Nobel Award. The conceptual basis of these investigations derived particularly from the hypotheses of the ionic mechanisms of membrane activity that had been developed by Hodgkin, Huxley, Katz and Keynes in England. In 1955 this stage of the investigation was described in the Herter Lectures of Johns Hopkins University, and was published in 1957 as *The Physiology of Nerve Cells*. Subsequently the ionic sieve hypothesis of inhibitory synaptic action developed from that early work has been corroborated not only in Canberra by the many associates listed in the references of the lecture, but also in several other laboratories.

There have been in recent years remarkable advances in the powerful microtechniques: electron-microscopy, microelectrode recording and micropharmacology. Eccles surveyed all these new developments in *The Physiology of Synapses* in 1964.

However, the nervous system is not simply to be understood as a system of synaptic transmissions. The organization of the pathways of communication is essential for even the simplest explanations of its performance. From 1960-1966 these organizational problems dominated the research programs of the Canberra laboratory. Soon the problems were studied at the much more challenging levels of the brain with investigations firstly of the dorsal column nuclei and thalamus, then of the hippocampus and finally of the cerebellum. The rationale of these studies is to understand the mode of operation of the structural patterns that form such a characteristic feature of the aggregations of nerve cells in the cerebellum and the hippocampus, for example.

From 1966 Eccles continued this research first at the Institute of Biomedical Research at Chicago and after 1968 at the State University of New York at Buffalo. Progress accounts appeared in two books, *The Cerebellum as a Neuronal Machine*, published conjointly with Professors M. Ito and J. Szentágothai as co-authors, and *The Inhibitory Pathways of the Central Nervous System* (1969) which are the Sherrington Lectures at the University of Liverpool.

In addition to this purely scientific study of the brain, Eccles has

followed Sherrington in developing a philosophy of the human person that is consonant with the whole of brain science. Various aspects of this philosophy were developed in lectures and broadcast talks, and recently the whole of Eccles' philosophical thought has been brought together in a book entitled *Facing Reality* published by Springer in the Heidelberg Science Library (1970).

The research work of Eccles in neurophysiology has been recognized by several honours and awards amongst which the following may be mentioned: Knight Bachelor, 1958; Fellow of the Royal Society, London, 1941 (Ferrier Lecturer, 1959; Royal Medal, 1962); Fellow Royal Australasian College of Physicians (Rennie Lecturer, 1963); Fellow Royal Society of New Zealand; Fellow Australian Academy of Science (President 1957-1961, Flinders Lecturer, 1963); Honorary Foreign Member, American Academy of Arts and Sciences, 1959; Fellow, Pontifical Academy of Sciences, 1961; Member Deutsche Akademie der Naturforscher «Leopoldina» (Cothenius Medal, 1963); Foreign Honorary Member, Accademia Nazionale dei Lincei, 1963; Honorary Fellow, Exeter College, Oxford; Honorary Member, American Philosophical Society, 1964; Hon. Sc.D. (Cantab.), 1960; Baly Medal, Royal College of Physicians, 1961; Hon. D.Sc., University of Tasmania, 1964; Hon. Fellow, Magdalen College, Oxford; Hon. Member, American Neurological Association; Hon. LL. D., University of Melbourne, 1965; Hon. Life Member, New York Academy of Sciences; Foreign Associate, National Academy of Sciences, 1966; Hon. D.Sc., University of British Columbia, Vancouver; Hon. D.Sc., Gustavus Adolphus College, 1967; Hon.Fellowship, American College of Physicians; Hon. D.Sc., Marquette University; Honorary Member, Accademia Medica Lombarda; Hon. Fellow, Indian Academy of Sciences, 1968; Hon. Member, Czechoslovak Medical Society J. E. Purkyne; Associate Member, Académie Royale de Belgique, 1969; Hon. M.D., Charles University, Prague; Hon. D.Sc., Loyola University, Chicago; Hon. M.D., Yeshiva University, New York.

In 1928 John Carew Eccles married Irene Frances Miller of Motueka, New Zealand, and there are nine children; four sons and five daughters, of whom the two eldest sons are scientists with Ph. D.'s. Rosamond collaborated with her father in much of his neurophysiological research, his son Peter is a radar meteorologist. Following divorce in 1968, Eccles married Helena Táboríková of Prague, Czechoslovakia, who is an M.D. of Charles University and a neurophysiologist. They collaborate in their research.

From *Nobel Lectures, Physiology or Medicine 1963-1970*, Elsevier Publishing Company, Amsterdam, 1972

Sir John Eccles died on May 2, 1997.