

KENNETH G. BAIMBRIDGE

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**Hugh McLennan**  
**1927-2004**



Dr. Hugh McLennan died unexpectedly at home on December 24, 2004. He was a staunch supporter of the Canadian Physiological Society, serving as Secretary from 1965-69, President from 1972-1973, and archivist for the last 10 years before his retirement. He maintained strong links with the Society even after his formal retirement from UBC.

Dr. McLennan was born on October 22, 1927 in Montreal and educated at McGill University. He obtained his MSc (1949) and PhD (1951) degrees for his research into the metabolism and synthesis of acetylcholine in brain preparations under the supervision of Dr. K.A.C. Elliot. Dr. McLennan was one of a group of Canadian Physiologists who had a significant presence in British physiology in the 1940's and 50's. From 1952-1953 he was an Assistant lecturer at University College London working in the laboratory of G.L. Brown where some of the seminal work on neurotransmitter physiology was being done. It was clear at this relatively early stage in his career that Hugh, above all, was a true scholar, capable of working at the highest possible level.

Hugh returned to Canada as a Research Fellow at Montreal Neurological Institute from 1953-1955 where he worked closely with Dr. Ernst Florey. He then took up a position as an Assistant Professor at Dalhousie University from 1955-57 before joining the Department of Physiology at UBC in September 1957, where he remained until his retirement in November 1992. He played a major role in the 60's and 70's period of rapid expansion in higher education and research. Hugh was always committed to Canada and unlike many of his generation refused to move to greener pastures down South. He understood that despite the inherent borderless nature of science, that there had to be a strong Canadian community of scientists. He expended a great deal of time on furthering the interests of the Canadian Physiological Society, a society which up till the late 1960's had never met as such. Long an expert skier he was key in creating the winter meeting of the Society at a ski resort. He wanted the community of Canadian physiologists to get to know each other and understand their common interests, both scientific and political. This meant having a meeting which gave opportunity for social interaction as well as science. He wanted Canadian students to find a sense of belonging to a Canadian scientific community with scientific depth and history.

Dr. McLennan's early scientific work included seminal studies of acetylcholine synthesis and metabolism in addition to groundbreaking research on inhibitory transmission by GABA. At University College London, he had acquired great skills in operating on cats and rabbits and he used this preparation in collaboration with Dr. Florey to examine the inhibitory effect of "factor 1" on the monosynaptic knee-jerk reflex and courageously suggested that "factor I may be the transmitter substance of certain inhibitory neurones". In his 1954-55 review of research at the Montreal Neurological Institute, Herbert Jasper noted, "the reports from Drs. Florey and McLennan on the isolation of the substances from brain tissue which have strong inhibitory or excitatory effects on the activity of the central nervous system were outstanding .... the isolation of a naturally occurring inhibitory substance in the brain, if confirmed by further study, may be a discovery of major consequence, not only for our understanding of normal brain function, but

also for the rational treatment of brain disorders". A subsequent collaboration between Dr. Florey and Merck & Co. led to the identification in 1956 of the active compound as GABA! However, doubt about its inhibitory role on spinal motoneurons arose when David Curtis in Australia showed that strychnine blocked inhibition but not the action of GABA. Indeed, even Dr. McLennan categorically stated in the 1970 second edition of his influential book "Synaptic Transmission", "the rejection of GABA as a transmitter in the spinal cord remains". Subsequent work of course identified the amino acid glycine as the main inhibitory transmitter acting on spinal motoneurons. Nonetheless, GABA later re-emerged as the most prevalent inhibitory neurotransmitter in the brain and more recent work suggest that glycine and GABA are in fact co-released by spinal interneurons.

Much of Dr. McLennan's research at UBC involved studies of the physiology and pharmacology of excitatory amino acid transmitters in the central nervous system. For the younger members of our Society that are used to strolling along row after row of posters on excitatory neurotransmitters at Society for Neuroscience meetings, it may be difficult to imagine that as late as 1980, the concept that glutamic acid was a major excitatory neurotransmitter was still a matter of some controversy. Neuropharmacologists in particular were concerned that no enzyme equivalent to acetylcholine esterase has been found, that the apparent concentration required for excitation was relatively high (mM rather than  $\mu$ M), and that just about every neuron seemed to be excited by glutamate.

Working with graduate students and postdoctoral fellows, including John Hall, Larry Burr, Scott Haldeman, T. Phillip Hicks, Kenneth Curry, Howard Wheal, Andrew Larder, David Magnuson, John Church, James Miller, Ronald Huffman, Kenneth Marshall, Tom Richardson, Martin Peet, Steven Kehl, and Graham Collingridge, and also in collaboration with other scientists including David Lodge and David Curtis, Dr. McLennan produced a series of papers that helped to establish unequivocally the excitatory actions of glutamate and aspartate and the identity of the different receptor subtypes upon which they act. The function of the different glutamate receptors had not been fully elucidated in the early 1980's but Dr. McLennan, with graduate student Steven Kehl and postdoctoral fellow Graham Collingridge, discovered the role of NMDA receptors in the phenomenon of long-term potentiation (LTP) and their two papers published in the Journal of Physiology in 1983 remain amongst the most cited papers in the LTP field. The following testimonial by Dr. Collingridge sums up better than I can hope to do, this exciting period in Dr. McLennan's research:

*"I spent the two most influential years of my research career in Hugh's lab. Hugh was the perfect supervisor for a young postdoctoral fellow. He provided an excellent research environment and was totally supportive but allowed freedom of expression. Working with Hugh and Steve Kehl was the most enjoyable period for me - we discovered the role of NMDA receptors in the induction of LTP and started to understand the function of kainate receptors in the hippocampus. I recall our discussion whether our results were best*

*explained by the existence of one (my view) two (Steve's) or multiple (Hugh's view) types of kainate receptor time has proven the latter to be true."*

Graham Collingridge

Not all of Dr. McLennan's research involved EAAs. He also published papers on catecholamines, GABA, dopamine, and acetylcholine; in some cases using one of his favourite preparations, the crayfish. In total Dr. McLennan published over 145 papers and his book entitled "Synaptic Transmission"; (1 st ed. 1963; 2nd ed. 1970) proved to be very influential and was, at that time, the definitive text. In May 1990, a symposium was held at UBC to honour Dr. McLennan's research career. It was attended by many of the early pioneers of research on inhibitory and excitatory transmitters including Ernst Florey, Jeffrey Watkins, David Curtis and David Lodge, and the proceedings were published in the Canadian Journal of Physiology and Pharmacology (Volume 96[7], 1991).

At UBC he served on the UBC senate and was Chair or Member of the Board of the Faculty Club on several occasions, including the time of the addition of the impressive Arthur Ericson extension. In the broader scientific community Dr. McLennan served with distinction on many Medical Research Council of Canada peer review committees and was a member of the MRC Council from 1971-1977. His research was continuously funded by the MRC throughout his career at UBC. He was the Canadian Delegate to the General Council of the International Union of Physiological Societies and served as the Chair of the Scientific Programme Committee when the Department of Physiology hosted the IUPS meeting in Vancouver in 1986. He was also an editor of Neuropharmacology and Experimental Brain Research, a member of the Physiological Society (UK) and a Fellow of the Royal Society of Canada.

Outside of science, Dr. McLennan had many and varied interests. One of his hobbies was the translation of Welsh poetry. Both before and after his retirement Dr. McLennan, whose well-modulated and clear speaking voice could easily have given him a career with CBC, used that gift to spend much of his time creating audio tapes of books for the blind using the facilities of the Crane Library at UBC. One memory that many of us treasure was of his Sarrazin lecture in 1985. Most Sarrazin lecturers choose to talk about their work in science, to unravel the thread of reasoning and experiment that led them to their distinguished status. Hugh, a keen historian, instead researched the life and times of Sarrazin ("The First Canadian Physiologists"). In his carefully illustrated talk he opened our eyes into the problems of the early settlers and of the manner of scientific exploration in the near wilderness that was Canada in the early days of European settlement. Throughout his life he was a keen and expert skier. He was one of the early investors in the Garibaldi Lift Company that first developed skiing at Whistler and he was President of the Western Division of the Canadian Ski Association from 1971-1974 and National Vice-President from 1972-1975. He was also President of the Kerrisdale Legion, a connoisseur of single malt Scotch whisky, a keen golfer, and record holder for the most number of victories in the Department of Physiology's annual conkers competition!

*BAIMBRIDGE: Hugh McLennan*

Hugh McClennan was an outstanding scientist, a wonderful colleague and a passionate Canadian, never seeing anything but the good in this country, treasuring its roots, and fascinated by its diversity. He was truly a distinguished Canadian and a distinguished Canadian scientist. His is survived by his wife of 55 years, Hilda, their daughter Catriona and son Neil. He will be much missed but fondly remembered by all who knew him.

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*(Author's title given as of the time of writing)*