

Professor Sir Gabriel Horn MD ScD FRS FRCP, 9 Dec 1927 – 2 Aug 2012

Gabriel Horn was appointed to the Cambridge Chair of Zoology in 1977 and served as Head of Department 1978-1994, having been Professor of Anatomy at the University of Bristol 1974-1977, and before that, Lecturer in Anatomy and Reader in Neurobiology in the Department of Anatomy, University of Cambridge. His first publication, while a medical student at the University of Birmingham, was entitled “The Neurological Basis of Thought”, anticipating much of his subsequent scientific work. That work ranged over many topics in neuroscience, studied in many ways. Early work focussed on the developing nervous system and the effect of thyroid deficiency. He then began to make microelectrode recordings from neurons in the central nervous system, investigating the ways in which information from different sensory modalities is integrated. He recorded extensively from the brains of freely-moving subjects and was an early contributor to the statistical analysis of spike train data. At an early stage in his career he became interested in the ways in which modification of synaptic transmission might be responsible for memory, working on habituation, a form of learning characterised by a progressive reduction in the behavioural response to a repetitive stimulus. Such behaviour may be reflected in a decrement in neuronal responsiveness, from which a neuronal model of learning might be derived. His work on the giant synapse of the squid and the movement detector system of the locust yielded insights into both synaptic mechanisms and sensory processing. As well as these relatively simple nervous systems, he began work on the vertebrate medial temporal lobe, using microelectrode recording techniques and behavioural training to test hypotheses, arising from clinical observations, concerning the role of this region in learning and memory.



Gabriel’s association with the Cambridge Department of Zoology substantially pre-dates his appointment as Professor in 1977. Together with Patrick Bateson at the Madingley Sub-Department of Animal Behaviour and Steven Rose at the Open University, he pioneered research on the neural basis of imprinting, the process whereby young animals, in this particular case domestic chicks, learn the characteristics of objects (normally parents) when exposed to them. He retained a passion for this research for the rest of his life, in the firm belief that effective treatment of neurological disease, often the cruellest of afflictions, requires a deep understanding of the relevant neurobiology. The work proceeded in a series of logical steps, eventually providing compelling evidence that net protein and RNA synthesis in a particular part of the chick forebrain (now known as the intermediate medial mesopallium or IMM) is specifically associated with learning. The research employed a range of techniques, it being clear that no one experimental approach was likely to yield a full understanding of the neural mechanisms underlying learning. Gabriel’s book ‘Memory, Imprinting and the Brain’, published in 1985, reported the substantial progress that had been made up to that time and the work has continued apace up to the present. The work constitutes a multifaceted study of learning mechanisms. It has involved behavioural studies. It has identified morphological and biochemical changes in synapses associated with learning. It has identified cell populations within the IMM that are activated in a learning-related manner. It has characterised the electrical activity of neurons in the IMM after learning, and has begun to reveal the role of sleep in memory. Neural network modelling based on the neurobiological results generated predictions testable by behavioural experiments. An interesting outcome of the work, in delineating neural mechanisms, has been to elucidate problems originally identified in behavioural studies. Conversely, behavioural

studies of imprinting have stimulated the neurobiological analyses. Such cross-fertilization between different levels of analysis was, on occasion, a bonus: it was not always anticipated when the experiments were designed. A summary of some of this work may be found in Horn, G (2004), "Pathways of the Past: the Imprint of Memory", *Nature Reviews Neuroscience*, 5: 108-120.

Gabriel's headship of the Department of Zoology saw a substantial increase in diversity of research in the Department and during that period the annual number of students reading Part II Zoology more than doubled. He made a major contribution to the establishment and development of the current interdepartmental Part II course in Neuroscience and, more generally, to the Cambridge neuroscience community. One aspect of the latter contribution, the annual Cambridge Neuroscience Seminar, continues to flourish under the aegis of Cambridge Neuroscience. Gabriel was elected a Fellow of the Royal Society in 1986 and was awarded the Society's Royal Medal in 2001. In 1992 he was appointed Master of Sidney Sussex College Cambridge, serving until 1999. On retiring as Head of Department, he moved back to the Sub-Department of Animal Behaviour at Madingley to continue the work on imprinting at its birthplace. Despite periods of ill health, in 2001 he chaired a government committee to review the origin of Bovine Spongiform Encephalopathy and in 2005 chaired a steering committee on "Brain Sciences, Addiction and Drugs" for the Academy of Medical Sciences, reporting to the Department of Health. Service to the University continued as Deputy Vice-Chancellor and Chair of the Cambridge University Government Policy Programme. Gabriel held honorary doctorates at the Universities of Birmingham and Bristol, and at the Beritashvili Institute of Physiology, Georgian Academy of Sciences. He was an honorary member of the European Brain and Behaviour Society and in 2011 was honoured by the British Neuroscience Association for outstanding contributions to neuroscience. In 2002 he was knighted for "Services to Neurobiology and the Advancement of Scientific Research".