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H G Callan died on the 3rd November, 1993, at the age of 76. 'Mick', to all who knew him, had continued an active scientific life up to the brief illness which preceded his death. He was one of the last of a line of scholars whose knowledge and interests encompassed the whole scope of biology. However, it is for his major contribution to our understanding of the structure of chromosomes, and how they function in replication and in the expression of their genes, that Mick will be remembered best by the scientific community. In particular, Mick Callan's name is inseparably linked with the giant lampbrush chromosomes of amphibian oocytes which provided such a powerful model for universal features of chromosome organisation and activity.

Born in Maidenhead on 15th March, 1917, to a school teacher mother and a naval architect father, Mick was educated at King's College School, Wimbledon, and at St John's College, Oxford. In 1938 he graduated with first class honours in Zoology. After working for a short time at the John Innes Institute in Merton, Surrey, Mick was awarded a scholarship for postgraduate research at the Stazione Zoologica in Naples where he studied the influence of sex hormones on the development of the octopus. This move was to signal a major turning point in his life, both personally and professionally. It was in Naples that he met his wife-to-be, Amaryllis, and it was also here, several years later, that he first glimpsed the lampbrush chromosomes which later were to fire many of his ideas. He writes in the preface to his monograph on lampbrush chromosomes (Springer-Verlag, 1986): 'It strikes me as remarkably appropriate that my wife's father, Dr Reinhard Dohrn, who was for many years Director of the Stazione Zoologica at Naples, was personally acquainted with Dr J Rückert, the investigator who first put lampbrush chromosomes 'on the map' and gave them their name. Rückert studied the lampbrush chromosomes of elasmobranchs at the Stazione Zoologica towards the end of the 19th Century, and it was in this same institute that I first saw the germinal vesicles of newt oocytes in 1947, and came to realise the particular advantages for study that are offered by these enormous cell nuclei, and their equally gigantic chromosomes'.

However, the idyllic period in Naples was interrupted by the Second World War, during which time Mick held commissions as flight lieutenant and squadron leader in the RAF, and became an expert in the newly-developing technology of radar. Anxiety over the safety of Amaryllis and her family ended with the war and the couple were eventually married in Naples in 1944. Their first move was to London, where Mick worked at the Biophysics Department of University College, and then to Edinburgh, where the famous developmental biologist C H Waddington was gathering a galaxy of bright young scientists at the Institute of Animal Genetics. Soon after receiving his doctoral degree, Mick was appointed to the Kennedy Chair of Natural History at St Andrews University in 1950. The young Professor Callan had the daunting prospect of following in the footsteps of D'Arcy Wentworth Thompson, one of the most eminent biologists of his generation. But Mick rose grandly to the occasion, for in the period 1950-1982 he built up the Department of Zoology from a few staff members housed around the specimen cases of the Bell-Pettigrew Museum, into a large, thriving, modern Department. His prolific research output and growing fame attracted many students and visiting research workers.

Mick's first studies with amphibian oocyte nuclei were on the structure of the nuclear envelope. It is generally forgotten that he was the first to describe the nuclear pores which allow molecular traffic in and out of the nucleus. With the assistance of S G Tomlin, who operated an early model of the Siemens electron microscope in the Wheatstone Physics Laboratory at King's College, London, he was able to examine whole-mount preparations of nuclear envelopes and make his seminal discoveries.

However it was the work of Callan and his collaborators on the lampbrush chromosomes of amphibian oocytes that attracted most attention and furthered our understanding of chromosome structure. For instance, Mick's observation of 'double-loop-bridges' resulting from a transverse breakage of a chromomere provided direct evidence for the existence of two chromatids per chromosome and, furthermore, indicated that the lateral loops contain a chromatin axis which is structurally continuous with the chromatid axis. Another issue of great theoretical importance which he challenged was whether or not DNA runs without interruption throughout the entire length of a chromatid and helps to maintain its structural integrity. The application of the enzymes deoxyribonuclease, ribonuclease and protease directly to unfixed lampbrush chromosomes allowed him to resolve this difficult question, confirming the uninematic nature of chromosomal DNA.

Although Mick was trained in classical cytology, he readily combined cytological approaches with developing molecular and immunological methods. For instance, he was quick to exploit the technique of DNA-fibre autoradiography invented by John Cairns and further developed by JA Huberman and AD Riggs. Mick's contribution was to describe the patterns of DNA replication in different tissues and developmental stages of the same organism, and in related organisms with vastly different DNA contents. What these studies showed was that whereas the rate of DNA synthesis was always roughly constant, the duration of DNA synthesis (S-phase) and the growth rate of the cell were dependent upon the number of replication sites initiated along the chromosomal lengths of DNA.

A continuing quest was to identify the genes and their associated molecules of the transcribing loops of chromosomes. Again Mick turned to the new technology, this time to the technique of *in situ* hybridisation developed in the laboratories of Ken Jones in Edinburgh and Joe Gall, then at Yale. Using cloned histone genes, Mick and his co-workers hybridised labelled probes with the nascent transcripts of lampbrush chromosomes. These pioneering experiments indicated that, in principle, it should be possible to identify the genetic nature of any chromosomal loop.

Mick Callan received many national and international scientific honours during his life. In addition to his FRSE in 1952 and his FRS in 1963, he was elected Foreign Member of the American Academy of Arts and Sciences (1974), Honorary Member of the German Society for Cell Biology (1976) and Foreign Member of the Italian Accademia Nazionale Dei Lincei (1982). He served on the UK Advisory Council on Scientific Policy (1963-4), as Trustee of the British Museum (1963-6) and on the Science Research Council (1972-6). Mick also took a keen interest in the condition of science in Eastern-bloc countries and visited the Soviet Union (on three occasions in the 1960s) and China (in 1980) to assist with their emergence from scientific isolation.

In 1982, at a time when universities were threatened by financial cut-back and staff redundancy, Mick selflessly took early retirement to protect his younger staff. However, his research career was not to be stopped. He continued work at the Gatty Marine Laboratory in St Andrews and in 1986 he published his book *Lampbrush Chromosomes*, the definitive work on the structures which had provided a lifetime's fascination. To the end of his life, Mick's research was at the forefront of discovery: he worked for a major part of each year along with his old friend and colleague, Dr Joe Gall at the Department of Embryology at the Carnegie Institution,

Baltimore. Together they published key studies, not only on lampbrush chromosomes, but also on novel supramolecular nuclear particles ('snurposomes') which are involved in the organisation of RNA-packaging and splicing factors.

Away from the laboratory, Mick loved nothing better than to spend time in the countryside with family, friends and his dogs. He was keen on outdoor pursuits, hill walking, shooting and fishing, and he was a weel-kent character about his country cottage on Feuchside. For all his fame, he remained a straightforward, down-to-earth man, who had time of day for all with whom he came in contact. He is survived by Amaryllis and their son and two daughters.

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