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Carl Franz Robinow
1909-2006

Carl Robinow was a professor of Microbiology at the University of Western Ontario from 1949 to 1974 and a Professor Emeritus active in research until three years before his death on 20th October 2006. He was devoted to academic life and was a stimulating teacher, as well as indefatigable in his application of microscopy and cytological techniques to discerning the structural elements of bacterial and fungal cells. He appreciated the many aspects of cellular organization and intimate structure but concentrated for the most part on the cell nucleus in growth and division. He was a biologist at heart and contributed in many ways to the cytological basis of microbial cell biology in his studies of bacteria and fungi. He was "hands on" at research; no aspect of his work, with or without collaborators, escaped his direct involvement and he was a meticulous observer at all stages of work. His capabilities were appreciated and honoured: The Harrison Prize (1957) and election to FRSC (1960); President of the Canadian Society of Microbiologists (1962) and of the Canadian Society for Cell Biology (1966); he was made a Professor Emeritus (1974) and awarded a DSc honoris causa by his University (1983).

He was born in Hamburg, Germany, on the 10 April 1909 as the second child of Franz and Marianne Robinow, joining a long-established professional family in that city. He was schooled in Germany and thereafter entered medical studies to graduate as MD from the University of Hamburg in 1934. This was a crucial time and the diaspora caused the family to disperse about the world. Because he did microscopy on tissue cultures and achieved his first paper in collaboration with one of his teachers (E.G. Nauck) he was able to join in 1935 the laboratory of Albert Fischer (Institute for Cell Cultures) in Copenhagen. In 1937 he moved to England to gain cytological experience in The Strangeways Laboratory, Cambridge, under Honor B. Fell, a major authority. He was to stay for a decade and initiate a distinguished career starting with epithelial cell cultures, which brought him into collaboration with J.O. Bland (St. Bartholomew's Hospital). In 1938 they published a classic study of the multiplication of vaccinia virus in epithelial cells.

The outbreak of war in 1939 brought a brief internment as a German citizen, along with a number of talented people who became important to world arts and science. By 1940 Carl had started his interest in bacterial cytology because G. Piekarski had observed what he thought were bacterial nucleoids using Giemsa stain. Bacteria were at that time considered almost without internal structure. This was a cytological challenge and he developed procedures of preparation and staining which, together with his great skill in gaining excellent micrographs, showed clearly resolved chromatinic bodies. In 1942 and 1944 he published persuasive illustrations and wrote insightfully on "the nuclear apparatus" of exemplary bacteria. The papers gained widespread attention because this demonstration of a DNA-containing (Feulgen positive) structure that divided directly in concert with cell division was the first shot in the long battle to fully describe bacterial cells and define the place of bacteria in biology. They were classified at that time as members of the plant Kingdom and it was to be another two decades before they had a Kingdom of their own. The papers impelled Rene Dubos to persuade Carl to write a 20 page illustrated addendum to his book, The Bacterial Cell, which was published in 1945 to be widely read and influential. There were invitations to visit, lecture and demonstrate from bacteriologists in major universities in the USA and these became coordinated into more than a year of touring with longer stays at Yale, Indiana, Purdue, and Washington. One of the side-trips was to the University of Western Ontario where work was in hand on the cytology of

bacteriophage infection using his techniques. Following that visit in 1949 he accepted an Associate Professorship in that Department of Bacteriology and Immunology in the Faculty of Medicine, where he was to stay for the rest of his career.

The laboratory he joined was developing a research program in bacterial structure and function and Carl did much to forward that intent. He continued his studies of bacterial spores. These were a direct stimulus to the parallel pioneer research by his student and colleague, P. C. Fitz-James, who initiated biochemical and structural studies of the differentiation of sporulating cells and of the resulting spores. He played a major part in the departmental studies of various bacteria and the cytological differentiation of cell structure from nucleus to cytoplasmic membrane using staining methods for both light and electron microscopy(the latter became available in the laboratory in 1954). His critical approaches to making suitable preparations assisted the production of excellent micrographs by students and colleagues. Although he was shifting his interest to the fungi in the mid 50s it is worth emphasizing that his studies of bacteria, the clarity of his reasoning and the elegance of his micrographs did much to help convince biologists of the unique cytological features of bacteria and that nuclear division was direct and unlike mitosis; this conclusion was assisted by observations, his and of others, of division in real time with phase microscopy and supported by the genetic work on model bacteria showing a single linkage group. At that time there was a lot to describe, interpret, and argue about and Carl was a welcome contender in national and international meetings. Sadly, for several years there was an uncomfortable polemic concerning mitosis or direct chromosomal division and Carl took his side of the argument very seriously; the combativeness involved was unlike his usual amusing and gentlemanly style.

In the last half of his career he introduced and maintained a standard for cytological studies of fungi as he had already done for the bacteria. In the late 50s and the 60s he studied exemplary budding yeasts, fission yeasts, and filamentous fungi concentrating on the nuclei, chromosomes, phenomena accompanying mitosis and the attendant biological generalizations. This field was open to research because there was debate about details and a lot of the information was unreliable. He found that the current view of yeast nuclear structure was faulty because the chromosomal components were not differentiated by conventional nuclear stains while they stained the nucleolus strongly. His descriptions were novel. Furthermore his electron micrographs, accomplished with John Marak, demonstrated that a "fibre apparatus" was involved in the mitotic process - an early view of the mitotic spindle. This work also identified the cytological markers that allowed Leland Hartwell to identify cell cycle mutants, setting the stage for that new area of research. Electron microscopy of a model fission yeast (S. pombe) with Kathleen McCully led to classic papers (1971) which he later expanded with light microscopy to identify the number of chromosomes. All this was a structural cytological accompaniment to the widespread genetic studies of the same exemplary species.

He did not confine himself to fixed and stained preparations, Live cell imaging by direct light or phase-contrast microscopy was a necessary accompaniment to all his studies and to his demonstrations for students or visitors. He did a fascinating cine-photomicrographic filming of the remarkable life cycle of Basidiobolus ran arum, which behaves like an amoeba within a cell wall structure resembling a filamentous fungus. He responded fully to requests for cytological help or advice and was an enthusiastic responder in conversations on biological concepts; he was a Darwinian enthusiast and loved evolutionary puzzles presented by structures such as feathers. An interesting challenge came late in his life when Esther Angert consulted him about cytological approaches to the enormous bacterium Epulopiscium fischelsonii which reproduces by forming multiple new cells in

its cytoplasm; exciting to him because it is similar in principle to the formation of multiple endospores by Metabacterium polyspora he had worked on fifty years before. The result was a detailed description in 1998 (when Carl was 89) of an unusual distribution of cellular DNA and unique cellular synthesis originating in patches of it. No less remarkable was the revisiting of old studies in a modern mode: these included the collaboration of two distinguished retirees, Carl Robinow and Eduard Kellenberger, in their 1994 paper "The Bacterial Nucleoid Revisited"; the review of yeast cytology with Byron Johnson in the book The Yeasts in 1985; and, finally, the review in two parts co-authored with J.A. Barnett in the journal Yeast published in 2002 when Carl was 93. These were final markers of a very active and productive life.

His life devoted to research was accompanied after 1938 by a very happy, fulfilling marriage and home life with the multi-talented and lively Rosie Derenberg. They had two sons, Anthony (now a documentary maker and actor) and Oliver (now a psychiatrist), who were a joy to them. Sadly, Rosie died of a cancer in 1974 which led to a rough patch in Carl's life. However, he settled into a simple single existence with almost daily attendance in his laboratory, which the Department let him have as long as he could use it, and continued to instruct and amuse old and new friends. For more than ten of the "retirement" years he continued to teach in the introductory course in microbiology and to the end he followed his research interests. An accidental fall in 2003 precipitated a series of health problems and surgical interventions which led eventually to nursing home life. The last three years were not easy due to affliction with aphasia and loss of memory; a sad end for such a lively minded soul. He was, however, gracious and patient and enjoyed visitors to the peaceful end despite all the difficulties and discomforts of the last few years.

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