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Keith Porter

For over half a century Keith Porter has contributed to the development of biological science and the people who do it. His work has been as important as that of any other individual to the development of modern day cell biology.

The majority of Porter's contributions have been made through his skillful and perceptive use of the electron microscope. Beginning in the 1940s, he identified a method for preserving and dehydrating cells so they could be observed as whole mounts in the electron microscope. His methods produced the first images of the internal structure of cells at resolutions greater than those achieved with a light microscope. The images demonstrated, however, that some form of ultramicrotomy would be necessary to take full advantage of the resolving power of electron microscopy.

During the early 50s Porter collaborated with a talented instrument designer at Rockefeller to produce the Porter-Blum ultramicrotome. This tool was practical and comparatively easy to use. Porter and his colleagues and students employed it to study a variety of tissues and cells, elucidating aspects of their fine structure. Muscle cells, liver tissue, and a variety of other epithelia soon yielded aspects of their micro-architecture to this approach. Porter and his colleagues were also able to visualize viruses in cells and helped to characterize the pathways of virus infection. Much of this work in the 1950s was accomplished in a laboratory at the Rockefeller Institute for Medical Research which was led jointly by Porter and George Palade. In collaboration with Albert Claude and Philip Siekevitz, this group opened up the fruitful dialogue between microscopy and biochemistry which was to become the field of modern cell biology. This group also was instrumental, during this period, in founding the American Society for Cell Biology and the Journal of Cell Biology (originally the Journal of Biophysical and Biochemical Cytology).

In the 1960s, Porter moved to Harvard where he set up an active laboratory for cell biology and trained a number of graduate students and postdoctoral fellows who joined him in an analysis of structural elements in the cytoplasm. This group studied microtubules and microfilaments in a variety of cell types, documenting their contribution to the development of cell shape and movement. His interest in cytomembrane systems led to an analysis of lipid uptake into epithelia. Together with many students and associates, this fruitful period led to the publication of over 100 research papers, and both the quality and interest of the work inspired countless additional studies by students and collaborators who applied Porter's techniques to their own scientific interests. During this period Porter also developed a teaching style in which the elegance of his micrographs and the clarity of his exposition were leavened by wit and irreverence, enlightening and entertaining an entire generation of Harvard undergraduates. His course in cell biology was again and again identified by biology students as among the best and most informative of their undergraduate years.

Porter's interest in cytoplasmic structure led him to explore the efficacy of high voltage electrons for examining the organization of the material between the well-defined elements of the cytomembranes and cytoskeleton, the so-called ground substance." The practicalities of setting up a high voltage microscope drew him to the University of Colorado, beginning at around 1970. There again, numerous successful collaborations were set up that allowed his skill and insight in microscopy to bring improved understanding to complex cellular phenomena. For example, a collaboration with Theodore Puck led to the description of changes in cell fine structure that accompanied malignant transformation and to the discovery that the morphology of transformation could be reversed by treatments with cyclic AMP. He collaborated with David Prescott to examine the structure of separated cytoplasm and nucleus, an interesting and novel experimental approach to cell biology. He collaborated with Pietro Motta in the application of scanning electron microscopy to the characterization of numerous cells and tissues, helping to work out methods for revealing the surfaces of fractured cells and tissues.

While his direct impact on the development of cell biology was significant, one of Porter's major contributions was made indirectly through the people he trained and influenced. <%-2>His former students are found throughout the world and his unique style has inspired many.<%0> ASCB President Dick McIntosh remembers Porter's formidable knowledge of biology, his intuitive sense of how cells work, his skills as a microscopist, and his keen sense of humor. McIntosh was a graduate student in Porter's lab and worked under him as Assistant Professor at Harvard in 1968-1970. McIntosh says that Porter's exceptional knowledge of biology made him adept at inferring meaning from images of cell structure. This style of doing science often provoked other members of the scientific community who wanted experiments and data, but McIntosh says that Porter's intuitions were often right and even when not, they generated a tremendous amount of good science. McIntosh remembers how Porter could make people laugh with a joke or an insulting phrase and how his outlook on work and life often put difficult issues into a rational perspective. He says that it was the combination of delight in good biology and the enjoyment of a good laugh that made working with Porter such a pleasure.

As a graduate student at Harvard in Porter's lab, Ursula Goodenough, ASCB's President-elect, recalls his good humor and critical eye during Porter's Monday afternoon seminars. Cell biologists from all over the world would come in to present their work, and Porter always sat in the same spot, next to the screen. As the Scientist of the Week would point to important features of the electron micrographs that were projected onto the screen, Porter would jump up, jabbing his finger at the screen, asking What about that? Don't you think that's important? What about the microtubules up there in the corner? Couldn't they be involved? Although the scientist was usually taken aback by this approach, Porter's students enjoyed it immensely. And these seminars were critical for Goodenough, for they taught her to look at what was really on the screen, not just at what was being touted as important; to be curious, incisive, and imaginative. Goodenough doesn't believe anyone was as good at it as Porter, and that he clearly set the standard in the interpretation of fine structure for everyone with whom he interacted. His obvious delight in the process was contagious.

Following Colorado, Porter moved to the Department of Biology at the University of Maryland, Baltimore County, and from there to the University of Pennsylvania, where he currently is Research Professor of Biology.