DOCUMENTS OF THE GENERAL FACULTY

REPORT OF THE MEMORIAL RESOLUTION COMMITTEE FOR
EDWARD LAWRENCE POWERS

The special committee of the General Faculty to prepare a memorial resolution for Edward Lawrence Powers, professor emeritus, molecular genetics and microbiology, has filed with the secretary of the General Faculty the following report.

Sue Alexander Greninger, Secretary
The General Faculty

IN MEMORIAM
EDWARD LAWRENCE POWERS

Larry Powers' academic and research contributions to The University of Texas at Austin and the scientific world span more than four decades. During this period, radiation science grew to worldwide importance with the development of the atomic bomb and nuclear power. Larry made many fundamental contributions to radiation science and the understanding of the cellular and biochemical effects of radiation.

A native of Charleston, South Carolina, Larry was born December 30, 1915, to an extremely poor Irish Roman Catholic family. There were virtually no books in his home, and he felt this lack keenly. He was overjoyed when the public library opened just two days after his fifteenth birthday. Upon graduating in 1933 from the Bishop England High School in Charleston, he entered Notre Dame University to study for the priesthood. This career path lasted only one semester. He then entered the municipal College of Charleston. His strong Catholic background continued to guide him throughout his life.

Larry served as undergraduate laboratory assistant in the general biology course in the College of Charleston and graduated in 1938 with a B.S. in biology, chemistry, and mathematics. He promptly started graduate studies in zoology at The Johns Hopkins University and earned his Ph.D. in genetics and protozoology in 1941. He met his future wife, Mary Eleanor "Elly" Fogarty, in a calculus class at the College of Charleston, and they were married in 1939 during his second year at Johns Hopkins.

For his dissertation, Larry studied the mating types of the ciliate protozoan, *Euplotes patella*, which can exist as "double" animals in which there are two nuclear complexes with a common cytoplasm. Thus, it was possible for him to obtain animals with two nuclei of different genetic constitutions. He found that double animals with different genes in their two nuclei were of the same mating type as single animals having these same genes in one nucleus. He, therefore, concluded that the interaction of the mating type genes is not dependent on their inclusion in the same nucleus. This was the first demonstration in *Euplotes* of the role of the macronucleus in determining a gene-controlled character. His further studies furnished considerable insight on the mode of action of genes in determining the mating type.

Larry began his professional career at the University of Notre Dame as instructor and assistant professor, where he continued his studies of the physiology and genetics of protozoa during the war years, 1941-45. His teaching included comparative anatomy, embryology, histology, physical anthropology, physiology, and genetics. While at Notre Dame, he was also a visiting lecturer for two years at Fordham University, where he taught genetics and general biology. Given his passion for scientific research, his very heavy teaching load must have interfered with his research efforts and encouraged him to seek a position elsewhere. His multidisciplinary background attracted attention, and he was hired in 1946 to the Argonne National Laboratory where he made seminal studies in radiation science. This was a time when there was an acute need for understanding the effects of radiation exposure. He focused, with his first graduate student, Charles Ehret, on the protozoan, *Paramecium*. This work used the new technology of electron microscopy to characterize radiation-induced damage within separate subcellular compartments.

Larry and his colleagues identified radiation-produced free radicals as intermediates in biological damage and found a general damage mechanism resulting from the reaction of oxygen with free radicals. They further discovered the first "isotope effect" in radiation sensitivity by substituting deuterium for hydrogen in water.
This led to the discovery of several ways in which water participates in the development of radiation damage in cells. Roles of water in the mechanisms of radiation-induced damage became a major research theme in Larry’s career. Particularly noteworthy at this time was the discovery of two effects of oxygen on dry spores of *Bacillus megaterium*, one immediate and one delayed. A new algebraic analysis quantified these effects.

A Guggenheim fellowship was awarded to Larry in 1958-59 for studies with Hal Gray at the Mt. Vernon Hospital, London, England, where they studied the physico-chemical compartmentalization of radiation effects in dry bacterial spores in order to understand better the effects of oxygen in wet mammalian cells. Larry combined his algebraic analysis of compartmentalization of radiation-induced effects in the bacterial spore with existing target theory of radiation-induced damage. This synthesis provided the first mechanism-based description of the repair of potentially lethal damage caused by ionizing radiation. He suggested, correctly in retrospect, that this description might help to explain the repair of radiation-induced sub-lethal damage in mammalian cells very recently reported at that time.

Between 1954 and 1960, Larry and his colleagues at Argonne and Marquette University studied the rates of heritable disorders in children of first cousins. This study, which depended on detailed family interviews, was the first to gain approval for the use of Chancery records of the Catholic Church not only in this country but also in the provinces of Como, Varsese, and Milano, Italy. The approval required establishing new and effective procedures for preserving confidentiality. Larry hoped that these results would help to understand the mutational load in non-irradiated human populations, thereby allowing better appreciation of the effects of irradiation.

Larry was persuaded by Wilson Stone to join the Department of Zoology at The University of Texas in 1965 as professor of zoology, where he established the Laboratory of Radiation Biology, and in 1968 founded the Texas Association of Radiation Research. Larry, with Alan Tallentire, a co-worker from The University of Manchester, England, continued to study the roles of water in the sensitivity of cells to radiation. These efforts led to the localization of radiation-induced free radicals in different cellular compartments, showing that radiation effects in cells exist even in the absence of oxygen, and pointed to the role of the hydroxyl radical in mediating many effects.

Studies with Michael Simic, a co-worker at UT and internationally recognized radiation chemist, revealed a great variety of chemical compounds that have oxidation properties correlated with their ability to enhance, or protect against, radiation sensitivity. This led to the systematic testing of compounds as sensitizers and protectors of radiation-induced cell lethality. Some of these chemicals were found to be useful as anti-tumor drugs in combination with radiation therapy in treatment of certain cancers.

Larry loved, required, and thrived on discussion and debate. He enjoyed a bit of polemic and particularly liked to challenge the common assumption that radiation effects could be extrapolated linearly to very low levels of radiation, where the effects are too small to be measured in terms of biological responses. On occasion, for the sake of argument, he made plausible cases for the beneficial effects of such low levels of radiation.

In 1975, Larry founded and was director of the Center for Fast Kinetics Research at UT. This facility served as a valuable international resource for the study of the kinetics of radiation-induced free radical and excited-state reactions for over twenty years.

In recognition of Larry's many contributions to chemistry, he was awarded the Bruno Bryer Memorial Medal by the Royal Australian Chemistry Institute in 1984 and the Fisher Award in Analytical Chemistry by the American Chemical Society. In 1985, Larry was awarded the first T.S. Painter Centennial Professorship in Genetics. He retired in 1987 and moved back to Charleston where he was first inspired to study science over fifty years earlier. He became professor in residence at the Grice Marine Laboratory of the College of Charleston named after his early mentor, George Daniel Grice. Larry died in Charleston on August 1, 2005. He was preceded in death by his wife, Elly, and is survived by his seven daughters and one sister.
The memorial resolution was prepared by a special committee consisting of Professors Austen F. Riggs (chair), Hugh S. Forrest and H. Eldon Sutton.

Distributed to the dean of the College of Natural Sciences, the executive vice president and provost, and the president on July 28, 2006. Copies are available on request from the Office of the General Faculty, WMB 2.102, F9500. This resolution is posted under "Memorials" at: http://www.utexas.edu/faculty/council/.