IN MEMORIAM

Marlene A. DeLuca
Professor of Chemistry and Biochemistry
UC San Diego
1936-1987

Marlene A. DeLuca succumbed to cancer on November 18, 1987 at the peak of her scientific career.

Marlene was born in La Crosse, Wisconsin on November 10, 1936. After obtaining the B.S. degree in Chemistry from Hamline University in 1958, Marlene entered the graduate program in the Department of Physiological Chemistry (now Biochemistry) at the University of Minnesota. Her Ph.D. research at the University of Minnesota which was conducted in Paul Boyer's laboratory was focused on the molecular mechanism of ATP synthesis in mitochondria. This became the foundation of her subsequent research that focused on the molecular mechanism of enzymes involved in bioenergetic processes. After obtaining the Ph.D. in 1962, Marlene's research interests in bioenergetics led her to Bill McElroy's laboratory at Johns Hopkins University where she initiated studies on the molecular mechanism of bioluminescence catalyzed by firefly luciferase.

After her postdoctoral studies in the McElroy laboratory, Marlene continued research on the molecular mechanism of firefly luciferase and initiated studies on the molecular mechanism of tRNA synthases, first as Assistant Professor of Biology at Johns Hopkins University from 1965 to 1969 and then as Assistant Professor at Georgetown University from 1969 to 1972. The move to Georgetown University was prompted by her marriage to Bill McElroy and his subsequent appointment as Director of the National Science Foundation. Following Bill McElroy's appointment as Chancellor of UCSD in 1971, Marlene joined the faculty of the Department of Chemistry (now Chemistry and Biochemistry) in 1972 and was assigned laboratory space in the Basic Science Building of the School of Medicine.

Soon after establishing her laboratory in the Basic Science Building, Marlene began collaborative studies with Joanne Ingwall and John Ross, neighbors in the Department of Medicine, on the effects of oxygen and glucose deprivation on enzyme and ATP levels in fetal mouse hearts in culture. These studies depended on accurate detection of light emission triggered by addition of small quantities of ATP to the firefly luciferin-luciferase system. Marlene's laboratory was uniquely suited for this task. The success of the collaborative studies set the stage for Marlene's most widely recognized work, that of harnessing bioluminescent systems to provide a broad spectrum of analytical methods for basic research and clinical applications.

An important first step in this direction was realized in 1975 when Ed Jablonski, her first graduate student at UCSD, successfully attached a dual- enzyme bacterial luciferase to porous glass beads attached to glass rods and showed that the immobilized enzymes emitted light when soaked in solutions containing NADH. Demonstration that the immobilized luciferase could detect NADH quantitatively was a prelude for the development of a wide variety of analytical procedures using matrices containing immobilized luciferases.

As early as 1976, Marlene began badgering the National Institutes of Health for permission to clone the gene encoding firefly luciferase for use as a reporter after expression in mammalian cells. However, owing to the restrictive guidelines imposed by NIH on recombinant DNA research in the 1970s, several years passed before her vision was realized. In early 1985, in collaboration with Don Helinski's laboratory in the

Department of Biology, firefly luciferase was expressed in active form after inserting the cDNA encoding it into the E. coli genome. Shortly afterward, the cDNA encoding firefly luciferase was inserted into carrot and tobacco plants in collaboration with Stephan Howell's laboratory in the Department of Biology and into cultured monkey kidney cells in collaboration with Suresh Subramani's laboratory in the Department of Biology.

In early stages of these studies, it was discovered that growing tobacco plants containing firefly luciferase glowed spectacularly after watering with a solution containing luciferin, the substrate for firefly luciferase. A photograph of a glowing tobacco plant, which was part of an article published in Science magazine, attracted the attention of the popular news media. Marlene was rather uncomfortable with this recognition because it interrupted her interactions with the people in her laboratory. To paraphrase Ed Jablonski's remembrance of Marlene, it was people, not science, who were most important in Marlene's life, her husband and collaborator, Bill McElroy, son Eric, friends near and distant, and those in the lab. There was special concern for those in the lab. Marlene interacted with them on the basis of mutual respect. She found it difficult to discipline a student verbally. Her infamous drawing of an unhappy face with "M.A.D." written under it was all that was necessary to correct a problem.

Continued interaction with this unique person has been dearly missed.

William S. Allison, Chair
Russell Doolittle
Susan S. Taylor