IN MEMORIAM

Sydney Kustu
Professor of Plant & Microbial Biology, Emerita
UC Berkeley
1943 – 2014

Sydney Govons Kustu, a distinguished scientist, a driving force behind the development of microbiology on the UC Berkeley campus, and a trailblazer for women in science, died in Berkeley on March 18, 2014. Born March 18, 1943, in Baltimore, Maryland, her family moved to Lansing, Michigan when she was 12. She proved to be a child prodigy, skipping three grades in school and receiving a multitude of honors during her youth. These honors included attending the Peabody Conservatory summer music camp for music composition, playing a piano concerto with the Lansing Symphony Orchestra at a very young age, winning the State of Michigan Detroit Free Press debate contest for which she was not only the youngest but also the first female to do so, and being awarded a National Merit Scholarship.

Kustu entered Radcliffe College for her undergraduate studies at the early age of 15. By itself this was a significant achievement. Although the institutions subsequently merged, Radcliffe College and Harvard College were separate and were, respectively, all- female and all- male colleges at the time of her matriculation. Radcliffe was considered Harvard's "coordinate institution for female students." Kustu received her BA degree in General Studies in 1963, thereby contributing to the integration of women into higher education by being among the first females to graduate from Harvard.

After graduating from Harvard, Kustu spent two years as a technician in the laboratory of Saul Roseman at the University of Michigan, where she received training in the purification and kinetic characterization of enzymes. She earned her doctorate in biochemistry with Professor Jack Preiss at UC Davis in 1970. He considered her, “one of the brightest if not the brightest of the over 100 researchers (postdoctoral scholars, sabbatical professors and 30 graduate students) present in my laboratory in my 45 years as an active faculty member.”

Kustu joined the laboratory of Professor Giovanna Ames at UC Berkeley after completing her doctoral thesis. Ames found Kustu to be “a superb experimentalist with golden hands.” She noted that “[Kustu’s] intuition and expansive view of scientific matters turned all experiments into a perfectionist’s game of foreseeing all possibilities and complications, addressing them in advance, and composing an experiment somewhat like a piece of music.”

After establishing her own laboratory as a faculty member, Kustu consistently worked with a small research group. This arrangement enabled her to make lasting contributions to microbiology such that her work is now part of the fabric of knowledge of genetics, metabolism and nutrition. A true intellectual, she read widely and attended seminars broadly. Without fail she asked the penetrating question that either clarified the issue under discussion or showed the need for additional evidence — in some cases in a pointed manner.

Kustu's research had broad implications. Among her many contributions to microbial genetics and physiology, she was best known for her work on how bacterial genes are regulated by the availability of nitrogen- containing compounds in the environment. Kustu discovered a new pair of genes involved in regulating nitrogen metabolism in bacteria — one of the first so- called two- component regulatory systems — and with that solved a fundamental puzzle of nitrogen regulation.

She was a strong advocate for young scientists and mentored numerous students and postdoctoral scholars, many of whom went on to productive careers in this country and abroad. They often spoke of the lasting effect Kustu had on their lives and of how her enthusiasm for science made working in her laboratory an exhilarating experience. One former student, Linda McCarter, recalled, "Her fierce intelligence unfailingly led her to the crux of every problem, her expectation for excellence was always inspiring, and her keen joy in science and the world was a great pleasure and privilege to share."

Throughout her career, Kustu was an effective and dedicated teacher at both the undergraduate and graduate levels. Her use of the Socratic method for teaching concepts in microbiology was particularly effective and inspiring. Students noted that Kustu was aware of the social undercurrents in science and was willing to speak about them. She was known for her high standards and dedication to science (her "higher calling"), and for her insistence on clear and concise writing.

In 1973 Kustu was hired as assistant professor of bacteriology at UC Davis, and in 1984 was promoted to full professor. It was during her time at UC Davis that Kustu initiated her pioneering studies of nitrogen metabolism. In addition to launching her research and teaching career, she assumed a prominent role in promoting and co- organizing the West Coast Bacterial Physiologists annual meeting held at the Asilomar Conference Center in Pacific Grove, California. She continued in this capacity for the greater part of the next two decades. In 2011 her efforts were recognized by a special symposium organized to honor her and her many contributions to microbial physiology.

In 1986 Kustu was recruited to UC Berkeley, where she helped lead the effort to revive and strengthen microbiology on campus. Her contributions culminated with the establishment of the Division of Microbiology within the Department of Plant & Microbial Biology (PMB). At Berkeley, Kustu continued her groundbreaking research on the regulation of nitrogen metabolism. She unraveled the function of the proteins she had discovered at UC Davis, and in so doing uncovered principles applicable not only to bacteria, but also to other major forms of life such as plants, animals and fungi. Driven by her enduring interest in bacterial physiology, she eventually turned to questions of how bacteria obtain and metabolize various nitrogen-containing compounds. These studies led to important insights into a family of membrane channels that transport ammonium ion as well as to the discovery of a new central metabolic pathway for the degradation of pyrimidines, building blocks of DNA and RNA.

A scientist who looked to solve problems with genetics and biochemistry first, Kustu was fearless in applying other disciplines to answer fundamental questions. When she lacked the necessary expertise, she formed collaborations with talented colleagues to arrive at solutions. Colleagues were impressed with her ability to integrate the tools of genetics and biochemistry with complementary methods to advance the understanding of complex physiological systems.

Kustu garnered a large number of awards during her career. She was elected a member of the National Academy of Sciences and a fellow of the American Academy of Arts and Sciences, the American Association for the Advancement of Science, and the American Academy of Microbiology. She was awarded a prestigious Gauss Professorship by the Göttingen Academy of Sciences and a Miller Professorship by UC Berkeley. She also was honored with a MERIT (Method to Extend Research in Time) award from the National Institutes of Health (NIH), which recognizes researchers who have demonstrated superior competence and outstanding productivity and guarantees funding for 10 years. Less than five percent of NIH-funded investigators are selected to receive MERIT awards.

In 1993, Kustu and six other women were elected to the National Academy of Sciences, representing a significant rise in the number of women inducted over prior years. Before 1980, very few women were elected to the National Academy, which embodies one of the highest levels of achievement for a scientist. At the time of Kustu's election, females accounted for less than five percent of Academy membership. Kustu was particularly proud of her inclusion in the Academy because, in her own words, "at one time it was forbidden fruit for women to do science." Since her election, female representation in the Academy has more than tripled. Women now account for 13% of the membership.

Likewise, when Kustu was recruited to Berkeley in 1986 only 15% of the faculty in the biological sciences were female. The ensuing years have witnessed striking changes, and women now represent an impressive one- third of the biological sciences faculty on the Berkeley campus. Informed by her own early career experience of how women scientists were not always treated as equals to their male counterparts, Kustu made a point of reaching out and mentoring every woman who joined the faculty of her home department of PMB. This led to institution of a mentorship program in PMB where all new faculty (male or female) were paired with an appropriate and supportive senior faculty member.

In addition to research, teaching and mentoring, Kustu was passionate about the arts and nature. She organized outings with friends and colleagues to Zellerbach Hall on the Berkeley campus and to museums in San Francisco, and often attended movies played at the Pacific Film Archives. She was particularly attracted to Southern literature and was a fan of Walker Percy and Shelby Foote. Her interest in the arts and literature was reflected in her service on the Library Committee of the Academic Senate. An avid hiker, Kustu made it a point to take daily long walks in and around Berkeley, especially to the UC Botanical Garden. Always gracious and likeable upon first interaction, she was very supportive of those in need of comfort and assistance. She also had particularly strong feelings for the infirm and the down- and- out.

Kustu retired from the University in March 2010, and was appointed Professor Emerita. She is survived by her son, Saul Kustu of Aptos, CA, and two sisters, Roberta Glassman of Calabasas, CA, and Marica Govons of Belmont Shores, CA.

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