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Berkeley's First Women Chemists

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By Marge d'Wylde

One of the important legacies of the UC system is that women were admitted as students two years after the University's founding in 1870. The Regents unanimously passed a resolution to admit women, who made up around 36% of the state's population at the time. The University Registrar announcement was clearly meant to encourage them to attend: "Young Ladies are admitted into the University on equal terms, in all respects with young men." In fact, seven women students had already applied and been accepted before they were "officially recognized" as there was no rule stating that they could not attend.

However, hiring women faculty, especially in the sciences, lagged significantly behind the admission of women students. The first woman chemist arrived on campus in 1915. Professor Agnes Fay Morgan joined the College of Agriculture as a professor in home economics. During her tenure at Berkeley, she pioneered biochemical research in vitamins and in the understanding of how the human body processes food. Sixty-three years passed before the arrival of Professor Judith Klinman in 1978. She was the first woman physical scientist on campus. Klinman is internationally renowned for her research in enzyme catalysis. In 1983 Professor Angelica Stacy joined the College of Chemistry as an assistant professor. Today Stacy is both professor of chemistry and Berkeley's associate vice provost for the faculty. Fourth in line was the arrival of Professor Darleane Hoffman in 1984. Hoffman was hired away from Los Alamos National Laboratory by Glenn Seaborg to continue her ground-breaking research into radioactive elements. These women were pioneers, as scientists and as women faculty and helped pave the way for future generations of women faculty and students in the sciences.

Agnes Fay Morgan (1884 – 1968) Professor Emerita Nutrition and Biochemist Emerita, Agricultural Experimentation Station, was a pioneer among women in American science. Morgan received her Ph.D. in Chemistry from the University of Chicago in 1914 and joined Berkeley's faculty the next year.

A 1949 article in Chemical and Engineering News, explained Morgan's reason for choosing the position at Berkeley. "After majoring in physical and organic chemistry, the new Dr. Morgan examined her fields of study and observed that there were many highly competent young men also looking for similar jobs. She decided to seek other related fields where there was less prejudice against women chemists." Morgan was scheduled to interview with the college's dean. However,

he sent his wife and teenage daughter to conduct the interview instead. They were apparently favorably impressed because she was offered a position, which she accepted for a salary of $1,800; male faculty members at the university were being paid $2,400 with a doctorate and $1,800 without one. At the time, there was a strong belief that women faculty should be unmarried when they were teaching. Morgan, however, was unusual because she was married when she accepted her faculty position.

Morgan arrived on campus only to learn that she would be teaching courses in nutrition and dietetics. Dietetics was, she said, "A subject I knew nothing about and nobody else knew much about at that time." She had to research the curriculum "mostly out of German medical journals." Her goal eventually became to "debunk, through scientific research methods, myths about common household customs of cookery, clean living and good order," and in that way promote sound practices in this "tradition-bound arena."

Some of the most significant scientific research to emerge from Morgan's laboratory concerned the biochemistry of vitamins and the nutritional value of foods. She became best known for her work examining the effects of pantothenic acid (vitamin B5) on adrenal gland function. In her early research, Morgan analyzed processed foods and characterized their vitamin composition. She was the first to establish that a preservative, sulfur dioxide, protected vitamin C but damaged thiamine.

Late in her career, she was involved in an Agricultural Experiment Station project that examined nutrition among older people in San Mateo County. That work yielded two important conclusions: that bone density began to decline in women between the ages of 50 and 65, and that dietary fat intake led to increases in serum cholesterol.

Morgan received the Garvan Medal in 1949, which is awarded to outstanding women in chemistry by the American Chemical Society. In 1954, Morgan and Wayne State University researcher Arthur H. Smith were the co-winners of the Borden Research Award from the Borden Company Foundation.

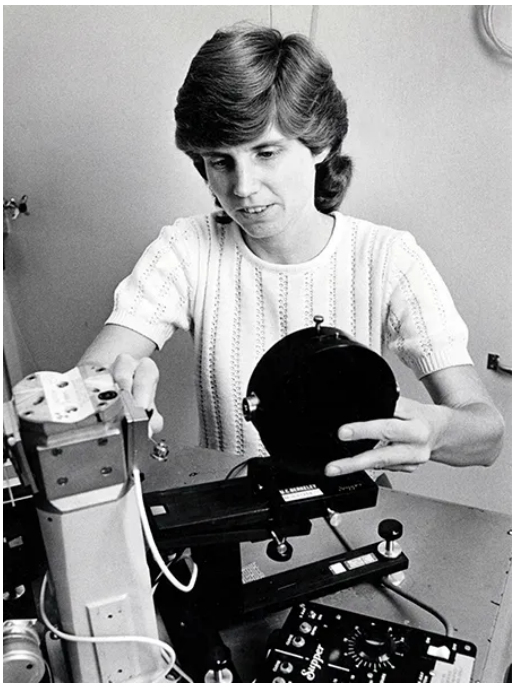
Judith Klinman (Active 1978-Present) is a Professor of the Graduate School and a Chancellor's Professor. She is Professor Emerita in Chemistry and Molecular and Cell Biology and a member of the California Institute for Quantitative Biosciences.

Among her many distinctions, Klinman was the first woman faculty member in the physical sciences at UC Berkeley. She also is the only woman to chair the Department of Chemistry,

serving in that capacity from 2000 to 2003. During her tenure she has been a Chancellor's Professor, a Guggenheim Fellow, and a Miller Fellow. She was elected to the National Academy of Sciences, the American Academy of Arts and Sciences, and the American Philosophical Society, and has received the Repligen Award and the Remsen Award from the American Chemical Society.

Klinman has contributed to the understanding of the fundamental properties that underlie enzyme catalysis. Early in her career, she developed the application of kinetic isotope effects to the study of enzyme catalysis, showing how these probes can be used to uncover chemical steps, to determine kinetic order, and to obtain substrate dissociation constants. She investigates how proteins and enzymes do everything from letting our bodies use oxygen to regulating neurotransmitters. Her research looks into the fundamental properties that underlie these reactions, often using isotope tracers to uncover the chemical steps involved. These studies include the role of hydrogen tunneling and protein dynamics in enzyme catalysis; the post-translational production of novel protein and peptide-derived cofactors and their roles in enzyme function; and the underlying principles of oxygen activation among enzymes that utilize a wide range of catalytic strategies.

She was awarded the National Medal of Science in 2012 by former President Barack Obama for her discoveries of fundamental chemical and physical principles underlying enzyme catalysis and for her leadership in the community of scientists. Klinman's parents told her when she started that if a woman chose a career in science it was typically as a lab tech. "But I had this underlying curiosity,'' she said. "I was determined to go the whole route.''



Angelica Stacy (active 1983 to present) is a Professor of Chemistry and the UC Berkeley Associate Vice Provost for Faculty. Along with her chemistry research and teaching, she is involved in research focused on undergraduate chemistry education. Stacy joined the College of Chemistry as an assistant professor in 1983.

Angelica Stacy's chemistry research focused on development of new synthetic methodologies, including the use of molten salts for the synthesis of oxide superconductors, electrodeposition (in aqueous solutions and molten salts) for the synthesis of thermoelectric materials, and the use of plasma-solid reactions for the synthesis of fluorides with interesting catalytic properties. The lab experimented with a plasma chamber in the development of chemistries for emission reduction of perfluorocarbon compounds produced by plasma processing of semiconductor

devices. Further exploration included two-dimensional and one-dimensional quantum confined thermoelectric materials.

Regarding her work for faculty inclusion Stacy says, “Diversity is an integral part of excellence. If we are to attract the best and the brightest then we need to draw on all the talented minds, not just from a few select groups. One only needs to look around at the faculty to realize that its composition does not reflect the diversity of our society, or even the diversity of our students. My post is critical in assisting our faculty and our leadership in using data to construct new paradigms for promoting greater diversity and equity in our faculty.”

Stacy has received many awards both for her chemistry research and for her work in education. She is the recipient of the President’s Chair for Teaching, University of California; Francis P. Garvan-John M. Olin Medal; Catalyst Award, Chemical Manufacturers Association; The Donald Sterling Noyce Prize for Excellence in Undergraduate Teaching; and the James Flack Norris Award for Outstanding Achievement in the Teaching of Chemistry.

Darleane Hoffman (active 1984 to 2013) Professor Emerita, Nuclear Chemistry has fundamentally added to our understanding of radioactive elements. In 1971, scientists still believed that transuranium elements did not occur in nature, but in that year Hoffman, working at Los Alamos National Laboratory, discovered small amounts of plutonium-244 in a rock formation. Hoffman also isolated and characterized fermium-257— “Work that represented a

monumental advance in the understanding of the fission process," according to Nobel Prize winner Glenn Seaborg. Hoffman was also noted for her study of the chemical and nuclear properties of rutherfordium, bohrium, and hassium, and she confirmed the existence of seaborgium.

Hoffman had not always dreamt of becoming a nuclear chemist. She originally entered Iowa State College with a major in applied art. However, a required chemistry class, and an inspirational professor, influenced her to switch majors. When her applied arts professor asked if a career in chemistry was appropriate for women, Hoffman replied, "Of course, my chemistry professor is a woman."

This question of gender would be a recurring theme throughout her career. When she originally applied for a job in the 1950s with Los Alamos National Laboratory's radiochemistry division, she was told that they didn't hire women in that field. This didn't discourage her and she became the first female division leader at Los Alamos, leading the isotope and nuclear chemistry division. According to Hoffman, "Nuclear science was started in large part by women, among them Marie Curie. If anything, women were prominent because it wasn't an established field, and so it was easier to break into."

In the early 1970s, Hoffman made an important discovery about nuclear fission. Scientists had known since the late 1930s that the nuclei of certain elements split when bombarded with neutrons. Hoffman discovered that the atoms of one element, fermium, could split spontaneously.

Among her many prizes, Hoffman was awarded the National Medal of Science for Chemistry by former President Bill Clinton in 1997 for her research efforts. Specifically, she was cited for her discovery of primordial plutonium in nature and the symmetric spontaneous fission of heavy nuclei; for pioneering studies of elements 104, 105, and 106, and for her outstanding service to education of students in nuclear chemistry and as director of the Seaborg Institute for Transactinium Science of the University of California.

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