IN MEMORIAM

Martin H. Graham
Professor of Electrical Engineering and Computer Science, Emeritus
UC Berkeley
1926-2015

A few paragraphs cannot do justice to Marty Graham's talents or his impact on his profession. He was a pioneer in computer science, a founding member of Berkeley's original Department of Computer Science, 1968-1973, chair of that department, 1970-1973, and secretary of the Academic Senate, 1978-1980. Those things are much more completely represented in two oral histories-- one taken in 1991 and archived in the IEEE Center for History of Electrical Engineering (Interview #131); the other taken in 2011 and archived in the Computer History Museum (catalog number 102746199).

In his 2001 architectural monograph *The Campus Guides: Rice University*, Stephen Fox spends a short paragraph describing the architectural significance of Abercrombie Laboratory, followed by a much longer paragraph describing its historical significance in computer science: Between 1957 and 1961, on the south end of its second floor, an electronic digital computing machine was taking shape. Fox points out that when it was completed, the computer occupied about 600 square feet of floor space, comprised 3,000 vacuum tubes cooled by a 15-ton air conditioner (an air conditioner capable of removing about as much heat per day as that required to melt 15 tons of ice), and was the largest, fastest computer on any U.S. campus.

R1, the Rice Computer, was the realization of a proposal by three Rice-University scientists whose research involved extensive computation. During the hot, humid Houston summers, the three enjoyed being at Los Alamos, where they used the MANIAC-2 computer. For the rest of the year, they wanted a copy of MANIAC-2 in Houston, where they could integrate their computations more efficiently into their day-by-day research and that of their students. Unfortunately, in those days, there were no ready-made state-of-the art computers available for purchase. Such a computer would have to be constructed on site. That would require an electrical engineer; and the obvious choice was Dr. Martin H. Graham, the Brookhaven engineer who had provided key innovations for the arithmetic processor of MANIAC-2. At the time, young Marty Graham was considering a similar

proposal from the University of Chicago, where plans for MANIAC-3 were being formulated. He would take on the Rice project if and only if the goal were to go beyond MANIAC-2, with new innovations, rather than merely to copy it, and if and only if he were given final authority regarding design decisions.

Born in Jamaica, Queens, in July 1926, Marty was just sixteen when he enrolled as a freshman at the Polytechnic Institute of Brooklyn, intending to study electrical engineering. On turning 18, two years later, he was drafted into the U.S. Navy. Desperately needing radio technicians, the Navy immediately tested Marty and promoted him to seaman first class before he'd even started boot camp. That was followed by nearly a year of technical training, which was not completed until after WW II had ended. He then had a six-month assignment to a naval air station in French Morocco.

On returning home, he took advantage of the GI Bill to finish his bachelor degree at Brooklyn Poly, and then to go on through a master's degree program in engineering science and applied physics at Harvard. This course-work-only program honed Marty's mathematical skills and strengthened his knowledge of basic science. Back in Queens, he divided his time between Brookhaven National Laboratory, where he conducted his dissertation research, and Brooklyn Poly, where he taught courses and tended to the non-dissertation requirements for the doctorate. After earning his doctorate in 1952, he continued his career at Brookhaven, working at the cutting edge of physical electronics, electronic instrumentation and digital circuitry. One of his tasks was to help build an improved version of the Los Alamos MANIAC computer at Brookhaven. While doing these things, he continued to teach part time at Brooklyn Poly. And then, in 1957, when Rice and U. Chicago each wanted a MANIAC type computer on its campus, he chose Houston over Chicago, accepted the role of leading the **R1** project, and began a nine-year career on the Rice University engineering faculty. Although, following its initial construction, **R1** began to be used for computations in the natural sciences (e.g., physics, chemistry, geophysics), it continued to evolve, with continuing hardware and software innovations. Thus it was a marvelous facility for student training in computer science. That marked the beginning of computer engineering education at Rice. Abercrombie Laboratory now is home to Rice's Department of Electrical and *Computer* Engineering.

In 1964, Marty spent a sabbatical at Berkeley; and in 1966 he accepted a position here as Professor of Electrical Engineering and Associate Director of the campus Computer Center. At that time there was a debate over whether there should be an academic department of computer science within the College of Letters and Science, or a division of computer engineering within the Department of Electrical Engineering. In 1968, the Computer Science Department was formed in Letters and Science, with Beresford Parlett as its chairman. Marty followed Beresford as chairman and served in that role until, in 1973, the department was merged with the Electrical Engineering Department to form the EECS Department. He was Secretary of the Academic Senate between 1978 and 80. Marty would spend the remainder of his career as Professor of EECS at Berkeley, officially retiring in 1994, but remaining very active in departmental and professional activities until shortly before his death. Of his 41 U.S. Patents, for example, 22 were in response to applications written and filed after 1994. His last patent application was filed in 2008.

At Berkeley, Marty's computer research was focused on communication with and between computers, and many of his patents were related to what is now known as **L**ocal **A**rea **N**etworking. In Houston, Marty had begun collaborating with Michael DeBakey regarding the use of computers to analyze cardio-electric potentials. At Berkeley, this led to his

participation in the establishment of a bioelectronics program in EECS. A few years later, Marty was one of a small group of faculty members that formed a pilot program with UC San Francisco. It tested the idea that, in spite of being separated by the San Francisco Bay as well as academic cultural differences, UC Berkeley and UC San Francisco could work together effectively to train graduate students in biomedical engineering.

The pilot program was a success, and soon was transformed into the Joint UC Berkeley, UC San Francisco Graduate Group in Bioengineering, with graduate bioengineering degrees offered jointly by the two campuses. A small executive committee carried out administration of the Graduate Group, and Marty was a member of the first of these--which was charged with guiding the Group through its formative years. Given the novel nature of the Group, the fact that its growing faculty membership was spread over departments in at least nine schools and colleges on the two campuses, as well as LBNL, and the fact that graduate groups usually do not have bi-weekly or monthly faculty meetings, Marty quickly recognized that the most urgent task was to create a sense of unity. To achieve that, out of his own pocket, Marty sponsored a Group retreat at Asilomar. In a sense, the Graduate Group actually was born at that retreat. The retreat was so effective that it was adopted as an annual event, where new students and faculty would be introduced and new research collaborations would be established. And now, more than 30 years later, it still serves those purposes. The success of this graduate program led to establishment, shortly after Marty's retirement, of an undergraduate Bioengineering Department in the Berkeley College of Engineering.

Marty's thoroughly practical approaches to engineering and its teaching were well known. He often pointed out that one does not usually find answers to real-world problems in a solution section at the back of a book and, as one of his own mentors had told him, that some real-world problems don't have solutions. His students often reported that they did not fully appreciate his unorthodox teaching style until long after they'd completed his courses, when they'd advanced far enough to realize just how much they'd learned from him.

He maintained close contact over scores of years with students and co-inventors and continued inventing and solving problems for others in his home laboratory. Interesting examples of the latter were two early problems with BART-- motor failure and failure in the system for remote detection of trains. With his help, both of these problems were solved. For nearly 20 years after retirement, until shortly before his death, Marty continued to attend the weekly departmental or divisional lunch meetings and to interact with the current EECS faculty. During this period, he also continued his research into the effects of stray electrical fields and currents (electrical pollution) on people and livestock. With his partner Dave Stetzer, he developed low-cost devices that thousands of people have used to measure and eliminate that pollution in their homes, schools and farms.

Marty and his wife Selma were married for over 66 years, having first met in 1947, prior to his completion of studies at Harvard. He was a father of two – Lisa (affectionately known as Laddie), a cutting-horse trainer in Mendocino County, who tragically died in an auto-accident in October 2007, and Andrew, a quality control technician who has worked for Boeing, near Seattle. Apart from his nuclear family, he is survived by his niece, Andrea Biero, who lives in France, his sister-in-law in New York, Ruth Franks, and her six children.

Edwin Lewis
Thomas Budinger
David Franks