Faculty Profile

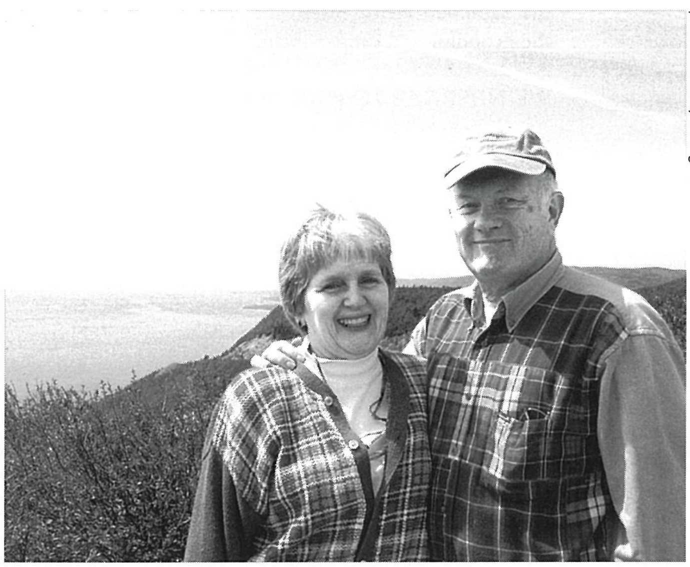
right on the Mark

by Thomas Heldt

Roger Mark's goal of helping others began as an MIT freshman and continues today as an MIT housemaster.

When asked in 7th grade to prepare a career notebook of a profession he might want to pursue in the future, young Roger Mark's entry was "Nuclear Physicist."

As a native of Brookline, Mass., Mark's vocational goal was to be realized not far from home — just across the Charles River at MIT, where he enrolled as a freshman in 1956. Despite his youthful determination, it dawned on him during a dynamics class that the abstract models and formulations used in physics did not come naturally to him. And since his 7th grade notebook failed to offer advice on alternative career paths, he decided to scout the campus for interesting research opportunities for a newly self-proclaimed electrical engineer.



photos courtesy of Roger Mark

Dotty and Roger Mark enjoy spending time in Nova Scotia, Canada, where they have a summer cabin.

He did not have to venture far, as the Laboratory for Communications Biophysics had recently been established under the leadership of Professor Walter Rosenblith. The lab's focus of applying signal processing and computer analyses to bioelectrical signals showed an intriguing facet of electrical engineering at the interface to basic physiology—one that was to become formative for Mark's future.

While determined to pursue a career in research, Mark experienced a strong desire to enter the medical profession, or—as he puts it—"to take care of sick people." Yet when he was offered admission to HMS, he declined in favor of first pursuing graduate studies at MIT in order to solidify his research skills. (The concept of "deferment" was unheard of at the time.)

After a solid year of research and coursework, and having passed the doctoral qualifying exams, Mark decided that the time was right for another attempt to gain admission to HMS. Much to his dismay, however, the admissions office at HMS remembered his note, hastily composed the prior year, indicating that he was not interested in enrolling. It took much lobbying and persuasion on his and Rosenblith's behalf to convince the HMS admissions committee that a dual degree in electrical engineering and medicine did, in fact, make sense and that he was, indeed, committed to finishing medical school. With these reassurances, he was—once again—granted admission, which this time he accepted without hesitation.

After an internship on the Harvard Medical Service at Boston City Hospital and military service in New Mexico, Mark joined MIT's faculty in the Department of Electrical Engineering and at HMS as an Instructor in Medicine. With his early research interests focusing on arrhythmia detection and analysis, he had a strong sense that access to large volumes of carefully screened data was essential for testing of new algorithms and devices.

He established a biomedical engineering laboratory at Boston City Hospital, which was later moved to the Beth Israel Hospital. Furthermore, he co-founded—with Steve Burns— MIT's Biomedical Engineering Center for Clinical Instrumentation, whose goal was to build microprocessor-based biomedical instruments. One of the products to emerge from this endeavor may very well have been the first bedside ECG monitor with integrated arrhythmia detector, a precursor to the now ubiquitous beeping bedside monitors found in intensive care units.

Yet one of the major contributions of Mark's work at the nexus of clinical medicine and biomedical instrumentation came in the form of the MIT-BIH Arrhythmia Database, which was the first generally available set of standard, expert-annotated ECG recordings. Used by more than 500 academic and corporate research sites worldwide, the database has become the FDA standard for testing of arrhythmia analysis algorithms.

Mark also developed an interest in remote health care delivery. While there are certainly no isolated populations in the Massachusetts Bay area, nursing home residents are often isolated economically from the mainstream of health care delivery. Along with like-minded fellow physicians, Mark founded the Urban Medical Group, a nonprofit private medical practice that continues to provide community-based geriatric primary care, including home visits and management of nursing home-based care. A key step forward in providing adequate and continuous medical care for nursing home residents—a result of intensive legislative lobbying efforts by members of Urban Medical—was the introduction of on-site nurse practitioners in Massachusetts. Mark's involvement with Urban Medical continues to this day and forms the basis of HST 230: Real Medicine, in which medical students participate in the longitudinal management of medically fragile patients.

A shift in gears came in the mid 1980s, when Mark was asked to assume the newly created position of co-director in HST. He accepted this post during a time when the future of the MEMP program was in jeopardy. He and Richard Kitz, MD, the co-director from Harvard, worked together to stabilize and streamline MEMP, enlarge the MD program, and start the Speech and Hearing program.

At the conclusion of his co-director tenure in 1996, he began to rebuild a research thrust in biomedical signal processing, computational modeling, and patient monitoring. His group, named Laboratory for Computational Physiology (LCP), is currently the largest it has ever been. It includes researchers with backgrounds in medicine, computer science, electrical engineering, physics, and mathematics, and others whose training spans several of these disciplines. The LCP is one of four core laboratories of the National Institutes of Health's Research Resource for Complex Physiologic Signals and is the home of the Resource's PhysioNet website (http://www.physionet.org), the world's largest repository of freely available recorded physiologic signals, time series and related open-source software for research.

In yet another new endeavor, Mark recently joined forces with MIT EECS professors Pete Szolovits and George Verghese, BIDMC intensivist David Delaney, and Philips Medical Systems to establish an NIH-sponsored Bioengineering Research Partnership to develope and evaluate advanced ICU patient monitoring systems to improve the efficiency, accuracy and timeliness of clinical decision making.

Roger and Dotty Mark meet weekly over dinner with the Executive Committee of the Student Government to discuss matters relating to Sidney & Pacific dorm. The students are, from left, Sriram Krishnan, David Oertel, Ryan Tam, and Anita Villanueva.

"Modern intensive care units employ an impressive array of technologically sophisticated instrumentation to provide detailed measurements of the pathophysiological state of each patient," he notes. "We plan to build monitoring systems that not only report these measurements to the clinicians but also form pathophysiological hypotheses that best explain the rich and complex volume of relevant data."

Mark's candor has earned him the respect of many colleagues and students, past and present, who have turned to him for advice over the years. A former student notes, "Although his stern, New England demeanor might intimidate those who do not know him, Mark's depth of personal commitment to his students is immeasurable."

His willingness to listen and accommodate those seeking advice was recognized with the 2001 Thomas A. McMahon Mentoring Award in HST and, in the same year, MIT's prestigious Frank E. Perkins Award for Excellence in Graduate Advising. And when the MIT administration was searching for new housemasters for two graduate student dorms, it was—among many other qualities—these accolades that brought him and his wife, Dotty, to the attention of the search committee. Mark, who had lived on campus only once during the fall of his junior year in 1958, considered the prospect of moving back to Cambridge an exciting opportunity. With their four children grown and out of the house, the Marks decided to apply.

"It was a great chance to undertake a major new project and work on it together," he said.

When selected in early 2002, they abandoned their tranquil life in Dover, Mass., and—along with more than 700 graduate students—moved into MIT's new graduate student dorm at the corner of Sidney and Pacific Streets in Cambridgeport. After almost two years in their new roles, the Marks have only one regret: not having seized such an opportunity earlier.

When not "housemastering" or teaching, Mark enjoys home repairs, sailing off the coast of Cape Cod, and pursuing a goal that has been a constant thread throughout his life—taking care of sick people.

Thomas Heldt, currently enjoying his final semester in the MEMP program, is fortunate to have Roger Mark as a graduate advisor.