



Lester Fuess Eastman

May 21, 1928 – August 9, 2013

On the crisp fall Ithaca day in 1950, when a handsome young man named Les Eastman arrived on the Ithaca campus following a tour in the post-World War II Navy, one could not have guessed the indelible mark this young man would leave over his sixty plus years on the campus.

Lester Fuess Eastman was a leading figure in the high frequency semiconductor device engineering and science community from its beginnings in the early 1960's through to his retirement. When he came to the campus on the GI bill, a short distance from Waterville, NY, where his farming family lived, his interests in electrical engineering stemmed from his Navy days and his world was inhabited by the vacuum tubes, microwaves and radar that he had encountered. By the time he graduated with his Ph.D. in 1957, the first transistor radios had arrived. This was a watershed time in electronics, and Les was not only a fast study, he chose his territory with care.

Gallium Arsenide, a compound semiconductor, was his first choice in this new field. This required that he grow his own semiconductor materials. The Gunn effect, where electrons slowed down as the force that was applied on them increased beyond a critical point, drew his attention. His and his students' first papers in this earliest effort were landmarks in high power microwave generation from semiconductors. Shortly he moved on to lead the development of compound semiconductor transistors which continued through many generations. They now are key to everything wireless and handheld that we use in our daily life. By the time two of us arrived on the campus as students in the mid-late 1970's, Les was again in the midst of another technical change: a change in the way he was growing his compound semiconductor materials. The new molecular beam epitaxy in ultra-high vacuum such as in outer space promised to make possible entirely artificial materials where intrinsic quantum

effects could be employed to achieve new properties. The approach was expensive, even by today's standards of research costs. Les led one of six multi-disciplinary faculty teams that prepared the proposal for the National Research and Resource Facility for Submicron Structures, an ancestor of today's Cornell Nanoscale Facility. The success of this proposal put Cornell at the academic forefront for making very tiny devices. In the next decades Les' group spawned a torrent of ideas and useful devices where the frequencies kept increasing, unusual effects were discovered, and promises of theory were reduced to practice. Atomic scale abruptness of MBE materials led to new directions in the transistors that are the backbone of communications today, multiple such abrupt junctions between different materials became critical to very efficient semiconductor lasers used with optical fibers. Nitrides made possible high power transistors, and they opened directions towards blue lasers and solid-state lighting, which are very contemporary topics.

His favorite pastimes were compound semiconductors, his students, family, and sailing, an order that cycled through in conversations. At technical meetings, Les would be in the front row encouraging students and other speakers, always courteous, always curious, and willing to share his insights. Favorite memories of Les' students of their time at Cornell always included their presentations at the premiere conferences, frequently international ones, and the dinner gatherings with well-wishers at these conferences where many technical insights were exchanged in the international undertaking that science and engineering is. For those from the U.S., this might have been their first trip to Paris or Vienna and for his international students it could be the first trip to San Francisco or Seattle. Many were the stories of language- and culture-induced misunderstandings or of Les being stopped by somebody on the streets in a foreign land shaking his hand and thanking him for a class or some direct or indirect influence. Les cared about his students deeply, helping them in every way he could. And those who came to his office on Saturday morning were the beneficiaries of extra insights since this was the only day when Les' phone was not constantly ringing.

One breakthrough idea that Les was particularly proud of was ballistic motion, where electrons would travel device-sized dimensions without encountering obstacles that slowed them down. This is exactly counter to the theme of negative differential velocity with which Les had started his career. This motion of an electron encountering no or few scattering events is now a foundation of nanotechnology in electronics. But, there was a decade when it would be criticized. Les had immense self-belief, an uncanny ability in discovery, an incredible approach to encouraging, promoting and supporting his students, and the discipline to reduce ideas to practice. This made him a major actor and his group a favorite for aspiring graduate students. It was his intuitiveness, borne of insight from years of rigorous work, and his enthusiasm that kept the generations of students coming. He supervised over 100

Ph.D. theses. These students now pervade academe and industry throughout the world.

Les fostered many international links. Having spent an early sabbatical leave in Sweden, these links were deep with a constant flow back and forth of the best students from Sweden. But, so were they with the United Kingdom---a source of summer researchers, France, and Germany, which made him a senior Humboldt fellow in 1994. The vitality he contributed to electronics in the United States through his many students, the continuous change and sequence of breakthroughs in his work, and the role he played in industry and federal research brought him many of the major awards of the profession including membership in the National Academy of Engineering. He is perhaps one of the very few after whom a technical conference is named.

Sailing was a love that Les developed in 1960 in Sweden and practiced on Cayuga Lake in the Skagerrak, a fixed keel, wooden folkboat from Scandinavia. Anybody with some experience, even just interest or curiosity, would be roped in with his partner, Dave Woodard, to maintain or crew it. His favorite company, however, was always his family, and he would describe the introduction of sailing to his granddaughter as if it had only happened the day before, when in reality, it was a generation before. Sailing was another manifestation of the peaceful and organized approach that was a constant of his life.

Les had met Anne, his future wife, on a blind date arranged by his sister. Anne, who started as a nurse, was his constant companion, and also the bread winner while he was a student. Once the children came, and Les's travel consumed much time, she was in charge of the daily demands of raising a family. Anne and Les were inseparable. As the evening came, you could count on Les saying, "Well, it is 5:30. It's quittin' time." It was time to be with Anne and family. Anne passed away soon after Les on December 16, 2013. Cornell and a legion of electrical engineers miss him---this incredible harmonious blend of sentiment, enthusiasm, promotion and intellectual rigor.

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