Microwave Laboratory.

When he died, Ed left a nearly complete book manuscript entitled "Probability Theory: The Logic of Science," which, in on-line and preprint form, has been widely read and studied. This monumental work exposes the foundations of what he called the calculus of inductive reasoning with a clarity and elegance that will continue to enlighten and delight his readers for many generations to come.

Ed characteristically insisted that some of the thorniest conceptual problems in physics—notably, in statistical physics and quantum theory—arise from a mistaken identification of probabilities as physical quantities, rather than as representations of the available information on a system, that is, from a confusion between the ontological and the epistemological. Like Albert Einstein, Ed was repelled by the Copenhagen interpretation of quantum mechanics and what he viewed as an incursion of mysticism into science. His dissatisfaction with quantum mechanics, with the uncertainty principle, and with the divergences arising in quantum electrodynamics, spurred him to reformulate QED to avoid the quantization of the electric field. His first work on neoclassical radiation theory, published with Fred Cummings in 1963, is probably Ed's most cited and most notorious paper. Whatever the final fate of Ed's campaign to exorcise the demons of quantum physics, there is no doubt that this paper stimulated many advances in technique and understanding in the early days of quantum optics. Certainly, the Jaynes–Cummings model remains as one of the most useful solvable models in all of physics.

A superb lecturer, Ed was a compelling and inspiring teacher. Every lecture was a new creation that reflected his own evolving understanding of science. He attracted many of the best students; with his continuing guidance, many have themselves become leaders in their fields.

Socially, Ed could be rather shy, but he was a generous and openhearted person. For many years, he hosted in his large home a weekly gathering of faculty, students, and their families. He was a gifted pianist, and impromptu musical performances on his splendid grand piano highlighted many of those occasions. Ed also enjoyed having faculty and student colleagues join him for outings at his rural Ozarks farm. Those of us who participated in those activities have fond remembrances of the freshness, intellectual excitement, and iconoclastic pleasure that we felt when we were in Ed's good company.

With Ed's passing, science has lost a uniquely provocative mind always ready to challenge our understanding of the deepest issues. His colleagues have lost a wise and trusted friend who will be greatly missed.

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Gregory Eugene Stillman

Gregory Eugene Stillman, a renowned researcher who specialized in semiconductor materials and devices, died of cancer on 30 July 1999 in Urbana, Illinois. At the time of his death, he was a professor of electrical engineering at the University of Illinois at Urbana-Champaign and a member of the university's Center for Advanced Study.

Stillman was born on 15 February 1936 in the rural Nebraskan town of Scotia. He earned a BS in electrical engineering in 1958 at the University of Nebraska. After graduating, he served in the US Air Force for five years as an officer and pilot in the Strategic Air Command.

In 1963, he entered the University of Illinois's graduate school, where he earned a MS in 1965 and a PhD in 1967—both in electrical engineering. For his thesis research, he synthesized and studied III–V compounds and devices, thus embarking on what was to be his 35-year involvement with III–V semiconductors.

In Stillman's PhD work and that of his fellow student M. George Craford, we find the first study and identification of the notorious DX center in III–V semiconductors. The phenomenon (called DX for "donor unknown") was first noticed in 1962 by engineers at General Electric Corp who were working on GaAsP (gallium-arsenide-phosphide), a material used for the prototype III–V alloy laser and light-emitting diode. Accounting for the DX center—which is a donor-related defect near the direct–indirect crossover of III–V alloys—remains an active area of research.

After completing his doctoral work, Stillman took his talents to the applied physics group at MIT's Lin-

GREGORY EUGENE STILLMAN

coln Laboratory. There, he began a series of studies of GaAs and other related III–V materials (optoelectronic and photonic) that evolved into an experimental *tour de force*.

For example, in 1968 Stillman and Charles M. Wolfe made ultrapure GaAs to address problems with Gunn diodes. Consequently, they were the first to observe and identify the discrete donor in this prototypical III–V system, and thereby opened the door to the rigorous characterization of III–V systems in general. The techniques that Stillman and Wolfe developed to measure a host of compound semiconductor properties—including carrier mobility, far-infrared emission, low-temperature selection rules, photoconductivity, and various false conductivity indications—are now firmly established and universally applied. Stillman also pioneered the photothermal method for studying impurities in III–V systems.

Because III–V materials form the basis of optoelectronics and photonics, Stillman was inevitably involved in the problem of making and studying III–V devices. He made fundamental measurements on avalanche photodiodes and their asymmetry in respect to hole and electron multiplication. In the general field of photodetectors—including quantum well heterostructures—Stillman became a much-cited expert whose measurements were widely regarded as the most substantial and accurate.

In 1975, he returned to the University of Illinois, following in the footsteps of John Bardeen, who had brought the study of germanium and silicon semiconductors to the university in 1951, and Nick Holonyak Jr, who had extended this activity to III–V semiconductors in 1963. Under Stillman's further influence, Urbana became a world-renowned center of III–V studies. He introduced sophisticated methods into his laboratory for growing and studying a whole range of III–V materials and heterostructures. He also identified and exploited a new dopant in GaAs and AlGaAs (aluminum-gallium-arsenide)—carbon—which turned out to be unique in terms of its high dopant density and stability against diffusion. Consequently, Stillman and his students introduced a new family of high-performance microwave heterojunction biopolar transistors that are now of great importance in wireless communications and digital–analog converters. By building and studying devices, he uncovered fundamental properties of crystal systems.

Stillman had a major effect on teaching at Urbana—on his graduate students and on the hundreds of undergraduates who took his course on semiconductor devices and electronics. Under his kind and steady guidance, his graduate students received many awards for their conference presentations—evidence of how effectively he taught them.

As one of the most-sought-after voices in the III–V field, Stillman was in constant demand to prepare review volumes. His own research resulted in over 300 publications, as well as a notable textbook, *Physical Properties of Semiconductors* (Prentice-Hall, 1989), which he wrote with Wolfe and Holonyak. Stillman chaired and served on many university, national, and international committees and served as president of the Institute of Electrical and Electronics Engineers' Electron Devices Society (1984–86).

Despite his many scientific and professional activities, Stillman somehow managed to maintain the interest in flying he had acquired earlier during his service in the Air Force. As both a pilot and an electronics expert, he was often called to testify in court proceedings involving aircraft accidents, including several major disasters.

Stillman gave much to his colleagues and community, and, for 35 years, to the study of III–V semiconductors. He will be missed sorely.

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