PHILIP EDWARD SEIDEN

first experimental evidence for the existence of spiral-wave modes in the stellar disks of galaxies, and the first confirmation of a theory proposed 10 years earlier by C. C. Lin.

In the 1990s, Phil's astronomical work centered on solar active regions. He showed that percolation phenomena can explain the appearance, lifetime, autocorrelation, and size distribution of sunspots. These results were based on computer models that he created over time in collaboration with Donat Wentzel of the University of Maryland, College Park. From 1983 until 1997, the Smithsonian Institution's Air and Space Museum in Washington, DC, featured a movie exhibit devoted to Phil's spiral galaxy work.

Immunology was at the center of Phil's attention during the last phase of his research life. He approached his work in this field in a truly multidisciplinary manner. His remarkably productive collaboration with Franco Celada, a basic immunologist from Genoa, Italy (Phil described Celada's title as "mouse-sticking immunologist"), began in 1987, when Phil quite serendipitously met Celada, who was working at the Hospital for Joint Diseases Orthopaedic Institute (HJD) in New York City. In 1992, the collaboration resulted in a computer model called IMMSIM (for immune simulation) that was based on a modified cellular automaton. A comprehensive model was created in 1997. Both the immunologist and the physicist were fascinated by the central role of the discrete stochastic encounters among specific cells that precede and condition the clonal expansion. Phil modeled the system to reflect the fluctuations that occur because of the distinct populations that initiate the response. IMMSIM turned out to approximate the outward workings of an individual's immune response and also to allow the performance of real immunological experiments by introducing parameter changes—each change representing a hypothesis—and observing the results on the screen. These experiments were called "in machina" in analogy to the classical in vivo and in vitro tests. The model is widely used as a research tool, for example, to predict the efficiency of a vaccine or focus experimental protocols.

When they tackled infection by model viruses, Celada and Phil, with their small team of American and Italian modelers, discovered that the relative efficiency of cell-mediated and antibody-mediated responses mounted by the immune system are dictated by the virus's characteristics, and that the two kinds of response often collaborate but sometimes compete with the evolutionary goal of offering the most apt defense. The fluctuations captured by IMMSIM have often turned out to look like some failures of immunity, and Phil exploited these examples to try to understand autoimmunity. As a result, Phil, with Martin Weigert and collaborators at Princeton University, developed the competitive tolerance hypothesis, which proposes a novel way by which autoantibodies may be regulated.

After retiring from IBM in 1997, Phil continued his research in immunology, both as a consultant on IMMSIM grants at HJD and as an adjunct faculty member at Princeton University, where he devoted his time to research and teaching. During his years at Princeton, Phil discovered IMMSIM's value as a teaching tool and used it for both a graduate course and a freshman seminar. His enormous talent for teaching became apparent—his students consistently rated the course as the best they had ever taken. His total commitment to the scientific process earned him the respect and awe of his students and colleagues. On the last day of his life, he modified IMMSIM to fit a particular experiment, e-mailed his students to advise and encourage them as they pursued their projects, and thanked them for discovering a bug in IMMSIM.

Phil's zest for life was very strong. He was ebullient, energetic, interactive, and ready to debate on subjects ranging from science, through linguistics, to gastronomy. An active participant in professional committees, he also enjoyed traveling, spending sabbaticals at the University of Grenoble, France; the Technion–Israel Institute of Technology in Haifa, Israel; and Indiana University. He was a kind and generous mentor, colleague, and friend.

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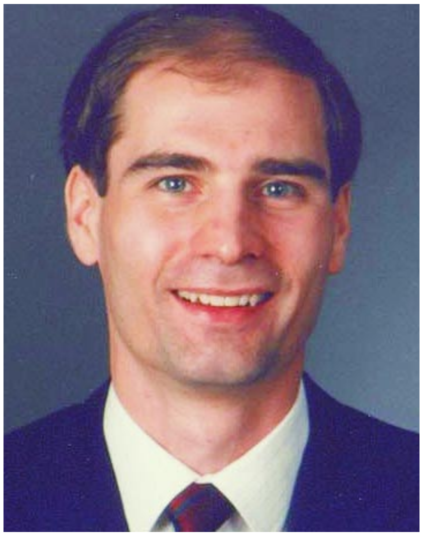
Eric Thomas Swartz

Eric Thomas Swartz, the founder and vice president of technology at Desert Cryogenics in Tucson, Arizona, died on 8 September 2001, after a long and gallant battle against leukemia. With his passing, the low-temperature physics community lost one of its youngest and brightest scientists, and Eric's family lost a devoted husband and dedicated father to four children.

Eric was born in Levittown, New Jersey, on 19 November 1959 and grew up in the Buffalo, New York, area. He began attending Rice University in 1977, graduating in three years with BS degrees in mathematics and physics. He then received an MS in mathematics from Rice in 1981 and a PhD in physics from Cornell University, under thesis adviser Robert O. Pohl, in 1986. Eric's doctoral dissertation on thermal boundary resistance at cryogenic temperatures was published in the July 1989 issue of the *Review of Modern Physics*. This research extended the mathematical understanding of Kapitza resistance, and the review has been cited numerous times in the technical literature.

Eric was regarded as one of the top cryogenic system designers of his time. At age 17, he designed his first cryostat, a 4.5-K refrigerator, while working a summer job at Lake Shore Cryotronics in Westerville, Ohio. While a graduate student at Cornell, Eric developed an improved helium-3 cryostat that could be inserted into a standard helium-4 dewar, thus allowing routine measurements to be conducted at temperatures from 0.28 K to more than 400 K. This design and designs for helium-4 cryostats were published in the *Review of Scientific Instruments*.



ERIC THOMAS SWARTZ

In 1986, Eric began his technical career at Cryosystems in Tucson, where he designed cryogenic systems, including dilution systems, ^{3}He and ^{4}He cryostats, and closed-cycle systems. In 1996, he founded Desert Cryogenics and custom designed cryogenic systems for companies like TRW Inc, IBM Corp, and Hughes Technologies, as well as for numerous other US and worldwide organizations. Of particular importance are his designs for cryogenic multiple-probe systems for wafer sizes up to 8 inches in diameter, with zero stress on the wafer. The systems operated from 1.5 K to 400 K, at frequencies from 0 to 50 GHz, and in high magnetic fields. Researchers who used cryogenic technology in their work found it advantageous and illuminating to chat with Eric at the March meetings of the American Physical Society, whether at the Desert Cryogenics booth or elsewhere.

Soon after Desert Cryogenics was founded, Eric was diagnosed with aplastic anemia, which subsequently evolved into myelodysplasia and finally leukemia. Although hospitalized for much of the five years preceding his death, Eric ensured that his business continued to run successfully, directing company business using a cell phone and laptop computer when he was unable to be onsite. Desert Cryogenics was subsequently expanded under Eric's vision.

Eric will be remembered for his thoughtfulness, integrity, and technical brilliance. He is missed by all who knew him and by the physics community to whom he made significant contributions in such a short time.

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