rarely interested in university politics, he was skillful enough to participate fully in university activities without wasting time on bureaucracy that would impede his research activity. Although he cooperated in every way with the performance measures to which universities are subject, he rose above and saw beyond them: Concerned to find the origins and truth in every topic that he studied, he constantly reminded all of us that it was the quality of papers that mattered, not the quantity or any other artificial measure. Philip will live long in our hearts, both as a colleague and a friend who enhanced both mathematics and our lives.

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Felix Marc Hermann Villars

Felix Marc Hermann Villars, a theoretical physicist and pioneer in biological physics, died of cancer on 27 April 2002 at his home in Belmont, Massachusetts.

Born on 6 January 1921 in Biel, Switzerland, Felix received the *Diplom* in physics and mathematics from ETH Zürich in 1945. During World War II, he served in the Swiss army as a staff meteorologist; he then returned to ETH Zürich and completed his doctorate in physics in 1946. His thesis research, with Gregor Wentzel, involved using meson field theory to study the properties of the deuteron. That work initiated a fruitful research career in theoretical nuclear physics and quantum field theory.

From 1946 to 1949, Felix was a research assistant at ETH Zürich. He was the first to recognize that the exchange of mesons that generate the nuclear force also contributes to the electromagnetic properties of nuclei. With this insight, he calculated the magnetic moments of three-body nuclei and laid the foundation for the systematic study of meson-exchange current effects in nuclei.

In the infancy of quantum electrodynamics, he and Wolfgang Pauli developed a simple and elegant method for regulating the mathematical singularities in quantum field theory and extracting finite physical results. The method, what became known as Pauli–Villars regularization, was influential and is widely used by students of field theory.


MIT

Felix Marc Hermann Villars

Felix was a visiting member of the Institute for Advanced Study in Princeton, New Jersey, for a year before he came to MIT in 1950. He rose through the ranks to become full professor in 1959, and later (1980–83) would serve as chairman of the faculty. In addition to his MIT appointment, he was also a lecturer at Harvard Medical School. At MIT, he initially focused on nuclear physics, studying collective motion and developing the theory describing collective rotations of deformed nuclei. With Felix's theoretical developments as a foundation, both meson exchange currents and rotational states in deformed nuclei became fields of active research at MIT and other nuclear electron-scattering facilities. Felix also returned to his wartime interest in atmospheric physics: He studied the scattering of radio waves by atmospheric turbulence and examined the effect of Earth's magnetic field on ionization in the atmosphere.

A rare individual with the breadth, courage, and versatility to tackle a completely new field, Felix turned to the study of biological and medical physics in the late 1960s. He envisioned bringing the tools of theoretical physics to bear on problems in medicine and biology, and he played a major role as a founding member of the MIT–Harvard Health Sciences Technology program. The objective of that program was to demonstrate to medical students that medical and biological problems could be analyzed fruitfully through the basic physical sciences and mathematics. Such analysis required understanding the meaning of scattered physiological data and casting them into a connected logical and analytical framework. Felix immersed himself deeply in the experimental literature and, from that data, created an analytical theory of central feedback and control problems in respiratory physiology, enzymology, and hormone physiology. His new insights became the foundation of new medical school courses in respiratory pathophysiology and quantitative physiology.

An inspiring teacher and research adviser, Felix gave memorable, lucid lectures in virtually every physics subject at MIT. His Harvard Medical School courses were master classes for medical students who sought a deep quantitative insight into organ physiology. He had the gift of formulating original, insightful problems with great clarity.

Felix was the coauthor of a pioneering and influential trilogy of undergraduate textbooks on physics with illustrative examples from medicine and biology. The texts—on mechanics, statistical physics, and electricity and magnetism—demonstrate to new students that the principles of physics can illuminate a range of biological and medical phenomena. For several years in the MIT physics department, Felix taught undergraduate courses based on these textbooks. Well into his retirement, which began in 1991, he returned to MIT to coteach a popular graduate course in biological physics and to collaborate on a graduate-level text.

Felix was a quiet, thoughtful man of great dignity. We remember fondly his pipe-lighting ritual: On being asked a question on any subject, he would put aside whatever he was working on, carefully fill his pipe with an aromatic blend, and light it while he collected his thoughts. When the tobacco was properly lit, he would smile and then provide an answer that had the clarity of a meticulously prepared lecture. He found great satisfaction in his beautifully maintained gardens and had a twinkle in his eye when he told his colleagues that Swiss chocolate was "brain food."

Those who knew Felix were inspired by the energy and devotion with which he cared for his family and continued his teaching and writing despite his final decade of illness. He is greatly missed by colleagues and friends, but his insights and his legacy of clear understanding will live on in the generations of students he taught and inspired.

George Benedek
John W. Negele
Massachusetts Institute of Technology
Cambridge ■