

early days of the IC industry. Although these concepts were known in principle, their elucidation by Gunter facilitated their rapid use for a generation of personnel working in production facilities. These concepts enabled workers to develop rapid "use tests" based on furnace thermal procedures and subsequent wafer etching to deduce the efficacy of the processes involved in controlling and, eventually, minimizing dislocation generation and macroscopic plastic deformation, which were major yield detractors for bipolar ICs.

With the burgeoning of the IC industry during the late 1960s, many publications in the scientific literature could be traced to real issues involved in the production of bipolar ICs. Indeed, the discussions at scientific conferences during these early days in the development of the IC industry were truly heady times.

During the 1970s at IBM, Gunter was involved with the improvements of growth techniques to produce better semiconductor materials and processes. Among these improvements were computer-controlled growth of large-diameter Czochralski silicon, growth of monocrystalline silicon ribbon, and growth of silicon carbide crystals. Even before the 1973 energy crisis, he had submitted proposals for solar energy conversion. Gunter also worked on innovative ways to produce low-cost, single-crystal silicon for photovoltaic energy generation. He was a member of the Department of Energy/Jet Propulsion Laboratory advisory group on high-performance, low-cost solar cells; in the early 1980s, this group studied the state-of-the-art poly-silicon properties and devices. These low-cost poly-silicon solar cells are currently produced widely and used as energy converters.

In 1982, Gunter retired from IBM and dedicated his efforts to building an academic laboratory, Arizona State's Semiconductor Materials Research Laboratory. He established a crystal growth laboratory with support from several government agencies. The expert crystal growth system developed by Gunter and his group achieved the growth of the largest gallium arsenide crystals grown at a university at that time. The system was an autonomous artificial intelligence system that not only automated the single-crystal growth process, but also used real-time feedback from the collected crystal growth parameter data. Gunter retired in 1988 from Arizona State and became

a professor emeritus of the college of engineering and applied sciences.

During his career, Gunter was also active in advising the NSF and the Advanced Research Project Agency. As a DOD consultant, he successfully oversaw research programs that addressed the leading issues of the day in IC manufacturing and related defect studies. He received more than 56 US patents. Gunter also supported scientific exchange programs with postdoctoral fellows from European and South African universities.

The most advanced and precise scanning oscillator topographic cameras were manufactured from 1982 to 1992 by Gunter's instrument corporation, the GHS Corp in Scottsdale, Arizona. By a serendipitous event, the Schwuttke family donated three of these cameras to the SUNY Stony Brook materials science department; the department chair, Michael Dudley, had, as a graduate student, met Gunter at a conference in Paris. He had admired Gunter's research, but had just become aware that Gunter had manufactured those wonderfully machined and highly crafted precision instruments with the unique capability of oscillation. The cameras will expand research capabilities and will be invaluable tools for students and faculty. The department has designated the section of the laboratory with the x-ray cameras as the Gunter H. Schwuttke Topography Facility.

Gunter not only loved science but also had a balanced view of the relationship among science, technology, and manufacturing as it influences the economy and society as a whole. Following his interests, when he could no longer focus his eyes well enough, his daughter Ursula, a distinguished scientist in her own right, sat beside him in the hospital and read to him the latest news in physics and about cosmology. His friends, colleagues, and students will miss him, because they valued his enthusiasm and high work standards. His extensive knowledge and strong character set the standard for his many colleagues to emulate.

ALFRED E. FEUERSANGER
Framingham, Massachusetts

HOWARD R. HUFF
*International SEMATECH
Austin, Texas*

Yvette Cauchois

Yvette Cauchois, a chemical physicist who profoundly influenced the development of x-ray spectroscopy and x-ray optics, died on 19 November 1999, following a bout with bronchitis



YVETTE CAUCHOIS

during a visit to northern Romania. Cauchois had been a professor of chemical physics at the Sorbonne in Paris and, from 1953 to 1978, had served as the director of the Laboratoire de Chimie Physique (Laboratory of Physical Chemistry) at the Sorbonne (now the University of Paris VI).

Born in Paris on 19 December 1908, Cauchois had been attracted to science since childhood. In 1928, after she received her bachelor's degree in physics from the Sorbonne, she entered the Laboratory of Physical Chemistry, whose director was Jean Perrin. In 1933, she defended her doctoral thesis in which she reported on the use of curved crystals in transmission for high-resolution x-ray analysis. That same year, Cauchois was appointed as the research assistant at CNRS (National Center for Scientific Research), becoming the research associate in 1937. She became an associate professor at the Sorbonne in 1945 and a full professor in 1951. In 1953, she was appointed as the chair of chemical physics. She was nominated as professor emeritus after she retired in 1978.

Cauchois established the fundamental principles of a new x-ray spectrometer that was named after her and was introduced in the early 1930s. The Cauchois spectrometer had the triple advantage of being highly luminous, having a high resolution, and being easy to manipulate. Using the spectrometer, she was the first (in 1934) to observe weak emissions in gases, and later to resolve numerous multiplets. Specialized laboratories in Europe, the US, Japan, and Australia were highly interested in this new technique. Universally used for the analysis of x rays and

gamma rays, it brought on a surge of development in the physics of radiation in these spectral regions.

In 1934, Cauchois pointed out that one could focus x-ray radiation with a curved crystal used in reflection for use in monochromators for x-ray scattering and then later in soft x-ray high-resolution spectroscopy. She was a pioneer in the development of x-ray imaging techniques using a curved crystal. During the 1930s and 1940s, she established the energy levels of atoms, singly or multiply ionized from an inner shell, to prove the existence of rare elements such as polonium and astatine and to develop actinide spectroscopy. After becoming the head of the Laboratory of Physical Chemistry, she focused on the subject of x-ray absorption and emission in solids and chemical effects on x-ray spectra.

In Europe, Cauchois was the first to develop and use sources of synchrotron light, initially at the National Laboratories of Frascati near Rome from 1963 to 1964, and in the early 1970s at LURE (Laboratory for the Use of Electromagnetic Radiation) in Orsay, France. She also became interested in extraterrestrial x-ray radiation; the Laboratory of Physical Chemistry collaboration with astrophysicists led to the obtaining of x-ray images of the Sun in 1970.

Cauchois made important contributions to the production of electron beams and the study of their interaction with matter, and to research on nuclear fluorescent resonance. Under her guidance, the Laboratory of Physical Chemistry was, for a long time, the only French center engaged in fundamental research in x-ray spectroscopy.

She was the second woman, after Marie Curie, to be president of the French Society of Physical Chemistry. She created an excellent teaching program of modern chemical physics and surrounded herself with competent colleagues in every discipline who were dispersed among many laboratories in France and abroad. When the laboratory at the Rue Pierre et Marie Curie in Paris became too small, she created a center for chemical physics at Orsay during the 1960s, long before the University of Paris XI was established. With zeal for her subject, she made progress in a field of French research during a period when few women dedicated themselves to science.

In 1933, Cauchois received the Ancel Prize from the French Physical Society. She received four prizes from the French Academy of Sciences: the Henri Becquerel Prize in 1935, the Gizbal-Baral Prize in 1936, the

Jerome Ponti Prize in 1942, and the Triossi Prize in 1946. She also was awarded the Henry de Jouvenel Prize in 1938 by the French Ministry of Education and the Medal of the Czechoslovak Society of Spectroscopy in 1974. In the 1960s, Cauchois was decorated as Commander of the Order of the Ministry of Education, Officer of the Honor Legion, and Officer of the National Merit by the French Republic. She received the Gold Medal of the University of Paris in 1987.

Cauchois was not only a woman of science, but she showed great interest in young and underprivileged people to whom she extended emotional help as well as material support. She had a great sense of humor and knew how to entertain others with her storytelling. She enjoyed the arts, particularly music—she was an expert on the grand piano—and she loved poetry. Her colleagues will remember her as someone who gave the best part of her life to her laboratory.

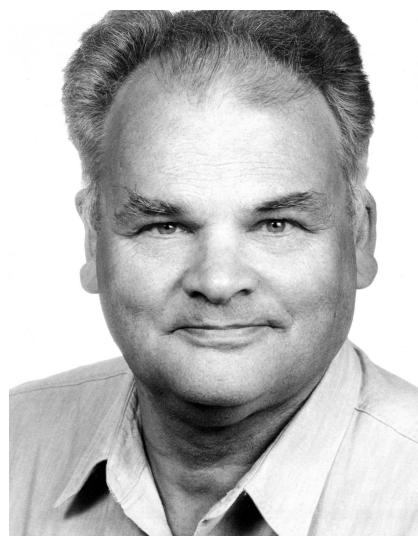
CHRISTIANE BONNELLE
*University of Paris VI
France*

Klaus Halbach

Klaus Halbach, a long-time staff physicist with the Lawrence Berkeley National Laboratory (LBNL) and an international expert in magnetic systems for particle accelerators, died on 11 May 2000 following a long and courageous battle with prostate cancer.

Born on 3 February 1925 in Wuppertal, Germany, Klaus received his PhD in nuclear physics from the University of Basel, Switzerland, on work involving nuclear magnetic resonance (NMR). After a three-year stint teaching at the University of Fribourg in Switzerland, Klaus came to the US in 1957 on a grant from the Swiss National Fund to work at Stanford University with a pioneer of NMR, Nobel laureate Felix Bloch. Klaus revered Bloch as both a colleague and a teacher.

In 1960, Klaus joined the precursor to LBNL, the University of California Radiation Laboratory. There, he worked in the magnetic fusion group in the area of plasma physics. Following a nearly one-year return to Fribourg, where he was an assistant professor and started a plasma physics group, Klaus returned to LBNL permanently, where his first assignment was to lead the homopolar plasma generator project. His work with plasma physics led him into accelerator



KLAUS HALBACH

design. In one of his first design endeavors, he made a major contribution to the Omnitron; that design laid the groundwork for the Bevelac.

For all his success as an accelerator designer, Klaus is probably best known for his later work on magnetic systems for particle accelerators. He and his colleague (and later son-in-law) Ron Holsinger developed the famous POISSON package of computer codes for solving the Laplace equation—codes still in use today. Building on the expertise he developed in analyzing and designing conventional magnets, Klaus went on to become one of the world's premier designers and developers of permanent magnet systems, primarily for use in wigglers and undulators. His contribution to the development of these permanent magnet insertion devices as synchrotron radiation sources was instrumental in the worldwide development of so-called third-generation light sources such as the Advanced Light Source and Advanced Photon Source. In 1995, in recognition of this work, the Advanced Photon Source Users Organization at Argonne National Laboratory awarded the Arthur H. Compton Prize jointly to Klaus and Nikolai Vinokurov.

Klaus was a consultant on accelerator projects and synchrotron light sources around the world, including the accelerator divisions at the Nuclear Physics Institute Jülich—now called the Research Center Jülich—in Germany and Los Alamos National Laboratory; the Stanford Synchrotron Radiation Laboratory; and the Advanced Photon Source at Argonne National Laboratory.

Although the only formal teaching position Klaus actually held was