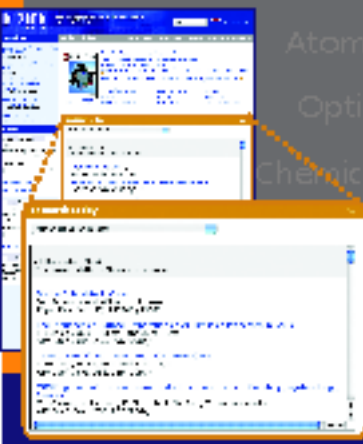


See www.pt.ims.ca/7374-51

Log into
www.physicstoday.org
every day!



See the articles just
published in your field.

uranium. The result of that work was a new material, CeS, which they called “impervium” and from which they made several hundred crucibles for use in Los Alamos. At the end of the Manhattan Project in 1946, Leo was appointed an assistant professor of chemistry at Berkeley; he became a full professor in 1955. He was elected to the National Academy of Sciences in 1959.

Leo’s first published paper was on the heat of sublimation of graphite, which yields carbon atoms near 3000 K. That topic was of particular interest because Pauling had popularized the concept of bond energies, and for carbon bond energies he used 125 kcal (710 kJ) for graphite’s heat of sublimation. Leo’s value was 170 kcal, far above Pauling’s. Pauling once came to Berkeley to discuss the problem but left refusing to change. Later work supported Leo’s, and Pauling finally had to change his carbon bond energies.

Another of Leo’s early papers showed that the equilibrium vapor above CuCl was mainly Cu_3Cl_3 molecules. Previous work had proposed Cu_2Cl_2 , similar to the well-known Hg_2Cl_2 above HgCl. Through thermodynamic arguments, Leo showed that the vapor above solids at high temperature can contain complex species including unusual oxidation states, and that the minor species become more important as the temperature is raised. That behavior became known as Brewer’s Rule, and it is a foundation of high-temperature chemistry.

Some of Leo’s early work was done in collaboration with Francis (Pan) Jenkins from physics and John Phillips from astronomy. They formed a spectroscopy group seminar that was well attended by the students of the day. From 1950 to 1970 Leo published papers on the spectra of such high-temperature molecules as CN, MgO, MgOH, CaO, SrO, ScF, TiO, ZrO, C_2 , and C_3 .

In 1960 a troublesome sore below his right eye was diagnosed as cancer. Many people thought that he would not survive, but radical surgery to remove his eye and part of his face saved his life. Leo always believed that the cancer came from his wartime work with beryllium. The photograph shown is dated 1953, but we all came to know Leo wearing his simple prosthesis.

Teaching was always a strong interest of Leo’s, and for several years he tried to instruct Berkeley graduate students about the complexities of the freshman chemistry laboratory experiments. In 1961 Leo and Kenneth Pitzer revised the classic 1923 text

AMERICAN CHEMICAL SOCIETY



Leo Brewer

Thermodynamics (McGraw-Hill) by Gilbert Newton Lewis and Merle Randall. He received numerous awards for his teaching and research and he held many invited lectureships. He was the head of the inorganic materials research division of the Lawrence Berkeley Laboratory from 1961 to 1975, and he directed the research of 40 PhD students and nearly two dozen postdocs throughout his career. His work includes nearly 200 articles and scientific presentations.

His last publications concerned the structure and bonding of metals. He met Niels Engel early in his career and became interested in Engel’s correlation between the number of available electrons and the crystal structures of metals. Leo was impressed with the strong bonds formed between metals from different regions of the periodic table, and he proposed the Brewer–Engel theory for such bonds.

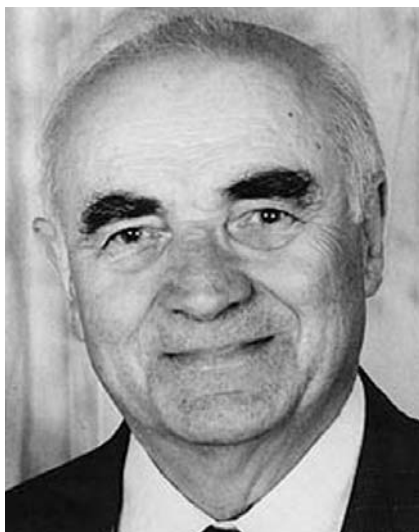
At the physics lunch table recently, someone remarked how valuable Leo was for his vast knowledge of chemical information. For many years he read *Chemical Abstracts* from cover to cover. He also had many other interests. Right after the atomic bombs were dropped he helped form the Northern California Atomic Scientists. He also had a longtime interest in California native plants and cultivated them around his home. A local manzanita and at least three California flowers are named after him.

Rollie J. Myers

University of California, Berkeley

Hubert Curien

Hubert Curien, crystallographer, former French minister of research and space, and leader of space policy, died of heart failure at his



Hubert Curien

country residence in Loury, France, on 6 February 2005.

The son of a city tax collector and an elementary school director, Hubert was born on 30 October 1924 in Cornimont, a small village in the Vosges region of France. With his fine sense of humor, he always referred to his origins: "Vosgians are determined; some say they are hardheaded, but they are not complicated and they believe in fundamental values." All those who have known him would easily admit that he was a Vosgian!

Hubert passed the entrance examinations of the two most prestigious grandes écoles in France—the École Polytechnique and the École Normale Supérieure. Choosing ENS, he studied the physical sciences and received his diploma in 1948 for work on the diffusion of x rays by liquids, methyl iodide in particular. In 1951 he received his doctorate from the University of Paris for the study of elastic waves and thermal diffusion of x rays in crystals.

His research work included the theory of Compton diffusion of x rays

by crystals, dipolar defects in lithium fluoride, and the phase diagram of gallium. He discovered three metastable phases of gallium (β , γ , and δ) and established their crystalline structure. His later work concerned the application of group theory in crystallography, twinning, and the theoretical representation of associations of crystals. In recognition, his name was given to the mineral "curienite," discovered in 1968.

In 1956, he was appointed professor at the University of Paris where he taught mineralogy and crystallography until 1994. Teaching was always an essential activity for him.

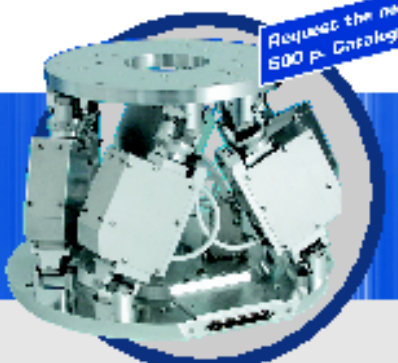
In parallel with his teaching, he occupied several key positions of responsibility: director general of CNRS in 1973, general delegate to Scientific and Technical Research from 1973 to 1976, president of the Centre National d'Études Spatiales (CNES) from 1976 to 1984, and president of the council of the European Space Agency (ESA) from 1981 until 1984. At that time, he was called by President François Mitterrand and Prime Minister Laurent Fabius to become minister of research and technology, a position he held from 1984 to 1986 and, later, from 1988 to 1993, when he was also minister of space. In addition to being a member or head of numerous national and international scientific societies, Hubert occupied many other prestigious roles, including founder of the European Science Foundation (ESF), its president from 1979 to 1984, and president of the French Academy of Sciences from 2001 to 2003.

As research minister, Hubert maintained a high priority for research in the successive governments that he participated in. Public-science budgets increased from 1984 to 1986, and grew in absolute terms by 15% between 1988 and 1993. While Hubert

was at CNES and was minister for research and space, France achieved a remarkable record of successes, including the first launch of the *Ariane* rocket, which granted Europe its independent access to space, and the beginning of the series of *SPOT* (*Satellite Probatoire d'Observation de la Terre*) satellites for the observation of Earth and also military observation and reconnaissance through the French Helios program. Those successes led him to initiate the first commercial space companies in Europe: Arianespace for the *Ariane* launcher and Spotimage for Earth observation data.

At the January 1985 ministerial meeting of the ESA council, Hubert, a born diplomat, spared no effort in negotiating the final consensus to increase the ESA science budget in real terms by 5% every year for 10 years. That decision made it possible to continue the *Giotto* comet mission, *Ulysses*, and the European contribution to the *Hubble Space Telescope*, and to launch numerous ambitious projects, including *Hipparcos*, *XMM-Newton*, *INTEGRAL*, *Rosetta*, and the *Huygens* probe on board *Cassini*. The growth and success of ESA activities are by no means coincidental; with his unique and pragmatic approach to the management of programs, Hubert led and oriented space research as nobody before him.

Hubert has left a clear mark on the history of Europe and on its success in science and technology. As minister, he helped initiate the Eureka program, which aimed to develop key technologies for the benefit of Europe and its industry. Even though his actions were inspired by the strong desire to give Europe its rightful place between the two superpowers of the time, the US and the Soviet Union, he was concerned with maintaining the best relationships with them. With



PI

Piezo • Nano • Positioning

Request the new
500 P. Catalog!

Hexapode & Piezo Nanopositioning Systems

6-Axis Alignment & Positioning Systems

■ Ultra-precision ■ High Force ■ Vacuum & Nonmagnetic Versions

PI is the global leader in Nanopositioning.
ISO 9001 certified since 1994.

www.pi.us/hexpt

Moving the NanoWorld www.pi.us

PI (Physik Instrumente) L.P. Tel: (508) 832-3456

the Soviets, he negotiated the flight of the first French cosmonaut, Jean-Loup Chrétien, in 1982, and with the Americans, the 1985 flight of his fellow astronaut, Patrick Baudry, on the space shuttle. In 1992, Hubert was awarded the COSPAR (Committee on Space Research) International Cooperation Medal for his significant contributions to the promotion of international scientific cooperation.

He often said that to manage space programs you had to keep your feet on the ground. With his feet on the ground, he nevertheless contemplated with childlike enthusiasm the prospects of sending human beings to Mars. Asked why he would support such an initiative, he responded, "Oh, pour le sport."

Hubert's profound dedication to science and to human relations explains the unique quality of the links that he established with all his partners, colleagues, and friends. We mourn a great man and a great friend, one who always made the time and effort to advise and assist in transforming difficulties into successes by making just, inspired, and sound decisions. With his exceptional blend of humanism and realism, Hubert attracted great respect from the political world. His great simplicity is a lesson for all those who have, or will have, responsibilities in managing people and large programs.

Roger-Maurice Bonnet

*University of Bern
Bern, Switzerland*

Paul Leon Hartman

Paul Leon Hartman, a professor emeritus of physics at Cornell University who made pioneering measurements of synchrotron radiation, died on 20 May 2005 in Ithaca, New York.

Born in Reno, Nevada, on 13 July 1913, Paul earned a BS in electrical engineering at the University of Nevada in 1934. He then started graduate study in physics at Cornell, which led to thesis work with Lloyd P. Smith on an early linear accelerator. He received his PhD in physics in 1938, and after a year as a physics instructor at Cornell, he left to work at the Bell Telephone Laboratories in New York City for the next seven years. There, Paul was actively involved in developing centimeter-wave generators for airborne radar with Jim Fisk and Homer Hagstrum.

Paul returned to Cornell and academic life in 1946 as an assistant professor with a joint appointment in physics and in the brand-new pro-

gram of engineering physics (EP), which addressed the need for a stronger physics component in engineering. Paul was an active charter member in formulating and guiding the program, which quickly developed an excellent reputation.

In teaching, Paul quickly moved into the leadership position in Cornell's venerable advanced laboratory course, required of all physics and EP undergraduate and graduate students. Paul's energy and wide-ranging skills as an experimentalist enabled him to interact effectively with students working on any of the more than 60 experiments in the course. He loved the challenge and satisfaction of teaching the course, which strongly influenced so many future physicists, and he continued in that role for nearly 40 years. Many former students went on to set up similar courses elsewhere, and he gave practical guidance on establishing such courses in his 1965 article in the *American Journal of Physics*.

Paul's research focused on UV physics, especially photoemission from ionic crystals and the production of excitons. Yet he was perhaps best known for his early investigation, with colleague Diran Tombouljian, of the far-UV spectrum of synchrotron radiation emitted by relativistic electrons in circular orbits. The measurements were performed on the 300-MeV synchrotron at Cornell using a vacuum-UV spectrograph to record the intensity from 5 nm to 40 nm without intervening windows. The results were far-reaching, not only in confirming the predictions of Julian Schwinger for the spectrum in the far-UV and soft x-ray region, but also in demonstrating the potential of



Paul Leon Hartman



pco.4000



Highlights

- excellent resolution (4008 x 2672 pixel)
- 14bit dynamic range
- image memory in camera up to 4GB
- low noise of 12e⁻ rms @ 8MHz
- 5fps at full resolution
- standard interface (IEEE 1394, camera link)

PCO AG

Dornpark 11
93309 Kelheim, Germany
fon +49 (0)9441 2005 0
fax +49 (0)9441 2005 20
info@pco.de
www.pco.de

In America please contact:
www.rockecorp.com

See www.pt.ims.ca/7374-55