Jean Brossel

Claude CohenTannoudji

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call said, "The APS must help members of Congress and the executive branch to understand that the future of our nation depends upon having a strong technological base, which in turn depends upon research and education in the physical sciences. The APS can play a significant role in increasing awareness of the dangers from the spread of weapons of mass destruction and in outreach programs that stimulate scientific literacy and promote interest in scientific activities." In addition to increasing federal support for physics, Bahcall said that it is important "to join with physicists in industry to reverse the tragic and dangerous decline of physics research in the private sector."

In other APS election results, **Philip Bucksbaum** (University of Michigan, Ann Arbor) was selected as the new chair-elect of the nominating committee, and the society's new international councillor will be **Sukekatsu Ushioda** (Tokoku University in Sendai, Japan). **Evelyn Hu** (University of California, Santa Barbara) and **Art Ramirez** (Lucent Technologies' Bell Labs in Murray Hill, New Jersey) are the newly elected general councillors of the society.

In Brief

The National Academy of Engineering, at its annual meeting in Washington, DC, in October, bestowed its Arthur M. Bueche Award on **Robert A. Frosch**. He was recognized for having "a career of advances in aerospace and automotive technology, and 'industrial ecology,' and for administration of research and development in industry, government, and academia." He is a senior research fellow with the Belfer Center for Science and International Affairs in Harvard University's John F. Kennedy School of Government.

Also at its annual meeting, the NAE presented its Founders Award to **Carver Mead**, Gordon and Betty Moore Emeritus Professor of Engineering and Applied Science at Caltech. The academy acknowledged Mead for his "visionary contributions in the field of microelectronics, including VLSI (Very Large Scale Integration) technology and computational neural systems."

On 1 December, **Vladimir Agranovich** began his appointment to the NanoTech Institute of the University of Texas at Dallas as the institute's first "Pioneer of Nanoscience." The purpose of this position is to help bring science and technology pioneers to the university for extended sabbaticals. Agranovich retains his post as head of the theoretical department in the Institute of Spectroscopy at the Russian Academy of Sciences near Moscow.

Next month, **Matthew Colless**, senior fellow of the research school of astronomy and astrophysics at the Australian National University, will become the new director of the Anglo–Australian Observatory in Sydney.

On 3 November, **Steven J. Dick** became the new director of NASA's history office and chief historian at NASA headquarters in Washington, DC. Before joining NASA, Dick worked as an astronomer and historian of science at the US Naval Observatory.

In October, **Louise Johnson** joined Diamond Light Source, a synchrotron facility in Oxfordshire, England, as director of life sciences. Johnson will continue her affiliation with Oxford University, where she is the David Phillips Professor of Molecular Biophysics.

Obituaries

Jean Brossel

With the death of Jean Brossel on 4 February 2003 in Périgueux, France, the scientific community has lost a key figure in the development of modern atomic physics and quantum optics in France after World War II.

Brossel was born in Périgueux in 1918 and entered the Ecole Normale Supérieure de Paris in 1938. The war interrupted his studies for two years, but he completed them in 1945. At that time, French laboratories were in bad shape: The research groups were disorganized and the equipment was very poor. Alfred Kastler of the physics laboratory at the Ecole Normale advised Brossel to go to Manchester, England, to receive research training in Samuel Tolansky's group at the physics laboratories of Manchester University. Brossel did. There, he learned Fabry–Pérot techniques and applied them to the study of atomic surfaces and the measurement of atomic hyperfine structures. The expertise he gained during that stay was very useful in his subsequent research work.

After three years in Manchester, Brossel returned to Paris. In the meantime, Kastler had received an offer from MIT to send one of his students to Francis Bitter's group for PhD work. Kastler proposed that Brossel go, and Brossel happily accepted the offer and went to MIT in 1948. Bitter's idea for detecting magnetic resonance in the excited state by changing the Zeeman structure of the emission spectrum didn't come to fruition. But while working on that same idea, Brossel came up with another one—the double resonance method—that turned out to be very successful and made for an outstanding PhD thesis. Instead of looking for a change in the frequency of emitted light, Brossel suggested that one look for a change in the light's polarization. That change would result from the radio-frequency–induced transfers between the excited Zeeman sublevels. Kastler had independently come up with the same idea and, a few months later, proposed the optical pumping method—polarizing atoms in the ground state through a transfer of angular momentum from polarized photons to atoms.

Jean Brossel

After completing his doctoral work, Brossel returned to Paris. In 1951, he and Kastler founded a research group that is now called the Laboratoire Kastler Brossel, and so started a great period at the Ecole Normale. Researchers at the lab demonstrated optical pumping the following year and obtained a wealth of exciting new results. They observed multiphoton RF transitions between Zeeman sublevels, where the atom absorbs several photons—not just one—during the transition. Other results included the observation of the narrowing of the magnetic resonance curves in the excited state due to coherent multiple scattering and the prediction and observation of light shifts.

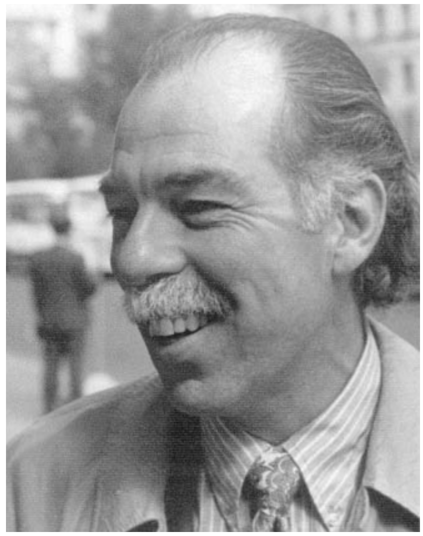
I joined the group at the Ecole Normale in 1955 and recall the exceptional atmosphere that prevailed in the lab. There was a great intellectual complicity between Kastler and Brossel, combined with a complementarity of their talents. Kastler was a "poet" of physics who had numerous elegant ideas, whereas Brossel was an outstanding experimentalist who had a deep understanding of the physical processes. It was Brossel who first gave a transparent interpretation of multiphoton resonances in terms of conservation of the total energy and angular momentum during the transition. He was also the first to interpret the narrowing of magnetic resonance curves when the vapor pressure increases as being due to a partial transfer of the phase relations between the coefficients of the excited wavefunction from one atom to another in a multiple scattering process. Because Brossel made crucial contributions to the results obtained by the group, it was especially sad that he did not share the 1966 Nobel Prize that Kastler won.

A new period in Brossel's career began when he became the lab's director in 1967. He was very good at identifying young, bright physicists and encouraging them to start promising lines of research with complete freedom. He also led the rise of the atomic physics group at the Ecole Normale to become one of international repute. With teaching as one of his concerns, Brossel created a physics graduate program that played an essential role in the formation of generations of young physicists, not only in atomic physics, but also in particle physics, condensed matter, statistical mechanics, and astrophysics. And during his term as head of the physics department (1973–85), he attracted several new research groups in different areas of physics.

Brossel devoted his life to science and to the development of his students. He set very high standards for himself and his colleagues. Until the end of his life, he continued his experiments, even blowing glass and filling cells. He was rather shy and very discreet; people who didn't know him were not easily inclined to approach him. But once they overcame this barrier, they discovered a warm and kind person, who enjoyed art, music, and history and also had a great sense of humor. Brossel's former students, colleagues, and friends deeply miss him.

Claude Cohen-Tannoudji
Collège de France
and
Laboratoire Kastler Brossel
Ecole Normale Supérieure
Paris, France

Earl Robert Callen


Earl Robert Callen

Earl Robert Callen, physicist, teacher, and advocate for human rights, died on 9 December 2002 at his home in Chevy Chase, Maryland, after a long struggle with cancer. His was a multifaceted career that included research work in government laboratories, research and teaching at the American University, and service as a representative of the US Office of Naval Research in Tokyo.

Earl was born on 28 August 1925 in Philadelphia, Pennsylvania, where he attended public elementary and secondary schools. Drafted into the US Army in 1943, he served in the Pacific theater until the end of hostilities. On his return to civilian life, he attended the University of Pennsylvania, where he majored in English and mathematics. He earned both his bachelor's (1948) and master's (1951) degrees at Penn.

Influenced by his older brother, Herbert, who was on Penn's physics faculty, Earl decided to become a physicist. After a year of taking courses there, including Herb's course in thermodynamics, Earl entered MIT as a graduate student. In his autobiography, he describes his entry there as a turning point in his life. His studies at Penn had not gone well. He had applied to, and was turned down by, three medical schools. But things changed for him at MIT: He went through the undergraduate physics textbooks and did all the problems in them—twice. As he put it, he was beginning to catch on. He became one of 15 research students working for a PhD under J. C. Slater. He earned his doctorate in 1954; his thesis dealt with the configuration interaction method applied to the hydrogen molecule.

After spending a year back in Philadelphia, where he worked at the Philco Research Laboratory, he went to the Washington, DC, area, where he joined the National Security Agency as a physicist, a position he held for five years. In 1959, he joined the Naval Ordnance Laboratory (NOL) to head the magnetism group. It was at that time that he began what would become a fruitful collaboration with his brother on the statistical physics of magnetic materials; in particular, they studied the temperature dependence of the anisotropy energy and the magnetostriction of ferromagnets. In two seminal papers (1963 and 1965), the Callen brothers developed a quantum-statistical theory of the temperature and field dependence of magnetostriction, forced magnetostriction, and thermal expansion of ferromagnets. They derived expressions for the strains in terms of thermal and quantum mechanical averages of angular momentum operator functions. They then showed that those averages could be written as products of functions of magnetization direction cosines times temperature-dependent momentum correlation functions.

The great advantage of their theory over the prior thermodynamic approach was that, now, the arbitrary coupling constants of the previous approach were replaced by averages that are easily expressed in terms of the magnetization. Using measured values of those magnetizations, one could predict the temperature dependence of the strains. There are no adjustable parameters. Earl and colleagues at NOL showed that the theory gave excellent agreement with the temperature dependence of the magnetostriction of yttrium iron garnet. Subsequent tests of the theory for several rare earth metals and compounds showed that the theory works remarkably well for almost all magnets made up of atoms having localized angular momentum.

While on sabbatical at Osaka University in 1965, Earl became inter-