

Temperature Physics in 1975; it drew 900 participants. That event apparently had an influence on Japan's low-temperature research proposals, which persuaded funding agencies by noting that "even the Finns could cool to those temperatures."

His most lasting contributions to science, though, came after 1975, in three areas: the study of spontaneous magnetic ordering in nuclear spin systems, the investigation of rotating ^3He superfluids, and the development of multichannel superconducting quantum interference device (SQUID) magnetometers for noninvasive studies of the human brain. His contributions in each of these fields alone correspond to more than an average lifetime's scientific achievements. The first two became feasible following his development of the different cooling techniques, and neuromagnetometry required a thorough understanding of SQUID-based measuring techniques.

In his low-temperature laboratory, nuclear ordering has now been investigated, using a cascade of two nuclear cooling stages in a series, in copper, silver, and rhodium at record-breaking low temperatures. In copper and silver, the ordered spin configurations of the magnetic-field-temperature phase diagram have now also been mapped in neutron diffraction measurements that involved a collaboration of Olli's laboratory with high-flux reactor teams from the Risø National Laboratory in Denmark and the Hahn–Meitner Institute in Germany. In the rhodium experiments, his low-temperature laboratory reached a nuclear spin temperature of 100 pK in 2000.

In the second area of superfluid ^3He research, Olli gained a 20-year monopoly on the exploration of quantized vorticity by starting a bold new initiative—the construction of a rotating nuclear-cooling refrigerator. Eight new structures were discovered in his low-temperature laboratory. The continuous meandering vortex sheet has become one of the celebrated epitomes of these unusual forms of quantized vorticity in systems with a multicomponent order parameter. When the 1996 Nobel Prize in Physics was awarded to David Lee, Douglas Osheroff, and Robert Richardson for their discovery of the ^3He superfluids, the Nobel committee noted that the researchers in Olli's laboratory had established the connections between quantized vorticity in superfluids and the quantum field theory of cosmic strings.

Similarly, in brain research, Olli's vision of the whole-head SQUID array

as an efficient brain imaging technique, now known as magnetoencephalography (MEG), has proven to be the best and only existing method for probing the brain on a time scale down to 1 ms with a spatial resolution of a few millimeters. Today, such equipment is approaching routine clinical service and more than 30 laboratories worldwide are using the MEG devices and techniques developed in Olli's laboratory.

During his more than 40 years of research, Olli generated numerous successful scientific and engineering projects. For those, he was recognized with distinction: He held foreign memberships in the US National Academy of Sciences and the Royal Swedish Academy of Sciences. In 1984, he shared the Fritz London Memorial Award with Weiner Buckel and David Thouless.

Most of all, his many PhD students and colleagues in the Helsinki University of Technology remember him as the dynamic founder of the low-temperature laboratory in 1965 and its charismatic leader until his retirement in 1995.

Matti Krusius

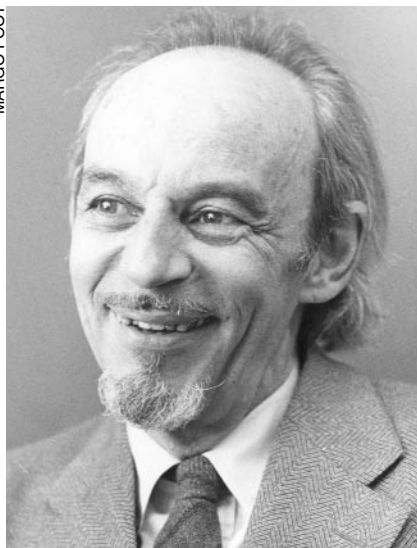
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Martin Deutsch

Martin Deutsch, who pioneered the use of organic scintillators in the US and established the existence of positronium, died on 16 August 2002 of cardiac arrest at his home in Cambridge, Massachusetts.

Deutsch was born in Vienna, Austria, on 29 January 1917. When he



Martin Deutsch

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was 17, he went to Zürich, Switzerland, and attended a secondary school there. He graduated and subsequently completed one semester at the Swiss Federal Institute of Technology. In 1935, he accompanied his mother to the US, where he later became an American citizen. His parents eventually settled in Cambridge and Deutsch enrolled at MIT, where he received his BS in physics in 1939 and his PhD in physics in 1941. In only 6 years, he had completed a course of study that customarily takes 11 years. His doctoral thesis, prepared under the guidance of Robley D. Evans, was entitled “A Study of Nuclear Radiations by Means of a Magnetic Lens Beta-Ray Spectrometer.”

Deutsch began his career at MIT in 1941 as an instructor of physics. He joined the Manhattan Project and worked at Los Alamos beginning in 1943. Three years later, he returned to MIT, where he spent the remainder of his professional life.

The next several years were notable for Deutsch’s achievements. He was the physicist who first realized the importance of Hartmut Kallmann’s 1947 discovery of organic scintillators and introduced their use in the US. Deutsch used them as a magic wand, performing nuclear spectroscopy experiments that beforehand would have been almost impossible. Thus he was the first to measure the angular correlation of two successive gamma rays. In 1951, Deutsch discovered the “ultimate atom”—positronium—which consists of an electron bound to a positron. In the next couple of years, he and his collaborators measured the most important properties of positronium’s ground state, namely its hyperfine splitting (the singlet–triplet energy difference) and the triplet state’s lifetime. Hyperfine splitting, which is about twice as large as one would conclude from naive estimates, is one of the most striking manifestations of quantum electrodynamics. Through this outburst of creativity, Deutsch dominated the field at that time. Many decades passed before anything substantially new was learned about positronium.

Around 1960, Deutsch switched to particle physics. Among the many topics he investigated were the Compton effect of the proton (at Cornell University) and the excited states of lambda hypernuclei (at Brookhaven National Laboratory). Although those experiments were successful, the glories of his positronium days were never recaptured. Perhaps this field did not quite correspond to his personal style, as he was used to doing

everything down to the last detail with his own hands. He became a full professor at MIT in 1953, and headed MIT’s Laboratory for Nuclear Science from 1973 to 1979. Following his retirement from MIT in 1987, he helped to prepare and set up the Borexino solar neutrino experiment at Italy’s Gran Sasso National Laboratory.

Deutsch was a great teacher, both in the classroom and as a thesis adviser. Among his many students was Nobel laureate Henry Kendall (see his obituary in *PHYSICS TODAY*, February 2000, page 70). Deutsch also was a sharp debater who mixed incisive criticism with Viennese charm. While he was totally committed to physics, he enjoyed gardening and cooking (especially stir-frying).

Those who knew him will cherish their souvenirs, and those whom he considered his friends will always be proud of that.

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Abraham Klein

Abraham Klein, a theoretical physicist and emeritus professor at the University of Pennsylvania and a leading figure in the community of nuclear theorists, died 19 January 2003 of complications from a stroke.

Born on 10 January 1927, Abe graduated from Brooklyn College of the City University of New York in 1947 with a BA in physics. His career started with his entrance to Harvard University, where he received an MA in physics in 1948. Under Julian Schwinger, Abe earned his PhD in just three years with a dissertation on the problem of one-meson exchange potential.

Abe stayed five more years at Harvard, first as an instructor and later as a junior fellow of the Society of Fellows, during which time he did research in field theory. At the beginning, still under Schwinger’s tutelage, he studied the higher-order corrections to the hyperfine structure and the Lamb shift in hydrogen. He also studied the fine structure of positronium. However, his most important contribution during that period was the reexamination—done solely by him—of the two-nucleon potential problem that Maurice Levy had worked out earlier. That contribution marked the beginning of Abe’s long-



Abraham Klein

term interest in nuclear force.

Even though Abe had few direct interactions with Schwinger, Schwinger had a profound influence on Abe’s thinking. Throughout his career, Abe continued to make use of the techniques in field theory that Schwinger had developed.

In 1955, after turning down an assistant professorship offered by Harvard, Abe decided to accept a tenured position at Penn, where he remained until his retirement in 1994. That choice shaped his future career. Far away from Harvard with its stimulating environment, Abe had to find his own orientation. He did so by testing different subjects, from field theory to solid-state physics, and by touching on the many-body problem. By Abe’s own admission, the first six years at Penn were difficult. Aside from having to help with the care of his new house, he had to carry a heavy teaching load and guide half a dozen PhD candidates.

The first sabbatical that Abe took—in Paris—was salutary. He went to the Laboratory of Theoretical Physics and High Energies, chaired by Levy, at the Université de Paris–Sud. It was there that I first met Abe. That sabbatical year turned out to be a watershed of his future work.

Abe met a number of nuclear theorists at Orsay, including some on leave from the US. At the time, Abe was struggling with the question of the existence of deformed solutions (nuclei) described by rotationally invariant Hamiltonians. He was unaware of the existence of the Hill–Wheeler projection method, and in fact, his ignorance on the subject, together with his interaction with the colleagues he had just met, led him to develop a formal-