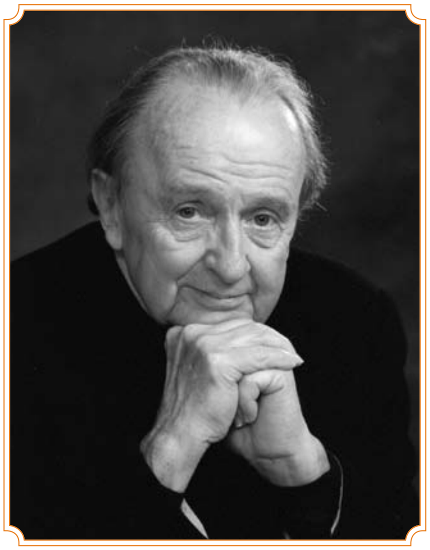
Louis S. Osborne PhD '50, longtime MIT physicist, dies at 88. Developed many of the experimental techniques that are now standard practice in high-energy physics

by Sarah H. Wright



Louis S. Osborne, a particle physicist whose cutting-edge research inspired colleagues and students alike, died January 22, 2012, of congestive heart failure. A long-time resident of Lexington, Mass, Osborne was 88.

Osborne PhD '50 worked as an experimental physicist, using photons, electrons and neutrinos to probe matter. He performed some of the early and seminal experiments to measure the photo-production of mesons from nuclei and developed many of the experimental techniques that are now standard practice in high-energy physics.

His research provided experimental data that contributed to the confirmation of the unitary symmetry model, which is the periodic table of the particles affected by the strong force and is an important component of the current model of the fundamental particles and their interactions.

Physics Professor and Department Head Edmund Bertschinger described Osborne as a "gentle giant of physics—giant in his capacity to find and develop the best in people. He trained many leaders in physics and industry. We will miss him dearly."

A native of Rome, Italy, Osborne received his BS from the California Institute of Technology, where he studied under Nobel Laureate Robert A. Millikan, famed for his oil drop experiment that measured for the first time the value of the elementary charge. After Caltech, Osborne served in the U. S. Navy, tending radar on an aircraft carrier in the Pacific. He arrived at MIT as a graduate student full of

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enthusiasm for physics, good humor and a love of all things Italian—qualities that never dimmed, according to colleagues.

"Lou embodied the joy of discovery. He was curious about everything and deeply committed to the big questions of high-energy physics," said Frank Taylor, senior research scientist in the Laboratory for Nuclear Science.

Pondering pions

Osborne's MIT career began with conducting research at the Laboratory for Nuclear Science in 1948 and with directing the MIT Synchrotron in 1950, where he carried out pioneering experiments in the photo-production of pions (pi-mesons), aiming to shed light on how these newly discovered subatomic particles are produced.

Later he worked with his students to develop the Differential Cerenkov Counter. Used to identify particles over a wide range of masses, the Cerenkov Counter has had important applications in the field of particle and nuclear physics.

Osborne joined the MIT faculty in 1959. In total, he devoted more than 50 years to understanding the fundamental building blocks of matter and the forces with which they interact.

"Lou was an outstanding hands-on experimental physicist, always at the cutting edge," said Nobel Laureate Jerome Friedman, an Institute Professor emeritus and Osborne's physics department colleague.

Osborne continued his pion photo-production studies at the Cambridge Electron Accelerator (CEA), which opened in 1962. Osborne welcomed the new facility with warmth, saying, "It was built with a marvelous attitude towards reliability…and with affection."

His CEA experiments, carried out at higher energies, contributed "important information in clarifying a number of physics issues, including providing evidence for two new pion-nucleon resonances that contributed to the confirmation of unitary symmetry," said Lawrence Rosenson, professor of physics emeritus, and an MIT colleague.

Osborne next joined Taylor, Rosenson and Friedman in an experiment at the Fermi National Accelerator Laboratory (Fermilab) near Chicago, studying deep-inelastic neutrino scattering from the nucleon. Their experiment provided an "important test of the Standard Model, our current model of the fundamental particles and their interactions," noted Friedman.

Collaborations at the Stanford Linear Accelerator (SLAC) National Laboratory, the Superconducting Super Collider (SSC) in Texas and at CERN, the European Organization for Nuclear Research in Geneva, followed. Thanks to Osborne, "all these campaigns were great adventures," Taylor said.

David Luckey, a CERN physicist and an MIT colleague for 20 years, said the highlight of his work with Osborne was "trying to build a magnetic detector for e+e-." Luckey credits Osborne, a scientific associate at CERN for 10 years, with focusing on experiments that would later lead to advances in physics.

Fiddling with the knobs

Osborne's ability to zero in on research with implications for the future made him an "ideal colleague and a terrific mentor of graduate students," Rosenson noted.

Osborne served as thesis advisor to, among others, Burton Richter PhD '56, a Nobel laureate and former SLAC director; Roy Schwitters PhD '70, a former SSC director; and Virgil Elings PhD '66, co-founder of Digital Instruments, which designed and sold scanning probe microscopes.

Osborne demanded his students develop confidence and independence—strengths of hand and mind crucial to sustaining world-class research. Elings had a physical encounter with this philosophy when his advisor once tore the wiring out of a device he was working on. "You can figure it out," Osborne said.

"Lou believed in fiddling with the knobs, in doing it yourself. He was the first person to have such confidence in me," Elings said.

Osborne's lab in Building 24 fostered that "fiddle-with-the-knobs" ethos Elings found so inspiring. Odd but useful pieces of equipment lay about the basement room. It was "easy to do small experiments as well as design and build prototype muon tracking chambers," Taylor said. "People who worked in that lab were happy to work with Lou."

In addition to carrying out experiments, teaching and advising, Osborne had an excellent command of theory and published a number of phenomenological models. While at MIT, he was granted a Fulbright Award, a Guggenheim Fellowship and a Minna-James-Heineman Fellowship. He was a fellow of the American Physical Society and a member of the American Academy of Arts and Sciences.

Osborne is survived by his wife, Barbara (Schiller); his sons, Marc and Duncan; his son, Brian, and daughter-in-law, Isabelle; his stepchildren, Amy and Michael, and their spouses; two nieces and five grandchildren. Contributions in Osborne's honor may be sent to the MIT Office of Memorial Gifts.

George Koster, physics professor emeritus, at 85

by Sarah H. Wright

George Fred Koster, a condensed matter physicist who contributed to advances in research on semiconductor materials and a devoted MIT educator who challenged students to demand excellence of themselves, died in his Brookline, MA, home on May 14, 2012. He was 85.

L. Barry Hetherington

Marc Kastner, Dean of the School of Science and Donner Professor of Science, described Koster as a "pioneer in the calculation of the behavior of electrons in solids. Over the decades this has become one of the most important areas of physics, chemistry and materials science, and George's work is an important foundation on which much has been built."

Kastner also commended Koster's contributions to MIT students and administration, noting he had long served as the department of physics graduate officer "with great skill and with compassion for the students. He will be greatly missed."

Koster (SB '48, PhD '51) joined the MIT faculty in 1956, working primarily in the areas of atomic and solid state physics. In studying the electrical conductivity of solids, he contributed to the theory of hyperfine structure of atoms; band structure of crystals; ferromagnetism, and impurity states and paramagnetism in crystals. For example, Koster studied gallium arsenide (GaAs), a costly and toxic but efficient semiconductor used to make infrared light-emitting diodes, laser diodes and the kind of solar cells that robotic rovers use on Mars.

A community journey

A native of the Bronx, New York, Koster arrived at MIT at age sixteen and stayed for 60 years. Family and friends joke that he took "time off" to serve in the U. S. Navy, returning to the Institute in 1946 to complete his degrees. Here, a community of creative and passionate minds challenged him as he would later challenge his own students. His dissertation advisor was Bernard T. Feld, physics professor and former director of the Laboratory for Nuclear Science. Feld, an anti-nuclear weapons activist who had worked with Nobel laureate Enrico Fermi on the Manhattan Project, encouraged Koster to work as a research associate at Lincoln Laboratory and at Brookhaven National Laboratory in New York. Both advisor and advisee were also Guggenheim Fellows at Imperial College in London.

Koster, a theoretical physicist, collaborated with another mentor, former MIT physics department chairman John C. Slater. An expert in microwave transmission, Slater had contributed to the MIT Radiation Laboratory ("Rad Lab"); he became a co-author, with Koster, of numerous articles published in journals including *Physical Review* and *The Journal of Applied Physics*.

In 1954, Slater and Koster devised a way to approximate electronic band structure, especially for the d-bands of transition metals. (The so-called "band gap" in a solid is a major factor in determining its electrical conductivity.) Theirs is sometimes called the SK tight-binding model.

"Koster was one of the first to apply group theory to the calculation of band structures, and his book, *Space Groups and Their Representations*, was a standard reference for many years," said Thomas Greytak, Lester Wolfe Professor of Physics, Emeritus.

Koster's signature course was his graduate-level solid state physics sequence, and his signature teaching style inspired some students when they became teachers.

Greytak, an experimental physicist who took Koster's courses, recalled working on Koster's problem sets "with a great feeling of satisfaction: not only had I solved the problems but I also understood things I knew would be of great utility to me in the future. Later, as a faculty member, I tried to pattern my problem sets on George's."

Serving the Institute community

Koster's enthusiasm for physics was matched by his enthusiasm for the MIT community. He carried out administrative and leadership roles with diligence and good humor. He performed exceptional service for the Department, Greytak noted, coordinating graduate admissions, counseling the graduate students and overseeing the graduate student financial support.

Ernest Moniz, professor of physics, Cecil & Ida Green Distinguished Professor, and Director of the MIT Energy Initiative (MITEI), said Koster was "meticulous in supervising the graduate program in physics. He was also a very kind person, always constructive when students went through a rough patch."

Alicia Duarte, former course manager for MIT's required first-year physics lecture courses, 8.01 and 8.02, said Koster's capacity for attending to individual students was remarkable. Though Koster, course administrator at the time, oversaw 1,000 students and 26 recitation sections, he was "patient and very approachable," she said.

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"His attention to detail and his knowledge of MIT rules and regulations were crucial to the success of these important courses," added Duarte, now in the Graduate Office of Electrical Engineering and Computer Science.

Koster's vision for consistency and excellence at MIT extended beyond his own research, teaching and administrative successes, noted his son, Karl Koster, executive director of Corporate Relations and the Industrial Liaison Program at MIT.

"My father's loyalty to MIT is a testament to this Institute's ability to attract and retain the highest-caliber people. He was very committed to opening the pipeline to MIT to minority students," Karl said.

Koster's published work on diversity is contained in the 1968 report, "Minority Recruitment in Physics at MIT," for the Council of Graduate Schools in the U. S.

Peggy Peterson, former Graduate Administrator and Education Administrator in physics, worked with Koster for 15 years. "He treated everyone with equal respect. Egalitarianism is his legacy," she said.

"George Koster was the complete faculty member—excellent in research and teaching, dedicated to his students and colleagues, and a mentor to younger people, including myself," said Physics Department Head Edmund Bertschinger.

Hiking and handball

Just as he insisted his students give 110 percent to every challenge in physics, Koster gave 110 percent to every challenge he encountered, from administration to athletics. A tournament-level handball player in a master's league, Koster played regularly with MIT colleagues. Moniz, who praised Koster's kindness with students, described him as "relentless" in handball. "We played for about ten years. He essentially always won, 21 to 17 ± 2, totally controlling the pace. While I was considerably younger, I had to keep running all over the place while he calmly controlled the center of the court," Moniz said.

Sometimes, Koster's court was nature itself. He took his young sons on hiking and camping trips throughout New England and on parts of the Appalachian Trail, leaving the toughest sections for himself. He completed the 270-mile Long Trail in Vermont and much of the 2,184-mile Appalachian Trail, hiking and camping alone in wilderness areas between Georgia and Maine.

In addition to *Space Groups*, Koster is the co-author of the reference texts, *Properties of the Thirty-Two Point Groups* and *Spectroscopic Coefficients for the pn, dn, and fn Configurations* (both, Technology Press, 1963). Koster was a Fellow of the American Physical Society and a member of Sigma Xi.

Koster is survived by his son Karl Koster and wife Lindley Huey of Brookline; son Paul Koster and wife Paula of Everett; and daughter Janet Raposo and husband Edward of Dedham.