

met two other consultants, Pief and Sid, and we decided to convene the first-ever conference on the use of sophisticated intelligence systems to verify arms control treaties. That began my long and fruitful collaboration with Sid and Pief, and I soon came to realize that the two men were giants in the field of arms control.

We helped the ACDA formulate its first treaty, SALT, but were unsuccessful in having the treaty organized around limiting warheads instead of missiles. Thus, to our dismay, the treaty encouraged the race toward multiple independently targetable reentry vehicles and an almost 10-fold increase in the number of deployed nuclear warheads. Indeed, it was not until the Strategic Arms Reduction Treaties I and II were signed in 1991 and 1993 that warheads were effectively limited, and the US had treaties that accomplished what we had sought in the original SALT.

Sid's deep interest in arms control led to his teaming with John Lewis to found Stanford's Center for International Security and Arms Control, one of the nation's leading security centers.

Sid had a long and close relationship with Andrei Sakharov. They met at a 1980s conference in Moscow, after which Sakharov invited Sid to his apartment and they talked into the night. Thus began a remarkable friendship and collaboration lasting until Sakharov's death in 1989. Sid then teamed up with Sergei Kapitzka, a Russian physicist, to prepare *Sakharov Remembered* (Springer, 1991), a remarkable homage by scientists worldwide.

In his later years, Sid collaborated with George Shultz at Stanford's Hoover Institution. He organized a seminar held on the 20th anniversary of the Reykjavik Summit, where President Ronald Reagan and General Secretary Mikhail Gorbachev had explored the elimination of nuclear weapons. The two presidents failed to reach agreement, and 20 years later, Shultz, Kissinger, Sam Nunn, and I wanted to examine whether it was an idea whose time had come. After the seminar, we published an op-ed in the *Wall Street Journal* expressing our views. Sid was the driving intellectual force behind our series of op-eds, which highlighted the existential danger of nuclear weapons and called for their elimination.

For the three of us, working with Sid left an indelible mark. In his efforts with

JASON, the Stanford arms control program, SLAC, and PSAC, Sid showed his dedication to the development of generations of physicists and public servants. Through it all, he served with his rich mix of wisdom, compassion, and humility.

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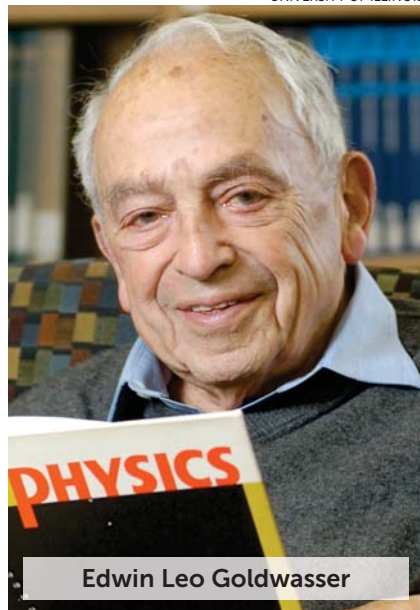


Edwin Leo Goldwasser

Edwin Leo "Ned" Goldwasser died on 14 December 2016. An excellent physicist, he loved science and shared that joy; conducted research at individual, large-group, and megascale accelerator-levels; and was passionate about human issues and the place of science in civil society. His broad contributions included not only innovative research and teaching but also international collaborations. His forte was promoting and realizing large-scale facilities for particle physics and other sciences.

Born in Manhattan, New York, on 2 March 1919, Goldwasser graduated from Harvard College with an AB in physics in 1940. During World War II, he served as a US Navy civilian physicist and developed methods to reduce ships'

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Edwin Leo Goldwasser

magnetic signatures to avoid mines. After the war he attended the University of California, Berkeley, and received his PhD in 1950 under Robert Brode. He accepted an invitation to join the University of Illinois at Urbana-Champaign.

Goldwasser immediately launched new collaborations with other faculty. He and Gilberto Bernardini used the Kerst betatrons in Illinois to do a groundbreaking study of elementary-particle photo production at threshold. In Rome on sabbatical in 1957, Goldwasser conducted lectures in Italian, which he learned from Laura Fermi. When the Argonne Zero Gradient Synchrotron was completed in 1964, he took his research program to higher energies, helped build a bubble chamber, and founded and chaired its users' group.

A devoted teacher, Goldwasser led the Illinois part of the Physical Science Study Committee, a collaborative effort with MIT. Among Goldwasser's contributions was the influential textbook *Optics, Waves, Atoms, and Nuclei: An Introduction* (Benjamin, 1965). In 2007 the American Physical Society presented its inaugural Excellence in Physics Education Award to the committee for its "major and ongoing influence on physics education at the national level."

Goldwasser was a key advocate for building a hundred-GeV-scale accelerator. He served on the National Academy of Sciences site-selection committee for the proposed facility. In a letter to Edwin McMillan at Berkeley in 1964, Goldwasser wrote that "the actual control must be in the hands of an organization similar to AUI [Associated Universities Inc, which at the time managed Brookhaven National Laboratory] but national in its scope."

The National Accelerator Laboratory (later renamed for Enrico Fermi) was founded in 1967. Inaugural director Robert Wilson asked Goldwasser to be deputy director. Goldwasser took what became an extraordinarily extended leave from Illinois. Wilson and Goldwasser formed a tight triumvirate with Norman Ramsey, president of the Universities Research Association, the Department of Energy's prime contractor for the new laboratory. Together they managed most of the lab's construction and subsequent operations. The facility was brought in on time and on budget.

Perhaps most important to Gold-

wasser was the creation at Fermilab of a strong ethos of affirmative action, equal employment opportunity, and fair housing. He wrote elegantly about the lab's efforts in an October 1969 *Bulletin of the Atomic Scientists* article called "Science and man: Breaking new ground at Batavia." He enlisted Kennard Williams to be the lab's equal employment and community relations officer. With Wilson, Goldwasser authored a laboratory mission statement that ended, "In any conflict between technical expediency and human rights, we shall stand firmly on the side of human rights. This stand is taken because of, rather than in spite of, a dedication to science."

Goldwasser was responsible for building a network of users and overseeing the planning for the Fermilab research facilities. One key ingredient was summer studies at the Aspen Center for Physics in Colorado. Another was resident theorists brought to Fermilab, among them William Bardeen. In his 1975 letter to Bardeen encouraging him to join, Goldwasser wrote, "I feel strongly that for the laboratory to provide the proper environment for me and others to work, there must be a component of the kind of intellectual activity theoretical physicists provide."

At a difficult time in foreign relations, Goldwasser was central to arranging the first US-USSR high-energy-physics collaboration at Fermilab. That experiment was the first to start when the accelerator came into operation in early 1972.

With a long-term interest in international science, Goldwasser served as a member and chairman of the Commission on Particles and Fields of the International Union of Pure and Applied Physics, the International Committee for Future Accelerators, and the American Physical Society's Committee on International Freedom of Scientists.

Persuaded in 1978 to return to university life in Urbana-Champaign, Goldwasser served first as graduate dean and then as vice chancellor of academic affairs. Among his contributions was implementing the administrative fabric of the National Center for Supercomputing Applications. His skillful administration and thoughtful, effective engagement earned the deep respect of members of the university community.

In 1986 Goldwasser again left Illinois to become associate director for develop-

ment at the Superconducting Super Collider Central Design Group at Berkeley. When the group moved to Texas, Goldwasser returned to Illinois, where he directed several campus programs until his retirement in 1988.

During 1993–94 Goldwasser worked at Caltech on the development of the detector for the Laser Interferometer Gravitational-Wave Observatory. LIGO, with a powerful Caltech-MIT contingent, had built a strong technical program that exploited the two sites, and Goldwasser brought extensive project-management expertise.

Goldwasser was an avid bike rider and tennis player. And in every place he worked and lived, his wife of 76 years, Lizzie, was a cohesive factor in integrating colleagues into the community.

In 1978 Fermilab director Wilson gave perhaps the best appreciation of Goldwasser: "The successes of the laboratory, the firm foundation for the future, the cultural ambience, the spirit of opportunity for all, the international importance of our work, are all monuments to his sense of the value of science and its place in our society."

Richard A. Carrigan
Fermilab
Batavia, Illinois

Ralph O. Simmons
University of Illinois at Urbana-Champaign



Kerson Huang

Kerson Huang, a professor emeritus at MIT who was best known for his contributions to statistical physics, died of cancer on 1 September 2016 in Danvers, Massachusetts.

Huang was born on 15 March 1928 in Nanning, Guangxi Province, China. After the Japanese invaded in 1937, he and his family moved to Manila, the Philippines. Following the end of World War II, he went to the US, where he obtained his BS in 1950 and his PhD in 1953, both in physics and both from MIT. His earliest research was on the *zitterbewegung* ("trembling motion") of the Dirac electron. Victor Weisskopf was his thesis adviser, but Huang worked more closely with Sidney Drell on meson field theory. He learned the pseudopotential method from Weisskopf and applied it to the study of the



Kerson Huang

quantum mechanical problem of hard spheres.

In the fall of 1955, Huang went to the Institute for Advanced Study in Princeton, New Jersey, for his postdoc and introduced to Chen Ning Yang the pseudopotential method. Together with Tsung-Dao Lee, they collaborated on the problem of dilute hard-sphere bosons and demonstrated the superfluidity of dilute Bose gases due to Bose-Einstein condensation. Huang presented that work at the institute to an audience that included Eugene Wigner, Freeman Dyson, J. Robert Oppenheimer, and Wolfgang Pauli. Pauli slept during the seminar and only woke up to comment that he did not like the pseudopotential because it is not Hermitian. However, he said later that Huang's work was *nicht dumm* ("not dumb"). Fifty years later the work was confirmed by experiments on Bose-Einstein condensation in alkali gases.

Huang returned to MIT in 1957 as an assistant professor and continued his studies in both many-body problems and particle physics. Ranging from high-energy to low-temperature physics, his research covered numerous topics, including pion decay, muon capture, high-energy scattering, bootstrap solutions, and imperfect Fermi and Bose gases. MIT mathematician John Nash frequently engaged Huang in discussions about the fundamentals and philosophy of quantum mechanics.

In the 1960s and 1970s, Huang worked on the dual resonance model. During a