



Credit: Lawrence Berkeley National Laboratory

Art R

ARTHUR H. ROSENFELD

1926–2017

Elected in 2010

“For leadership in energy efficiency research, development, and technology deployment through the development of appliance and building standards and public policy.”

ASHOK GADGIL, DAVID B. GOLDSTEIN,
AND JONATHAN KOOMEY

ARTHUR HINTON ROSENFELD passed away on January 27, 2017. He was 90 years old.

Over the course of his career he inspired thousands of students, postdocs, and other researchers to make the world a better, more energy-efficient place and, with a combination of personal charm and convincing analysis, motivated policy-makers to adopt these ideas. His quick wit, enthusiasm, and unrivaled personal energy made him a beloved figure in the world of energy efficiency policy and technology.

Even when expressing controversial ideas, he did it in a disarming and often whimsical way, without putting his ego in the debate. He communicated a sense of wonder and innocence, while recognizing the importance of getting the numbers right. He unerringly identified the right questions to ask about the right topics, and had the persistence to take research results all the way to advocacy that had real societal impact. And he did it with a friendly and collegial charm that is reflected in the fact that his students simply called him “Art” rather than “Professor Rosenfeld.”

Born in Alabama on June 22, 1926, Art spent his childhood in Egypt, where his father was a consultant to the Egyptian sugarcane industry. He graduated from Virginia Polytechnic

Institute with a BS in physics at age 18, enlisted in the Navy toward the end of the war, and afterward enrolled in the Physics Department of the University of Chicago, where Enrico Fermi accepted him as his last graduate student.

After receiving his PhD in physics in 1954, Art joined the physics faculty at the University of California at Berkeley, where he worked in—and, from 1969 to 1974, led—the particle physics group (“Group A”) of subsequent Nobel Prize winner Luis Alvarez at Lawrence Berkeley National Laboratory (LBNL).

The oil embargo of 1973 galvanized Art and he began asking endless questions. Why were Bay Area offices all brightly lit at 2:00 AM when nobody was there? Why were California home heating bills comparable to those in Minnesota? Why were utilities giving away 200-watt electric light bulbs? Why were the then popular Eichler Homes using electric resistance heating with no roof insulation? For what activities, and in what devices, was the US consuming energy? And what were the physics-based limits for how little energy these activities really needed?

These and other questions led Art and several of his colleagues to frame the energy problem in terms of “how to accomplish society’s goals most efficiently and cheaply” rather than “how to supply enough energy.” This reframing was revolutionary in an era when most people thought energy consumption and economic growth always increased in lockstep.

After a yearlong “sabbatical” from particle physics, Art decided to continue working on the efficient use of energy, mainly in buildings. In 1975 he founded the Center for Building Science at LBNL, which he led until 1994. During the 1970s and early 1980s he attracted a cadre of talented, creative, and energetic people to LBNL, and together they built a world-class center for energy and environment studies. The center also inspired a small army of students at UC Berkeley to focus on energy efficiency, and these researchers helped develop the energy efficiency industry once they left the university.

Art’s contributions to the fledgling knowledge base of building science were seminal, and he is widely considered

the father of energy efficiency. The Center for Building Science developed a broad range of energy efficiency technologies, including electronic ballasts for fluorescent lighting—a key component of compact fluorescent lamps (CFLs)—and a transparent coating for window glass that blocks heat from either escaping (winter) or entering (summer). He was personally responsible for developing the DOE-2 series of computer programs for building energy analysis and design that has been the gold standard for building energy analysis for more than 25 years.

Art's work quickly took him into the policy arena. In 1975 utilities had selected sites and requested permits for 17 GW of power plants to come online by 1987. But long before 1987 all but 3 GW had been quietly forgotten. An even more extravagant report by Ronald Doctor of RAND in Santa Monica had projected the need for 150 GW of new power plants for California by 2000, which would put one GW of power plants every 3 miles along the coast between San Diego and San Francisco. Art worked with legislators, regulators, and the then new California Energy Commission to implement much less expensive efficiency policies that made those plants superfluous. California's peak demand has been held to 60 GW today, preventing at least \$75 billion in wasted investment.

Art was cofounder of the American Council for an Energy Efficient Economy (ACEEE) and the California Institute for Energy and the Environment (CIEE). He authored or coauthored over 400 refereed publications or book chapters.

During the Clinton administration Art was senior advisor to the US Department of Energy's assistant secretary for energy efficiency and renewable energy (1994–99). He also served on the California Energy Commission (CEC), appointed by Governor Gray Davis in 2000 and reappointed in 2005 by Governor Arnold Schwarzenegger.

In 2010 he returned to LBNL and was soon recognized as Distinguished Scientist Emeritus. Until his death he devoted his attention to an international campaign for the adoption of white roofs and "cool-colored" surfaces to reduce heat islands and mitigate global warming.

In addition to his NAE membership, his many honors include the Leo Szilard Award for Physics in the Public Interest from the American Physical Society (1986), the US Department of Energy's Carnot Award for Energy Efficiency (1993), the University of California's Berkeley Citation (2001), the Global Energy International Prize from Russian president Dmitry Medvedev (2011), the National Medal of Technology and Innovation from President Barack Obama (2011), and the Tang Prize for Sustainable Development (2016).

Of all his prizes Art was most proud of the Enrico Fermi Award in 2005, the oldest and one of the most prestigious science and technology awards given by the US government and named for his mentor. The award recognizes scientists of international stature for a lifetime of exceptional achievement in the development, use, control, or production of energy. He received the award from DOE secretary Samuel W. Bodman on behalf of President George W. Bush, "for a lifetime of achievement ranging from pioneering scientific discoveries in experimental nuclear and particle physics to innovations in science, technology, and public policy for energy conservation that continue to benefit humanity."

According to John Holdren, director of the White House Office of Science and Technology Policy under President Obama, "Art Rosenfeld had an enormous impact on US energy policy, starting in the early 1970s, with his insights and compelling quantitative analyses pointing to the potential of increased end-use efficiency as the cheapest, cleanest, surest response to the nation's energy challenges."

California governor Jerry Brown remembered that, "In 1975, Art Rosenfeld told me that simply by requiring more efficient refrigerators, California could save as much energy as would be produced by the proposed Sundersert Nuclear Power plant. We adopted Art's refrigerator standards and many others, did not build the power plant, and moved the country to greater energy efficiency. This is but a small piece of Art's legacy and his central role across decades of promoting energy efficiency in California and around the world."

Former DOE secretary Steven Chu reported that California froze “per capita electricity growth, despite huge electrification, by methodical introduction of advanced appliance and building standards and the creation of a \$1B/yr energy efficiency program funded by a ‘public goods’ charge on electric bills. This marked change in per capita energy was accurately identified as the ‘Rosenfeld Effect,’ which is continuing today, four decades later.” He added that Art’s “indefatigable, high-energy devotion to [the country’s] energy challenges became a role model for a large number of younger scientists, including myself. It is a privilege to have known and worked with Art...a warm, gracious, and generous individual.”

When friends asked Art what he did for relaxation, he would say “relaxing makes me nervous.” He did enjoy going jogging every weekend, particularly with his children.

Art married Roselyn Bernheim in 1955; she died in 2009. They are survived by daughters Dr. Margaret Rosenfeld and Dr. Anne Hansen, two granddaughters and four grandsons, and the entire energy efficiency community.