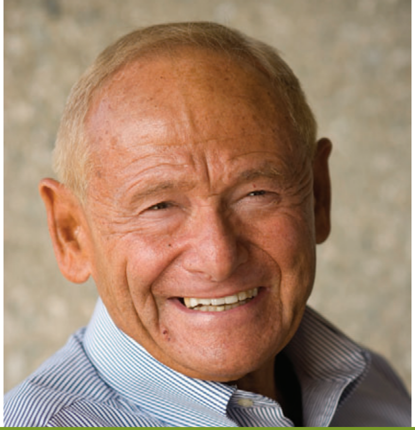


THOMAS J. AHRENS
1936–2010

Thomas J. Ahrens (MS '58), the Jones Professor of Geophysics, Emeritus, died at his home in Pasadena on November 24. He was 74.

Ahrens, who worked in the U.S. Army's Ballistics Research Laboratory from 1959 to 1960 en route to earning his doctorate, was among the first to take shock-compression techniques developed by government labs for testing nuclear weapons and apply them to the academic study of conditions deep within the earth. These methods subjected materials to extremely high temperatures and pressures by smashing two samples together at very high speeds—in other words, by loading one into a cannon and shooting it at the other. (Nowadays, researchers reach these conditions routinely by squeezing a sample between diamond anvils and heating it with a laser.)

Ahrens's first "cannon" was a shotgun from Sears, but over the years larger and larger pieces of ordnance found their way into the subbasement of South Mudd—culminating in three 20-foot-long barrels cut from six-inch-caliber naval guns and joined end-to-end to form the pump section of a two-stage "light gas gun" that was in use until 1991. The first stage of such a gun uses a conventional smokeless-powder charge to fire a piston down the barrel, which is filled with highly compressible hydrogen. Halfway to the muzzle, the gun abruptly necks down into a second, smaller-diameter barrel containing the sample projectile and separated from the pump barrel by a thin metal plate. The supercompressed hydrogen bursts through the plate, gains additional velocity from being forced into the smaller second stage, and shoots the projectile at velocities of up to 7.5 kilometers per second—more than the minimum impact speed of a slow asteroid hitting Mars, and two-thirds the minimum impact velocity with Earth.

In the 1980s, Ahrens's team used a single-stage, 40-millimeter gun capable of achieving pressures of 400,000 times Earth's atmosphere—sufficient to melt an 80-gram iron projectile on impact—to estimate the temperature profile of Earth's core. Other studies looked at the effects of meteor strikes. Ahrens concluded from these that our water (and much of our atmosphere) must have arrived from the outer reaches of our solar system via icy comets after the protoplanets that formed Earth had finished crashing into one another—otherwise, each fresh impact would have blasted such volatile substances into space.

In 1986, Ahrens and former postdoc Manfred Lange published a calculation of the amount of carbon dioxide that would have been released into the atmosphere when a 10-kilometer asteroid splashed into shallow seas just off the Yucatán peninsula 65 million years ago. Ahrens and Lange used bullets of steel and targets of limestone, a common sedimentary rock made of calcium carbonate, and concluded that enough of the greenhouse gas would have been generated to raise Earth's average surface temperature between 5 and 20°C for up to 10,000 years. If this didn't kill the dinosaurs, it would have made them mighty uncomfortable.

"Tom was a highly productive scientist and a dedicated mentor to dozens of students, postdocs, and visitors who now fill the ranks of mineral physicists at universities around the world," says Professor of Geology and Geochemistry Paul Asimow (MS '93, PhD '97), an Ahrens protégé who now runs the Lindhurst Laboratory of Experimental Geophysics, as Ahrens's gun collection is formally known.

Born in Frankfurt, Germany, on April 25, 1936, Ahrens received his BS from MIT in 1957 and his PhD from Rensselaer Polytechnic Institute in 1962. He headed the Poulter Laboratory's geophysics section at the Stanford Research Institute from 1962 to 1967 before joining Caltech as an associate professor. He became professor of geophysics in 1976, and was the W. M. Keck Foundation Professor of Earth Sciences from 1996 to 2001; he was named Jones Professor in 2004, and went emeritus in 2005.

Ahrens published nearly 400 papers and held three U.S. patents. He was a member of the National Academy of Sciences and the American Academy of Arts and Sciences, and was a Foreign Associate of the Russian Academy of Sciences. His professional honors included the Geological Society of America's Day Medal, the American Physical Society's Duvall Award, the American Geophysical Union's Hess Medal, and the Meteoritical Society's Barringer Medal. The asteroid 4739 Tomahrens (1985 TH1) is named after him.

Ahrens is survived by his wife, Earleen; children Earl, Eric, and Dawn; and grandchildren Greta, Violet, Jacqueline, and Samuel.
—DS/MW e&s

EUGENE W. COWAN
1920–2010

Eugene W. “Bud” Cowan (PhD ’48), professor of physics, emeritus, passed away on November 4 in Menlo Park, California. He was 90.

Cowan’s research included investigations of high-energy interactions of cosmic rays, air-pollution studies, and studies of the earth’s magnetism.

An innovative instrument builder, Cowan was best known for his perfection, in 1950, of a cloud chamber capable of continuous operation. A cloud chamber makes the tracks of subatomic particles visible, allowing the particles themselves to be identified. The chamber works by causing droplets of vapor to condense along the trail of ions the particle leaves behind as it interacts with air molecules. Previous cloud chambers had required a sudden, large drop in chamber pressure in order for this condensation to occur, followed by a rest period during which no observations could be made. Cowan’s innovation eliminated the need for the pressure decrease and thus eliminated the rest period.

Cowan was particularly proud of his work in the early 1950s on the Xi “cascade” particle, the first doubly strange baryon. His cloud-chamber image clearly confirmed the existence of the particle and provided important input that led to the subsequent development of the quark model. His later work focused on the dynamics of the mechanism that generates the earth’s magnetic field.

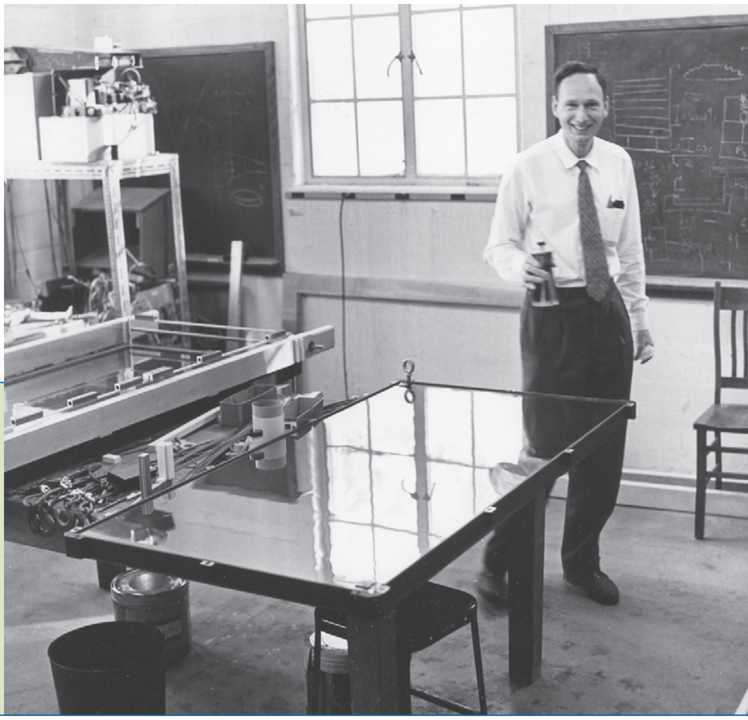
Cowan was born in 1920 in Ree Heights, South Dakota. After receiving his BS at the University of Missouri and his SM at MIT, where he was an instructor in the radar school and at the Radiation Laboratory, he came to Caltech in 1945. Cowan earned his doctorate under cosmic-ray researcher and Nobel laureate Carl Anderson (BS ’27, PhD ’30). He became a research fellow in 1948, an assistant professor in 1950, and an associate professor in 1954. In 1961 he was promoted to professor of physics, and he became an emeritus professor in 1986.

Cowan was awarded four patents, including one for his innovative cloud chamber. He was a fellow of the American Physical Society.

Long recognized for the quality of his teaching, Cowan received the 1986 Associated Students of the California Institute of Technology (ASCIT) award for teaching excellence for his course on classical electromagnetism.

Says his son, Glen, a particle physicist at Royal Holloway, University of London, “My father truly enjoyed being part of the Caltech community. I believe he was there almost every day from 1945 to 2008. Maybe that’s some kind of record.” An avid hiker in the San Gabriel Mountains, he “walked the two and a half miles to and from work for probably more than 50 years, and for much of that time also went daily to the Caltech pool and gym.” In 2008, Cowan and his wife, Thelma, moved from Pasadena to Menlo Park, California, to be near their daughter, Tina, a geneticist at Stanford University.

Cowan is survived by his wife of 54 years, Thelma Rasmussen Cowan; daughter Tina Cowan Hiltbrand and son Glen Cowan; and grandchildren David and Karin Hiltbrand. *—KS* e&S



Bud Cowan with one of his cloud chambers—the flat panel that looks like a tabletop—circa 1959. Photo courtesy of Glen Cowan.