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Albert Vinicio Baez

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Al Thompson; George Castro

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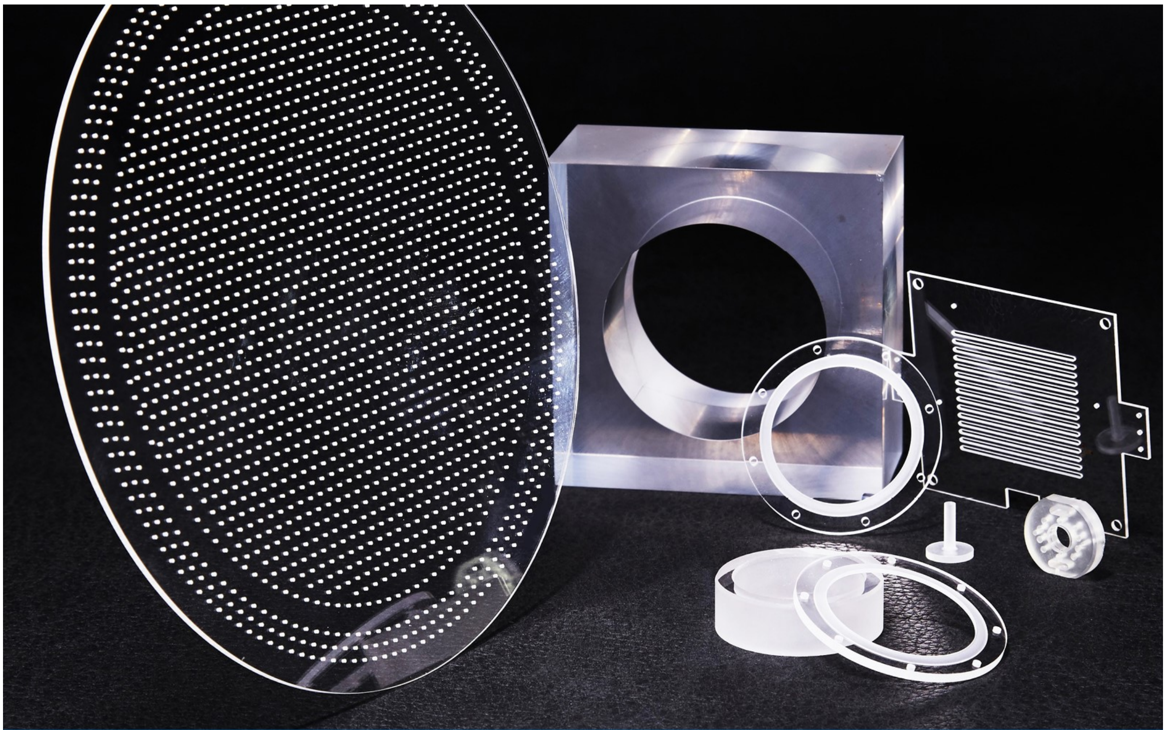

while the other sulfur atom has a valence state of +6. The two peaks we had observed originated from the two different sulfur atoms. Not only was the photoelectron method a promising technique as a quantitative chemical analysis method, but more important, it could be used to investigate the valence state of the atoms.

Kai was pleased when we met the following morning, for he had seen the product of the prior night's work on his desk. We all realized the potential of the discovery; Kai quickly reallocated resources toward the new technique, which he gave the acronym ESCA. Within a few years, the Uppsala group could boast an international leadership position in the field while, simultaneously, several groups around the world initiated activities in the new area of research.

Kai's ultimate recognition from the scientific community came with the Nobel Prize in Physics in 1981 "for his contribution to the development of high-resolution electron spectroscopy." He shared the prize with Arthur Schawlow and Nicolaas Bloembergen.

The Nobel Prize was the culmination of a series of distinguished international awards, honorary doctoral degrees, and academy memberships Kai received in his lifetime. They all pay tribute to a man who today would be called a successful scientific entrepreneur: a dedicated scientist, an engineer who was fascinated by the latest technological innovation, a businessman who could both allocate and attract money for important scientific research, a research manager, and a champion for physics in Sweden.

Stig B. Hagstrom
Stanford University
Stanford, California

Albert Vinicio Baez

Albert Vinicio Baez, a pioneer in x-ray optics and codeveloper of the x-ray reflection microscope, died of natural causes on 20 March 2007 in Redwood City, California. In addition to being a noted physicist, Al was a passionate humanitarian and educator.

Al was born in Puebla, Mexico, on 15 November 1912. When he was two years old, his family moved to Brooklyn, New York. He graduated with a bachelor's degree in mathematics from Drew University in 1933 and a master's in mathematics from Syracuse University in 1935. From 1940 to 1944, Al taught at Wagner College on Staten Island, where he became a full professor. In 1944 he moved to Stanford University; there he taught undergraduate courses in physics and mathematics. After World War II, he decided to switch from mathematics to physics for his PhD. With Paul Kirkpatrick as his research professor, he wrote his thesis, "Principles of X-Ray Optics and the Development of a Single Stage X-Ray Microscope"; he received his PhD in 1950.

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Albert Vinicio Baez

In 1948 Al and Kirkpatrick developed the theory of using grazing-incidence mirrors to focus x rays. For their focusing geometry, they envisioned two such mirrors mounted perpendicular to one another to overcome limitations of conventional optical systems. Unfortunately, developing a usable instrument was not possible because high-quality mirrors and intense x-ray sources were not available. However, the focusing geometry, named in the research team's honor (the Kirkpatrick–Baez configuration), is now widely used at synchrotron facilities and in some astrophysics experiments to produce high-intensity, focused x-ray beams smaller than 1 μm^2 with a wide energy bandpass.

During a brief stint at the Cornell Aeronautical Laboratory in Buffalo, New York, in 1950, Al found he was uneasy doing operations research for a classified US Navy project. He soon moved to the University of Redlands in California, where he continued his research on x-ray optics. Realizing the potential of Fresnel zone plates for high-resolution microscopy and telescope imaging with soft x rays and extreme UV radiation, in 1952 he outlined the theoretical advantages and method of fabrication. Later, in 1962, he published in the *Journal of the Optical Society of America* a paper demonstrating the fabrication of zone plates and the

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Randolph A. Nanna, Publisher

achievement of diffraction-limited resolution in the UV.

Al was a Quaker and had a passionate interest in science education. In 1951 he combined the two when he went to Iraq for a year under the auspices of the UN Educational, Scientific and Cultural Organization (UNESCO) to help establish the departments of physics, chemistry, and biology at Baghdad University. With his wife, Joan, he coauthored the book *A Year in Baghdad* (J. Daniels, 1988), which recalls the challenges of raising three daughters in a startlingly different environment.

In 1956 Al returned to Stanford, where he began working with MIT physics professor Jerrold Zacharias, who had formed the Physics Science Study Committee. The PSSC was an effort to reshape the way physics was taught in high schools. In 1958 Al moved his family to Cambridge, Massachusetts, and began working at the Smithsonian Astrophysical Laboratory.

From 1961 to 1967, Al was the first head of the division of science teaching at UNESCO in Paris, where he helped develop projects in the basic sciences in Asia, Africa, Latin America, and the Arab states. He made a series of almost 100 films on physics principles for the *Encyclopedia Britannica* Educational Corporation from 1967 to 1974. He wrote an undergraduate physics textbook, *The New College Physics: A Spiral Approach* (W. H. Freeman, 1967). Additionally, he was a chairman of the commission on the teaching of science for the International Council of Scientific Unions and of the commission on education for the International Union for Conservation of Nature and Natural Resources.

Al liked to tell how surprised he was when, as he was registering for a physics conference in Geneva, Switzerland, in 1963, he was asked, “Are you the father of [folksinger] Joan Baez?” His daughter had just been on the cover of *Time* magazine. From then on, it was often the first question he was asked—even at physics conferences.

A lifelong pacifist, Al opposed both the nuclear weapons buildup of the 1950s and, later, the Vietnam War; he worked with many peace and humanitarian programs. After his retirement, he served as president of Vivamos Mejor North America (Let Us Live Better), which strives to improve the quality of life in Latin America through science-based education and community development projects.

When Al gave talks to students, he often mentioned the importance of the 3 *C*s—curiosity, creativity, and compassion. His many friends felt that he embodied those qualities, and we miss his stimulating ideas and gentle ways.

Al Thompson
Berkeley, California
George Castro
San José State University
San José, California

Horace Richard Crane

Experimental physicist H. Richard “Dick” Crane, who was the first to measure the magnetic moment of free electrons, died of age-related complications in Chelsea, Michigan, on 19 April 2007, just months short of his 100th birthday.

Born on 4 November 1907, Crane was raised in Turlock, a small farming town in central California. His parents encouraged their young son’s fascination with technology by letting him experiment with mechanical and electrical devices around the house. By age 14 he was licensed for amateur radio, an interest that lasted the rest of his life.

In 1926 Crane enrolled as a freshman at Caltech; when he graduated in 1930, jobs were hard to find, so he returned to Caltech for graduate school. He joined Charles Lauritsen’s group as a graduate assistant and helped build an accelerator used for studies of nuclear properties and for neutron production. Crane also tried to find evidence for the existence of the neutrino. By age 28 he had finished his thesis and done a year of postdoctoral work and had already been lead author on 17 letters and articles in *Physical Review*.

In 1935 Harrison Randall at the University of Michigan found the money to hire the bright Californian as an instructor. On arriving in Ann Arbor, Crane began building a 1-MeV accelerator and also undertook experiments with radioactive sources. Over the years 1936–40, he continued the study of nuclear disintegration, gamma and beta spectra, and mechanisms of electron energy loss.

He also continued to search for the neutrino. In 1938 he and Jules Halpern published the first convincing quantitative measurements of neutrino momentum. And in 1939 Crane searched for neutrino absorption by burying a radioactive source in a bag of salt and looking for sulfur produced by the inverse beta decay of chlorine; he was able to set an upper limit for the cross section of the process, and he also discussed the astrophysical implications of his result. Crane’s last publication on neutrinos, in *Reviews of Modern Physics* in 1948, re-