work in the US by Murray Gell-Mann, David Sharp and Timothy Wagner. The interplay between strong and weak interactions became a lifelong interest for Oneda; for the last part of his life he systematically obtained relations between measurable quantities that were not explicitly dependent on specific models for the hadrons. He was able to obtain numerous elegant results from this approach. It is fortunate that he was able, with Yoshio Koide, to complete a book based on this research, *Asymptotic Symmetry and Its Implications in Elementary Particle Physics*, which has just appeared in print. It will remain as a lasting monument of his contribution to the field he loved. In addition, Oneda served as an inspiring mentor for numerous students.

Oneda grew up in prewar Japan and suffered like so many others from the hardship of the war. But he survived and persevered. In coming to live in the US he had to adapt not only to an alien language but also to an alien culture. This he did with considerable grace. Oneda was a sweet, sterling man, kind and warm, totally honest and straightforward in his dealings with others. He is greatly missed by all those who knew him.

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Paul Kirkpatrick

Paul Kirkpatrick, professor emeritus of physics at Stanford University, died in his sleep on 26 December 1992 at the age of 98. A pioneer in the use of x rays for scientific purposes and the earliest practitioner of holography, Kirkpatrick invented the grazing-incidence reflection x-ray microscope.

Kirkpatrick was born near Wessington, South Dakota, 21 July 1894, to a family of homesteaders. His parents moved to Southern California, where he later graduated from Occidental College.

He taught physics for two years at a Presbyterian mission in Hangchow, China, and later served in the US Army during World War I. He then went to the University of California, Berkeley, where he received his doctorate in physics in 1923.

His first job after that was at the University of Hawaii, where he was the sole member of the physics department. For lack of research facilities he used old hospital x-ray

Paul Kirkpatrick

equipment to study the polarization of x rays reflected from crystals. He eventually went to Stanford in 1931. There, using a two-crystal x-ray spectrometer of great sensitivity built by P. A. Ross, Kirkpatrick proved experimentally that the magnitude of the Compton shift is measurably less than the value given by Arthur H. Compton's formula. Felix Bloch, then a newcomer to the Stanford physics department, elaborated a formula supporting Ross's and Kirkpatrick's premise that atomic binding of the scattering electrons was responsible for the discrepancy.

Kirkpatrick's x-ray microscope uses a crossed pair of curved mirrors. A single curved mirror reflecting x rays at grazing incidence from a point source produces a highly astigmatic image—a line. Kirkpatrick proved experimentally that one could correct the astigmatism by allowing the radiation from one mirror to land on a second at right angles to the first. The second mirror "squeezes" the line down to a point. The image of an extended object is magnified when the distance parameters are chosen properly. The basic paper on this subject appeared in 1948.

When Dennis Gabor proposed the process of image formation by reconstructed wavefronts in his seminal 1948 paper on holography, Kirkpatrick sensed this might be a route to another form of x-ray microscopy; he and his graduate student Hussein El-Sum produced holograms and reconstructions with visible light approximately ten years before the invention of the laser.

Kirkpatrick was an early critic of the growing dominance of research over teaching at major universities and was recognized for his teaching abilities. He was a popular but ruthlessly demanding teacher, with a marvelous sense of humor that enlivened his lectures. He continued to ride a bicycle on the Stanford campus well into his 90s. He was a vegetarian and did not use alcohol or tobacco. He promoted peacemaking activities and participated in a science education mission for UNESCO in India in the 1960s.

Paul Kirkpatrick's human warmth extended to his immediate family and to all of his associates.

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Walker Bleakney

Walker Bleakney

Walker Bleakney, an internationally respected physicist, died on 15 January 1992 in Santa Barbara, California, at the age of 90. During his lifetime he contributed to atomic and molecular physics and to fluid dynamics.

Bleakney was born into a farm family in Eldertown, Pennsylvania, on 8 February 1901. He attended Whitman College in Walla Walla, Washington. The entire class of 1924 in physics consisted of four students: Bleakney, Walter Brattain, E. John Workman and Vladimir Rojansky, all of whom went on to outstanding careers in physics. Bleakney spent a year at Harvard before being attracted to the University of Minnesota, from which he received a PhD in physics in 1930. He went to Princeton University as a National Research Fellow, and two years later he became an instructor of physics there, thus beginning 37 years of service to the department. He was named Cyrus Fogg Bracket Professor of Physics in 1953 and Class of 1909 Professor of Physics in 1963. Bleakney was a highly respected chairman of the department from 1960 to 1967, which were years of significant transition and change.

Bleakney's early research was on ionization of gases. As part of this research he developed a mass spectrometer of innovative design that was widely hailed as an important contribution to the study of atomic and molecular physics. One of the first US physicists to become involved in defense research, he started in 1940 what became the Princeton University station of the National Defense Research Committee. He led studies of damage by various stages of blast waves and missile damage to military structures, an area called terminal ballistics. An important part of the program Bleakney directed was the study of blast waves by means of a simple device that came to be called a shock tube, in which bursting of a cellophane diaphragm separating two sections of an air-filled pipe launched a shock wave into the lower-pressure end when the pressure in the other end became high enough. This pioneering work on blast waves continued after the end of World War II, particularly with development of many types of new instrumentation, and Princeton became a well-known center producing a wealth of results and graduates in the field.

Bleakney was a wise mentor and was appreciated as well for his sense of humor. One of his many lasting contributions to the Princeton physics department was his gift of a large, tastefully designed wastebasket (the "W. B. Memorial Wastebasket") strategically placed near the departmental mailboxes for the efficient disposal of junk mail.

Many people benefited from Bleakney's wise guidance and help, which he gave unselfishly. All of us benefited from having known a man with a zest for life and with outstanding human qualities.

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