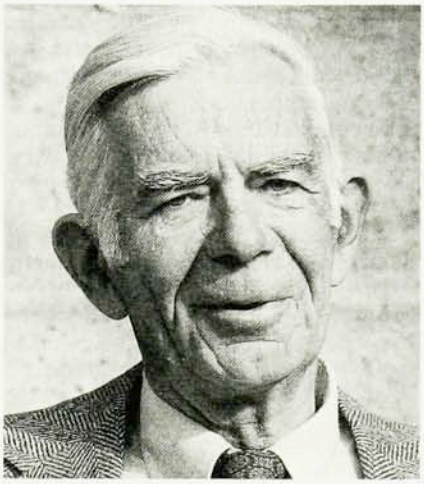
AAPT HONORS H. RICHARD CRANE WITH PHILLIPS AWARD

The Melba Newell Phillips Award of the American Association of Physics Teachers is given "only occasionally, to AAPT leaders who display a truly unique life of creative leadership, dedicated service, and exceptional contributions." In June the AAPT presented the award to H. Richard Crane, citing his "unusually broad, deep, and persistent service to the physics education community, much of it in support of AAPT programs." Crane is the third winner since the Phillips Award was established in 1981.


JENS ZORN

H. Richard Crane

Crane served as president of AAPT in 1965 and was chairman of the AIP governing board from 1971 until 1975. He has written a regular column in the AAPT magazine *The Physics Teacher* since 1983. The column's title, "How Things Work," reflects Crane's penchant for designing simple classroom demonstrations that have subtle explanations.

Probably Crane's best-known work is his measurement of the *g*-factor of the free electron, a quantity that relates the magnetic moment to the angular momentum. Before Crane and his collaborators designed the experiment, Niels Bohr and others had argued that the uncertainty principle precluded any measurement involving the magnetic properties of the free electron. This argument was widely taken to rule out a measurement of the *g*-factor. But Crane demonstrated that the difficulties cited by Bohr were peculiar to the Stern–Gehrlach approach, which Bohr had used to analyze the problem, and not intrinsic to all measurements of the *g*-factor. Today the *g*-factor of the electron is one of the most precisely known physical quantities.

Crane and his graduate students injected an electron beam into a solenoidal magnetic field in such a way that the spin vectors of the electrons were initially polarized along a direction perpendicular to the field. The electrons described helical orbits in the solenoid, while their spin vectors precessed gyroscopically. In theory, if the *g*-factor of the electron were exactly 2, which is the value predicted by the Dirac equation, the precession frequency would equal the orbiting frequency. But since quantum electrodynamics introduces small corrections into the Dirac formula, the two frequencies are not precisely the same. In the Crane experiment, the electrons were allowed to orbit many thousands of times, giving their spin vectors time to stray out of phase with the orbiting motion of the electrons. Crane measured the phase shift, which enabled him to calculate the amount by which the *g*-factor differs from 2.

Another of Crane's well known innovations was his design of the racetrack-shaped accelerator. Before Crane's work, accelerators were built with circular orbits, because designers did not believe that noncircular orbits would be stable. However, in the early 1950s Crane built a prototype of an oval accelerator, which offered its users the advantages of having long, straight sections of the orbit, where the magnetic field was very weak. Experimenters were able to extract the electrons from the accelerator more easily in the straight sections, and could mount large pieces of equipment along these sections.

During his teaching career, Crane was known to undergraduates as an unusually approachable professor. He spent much time with students during office hours and in the lab, giving them the benefit of his "very deep physical intuition," recalls David Wilkinson (Princeton), who took undergraduate courses taught by Crane in the 1950s and went on to become one of Crane's graduate students. Wilkinson remembers one particular course—an electronics course that most physics majors did not look forward to. By lecturing on contemporary research problems, Crane was able to make the course surprisingly interesting to physicists. He "was not afraid to try new things" in the classroom, including an experimental instant-feedback technique that called for installing buttons marked "yes" and "no" at each student's desk. In the early 1960s Crane was a leading force in establishing the Commission on College Physics in its first offices at the University of Michigan, and beginning in 1965 he published a series of articles on physics teaching.

Crane's reputation for guiding his graduate students with a light hand attracted many to his laboratory, recalls Wilkinson, and by allowing his students an unusual amount of autonomy he prepared them for a successful transition into post-graduate work. During his work in Crane's lab, Wilkinson remembers feeling very independent almost all of the time. "But when I needed him," says Wilkinson, "he was there with good, solid, horse-sense advice."

Crane received a bachelor's degree (1930) and a PhD (1934) in physics from Caltech. He remained at Caltech for one year as a research fellow and then became an instructor in the physics department at the University of Michigan. He became a professor there in 1946, was the department chairman from 1965 until 1972, and has been professor emeritus since 1978.