



Francis Marion Pipkin

The death on 5 January 1992 of Francis Marion Pipkin, the Frank B. Baird Professor of Science at Harvard University, after a sudden and brief illness, was a tragic loss for atomic and elementary particle physics. Pipkin was born in Marianna, Arkansas. He served as an Army private during World War II and was awarded a Bronze Star Medal for his heroic rescue of wounded colleagues while under fire. In 1946 he enrolled at the University of Iowa, where he majored in physics. In 1950 he entered Princeton University for graduate work.

There Pipkin carried out experimental research under the supervision of Donald R. Hamilton, much of it jointly with Aaron Lemonick. They used atomic beam methods to study the nuclear moments of short-lived nuclei produced at the cyclotron. Pipkin was appointed a Junior Fellow at Harvard in 1954. In 1957 he was appointed assistant professor of physics. Doubting the interpretation given in a letter on electron spin resonance in *Physical Review*, Pipkin took up the subject experimentally. With a student, Jackie W. Culvahouse, he studied the spin and g-value, as well as the nature of the beta-decay matrix elements, of isotopes of arsenic.

These radioactive nuclei were created by neutron activation of the stable arsenic donors contained in single crystals of silicon. The technique was to orient these isotopes by microwave saturation of individual hyperfine lines of the electron-spin resonance. They found that nuclear polarization could be produced by driving "forbidden" transitions that corresponded to simultaneous electronic and nuclear flips. The orienting transitions were detected by the alterations produced in the directional distribution of the emitted gamma rays. The work was one of the first examples of dynamic nuclear orientation. Pipkin next used the new technique of optical pumping to make precise measurements of the hyperfine structures of the several hydrogen isotopes. With a series of thesis students, he studied the effects of inert buffer gases that led to much narrowed resonances.

His studies of radioactive isotopes in crystals continued with the use of the ferromagnetic field in iron, when adiabatically demagnetized to low temperatures, as a polarizing force for dissolved impurities. At the same time, with the construction of the Cambridge Electron Accelerator, Pipkin undertook programs in high energy "photon" and particle physics.

His study of electron-positron pair production at wide angles as a test of quantum electrodynamics at GeV energies was severely delayed by the catastrophic explosion of the hydrogen bubble chamber at the CEA, which put the accelerator out of business for about two years. Pipkin continued to devote much of his time to projects in high-energy particle physics, as a member of a team at the Cornell Wilson Synchrotron Laboratory, where he helped design, construct and use the CLEO detector, and at Fermilab, where he also served on the program advisory committee for four years. At Harvard he also continued an active program in low-energy atomic physics. One project studied the Lamb shift in several excited states of atomic hydrogen, using separated rf interaction regions on a fast atomic beam to obtain improved resolution. This work contributed to a better value of the fine structure constant. Other Francis M. Pipkin experiments used high-powered lasers to study electronic properties of molecular hydrogen. Pipkin taught and inspired more than 60 PhD students and had many postdoctoral collaborators in his 37 years at Harvard. He also served Harvard as associate dean of the faculty of arts and sciences for undergraduate education from 1974 to 1977 and as chairman of the physics department from 1985 to 1988. He was chairman of the division of electron and atomic physics of the American Physical Society in 1975-1976.

The several students he left behind, especially those working on his low-energy physics projects, suffered an enormous loss with his untimely death. His friends and colleagues will miss his limitless energy, deep understanding, wisdom and generosity in giving his time and energy to matters of institutional importance, as well as his always wise advice and deep personal friendship.

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