At a meeting of the FACULTY OF ARTS AND SCIENCES on May 18, 1993, the following tribute to the life and service of the late Francis Birch was spread upon the permanent records of the Faculty.

FRANCIS BIRCH

BORN: August 22, 1903
DIED: January 30, 1992

Geophysicists concerned with the nature of the earth’s deep interior probably owe more to Francis Birch than to any other scientist of his day. By investigating the behavior of solid materials at high pressure, and by combining these results with seismic observations, heat flow determinations, and gravity measurements, he was able to propose earth models that were marked improvements over their predecessors.

Francis was born in Washington, D.C. on August 22, 1903, the son of George Albert and Mary Clayton (Hemmick) Birch. He entered Harvard in 1920, graduating in 1924. After two years as an employee of the New York Telephone Company he obtained an American Field Service Fellowship that led to two years of study and research on magnetism at Strasbourg in the laboratory of Pierre Weiss. Francis then returned in 1928 to Harvard as a graduate student in physics, working primarily on high-pressure research in the laboratory of Percy Bridgman. He was an Instructor and Tutor in Physics, 1930-32, and received his doctorate in 1932.

During this period an interdepartmental program to study the physics of the earth and the physical properties of its materials was begun by Percy Bridgman and his friend, geologist Reginald Daly. A committee on Experimental Geology and Geophysics, of which Francis Birch was later the long-term chairman, was established in 1931 by the Faculty of Arts and Sciences, supported by an endowment from the Mallinckrodt family. Francis was appointed Harvard’s first Research Associate in Geophysics in 1932, a position he held until he became an Assistant Professor in 1937. He then rose through the academic ranks, becoming Sturgis Hooper Professor of Geology in 1949, a chair he held until his retirement in 1974. When he became Chairman of the then Division of Geological Sciences in 1958 the geology faculty was housed in the ancient museum building, except for Francis himself, who occupied Dunbar Laboratory, a converted garage off Hammond Street. He worked tirelessly, first with potential benefactors, and later with the architect, to obtain the modern laboratory space that was so desperately needed. The Hoffman Laboratory of Experimental Geology and Geophysics was completed in 1963, the last year of his chairmanship.
The geology faculty was a diverse group of people dealing with one aspect or another of our richly varied earth. At an informal lunch table at the Faculty Club one could learn of the discoveries, hopes and enthusiasms of one’s colleagues. Francis quickly became a central member of the group. Ideas, exchanged freely in an atmosphere of trust and mutual respect, often found their way into print. Francis, always meticulous in acknowledging his sources, would sometimes surprise us by carefully citing, months or years later, something that had been scrawled casually on an overturned place mat (no tablecloths then!).

During the second world war Francis took leave from Harvard in 1942 to enter four years of government service for which he was awarded the Legion of Merit in 1945. He had done research at the Radiation Laboratory at M.I.T. as early as 1940, and was appointed a member of the staff there (1941-42), but left soon to serve as a Lieutenant Commander, later Commander, in the U. S. Navy (1942-45), first in the Bureau of Ships in Washington, D.C. developing proximity fuses, and finally with the Manhattan Project at Los Alamos where he headed the research on the Hiroshima bomb.

Francis' first investigations were to measure the elastic properties of rocks and minerals at high pressures and temperatures, in order to better interpret seismic data. Francis then became concerned with the thermal conductivity of rocks and with the nature of heat sources and the mechanisms of heat transfer, and later began investigations of phase transformations at high pressures. A classic paper, “Elasticity and Constitution of the Earth's Interior,” appeared in 1952 presenting an earth model that became the prototype for those that have followed.

With thermal conductivities it is possible to determine heat flow on the basis of temperature measurements in tunnels, wells and drill holes. Studies by Francis, or by others under his guidance, were made in the Colorado Front Range, in the Swiss Alps, and elsewhere. Later, thanks to National Science Foundation funding, and to technological advances, drill holes were made across the United States for this purpose. Regional gravity observations were made by students in the northeastern states, Canada, and California, more or less concurrently with the heat flow studies.

Francis' name does not appear on many contributions because he was rarely a coauthor of papers based on student theses. He was always helpful to younger colleagues in both encouragement and material assistance. A reserved and rather private personality hid an underlying warmth and an intense loyalty to his colleagues and to his students who held him in awe and deep respect. When he shared a major award with the British geophysicist, Sir Edward Bullard, his students, disturbed by the asymmetry, referred to him for some years thereafter as “Sir Francis.”

Francis was awarded the Arthur L. Day Medal of the Geological Society of America in 1950, became the Society’s President in 1964, and was awarded its Penrose Medal in 1969. Elected
to the National Academy of Sciences in 1950, Francis was later awarded the William Bowie Medal of the American Geophysical Union (1960), the National Medal of Science (1968), the Vetlesen Prize of Columbia University (1969). He received honorary doctorates from the University of Chicago (1970) and Harvard (1982), the latter as Harvard’s “--great explorer of the earth’s interior.” He received the Bridgman Medal (1983) of the International Association for the Advancement of High Pressure Science and Technology, and was a fellow of the American Physical Society, an honorary member of the Geological Society of London, and a member of the Royal Astronomical Society of Great Britain, receiving its Gold Medal in 1973. More than six hundred of the world's leading geophysicists attended a symposium on “The Nature of The Solid Earth” (April 16-18, 1970) honoring Francis’ first forty years of teaching at Harvard. Many emerged from the subway, on the eve of the symposium, into a Harvard Square filled with tear gas, broken glass and burning debris, but were undeterred. A festchrift under the same title appeared two years later.

Francis is survived by his wife, Barbara (Channing) of Cambridge, and by their children: Anne C. Hughes of Cambridge, Francis S. Birch of Durham, New Hampshire, and Mary N. Birch of Cambridge. Many happy summers were spent at their farm in Kensington, New Hampshire, and later at Wareham, on Buzzards Bay. Francis died at home on January 30, 1992.

A story told several times by Francis reveals something of his approach to geophysics: it concerned a dream reported to him by R. A. Daly in which the latter lowered a clock, on a wire, into a well. Why? “--in order to find out what time it was down there.”

Respectfully submitted,

Kenneth T. Bainbridge
Adam M. Dziewonski
Michael B. McElroy
Raymond Siever
James B. Thompson, Jr., Chairman