MEMORIAL RESOLUTION

FELIX BLOCH
(1905 - 1983)

Felix Bloch died in Zurich on September 10, 1983, suddenly and unexpectedly, at age 77. He had been working and thinking of physics virtually up to the last day of his life. With his passing went one of the great and historic physicists of the twentieth century.

Felix was born in Zurich on October 23, 1905. His father urged him to study engineering, and after graduation from gymnasium, he entered the Federal Institute of Technology (ETH) in Zurich with the intention of pursuing such a career. However his interests really lay in theoretical directions, and physics and mathematics attracted him much more than engineering. After a year he transferred to the division of Mathematics and Physics at the same institution. There could hardly have been a better time, for these were the years 1924 to 1927 in which the modern quantum theory emerged in such splendor. During this climactic period, de Broglie, Heisenberg, Dirac, Schroedinger, Goudsmit and Uhlenbeck, and a little earlier, Pauli, had all made their great contributions to quantum physics and its implications for atomic structure.

Felix took Debye's introductory course in physics and was strongly influenced by the high quality of his lectures. In 1926 he started to attend colloquia at the ETH and at the neighboring University of Zurich, where Schroedinger was teaching. Felix always fondly recalled how Debye, who ran the colloquium, suggested to Schroedinger to give a colloquium on the recent work of de Broglie. At the conclusion of the talk Debye suggested that what was needed was a wave equation to put de Broglie's ideas into the proper context. And so it was that Felix heard a subsequent colloquium by Schroedinger in which he did just that, thereby discovering the wave mechanics which has so much shaped the sciences since that time.

Debye suggested that Felix should do his thesis work at Leipzig, where Heisenberg would soon join the faculty. In this way Felix became the first graduate student of Heisenberg, who had himself just discovered quantum mechanics. Under Heisenberg's tutelage he attacked the problem of the quantum theory of electrons in crystals. His thesis on this subject is a classic which provided the basis for the modern quantum theory of the solid state and all its implications for semiconductor technology.

Felix returned to Zurich as Pauli's assistant in 1928 where he worked on the theory of superconductivity. In the next year he became a Lorentz Fellow in Holland where he worked with both Kramers and Fokker. During this period he demonstrated that his thesis work could be successfully extended to the theory of electrical conductivity, in agreement with experimental results. Moving again to Leipzig in 1930 with Heisenberg, Felix worked on ferromagnetism and established the nature of the boundaries between domains, which have subsequently been known as "Bloch Walls".

After Leipzig, Felix went to Copenhagen to Niels Bohr's institute, and as one result of his visit, became a lifelong friend of Bohr, subsequently visiting Bohr many times in Copenhagen.

There he also worked on his famous contribution to the theory of stopping of charged particles in matter. After returning to Leipzig in 1932, where he became Privatdozent, it became evident that storm clouds were forming over Germany and Europe. When Hitler came to power in 1933 Felix left Leipzig for his native Zurich. Along with many others, he left Europe in 1934 after spending some time as a Rockefeller Fellow in Rome. In Rome he became familiar with Fermi and his style of work, and also with Majorana.

In 1934 Felix joined the Department of Physics at Stanford at the invitation of its chairman, David Webster. The Physics Department was small but had a number of good physicists including P. A. Ross, Paul Kirkpatrick, W. W. Hansen as well as D. Webster. Felix brought some new areas of research to Stanford and in particular started to do neutron physics there. In two seminal notes in 1936 he first suggested the use of magnetic scattering of neutrons to measure the magnetic moment of the neutron. This idea later led to a famous experiment that Bloch and Alvarez did in Berkeley in 1939 to measure the neutron's magnetic moment and undoubtedly led Felix later to conceive the idea of nuclear induction for measuring the magnetic moments of nuclei. The initial experiments on nuclear induction were done after World War II. For this work, carried out independently by Purcell, Torrey, and Pound at Harvard, Felix Bloch and Edward Purcell were jointly awarded the Nobel Prize in physics in 1952. In the work on nuclear induction Felix collaborated with W. W. Hansen and M. Packard. The nuclear induction work became the foundation of extensive new fields of research in physics, chemistry, biology, physiology, and medicine. The recent successes of magnetic resonance imaging in diagnostic medicine surely rival the tremendous advance brought about by Roentgen's discovery of x-rays.

During the Second World War Felix worked briefly at Los Alamos but spent most of the war years on antiradar work in F. Terman's Radio Research Laboratory at Harvard. In 1945 Felix returned to teaching and research at Stanford, where in addition to his work on nuclear induction, he and Leonard Schiff built a great physics department. In all the years at Stanford, up to and including his emeritus life, from 1971 until 1983, there were always visitors who would come to talk physics to him to hear his views on almost any subject. He was a warm and compassionate man with a profound understanding of the human condition and it benefited almost anyone to have a conversation with him. Felix had a commanding presence, influencing all who met him.

During the brief interlude of one year in 1954 Felix became the first Director of the newly formed CERN in Geneva. The world of science knows well the subsequent achievements of CERN, and this truly European co-operative center of research owes much to the way in which Felix implemented and formatted its early scientific policies. At CERN Felix recognized that his administrative duties were in conflict with the physics he so loved to do and so he returned to his Stanford professorial position. At Stanford, Felix was always a stimulating teacher and his influence on undergraduates and on his graduate students was profound and lasting. Appreciation of his many accomplishments came in the form of honorary degrees and other honors from many countries. In 1965 he served as President of the American Physical Society.

Felix loved nature, particularly mountains, and was a mountain climber in his younger days. He was very fond of skiing and even in his later years could be seen enjoying the slopes in his old ski suit and his old-fashioned and battered skis. He was also a lover of music and art and played the piano well and with tremendous satisfaction. Despite the extraordinary gifts that Felix gave to the world, he remained a basically modest person all his life. We do not mean

quietly modest, for he held strong opinions and was usually outspoken in expressing them. No one had any doubt about what Felix was saying or where he stood on any issue. He enjoyed a good intellectual fight, and together with his colleagues at Stanford there were often many sparks flying. He had tremendous self-confidence and his firm and steadfast character opposed anything mean, petty, or base and he spoke out fearlessly against anything he thought politically or morally bad.

Felix and Lore Misch were married in 1940 after having met in the previous year at an American Physical Society meeting. Lore also holds a Ph.D. degree in physics and worked in the field of x-ray crystallography. Lore and Felix had four children, and at the time of his death, there were nine grandchildren. The entire family was close-knit and it was always a great pleasure to witness the warmth with which the grandchildren embraced their grandfather.

Those of us who were privileged to know Felix Bloch during his many years at Stanford learned much from him, not only about physics, but also about all the best things in human companionship. We know that we speak for many others as well, and we are all going to miss him more than we know.

Robert Hofstadter, Chair
Marvin Chodorow
Arthur L. Schawlow
J. Dirk Walecka