

# Enrico Fermi: Nobel Laureate Physicist

Enrico Fermi, Nobel laureate physicist who became a member of the University of Chicago physics faculty, was born in Rome Italy, on September 29, 1901. He died in Chicago on November 28, 1954.

The son of a railroad official, Fermi studied at the University of Pisa from 1918 to 1922, and later at the Universities of Leyden and Göttingen. He became professor of theoretical physics at the University of Rome in 1927. Two years later, Fermi was awarded a membership in the Italian academy.

## Led Italian Physicists

Fermi became the leading figure of a group that not only revolutionized modern Italian physics but whose influence has been felt in science and physics throughout the world.

Other members of the group were Emilio Segre, Edoardo Amaldi, Oscar D'Agostino, and later Bruno Rossi. Working with his colleagues, Fermi began the career that led him to equal fame both as a theoretical and experimental physicist.

## Other Contributions

Although known today primarily as a leading nuclear physicist, Fermi also made major contributions to the statistics of electron gas, the statistical model of the atom itself, and fundamental contributions to an understanding of radioactivity.

In 1934, Fermi initiated the studies that led to his winning of the Nobel Prize. In that year, he began to bombard atomic nuclei with neutrons. The neutrons were provided by small amounts of the gas radon (produced by radium) mixed with beryllium powder. The radioactive gas gave off alpha particles

which struck the nuclei of beryllium atoms and caused these to give off neutrons.

With extremely simple equipment, Fermi began systematically bombarding the elements in the periodic table, beginning with the lightest element and moving up to the heavier elements. In the process, Fermi and his associates analyzed the chemical end products of the neutron bombardment.

## Discovered New Element

When at last they came to uranium, then the heaviest known element, they found that more than one element was produced by the bombardment, and that at least one of the radioactive products seemed to be none of the existing elements close to uranium. In their first report, produced in May, 1934, they did not claim the discovery of a new element, but rather related what indications they had found that such an element might be produced. Actually, they had not produced a new element, but, as later analysis showed, they had split the uranium atoms.

## Increased Radioactivity

In a second series of experiments with neutron bombardment, Fermi and his associates discovered that by passing neutrons through other elements they could be slowed down and the amount of artificial radioactivity they produced could be greatly increased. At that time, Fermi and the members of his group obtained an Italian patent on this method. The patent rights were assigned to a friend, G. M. Giannini, in the United States, who applied for an American patent. The latter was granted, after a five-year delay, in 1940.



Enrico Fermi

The status of the patent was not clarified until 1953, when the Atomic Energy Commission awarded the inventors the relatively nominal sum of \$300,000.

## First Atomic Pile

Both of these studies of Fermi's were essential precursors of the eventual work that led to the building of the first atomic pile and the first controlled release of nuclear energy.

These studies led to Fermi's receiving the award of the Nobel Prize in 1938. Fermi used the opportunity offered by the trip to Sweden to receive the Nobel Prize to leave Italy. He and his family, which included a daughter, Nella, and a son Giulio, had grown increasingly restive under the Fascist regime.

## Professor At Columbia

Fermi came to the United States and accepted a position as a professor of physics at Columbia University. By this time, the work of Fermi had been duplicated in other laboratories

and theoretical analysis of the results had indicated that nuclear fission had actually taken place. As a result, Fermi was chosen by his colleagues to go to Washington, D.C., to interest United States government officials in the possibility of building a nuclear weapon by means of a controllable nuclear fission.

## At U Chicago

Unsuccessful in negotiating for support at first, Fermi and other scientists persisted. The project began which was to become the Manhattan Engineering District and produce the first atomic bomb. Working first at Columbia and then transferred to the University of Chicago, Fermi was placed in charge of building the first atomic pile in the squash court under the west stands of the University's Stagg Field. Later he was transferred to Los Alamos, New Mexico, as chief of the advanced physics department. For his bomb work, President Harry S. Truman presented him on March 20, 1945, with a Medal of Merit.

## Site of Chain Reaction

The site on the University of Chicago campus where Fermi and his colleagues achieved the first nuclear chain reaction today is marked by a sculpture by Henry Moore titled: "nuclear energy." Nearby stands a plaque which reads, simply: "On December 2, 1942, man achieved here the first self-sustaining chain reaction and thereby initiated the controlled release of nuclear energy."

On the tenth anniversary, 1952, Fermi spoke again at a gathering of many of the men who had been in the squash court at the historic occasion.

## Later Research

At the war's end, when the University of Chicago decided

to keep together the nucleus of the scientists who had worked in the Metallurgical Laboratory on the campus on the development of the bomb, Fermi joined the staff of the newly-founded "Institute for Nuclear Studies."

After that, he continued his investigations of the nucleus of the atom, concentrating on the nature of the particles that make up the nucleus. Particular emphasis in his investigations was placed upon the short-lived nuclear particles known as mesons.

As an aid in this investigation, Fermi served as a consultant in the design of the University's synchrocyclotron.

After the war, Fermi was active in research conducted at the Atomic Energy Commission's Argonne National Laboratory, located about 30 miles southeast of the NAL site. He was known as a great teacher who helped to stimulate the development of several men and women who have gone on to do significant research in physics at other centers throughout the world. The Enrico Fermi Institute For Nuclear Studies, at the University of Chicago, now is directed by Physicist Robert Sachs, formerly of Argonne.

Dr. Fermi held honorary degrees from the Universities of Utrecht, Heidelberg, Washington University (St. Louis), Columbia, Yale and Rockford (Illinois) College. He was awarded the Franklin Medal by the Franklin Institute in 1947, the Barnard Gold Medal from Columbia University in 1950. In 1950, he was elected a member of the Royal Society of England. He was also a member of the American Philosophical Society, American Physical Society, and Sigma Xi.