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# M. N. Rosenbluth, 76, an H-Bomb Developer Who Sought Peaceful Uses for Fusion, Is Dead

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Marshall N. Rosenbluth, a pioneer in unleashing and taming nuclear fusion, the force that powers the sun and stars, died on Sunday in San Diego. He was 76.

The cause was pancreatic cancer, according to the University of California at San Diego, where Dr. Rosenbluth had taught.

A modest man whose insights were not as well known as those of more flamboyant colleagues, Dr. Rosenbluth as a young man helped invent the hydrogen bomb, was exposed to radioactive fallout in a nuclear test and soon thereafter devoted himself to trying to harness thermonuclear fire for peaceful ends.

In 1997, he won the National Medal of Science, the nation's highest scientific honor, for contributions to nuclear fusion and plasma physics, the study of hot electrically charged gases like those in interstellar space and the atmospheres of stars.

Known as the dean of plasma physics, Dr. Rosenbluth was a world leader in trying to turn the hot plasmas of nuclear fusion into nearly limitless electrical power.

"Marshall was a scientist of towering stature," said Dr. Marvin L. Goldberger, a former president of the California Institute of Technology and a former director of the Institute for Advanced Study in Princeton, N.J.

A warm, friendly person who liked opera and sometimes smoked a pipe, Dr. Rosenbluth won many friends among the physicists who came to dominate the nation's scientific life in the atomic era and won respect from them for his keen intellect.

"He was incredibly capable at analyzing problems and finding solutions to a great depth of understanding," said Richard L. Garwin, a physicist who worked with Dr.

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Rosenbluth on the hydrogen bomb.

Born in Albany, Marshall Nicholas Rosenbluth graduated from Harvard in 1946 and went to graduate school in physics at the University of Chicago, where many of his teachers had recently helped to invent the atomic bomb.

He liked to tell friends how Enrico Fermi and Edward Teller -- two stars of 20th-century physics -- got into an argument in 1949 while listening to him defend his doctoral thesis.

"It went on and on," recalled Harold Agnew, then a graduate student at Chicago, who eventually directed the weapons laboratory at Los Alamos, N.M. "Finally, Fermi turned to Edward and said, 'O.K., you pass.' And then he turned to Marshall, who was just 22, and said 'O.K., you pass, too.'"

In 1950, Teller recruited Dr. Rosenbluth to join the Los Alamos National Laboratory, where the young scientist did secret research that helped create the hydrogen bomb. Dr. Teller, considered the father of the bomb, credited Dr. Rosenbluth with important details of its design.

In 1952, preparing for the bomb's first explosive test, Dr. Rosenbluth went to the South Pacific. One night he ate too much shrimp and had trouble sleeping, as recounted in Richard Rhodes's 1995 book "Dark Sun: The Making of the Hydrogen Bomb."

Sleepless, Dr. Rosenbluth pondered the bomb's design and suddenly realized that the scientists had made a serious mistake that could result in a dud.

The problem was soon acknowledged and fixed with a new explosive core. When detonated, the hydrogen bomb vaporized a mile-wide island with power 700 times as great as the atom bomb dropped on Hiroshima.

In 1954, again in the South Pacific, Dr. Rosenbluth was aboard a Navy destroyer when a hydrogen bomb test turned out to be unexpectedly strong and showered his ship with radioactive fallout.

"It was pretty frightening," he recalled in Mr. Rhodes's book. "There was a huge fireball with these turbulent rolls going in and out. The thing was glowing. It looked to me like a diseased brain up in the sky. It spread until the edge of it looked as if it was almost directly overhead. It was a much more awesome sight than a puny little atomic bomb. It was a pretty sobering and shattering experience."

Around this time, Dr. Rosenbluth joined a small group of scientists who developed the Monte Carlo simulation, now a standard research tool in statistical mechanics, chemistry, biochemistry and other fields. It involves random sampling to simulate physical systems.

Dr. Rosenbluth also turned his energies to the challenge of harnessing nuclear fusion for peaceful purposes. His dream was to find a way to compress fickle hot plasmas into stable configurations that generate excess power, a task that has been compared to using rubber bands to hold a blob of jelly.

In 1956, he joined General Atomics, a San Diego company that sought to pioneer fusion energy. He also taught physics at the University of California at San Diego, joined the Institute for Advanced Study in Princeton and directed the Institute for Fusion Studies at the University of Texas. He retired in 1993 as an emeritus professor of physics at San Diego.

In the cold war, Dr. Rosenbluth advocated science exchanges with the Soviet Union. "The more interaction there is, the less paranoia," he said in 1985. "The Russians certainly have shown a good deal of that."

More recently, he worked to foster international teamwork in fusion and physics research. He was a central figure in the International Center for Theoretical Physics in Trieste, Italy, and of the International Thermonuclear Reactor, a program to demonstrate the feasibility of using fusion to generate power.

For more than half a century, Dr. Rosenbluth aided the federal government, serving on panels like Jason, which is composed of eminent scientists who advise security agencies on knotty scientific issues.

He was a member of the National Academy of Sciences and received numerous awards, including the E. O. Lawrence Award, the Albert Einstein Award and the Enrico Fermi Award.

A resident of the La Jolla area of San Diego, Dr. Rosenbluth is survived by his wife, Sara, and four children from a previous marriage, Alan Edward, Robin Ann, Mary Louise and Jean Pamela.

With typical modesty, Dr. Rosenbluth made little fuss about his achievements on his faculty profile at San Diego. It was three sentences long.

Photo: Marshall N. Rosenbluth (Photo by Laura Moore/U.C.S.D., 2001)