



Photograph by Fabian Bachrach.

Joseph R. Ditrach

JOSEPH ROBERT DIETRICH

1914–1982

BY DAVID OKRENT

JOSEPH ROBERT DIETRICH, retired Chief Scientist, Nuclear Power Systems, Combustion Engineering, Inc., died in Newport News, Virginia, on November 4, 1982, at the age of sixty-eight, from amyotrophic lateral sclerosis, sometimes called Lou Gehrig's disease. Dr. Dietrich was internationally known for a pioneering career in nuclear power reactor development that spanned more than thirty years and included the nuclear design of the prototype power plant for the world's first nuclear submarine, the *Nautilus*, and the Atomic Energy Commission's first boiling-water reactors.

Joe Dietrich was a natural leader in a quiet, reflective way. At heart a scientist and a thinker who was moved more by the power of logic than the desire for power, he was widely respected for his judgment, for his ability to get to the technical heart of the matter, for his lack of bias, and for his knack of dealing with people who had opposing views and getting them to settle their differences. A pragmatic physicist, he combined an intimate knowledge of the theory of reactors and the engineering details of reactor design and construction that was rarely matched.

Dr. Dietrich was born in Miles City, Montana, on August 25, 1914, but grew up with his three brothers on the family farm on the banks of the James River outside of Newport News. During his teenage years he helped out both on the farm and in the family restaurant business, which prospered until his father's death and the onset of the Great Depression. Dr. Dietrich did his undergraduate

college studies at the College of William and Mary in Williamsburg, Virginia, and received a B.S. in physics and chemistry in June 1935. He went on to earn his M.S. and Ph.D., both in physics, from the University of Virginia in June 1937 and June 1939, respectively.

Following a postdoctoral year at Yale University, Dr. Dietrich was employed by the National Advisory Committee for Aeronautics (NACA), the forerunner of the National Aeronautics and Space Administration (NASA), first at its Langley Field Laboratory and then at the new NACA laboratory in Cleveland, Ohio. As Head of the Rockets Section, he worked on jet-assisted take-off. During this time period he met Adelia Perkins of Newport News and they married in 1943. Joe and Dee had three children - Christine (Kit), David, and Joseph.

Dr. Dietrich became very interested in the potential for civilian application of the fission process, and in 1946 he arranged to have NACA send him on loan to Oak Ridge National Laboratory where he undertook a crash course in reactor physics together with then Captain Hyman Rickover of the Navy and John Simpson of Westinghouse, among others. Dr. Dietrich worked on the Daniels Pile, a very ambitious, gas-cooled reactor concept. However, it was dropped shortly after establishment of the Atomic Energy Commission.

Rickover set up a group to design a nuclear power plant for submarines, and Joe Dietrich was placed in charge of the physics design. This project was moved to Argonne National Laboratory in Illinois in 1948, where Dr. Dietrich worked under Harold Etherington and Walter Zinn, the Laboratory Director. The *Mark I* land-based prototype was designed and built as planned, beginning operation in 1953, in spite of the fact that they had only Marchant mechanical calculators on which to perform the needed analysis and were faced with the formidable constraints posed by submarine operational requirements as well as limits on the availability of highly enriched uranium-235. The *Nautilus* itself was launched the following summer.

In 1953 Dr. Dietrich formally joined Argonne National Laboratory as Associate Director of the Reactor Engineering Division with responsibility for the nuclear design and analysis of experimental

power reactors. An Argonne scientist named Sam Untermyer had proposed an experiment designed to test two hypotheses. The first was that a water-moderated reactor would be self-limiting in the event of an accident involving a rapid increase in the neutron multiplication rate; the other idea was that one could design a boiling reactor that would really work. Walter Zinn approved the experiments, and Joe Dietrich headed up the theoretical work. Three separate experiments, which became known as the boiling reactor experiments (BORAX) series, were rapidly built and run, very successfully. They included the first experiment in which a water-cooled reactor was subjected intentionally to large, rapid increases in multiplication rate well into the region where the reactor was critical on prompt neutrons alone, and demonstrated the inherent shut-down capability of the boiling process.

The final experiment on **BORAX I** involved deliberate destruction of the reactor by inducing a transient severe enough to melt the core. This experiment, which was run partly to introduce a sobering effect on those who prematurely thought nothing could go wrong, led, among other things, to much subsequent exploration of the "steam explosion," a rapid exchange of heat between the molten fuel and liquid water that led to damaging pressures. The **BORAX** experiments also represented the first instance of public use of nuclear-generated electricity in the United States, in 1955, although nuclear electricity was first generated in December 1951 at the liquid-metal-cooled, fast neutron Experimental Breeder Reactor (EBRI). The papers on the BORAX experiments were among the principal highlights of the First International Conference on Peaceful Uses of Atomic Energy held by the United Nations in Geneva in 1955, and represented an important beginning in establishing Dr. Dietrich's international recognition.

In 1956 Dr. Dietrich left Argonne to join Dr. Zinn in forming the General Nuclear Engineering Corporation in Dunedin, Florida. Dr. Dietrich served as Vice-President and Director of Physics for projects that included the ambitious Boiling Nuclear Superheater (BONUS) Power Station. General Nuclear Engineering became a part of Combustion Engineering (CE) in 1959, and in 1964, when the CE nuclear power efforts were consolidated in West Hartford,

Connecticut, Dr. Dietrich took on the technical direction of the nuclear analytical and safety design and development of the CE pressurized water, nuclear steam supply systems. He retired from the position of Chief Scientist of Nuclear Power Systems a few years before his death and moved back to Newport News where, together with his wife, he built a new home on the old Dietrich family farm.

Dr. Dietrich was elected to the National Academy of Engineering in 1975. He was elected Vice-President of the American Nuclear Society in 1976 and served as President of that society from June 1977 to June 1978. Among his other professional activities was the position of Editor of the quarterly review, *Power Reactor Technology*, from 1958 to 1965.

Among the major publications by Dr. Dietrich are the chapter titled "The Reactor Core" in Volume I of the classic, *The Technology of Nuclear Reactor Safety*; the chapter on reactor calculations in the *Nuclear Engineering Handbook* edited by Etherington; and the book *Solid Fuel Reactors* (written with Walter Zinn), a presentational volume by the U.S. delegation at the Second International Conference on Peaceful Uses of Atomic Energy, Geneva, 1958.

Joe, as he was known to his many, many friends (or Bob as he was known to his family), was a remarkable person as well as a very able scientist. Warm, thoughtful, considerate, kind, fair, wise—these are all adjectives that could most properly be attributed to Joe. He was good to work with, to work for, or to have working for you. His steady, quiet, yet forthright approach to issues, both personal and technical, was a pleasure to behold. A real gentleman in the best sense of the word, Joe Dietrich will be truly missed.

