Joseph Bishop Keller, Professor Emeritus of Mathematics and Mechanical Engineering at Stanford University, former Professor of Applied Mathematics at the Courant Institute of Mathematical Sciences, New York University, and member of the Geophysical Fluid Dynamics Program at the Woods Hole Oceanographic Institute, died from cancer in his home at Stanford on September 7, 2016, at age 93.

Known for his remarkable breadth in the physical sciences, the life sciences and engineering, Joe Keller demonstrated the significant impact of mathematics in understanding scientific phenomena and creating solutions for engineering problems. Considered by many as the “Dean of Applied Mathematics,” Keller was best known for his geometrical theory of diffraction, a seminal method for determining how acoustic or electromagnetic waves are deflected by the surface of an object. This had broad applications to radar, stealth technology and antenna design, and has become an indispensable tool for engineers and scientists. Keller also studied many other issues related to national security, including the possibility that underwater explosions of atomic bombs might cause a tsunami - a question that concerned the U.S. government as it prepared to test nuclear devices at Bikini Atoll more than half a century ago.

Keller’s wide-ranging interests and gift for finding the mathematical essence of problems allowed him to contribute to many fields. He developed and used a mathematical method of approximation known as “asymptotic analysis” to tackle problems that cannot be solved exactly, and applied it to predict behavior throughout the domains of science. For example, he used the method to describe eigenvalue spectra in quantum mechanics, to develop optimal strategies for runners in a race, to study the propagation of nerve pulses, to model the development of the visual system in mammals such as kittens, and to understand the locomotion of worms and how it differs from that of snakes. His lectures were paragons of clarity that elucidated mathematical ideas for everyone; for example, in one of his annual Christmas Lectures at NYU, he outlined a method for ranking the strengths of basketball teams that was later reinvented and used to rank webpages by the founders of Google. He drew inspiration from everything and inspired many. With a child at a party, he might discuss how tiny soda bubbles assemble and form patterns in a glass, and later discuss the nuances of fluid dynamics or wave propagation with a colleague. His intellectual curiosity and humor were recognized in two Ig Nobel Prizes for “research that makes you laugh and then makes you think”. The first of these, in 1999, honored his work explaining why teapots dribble and how to avoid it. The second, in 2012, recognized his discussion of the physical forces that make a jogger’s ponytail swing horizontally while the jogger is oscillating vertically.

Keller was a member of the National Academy of Science (NAS), a Foreign Member of the Royal Society of London, and Honorary Professor of Mathematical Sciences at the University of Cambridge. He has received some of the world’s highest scientific honors, including the Wolf Prize in Mathematics (1997), the Frederick E. Nemmers Prize (1996), the NAS Award in Applied Mathematics and Numerical Analysis (1995), the National Medal of Science (1988), the Timoshenko Medal (1986), the Eringen Medal (1981), and the von Karman Prize (1979). He was the Gibbs Lecturer of the American Mathematical Society (1977), and the von Neumann Lecturer of the Society of Industrial and Applied Mathematics (1983). His work earned him honorary doctorates from eight universities in the US and Europe.

In awarding him the Wolf Prize in Mathematics, the Wolf Foundation noted that Keller “brought a deep understanding of physics and a superb skill at asymptotics to an astonishing range of problems,” adding, “He is really the model of what a mathematician interested in a wide variety of physical phenomena can and should be.”

Keller is survived by his wife, Alice S. Whittemore, his children, Sarah N. Keller of Bozeman, MT, and Jeffrey M. Keller of Somerville, MA, step-daughters Gayle Whittemore of Los Angeles, CA and Margot Palermo of Brook Haven, NY, as well as ten grandchildren and step-grandchildren, and several nieces and nephews.