

Tribute to Professor Wolfgang Wagner (1940-2024)



Prof. em. Dr.-Ing. habil. Dr.-Ing. e. h. Wolfgang Wagner passed away unexpectedly on August 12, 2024.

Wolfgang Wagner was born on June 4, 1940. He began his university studies at the Technical University of Berlin. He completed his dissertation and habilitation at the Technical University of Braunschweig. Beginning in 1975, he was on the Faculty of Mechanical Engineering at Ruhr University Bochum, serving as the Chair of Thermodynamics. He became Professor Emeritus in 2006.

Professor Wagner was one of the leading international scientists in the field of thermophysical properties. This scientific field is a key prerequisite for the design and optimal operation of plants and components in energy, process, and environmental engineering. Among his major scientific achievements are the following:

- Development of precision apparatus for measuring the density of gases and liquids over wide ranges of pressure and temperature. In conjunction with the invention of the magnetic suspension balance and the two-sinker method, Prof. Wagner's research group succeeded in reducing the measurement uncertainty of the density of gases and liquids by an order of magnitude, from 0.1% to 0.01%. Precision density measurements were conducted on a large number of scientifically and technically important substances in the gas and liquid phases, including the states of boiling liquid and saturated vapor. These measurements remain a key foundation for the development of equations of state.
- Under the leadership of Prof. Wagner, his team developed reference-quality equations of state for pure fluid substances and fluid mixtures. The methods developed for optimizing the structure of multi-parameter empirical equations of state were a prerequisite for the formulation of highly accurate equations of state. These methods made it possible for the first time to describe the entire fluid thermodynamic state region, including the vapor–liquid phase equilibrium, with a single equation of state in such a way that all measured values of the various state properties were reproduced within their measurement uncertainty. For a number of substances, these equations were officially adopted as international standards by organizations such as IUPAC, IAPWS, GERG, and ISO.

- Professor Wagner led the development of the standard reference equation of state for the thermodynamic properties of water, the IAPWS Formulation 1995 for the Thermodynamic Properties of Ordinary Water Substance for General and Scientific Use (known as IAPWS-95). IAPWS-95 remains the widely used international standard for the thermodynamic properties of water and steam; its comprehensive accuracy over a wide range of fluid conditions remains unsurpassed. In parallel, Prof. Wagner led the development of a computationally simpler formulation to meet the special needs of the steam power industry, the IAPWS Industrial Formulation 1997 for the Thermodynamic Properties of Water and Steam (known as IAPWS-IF97). Since the late 1990s, IAPWS-IF97 has provided the “steam tables” that are central to the design and testing of boilers, turbines, and other steam power equipment throughout the world.

Professor Wagner was involved in the activities of the International Association for the Properties of Water and Steam (IAPWS) beginning in 1975. His precise and conscientious work, as well as his clarity of thought, contributed greatly to the work of IAPWS. He received the award of IAPWS Honorary Fellow in 1998, and received the Gibbs Award, the highest scientific honor given by IAPWS, in 2008.

From 1995 to 2022, Prof. Wagner served as the deputy chair of the German National Committee of IAPWS. In 2022, he was actively involved in the establishment of the German–Swiss National Committee of IAPWS, the German–Swiss Association for the Properties of Water and Steam (GSAPWS) e.V., where he subsequently served as an auditor.

Additional prestigious awards received by Prof. Wagner include the Yeram S. Touloukian Award of the American Society of Mechanical Engineers (ASME), the world's highest honor in the field of thermophysical properties, in 2003; the Donald L. Katz Award from the Gas Processors Association (GPA) in 2022; and an honorary doctorate from the Faculty of Mechanical Engineering at the Technical University of Dresden awarded in 2015.

We mourn the loss of an outstanding scientist who consistently sought solutions with an open mind and selflessness, demonstrating a high level of expertise, creativity, persistence, collegiality, and self-discipline. We will remember him with great respect.

Prof. Dr. Hans-Joachim Kretzschmar, First Chair of the GSAPWS e.V.

Michael Rziha, Second Chair of the GSAPWS e.V.

Dr. Allan H. Harvey, U.S. National Delegate to IAPWS