



Prof. em. Dr.-Ing. habil. Dr.-Ing. e. h.
Wolfgang Wagner (1940–2024)

TRIBUTE TO PROF. WOLFGANG WAGNER

The German-Swiss Association for the Properties of Water and Steam (GSAPWS) e.V. mourns the loss of our honorary member and IAPWS Honorary Fellow

Prof. em. Dr.-Ing. habil. Dr.-Ing. e. h. Wolfgang Wagner,

who passed away suddenly and unexpectedly on August 12, 2024.

Prof. Wolfgang Wagner was born on June 4, 1940. After completing his studies, he began his academic career at the Technical University of Berlin. He completed his dissertation and habilitation at the Technical University of Braunschweig. In 1975, he was appointed to a C3 professorship, and in 1984 to a C4 professorship in Thermodynamics at the Faculty of Mechanical Engineering at Ruhr University Bochum. Since 2006, he had been professor emeritus.

Prof. 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.

His major scientific achievements are as follows:

Prof. Wagner developed precision apparatuses 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%.

He conducted precision density measurements on a large number of scientifically and technically important substances in the gas and liquid phases.

Using the measuring apparatuses developed, precision density measurements for important substances in the gas and liquid phases, including the states of boiling liquid and saturated vapor, were carried out in Prof. Wagner's department. These measurements remain a key foundation for the development of equations of state.

Under his leadership, his team developed reference-quality equations of state for pure fluid substances and fluid mixtures.

The methods developed by Prof. Wagner 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 state region, including the liquid region and gas-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 institutions such as IUPAC, IAPWS, GERG, and ISO.

He conducted research on the critical point of pure substances, including the development/design of precision measuring apparatus.

The multi-cell apparatus developed in Prof. Wagner's department made it possible for the first time to measure the density of carbon dioxide and sulfur hexafluoride at the critical point with extreme precision. Based on these measurements, "new" values of critical exponents under the conditions of gravity were determined.

Based on his scientific achievements, Prof. Wagner was a highly sought-after member of numerous international scientific organizations.

He had been actively involved with the International Association for the Properties of Water and Steam (IAPWS) since 1975. Over the decades, he helped shape and influence IAPWS through his precise and conscientious work. The clear wording of his written documents and publications, as well as the comprehensibility of his lectures, contributed significantly to this.

The most important results were the IAPWS standards developed under his leadership:

The scientific standard known as the IAPWS-95 formulation for the thermodynamic properties of water and steam was declared internationally binding by IAPWS in 1995. The underlying equation of state achieved an accuracy in the entire fluid state region that remains unsurpassed to this day.

Based on the scientific standard, the industrial standard for the calculation of thermodynamic properties of water and steam, known as the Industrial Formulation IAPWS-IF97, was developed under the leadership of Prof. Wagner.

Both the scientific formulation IAPWS-95 and the industrial formulation IAPWS-IF97, as well as the supplementary formulations, remain international standards to this day. Prof. Wagner was an important co-author of an additional eight releases, supplementary releases, and guidelines from IAPWS.

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.

The scientific work of Prof. Wagner has been recognized with numerous prestigious awards.

He received the Honorary Fellow Award from the International Association for the Properties of Water and Steam (IAPWS) in 1998.

In 2003, he was awarded the Yeram S. Touloukian Award by the American Society of Mechanical Engineers (ASME), the world's highest honor in the field of thermophysical properties.

He was honored with the Gibbs Award, the highest award from IAPWS, in 2008.

In 2022, he was presented with the Donald L. Katz Award from the Gas Processor Association (GPA).

Prof. Wagner was named an honorary member of GSAPWS e.V. in 2024.

The highlight of the many honors he received was an honorary doctorate from the Faculty of Mechanical Engineering at the Technical University of Dresden awarded to him 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.