

Julius Erich Wess

Julius Erich Wess, a leading figure of modern theoretical physics, died unexpectedly from a stroke on 8 August 2007 in Hamburg, Germany. Mentor to a generation of particle theorists, Wess was best known as a father of supersymmetry, a concept that revolutionized particle physics.

Wess was born on 5 December 1934 in Oberwölz, Austria. He grew up with his two brothers during World War II, hiking and climbing whenever he could. He studied at the University of Vienna with Hans Thirring and Walter Thirring. It was also there that he met his lifelong friend and collaborator Bruno Zumino.

After receiving his PhD in 1957 with a thesis on Compton scattering on vector particles, Wess took a series of post-doctoral positions, first at the nascent CERN laboratory in Geneva, Switzerland; then back in Vienna; and later in Seattle, Washington. In 1966 he was appointed associate professor in mathematical physics at the Courant Institute of Mathematical Sciences at New York University. In 1968 he returned to Europe to take the chair in theoretical physics at the University of Karlsruhe in Germany. Throughout his career, Wess stressed how fortunate and grateful he was, as a rising young physicist, to have had the opportunity to travel to the US and join the international scientific community at a time when the devastations of war were still fresh in everyone's mind.

Wess was a pioneer in the generation of physicists who harnessed the mathematical power of group theory and applied it to physics. Previously, physicists developed a theory and used symmetries to help find and characterize its solutions. Wess and his peers stood that on its head. They identified the symmetries of systems, then used those symmetries to find the underlying theories. It was precisely that approach that led to the enormously successful standard model of particle physics.

His early work centered on effective field theories for hadrons, especially the interactions connecting pions and kaons with protons and neutrons. His 1969 papers with Sidney Coleman, Curtis Callan, and Zumino detailed the mathematical structure of theories with spontaneously broken symmetries. The papers laid much of the foundation for phenomenological hadron physics, but they have had even wider application. They are still being cited today.

Wess's most highly cited work is the

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1971 paper with Zumino on anomalies in effective field theories. Anomalies occur when quantum effects violate classical symmetries, giving rise to physical phenomena such as the decay of a neutral pion into two photons. Wess and Zumino showed that anomalous terms in effective Lagrangians must obey certain consistency relations. Those conditions are so important that the terms are now named after them.

Despite the fame of that early work, Wess will always be known for the 1974 papers in which he and Zumino constructed the first renormalizable supersymmetric quantum field theory in four dimensions and exhibited its nonrenormalization properties at one loop. Their work ignited an explosion of interest in supersymmetry, a concept that has come to dominate much of modern theoretical physics. His textbook on supersymmetry, with one of us (Bagger), is still a standard reference after 25 years.

Supersymmetry is a new type of symmetry that transforms bosons into fermions and vice versa. Deeply embedded in string theory, it predicts that spacetime has new fermionic dimensions that manifest themselves as particles. The nonrenormalization properties of supersymmetric theories have powerful implications for Higgs physics, making the discovery of supersymmetry one of the most sought prizes at the CERN Large Hadron Collider. It is a tragedy that Wess did not live to see the outcome of those experiments.

In 1990 Wess moved to Munich, Germany, where he became a director of the Max Planck Institute for Physics and professor at the Ludwig-Maximilians University. After his official retirement in 2002, Wess moved to DESY, the Ger-

man Electron Synchrotron in Hamburg, where he worked until his death. In his later years, he focused his research on field-theoretic applications of noncommutative geometry, which involves a new type of symmetry beyond Lorentz invariance and even supersymmetry. He also became increasingly active in advisory roles. From 1993 to 1996, he served as chair of the DESY Scientific Council; he was also an influential member of the High Energy Particle Physics Board of the European Physical Society.

For his many contributions, Wess was awarded the 1988 Dannie Heine-man Prize for Mathematical Physics of the American Physical Society; the 1987 Max Planck Medal, the highest distinction of the German Physical Society; and the 1986 Gottfried Wilhelm Leibniz Prize from the German Research Foundation. He was a member of the Bavarian Academy of Sciences and Humanities, the German Academy of Sciences Leopoldina, and the Austrian Academy of Sciences. But perhaps his greatest tribute is the number of results that have entered physics textbooks under the label Wess-Zumino.

Over the years Wess supported scientific dialog with Eastern bloc countries and the Soviet Union and strengthening of German-Israeli scientific ties. At the time of his death, he was working to increase scientific opportunities for young physicists in the Balkans. Drawing on his own experiences, he was a firm believer in the international community of scientists.

Despite the importance of his scientific work, Wess was modest and unpretentious. He had a passion for the outdoors and often climbed straight up or down a mountain, irrespective of where the path led. His great warmth and subtle humor inspired a generation of students and postdocs. To the end, he remained a thoughtful man of Viennese charm and grace. He will be greatly missed.

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