

## In memory of Andrei Alekseevich Slavnov

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The outstanding world-famous theoretical physicist, academician of the Russian Academy of Sciences (RAS), and chief researcher in the Department of Theoretical Physics at the V A Steklov Mathematical Institute, Andrei Alekseevich Slavnov, passed away on August 25, 2022 at the age of 82. His scientific findings in the quantum theory of gauge fields underlie the modern Standard Model in fundamental interaction physics.

A A Slavnov was born on December 22, 1939 into a family of clerks. His mother Mariya Vladislavovna Slavnova (Dmikhovskaya) was head of the Financial Department at Mosstroytrans (the corporation for building technology in the field of transport infrastructure). His father Aleksei Alekseevich was a senior inspector at a state bank.

In 1956, Andrei Alekseevich Slavnov finished Moscow school no. 423 with a gold medal and entered the Physical Department of M V Lomonosov Moscow State University (MSU). In 1962, he graduated from the university with an honors degree. He then entered postgraduate studies in the Department of Theoretical Physics at the V A Steklov Mathematical Institute.

As a postgraduate, A A Slavnov became engaged in problems surrounding the development of the vector field theory. In 1965, he defended his candidate thesis, “Some questions of vector field theory,” and, in 1972, the doctoral thesis, “Renormalizations in theories with nontrivial internal symmetry,” in which he formulated the modern theory of renormalizations of nonabelian gauge fields.

A A Slavnov constructed a gauge-invariant renormalization procedure allowing a quantitative analysis of models of electroweak interactions and deep inelastic processes in quantum chromodynamics. He derived relations known as Slavnov–Taylor identities, which play the key role in the gauge field renormalization theory. His work on constructing explicitly gauge-invariant renormalization of supersymmetric gauge theory underlies the modern supersymmetric extensions of the Standard Model.

Invaluable is his contribution to the development of nonperturbative methods in theoretical high-energy physics. He proposed a new approach to  $1/N$  expansion of matrix models and on its basis constructed a low-energy action for quantum chromodynamics. He was one of the pioneers in supercomputer simulations of finite temperature confinement–deconfinement phase transitions in quantum chromodynamics.

In an international collaboration, A A Slavnov calculated the critical temperature of the phase transition in quantum chromodynamics with dynamic fermions on a lattice with a record small spacing to reveal a phenomenon of quark–antiquark string discontinuity at a critical temperature. He



Andrei Alekseevich Slavnov  
(22.12.1939–25.08.2022)

carried out several studies on the further development of quantum gauge field theory, including construction of gauge-invariant infrared regularization of the Yang–Mills theory and a solution to the problem of ambiguity of nonabelian gauge field quantization. In his last years, he formulated a modified Yang–Mills theory allowing the existence of soliton solutions.

From 1992 to 2020, Andrei Alekseevich was head of the Department of Theoretical Physics at the V A Steklov Mathematical Institute of RAS (MIAN). During these years, he made an important contribution to the maintenance of high scientific traditions of the School of Theoreticians founded by Nikolai Nikolaevich Bogoliubov. In the Department of Theoretical Physics at MIAN, research on nonperturbative methods in the gauge-field, superstring, and brane theories performed under A A Slavnov’s guidance gained worldwide recognition and is being carried out today.

A A Slavnov successfully combined his extensive research and organizational work with the education of young scientists. For many years, he was head of the Department of Theoretical Physics at the MSU Physical Faculty. His lecture courses “Gauge field theory” and “The method of path integral” were acknowledged by numerous students to be the best in the world in this research area. The monograph *Introduction to quantum gauge field theory*, which he wrote together with L D Faddeev, is a classical textbook for theoretical physicists all over the world. Many disciples of his became prominent scientists and are working successfully in Russian and foreign research centers.

The range of the scientific-organizational activities of Andrei Alekseevich was broad. He was chair of the Dissertation Academic Council of the V A Steklov Mathematical Institute of RAS, a member of the Academic Council of the MSU Physical Department, and editor-in-chief of the journal *Teoreticheskaya i matematicheskaya fizika (Theoretical and Mathematical Physics)*. He worked for many years on expert councils of the Higher Attestation Commission (HAC) and the Russian Foundation for Basic Research (RFBR).

For his outstanding scientific service, he received the 1995 State Prize of the Russian Federation, the 1999 Humboldt Prize for research work (Germany), the 2007 V A Fock Prize of the Russian Academy of Sciences, the I Ya Pomeranchuk Prize in theoretical physics given by the A I Alikhanov Institute for Theoretical and Experimental Physics (ITEP) (2013), and the N N Bogoliubov Gold Medal of the Russian Academy of Sciences for his outstanding output in mathematics, theoretical physics, and mechanics (2014).

Andrei Alekseevich was famous for his high scientific principles, adhesion to science, inherent refinement, and considerate and benevolent attitude toward people. This is how his family, friends, disciples, and colleagues will remember Andrei Alekseevich Slavnov.

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