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Rudolf Grimm Receives Inaugural Faddeev Medal

This week physicists Vitali Efimov and Rudolf Grimm will receive the Faddeev Medal for having made history in physics. In 1970, Efimov discovered an effect that was subsequently called Efimov effect. 35 years later, Grimm and his research team were the first to experimentally proof this quantum phenomenon, which had been repeatedly questioned by experts in the field.

Rudolf Grimm and Vitali Efimov will receive the award at a special session at the 22nd International Conference on Few-body Problems in Physics in Caen, France, on July, 11th 2018. Efimov will be recognized for his theoretical discovery that, due to quantum mechanical properties, a bosonic three-body system has an infinite number of three-body bound states even if a dimer of the same particles is not formed. This discovery is now known as Efimov effect. Grimm at the Institute for Experimental Physics, University of Innsbruck, and the Institute for Quantum Optics and Quantum Information at the Austrian Academy of Sciences will receive the medal for confirming the existence of Efimov quantum states in experiments with ultracold quantum gases. This first experimental proof of the Efimov effect was published in the journal *Nature* in 2006.

Making history in physics

It is one of the big stories in scientific history: In 1970, a theoretical physicist in Russia discovered a surprisingly simple solution for an extremely complicated problem. Efimov was studying the behavior of three quantum objects attracting each other. While the interaction of two-body systems can easily be calculated, the observation of the behavior of interacting many-body systems poses a bigger problem for physicists. Efimov proposed that quantum mechanical properties allow three particles to form a bond even if the two-particle attraction is too weak to support a two-body bound state. What is even more astounding: When the distance between the particles is increased by factor 22.7, an infinite number of Efimov states is possible. According to the theoretical physicist the phenomenon is universal in character, which means it applies to particles in the atomic nucleus as well as to

molecular compounds. His proposal was viewed with skepticism and was considered a theoretical curiosity by fellow experts. The experimental detection of the Efimov states remained an elusive goal for many years. 35 years after the publication of Vitaly Efimov's theoretical proposal, quantum physicists in Rudolf Grimm's and Hanns-Christoph Nägerl's research group in Innsbruck were able to experimentally confirm these unique quantum states. This discovery triggered the establishment of a new research field in physics. "The existence of the Efimov effect has changed our view on how the behavior of complex many-body systems results from the fundamental interaction of pairs," says Rudolf Grimm.

The Faddeev Medal

The Faddeev medal, awarded for the first time in 2018, is named in honor of the late Russian physicist and mathematician Ludvig Faddeev, one of the most distinguished figures in modern mathematical physics. The medal was introduced in 2016 by the Few-Body Systems Topical Group of the American Physical Society and the European Research Committee on Few-Body Problems in Physics. It is awarded every three years to a scientist (or scientists) who significantly advanced the field of few-body physics.

Links:

- International Conference on Few-Body Problems in Physics (FB22) https://fb22-caen.sciencesconf.org/
- Fadeev Medal https://www.aps.org/units/gfb/awards/faddeev-medal.cfm
- Ultracold Atoms and Quantum Gases (Rudolf Grimm) http://ultracold.at/grimm/

Photos: https://iqoqi.at/en/iqoqi-innsbruck/media-and-press

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