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In memory of Andreĭ Stanislavovich Borovik-Romanov

Academician Andreĭ Stanislavovich Borovik-Romanov died on 31st July 1997 at the age of 77. We have lost an outstanding physicist, an organizer of science, and teacher. He lived a bright life rich in uncommon events. To his last minute Andreĭ Stanislavovich was full of plans concerned with his favorite science, and looked with a keen interest at the surrounding world.

Andreĭ Stanislavovich Borovik-Romanov was born on 18th March 1920 in Petrograd (now St.Petersburg) in a family of physicists. He started research work as early as in his third year at the department of physics of Moscow State University, participating in the development of spectral methods for metallurgy. World War II interfered with his studies: he volunteered for the army. Dismissed from the armed forces in 1945, he returned to the university and in 1947 graduated from the chain of low temperatures.

Andreĭ Stanislavovich considered himself a student of P G Strelkov, a corresponding member of the Academy of Sciences of the USSR and a brilliant experimentalist, for whom he had great love and respect. In Strelkov's laboratory he was apprenticed in fine physical experimentation, and carried out a series of studies related to low-temperature metrology. This resulted in the development of the high-precision gas thermometer used for the national standard scale of practical temperature.

The first fundamental results obtained by A S Borovik-Romanov were in the field of magnetism. Studies of static magnetic properties using extremely sensitive experimental techniques brought him to the discovery of weak ferromagnetism in antiferromagnecs. To explain this phenomenon he put forward the hypothesis of the non-collinearity of spins. This idea was confirmed by further experiments and theoretical substantiation proposed by I E Dzialoshinsky. The works of Andreĭ Stanislavovich considerably changed the concepts of magnetic phenomena and stimulated numerous experimental and theoretical investigations worldwide. Another result related to these studies was the discovery of piezomagnetism in antiferromagnecs — a phenomenon whose very existence had been challenged for a long time. It was a vivid manifestation of his experimenter's skill and clever approach to problem solving.

From the magnetostatic properties of weak ferromagnetics Borovik-Romanov went over to studying their dynamic behavior. In these studies he was both a theoretician and an experimentalist. He was the first to calculate the spectrum of antiferromagnetic resonance and the dispersion law of spin waves for this class of compounds. Two branches in the energy spectrum of spin waves were predicted to exist,

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with the acoustic mode being gapless. Different experimental techniques were employed by Andreĭ Stanislavovich for studying these phenomena: heat capacity measurements, high-frequency spectroscopy, and magnetooptics. He obtained a number of fundamental results: he discovered an antiferromagnetic resonance and studied its spectrum, discovered the parametric generation of spin waves, and observed inelastic light scattering by thermal and parametrically excited spin waves and phonons. The experimental results confirmed the main theoretical conclusions.

In the late 1970s Borovik-Romanov made a sharp turn in his studies: he was appointed in charge of construction of the first Soviet nuclear demagnetization cryostat for superlow temperatures and embarked upon studying superfluid ^{3}He. He resolved many mysteries of the spin dynamics of superfluid ^{3}He phases and experimentally discovered a new phenomenon; magnetic superfluidity. In these experiments he was able to excite and measure the superfluid spin current in ^{3}He – B, — that is, the superfluid transport of magnetic moment over macroscopic distances without the transport of

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mass. Experimentally observed were the spin analogues of phenomena known for superconductors and superfluids, such as the Josephson effect for the spin current, the critical spin current, quantum spin vortices etc.

In recent years Andreĭ Stanislavovich returned to studying the dynamic properties of antiferromagnecs. He investigated nuclear magnetic resonance in quasi-one-dimensional antiferromagnecs and obtained important results on the suppression of quantum spin fluctuations by a magnetic field. He was going to report these results at the International conference on magnetism in Australia on 31st July 1997. Sadly, he did not have the time for this.

All the scientific research of Andreĭ Stanislavovich is marked with his special style. He had a keen scientific intuition (he used to call it his good luck), which was most vividly manifested in the way he selected the experimental objects in the case of weak ferromagnetism and in his studies of superfluid ^{3}He. He considered it very important to change his topics from time to time or at least the experimental methods. He often used to say, 'It would be nice to think up something new'. And he did. The special style of Andreĭ Stanislavovich was also illuminated by his attention to the methodological side of the experiment, his consistency of aim, and his critical approach to the results. He was a scholar who deeply understood and loved his science.

Andreĭ Stanislavovich was an excellent teacher, he liked to mix with the young, share his experience, and learn new things. He was always surrounded by his students, he infected them with his keen interest in science and in the diverse problems of life. Many of his pupils became renowned scientists, whose works have received international recognition. For many years he taught at the Moscow Institute of Physics and Technology, where to his last day he held the chair of physics and technology of low temperatures. His lectures on low-temperature magnetism were very popular, as well as his reviews on various topics.

Borovik-Romanov spent a lot of time and effort on the organization of science. From 1963 to 1984, when P L Kapitsa was Director of the Institute for Physical Problems, he was his deputy. After the Kapitsa's death Andreĭ Stanislavovich became Director of the institute for many years to come. His benevolent attitude to people, combined with his standing as an important scientist, had won for him the heartfelt respect of his colleagues. Andreĭ Stanislavovich presided at the all-Moscow seminar on magnetism, which greatly influenced the development of this branch of physics in this country. He was deeply involved in the organization of research concerned with low temperatures and magnetism both in this country and in the framework of international research projects. Borovik-Romanov was an active member of the Board of the Department of General Physics and Astronomy of the Russian Academy of Sciences. Andreĭ Stanislavovich was the founder of *Pis'ma v Zh. Eksp. Teor. Fiz.* [*JETP Lett.*], the most prestigious physics journal in Russia, and was its editor for a long time. Till his death, Borovik-Romanov was Editor of *Zh. Eksp. Teor. Fiz.* [*JETP*].

The works of Andreĭ Stanislavovich won universal recognition. He was awarded the Lomonosov Prize for his studies of weak ferromagnetics, and the State Prize of the Russian Federation for his research on superfluid ^{3}He. In 1966 Borovik-Romanov was elected a corresponding member of the Academy of Sciences of the USSR, and became full member in 1972. He was also a member of many foreign academies. His achievements were rewarded with the Order of Lenin, the Order of the Red Banner of Labor, and the Order of Patriotic War of Second Degree.

Andreĭ Stanislavovich loved life in all its manifestations. He loved art, music, was fond of history enjoyed traveling and deeply understood and took to heart all that happened in the country. A man of high culture, a simple and benevolent person, Andreĭ Stanislavovich enjoyed the love and respect of all who knew him. His name will forever remain in science, and he will live in the memory of his students, colleagues, and friends.

A F Andreev, A A Boyarchuk, V L Ginzburg,
V V Dmitriev, I K Kamilov, N M Kreĭnes,
Yu A Osip'yan, L P Pitayevskiĭ, L A Prozorova,
A M Prokhorov, I L Fabelinskiĭ, I A Yakovlev