

## In memory of Aleksei Norairovich Sissakian

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Academician Aleksei Norairovich Sissakian, a widely known physicist of world fame, important administrator of Russian science and international research cooperation, member of the Presidium of the Russian Academy of Sciences (RAS), Director of the Joint Institute for Nuclear Research (JINR) in Dubna, died on 1 May 2010 at the age of 65.

Aleksei Norairovich Sissakian was born on 14 October, 1944 in Moscow into a family of researchers. His father—Academician Norair Martirosovich Sissakian (1907–1966)—was a well-known biochemist, one of the founders of space biology, and his mother—Varvara Petrovna Sissakian-Alekseeva (1910–1990)—worked in the field of agrochemistry. Aleksei Sissakian attended Moscow schools Nos 16 and 17 and graduated *magna cum laude* (with a silver medal).

In 1962, he enrolled in the Physics Department of Moscow State University; he majored in theoretical physics and graduated in 1968. The same year A N Sissakian began working at the Laboratory of Theoretical Physics (LTP) at JINR under the supervision of Academician N N Bogoliubov.

Working in Dubna, A N Sissakian rose all the way from intern researcher to JINR director. As a scientist and manager of science, he was a prominent representative of N N Bogoliubov's scientific school.

A N Sissakian's main research fields were elementary particle physics, the development of approximate methods and equations of quantum field theory, the question of quantization of systems with nontrivial geometry, symmetry, and topology, and the physics of strong interactions at high temperatures and densities.

In quantum field theory, A N Sissakian and his coauthors were the first to propose and elaborate the approximation of rectilinear paths — an effective method of continual integration which is widely used in theoretical physics, in particular, for solving the polaron problem and for studying the eikonal approximation in high-energy physics and in problems of quantum chromodynamics. In 1973, this work was awarded the Lenin Komsomol Prize in Science and Technology. In 1980, he defended his doctoral thesis in which he developed a multicomponent approach in the theory of multiple particle production, allowing him to describe the processes of inelastic collisions of elementary particles. Using this approach, he was able for the first time to predict a number of new correlation effects which were experimentally confirmed in elementary particle accelerator experiments at the Institute for High Energy Physics in Protvino, the Enrico Fermi National Accelerator Laboratory in the USA, and the European Organization for Nuclear Research in Geneva.

A N Sissakian and his colleagues suggested a new description of processes with large transferred momenta in



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the framework of the three-dimensional formalism of the quantum field theory. In this work, they generalized the Matveev–Muradyan–Tavkhelidze quark counting rules to the case of inclusive processes; this resulted in establishing a connection between the characteristics of these processes and the quark structure of colliding particles, and they also obtained a generalization of the Koba–Nielsen–Olesen scaling to the case of semi-inclusive processes.

In mathematical physics, A N Sissakian supervised a project that produced a series of publications on classical and quantum superintegrable systems in constant curvature space, on the question of generating topologically nontrivial objects in models with oscillatory interaction and in supersymmetric one-dimensional quantum mechanics. In recent years, A N Sissakian and his colleagues were developing the method of contraction of Lie algebras as applied to problems of theoretical physics.

The work of A N Sissakian's research team on one of the most pressing problems in elementary particle physics — the development and application of nonperturbative methods in

quantum field theory — became widely known. A new efficient approach formulated on a first-principles basis and not requiring additional model-specific assumptions was developed for this field.

A N Sissakian and his colleagues elaborated new approaches to describing processes of very high multiplicity and received a number of original results. He was the first to establish criteria for the phenomenon of thermalization, and studied manifestations of different mechanisms of multiple generation of particles of considerable interest for experimental programs at the Large Hadron Collider at CERN, etc.

In recent years, A N Sissakian had supervised promising research programs aimed at searching for processes of the formation of the mixed quark–hadron phase of nuclear matter in collisions of heavy ions. He initiated a large-scale project of a new heavy ion collider complex (NICA) based on the existing accelerator facility at JINR for studies of phase transitions and critical phenomena in nuclear matter.

A N Sissakian, recognized by the physics community as a brilliant theorist, always combined active research with educational and science-administration work: he occupied the positions of Chair of Fundamental and Applied Problems of Microworld Physics at the Moscow Institute of Physics and Technology, held Chair No. 11 at the Moscow Engineering Physics Institute, and was professor at M V Lomonosov Moscow State University, Vice President and Chair of Theoretical Physics at Dubna International University, head of the scientific seminar ‘Symmetries and Integrable Systems’ at JINR LTP.

A N Sissakian was editor-in-chief of the journal *Pis'ma EChAYa* (Letters to Elementary Particles and Atomic Nucleus), was deputy editor-in-chief of the journal *Fizika Elementarnykh Chastits i Atomnogo Yadra* (Physics of Elementary Particles and Atomic Nucleus), served on the editorial boards of several scientific publications, specialized councils, and program committees of international conferences and symposia, and organized major international conferences and schools on modern particle physics.

In his position of JINR Vice Director in 1989–2005 and Director after 2006, A N Sissakian made a great personal contribution to the preservation and development of the potential of the Institute, to defining its future research programs and research prospects. His contribution to improving the JINR scientific and industrial base, to the modernization of the Institute as an open international nuclear physics center, to extensive cooperation with national and international scientific and educational centers, and to training highly skilled research staff was very important.

In 2006 A N Sissakian was elected Corresponding Member of the Russian Academy of Sciences (RAS), and in 2008 became a Full Member and member of the Presidium of the RAS.

A N Sissakian contributed greatly to the advancement of science centers in Russia when occupying the post of President of the Union of Russian Science Centers. He was the first Vice Chairman of the Russian Pugwash Committee, set up in the Presidium of the RAS.

A N Sissakian worked very hard on expanding the innovative activity at JINR and in the town of Dubna as a whole, implementing cutting-edge high-technology projects at JINR in the Special Economic Zone of Technical-Innovation Type established by a Russian Government decision in Dubna. A N Sissakian orchestrated a broad

international integration of innovative activity that involved JINR member countries. He actively participated in the creation in December 2009 of the International CIS Nanotechnology Innovation Center, whose charter members were 15 organizations representing nine states. The center will be based at JINR and the Kurchatov Institute and will use the potential of the Special Economic Zone; other European countries participating in JINR — Germany, Poland, the Czech Republic, Slovakia, Italy, and some others — may in the future join in the work of the center.

A N Sissakian's achievements in research and in science-organizational activities brought him high governmental and academic awards. He received ten Russian and foreign orders and medals, including the Orders of Honor and Friendship, was a laureate of the Lenin Komsomol Prize in Science and Technology (1973), received the Moscow Region Governor Award (2007), and was elected foreign member of the National Academy of Sciences of Armenia and honorary doctor of many foreign universities.

Beginning in his school years, Alexei Norairovich's favorite passion was poetry. He published several collections of poems which enjoyed great success with his close colleagues and friends.

Alexei Norairovich was always exceptionally unselfish in his devotion to science and to his work, displaying amazing dedication and ability to work hard for long hours, with a wonderful combination of tremendous willpower with kindness and responsiveness to relatives, friends, colleagues, and other people.

A N Sissakian's untimely death is a heavy blow to the scientific community in this country and on the international scene, an irreparable loss to his colleagues, students, and successors, and to the entire staff of the Joint Institute for Nuclear Research in Dubna.

The appealing and kind image of Alexei Norairovich Sissakian — outstanding scientist and remarkable man — will forever remain in the memory of the people who knew him.

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