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***PERSONALIA***

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# In memory of Alexei Borisovich Kaidalov

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On 25 July 2010, Alexei Borisovich Kaidalov, an outstanding theoretical physicist of world renown and correspondent member of the Russian Academy of Sciences, died at the age of 70.

Born in Moscow, Kaidalov was educated in nuclear and elementary particle physics at the Engineering Physics Institute (MEPhI), from which he graduated in 1963. He completed his diploma thesis under the guidance of I Ya Pomeranchuk, who then headed the Theoretical Department at the Institute of Theoretical and Experimental Physics (ITEP), which Kaidalov joined soon after his graduation from MEPhI and to which he remained devoted to the end of his days. Having started his academic career as a junior researcher, he became the head of a theoretical laboratory. He defended his PhD thesis in 1968 and received the degree of a Doctor of Sciences in 1979. In 2003, Kaidalov was elected a correspondent member of the Russian Academy of Sciences.

Even at the onset of his carrier, the young researcher showed a keen scientific intuition, the ability to see the most essential features of physical phenomena and to offer a suitable theoretical interpretation. At that time, experiments at the ITEP and Protvino accelerators (and later at ISR at CERN) started yielding a plethora of information about high-energy hadron interactions. With basic studies in high-energy physics just gaining momentum at that time, the method of complex angular momenta based on the analyticity and unitarity of the scattering amplitude (the Reggeon theory) marked a real breakthrough in this domain.

Kaidalov pioneered the application of this approach to a systematic description of the hadron–hadron interaction dynamics at high energies. His first work investigated the role of moving Regge cuts, a relevant problem at that time. Kaidalov predicted a number of striking qualitative effects arising from the contribution of cuts to the cross sections of two-particle processes, which were later confirmed in experiment.

A thorough analysis of diffraction dissociation processes enabled Kaidalov to establish the lower bound for two-Pomeron cuts, thereby removing any doubt as to the necessity of taking them into account. His analysis of inelastic diffraction processes was of paramount importance for understanding the structure of the Reggeon field theory. He was the first to derive the triple-Pomeron interaction constant that characterizes the contribution of more complicated ('enhanced') diagrams of the Reggeon field theory. The method of Reggeon dispersion sum rules proposed by Kaidalov was used to predict the exotic baryon resonance with spin and isospin 5/2.

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Alexei Borisovich Kaidalov
(20.07.1940 – 25.07.2010)

Kaidalov made an invaluable contribution to the theory of multiple high-energy processes. When most theorists regarded the first experimental data as a mere haphazard collection of plots and figures, Kaidalov identified the main experimental findings as the effects of multiperipheral dynamics and $t$-channel quantum numbers. He and his co-workers proposed a model of Reggeized one-pion exchange that permitted systematizing and quantitizing a large number of inclusive and exclusive reactions in a broad energy range.

The advent of quantum chromodynamics required the general phenomenological results of the Reggeon theory to be reformulated in terms of quarks and gluons. Kaidalov developed a new approach to the description of multiple processes at high energies (known as the quark–gluon string model) based on fundamental features of the Reggeon method, the topological $1/N$ expansion of QCD amplitudes, and current views of the confinement mechanism. This model was used to clarify the relationship between different Regge trajectories, to theoretically estimate cross sections of multiple hadron processes, to quantitatively describe a multitude of inclusive processes, and to predict the masses and widths of new hadron resonances, including exotic ones. Moreover, the

model was in excellent agreement with the results of experiments at modern hadron colliders and with cosmic rays; it allowed predictions for superhigh-energy accelerator experiments. Kaidalov showed keen interest in the processes of creation and annihilation of hadrons containing heavy quarks. The first physical results obtained at the Large Hadron Collider proved to be in good agreement with the predictions made in Kaidalov's studies.

Equally well known is Kaidalov's work on nucleus–nucleus interactions at high energies, extending the Glauber–Gribov approach, and on deep inelastic lepton scattering at small $x$; this work couples the Reggeon method with QCD evolution.

Kaidalov was a reputable expert in every field of high-energy physics. His deep theoretical knowledge and clear understanding of the very essence of physical phenomena attracted many Russian and foreign theorists who sought stimulating discussions with him, always marked with an attitude of benevolence and respect for the interlocutor and a willingness to share the ideas and explore new ones.

Being a distinguished theoretical physicist, Kaidalov had a significant reputation among the experimenters with whom he collaborated extensively and fruitfully. Their joint efforts yielded results and predictions of primary importance for elementary particle physics.

Wherever Kaidalov delivered his lectures and reports, whether it was at a representative international conference or a regular ITEP seminar, they always drew many listeners and aroused the great interest of the audience as models of lucidity and freshness of thought. Kaidalov was a man of broad outlook, immense enthusiasm, and unselfish devotion to science. These and his many other personal virtues, such as openness and a talent for human communication, brought him many friends and associates. He was a broadly educated person of many gifts and skills, loved arts and music, and had a particular keenness for downhill skiing.

The multifarious activities of Kaidalov as an organizer of science deserve special mention. He was deputy editor-in-chief of the journal *Yadernaya Fizika* (*Nuclear Physics*), headed a theoretical laboratory at ITEP, and during many years chaired the Scientific and Technical Council of ITEP. In addition, he was the chairperson of the International Pomeranchuk Prize Organizing Committee and an organizer of and active participant in the ITEP International Winter School of Physics. His lectures were extremely popular among young physicists and long ago became a bibliographic rarity. Kaidalov published over 300 papers in the leading Russian and foreign journals. His scientific achievements were rewarded with government decorations.

The untimely death of A B Kaidalov is an irreparable loss to the scientific community. His charming and creative personality, devotion to science, and regard for scientific truth will live in the memory of friends and colleagues.

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