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Nikolaĭ Sergeevich Dikanskiĭ (on his sixtieth birthday)

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July 30, 2001 is the birthday of Nikolaĭ Sergeevich Dikanskiĭ, Corresponding Member of the Russian Academy of Sciences (RAN), head of a laboratory at the G I Budker Institute of Nuclear Physics of the Siberian Branch of the Russian Academy of Sciences (SO RAN), the Rector of the Novosibirsk State University (NGU).

N S Dikanskiĭ's life in science is tied to the physics and technology of accelerators and charge particle storage rings, and to the development of a colliding beam method, where he obtained a number of fundamental results.

Having graduated from Novosibirsk State University in 1964, N S Dikanskiĭ joined the Institute of Nuclear Physics (IYaF) and very soon grew to be one of the leading scientists in the research with colliding electron – positron beams on the VÉPP-2 facility. His work on nonlinear oscillations of particles and their stochastic motion in the vicinity of nonlinear resonances made it possible to obtain realistic evaluations of the probability of particle capture into the separatrixes of these resonances. He was a productive participant in the work on studying the stability of coherent oscillations of stored beams. The generalization of the experimental data obtained made it possible for N S Dikanskiĭ and his co-authors to formulate the basic concepts of the general theory of coherent oscillations of beams in storage rings in 1969. This work led to finding a number of general types of behavior that concern specific features of evolution and the possibility of damping coherent oscillations of stored beams. It was thus established that the ability of a system to damp out coherent beam oscillations is closely connected to its ability to cool this beam. Other important applications of the theory developed were the possibility to analyze general properties of both coherent oscillations of colliding beams and of the specifics of coherent oscillations of systems with intense beam cooling.

The work on electron cooling of beams of heavy charged particles occupies an important place in the scientific biography of N S Dikanskiĭ. He was one of the leaders in the development of the NAP-M facility which was the first in the world to run experiments on the electron cooling of protons. The importance of the very first results was so obviously high that very soon a laboratory was created in IYaF to develop cooling techniques for heavy-particle beams. Nikolaĭ Sergeevich leads this laboratory to this day. As a result of the research conducted by N S Dikanskiĭ with his co-authors it was discovered that the physics of processes taking place in actual setups when ions are cooled by electrons is very rich and the cooling efficiency proved to be many times higher than the expected values. The main results of this research are widely known in the international accelerator community; they largely stimulated the study, modernization and application of heavy-particle cooling techniques in the leading accelerator centers of the world. Owing to this work by

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N S Dikanskiĭ and his co-authors, the combination of words 'ultracold beams', which was born as an image, entered the working terminology of accelerator physics.

In addition to generating extensive experimental and theoretical material, the work on electron cooling was a stimulus to developing a theory of coherent fluctuations in stored beams — these were problems that were a focus of interest for N S Dikanskiĭ and on which he worked for a number of years. It was shown that general methods of statistical physics and plasma theory can be successfully applied to the description of spontaneous coherent oscillations (coherent fluctuations). This led to the derivation of the kinetic equations that describe the mutual relaxation of particles in the beam and its coherent fluctuations, i.e. the scattering of beam particles from particle bunches formed in the beam owing to thermal motion. The theory thus developed made it possible to carry out consistent calculations of the so-called turbulent effect of elongation of intense bunches; this phenomenon occupied quite a few accelerator physicists for many years.

Another important problem to the solution of which Nikolaĭ Sergeevich devoted many years, was the design and

construction of proton – antiproton and other hadron colliders that use electron cooling. Many theoretical and technological finds of Dikanskiĭ and his co-authors, published in papers of this series, are now used for considerable improvements in the parameters of already active facilities. The closely related work done by N S Dikanskiĭ and his co-authors on designing a neutrino factory and muon colliders has now become an independent field of accelerator physics.

The work on applications of ion beams that was started at IYaF SO RAN on N S Dikanskiĭ's initiative more than 20 years ago led to the creation of a new generation of novel implanters for processing semiconductor materials. Some of these implanters are still functioning at various plants in Novosibirsk.

Nikolaĭ Sergeevich's inexhaustible energy, his diverse and profound knowledge and his managerial abilities constantly attract a stream of scientific talent to him. For every one of his young students, Dikanskiĭ finds a task to their liking and their ability. His style of team discussion makes working with him especially interesting. For many years now he has been actively working in Novosibirsk State University where he rose from student to rector. He continues to strengthen the educational system based on mandatory involvement of senior-year students in the research at the Novosibirsk Research Center Institutes; this system was created by his predecessors at the time when NGU was created and expanded.

We congratulate Nikolaĭ Sergeevich on his 60th anniversary of the birth and wish him further creative achievements.

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