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PERSONALIA

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Aleksandr Nikolaevich Skrinsky (on his seventieth birthday)

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Aleksandr Nikolaevich Skrinsky, outstanding physicist, Full Member of the Russian Academy of Sciences (RAS), Director of the G I Budker Institute of Nuclear Physics (INP) of the RAS Siberian Branch (SB), Head of the Section of Nuclear Physics of the Division of Physical Sciences of the RAS, celebrated his 70th birthday on January 15, 2006. Many famous chapters in the history of high-energy physics are closely connected with Skrinsky's name.

The development and maturation of the colliding beam method based on accumulating charged particles in storage rings is the foundation of today's experimental high-energy physics which studies properties of elementary particles and the laws that govern their world.

On the initiative of his teacher G I Budker, Skrinsky guided and actively participated in the designing and building of the VEP-1 electron – electron colliding beam facility (1964) and later, in 1966, the VEPP-2, the first-in-the-world electron – positron beam collider. These facilities were used to conduct a series of experiments on quantum electrodynamics (1965 – 1967) (simultaneously with similar experiments in the USA at the Stanford storage rings); experiments were also run for the first time to study light vector mesons and to search for the multiple production of hadrons in electron – positron annihilation events (1967 – 1970).

Skrinsky and his colleagues utilized the VEP-1 and VEPP-2 for a series of pioneering studies of collective effects in storage rings. They observed for the first time coherent longitudinal and transverse instabilities, studied the mechanism of their initiation, and proposed and implemented techniques for instability suppression. The beam – beam effects in cyclic accelerators were studied both theoretically and experimentally. Skrinsky was the first to point to the nonlinear nature of this interaction and to demonstrate the role of nonlinear resonances and stochastic instabilities in limiting the luminosity of colliding-beam facilities.

The approach initiated by Skrinsky in 1966 for the practical preparation of polarized electron and positron beams in storage rings and their applications in elementary particle physics and nuclear physics proved very important and fruitful. He suggested a method for producing longitudinally polarized beams in storage rings, including those with colliding beams; he also took part in furnishing the theoretical proof of the feasibility of this technique (1970).

Skrinsky participated in the development of the theory of spin motion in real magnetic fields in accelerators and storage rings and suggested methods of controlling the motion of spins via spin rotators. These methods found their implementation in the electron ring of the HERA collider (Hamburg) in experiments involving internal targets and colliding electron – proton beams, and, in collaboration with the Budker

Uspekhi Fizicheskikh Nauk **176** (2) 229 – 230 (2006)
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Aleksandr Nikolaevich Skrinsky

INP, in the RHIC storage facility (Brookhaven, USA), as well as in the NIKHEF storage facility (Amsterdam).

Skrinsky took part in developing the methods of measuring the polarization of the circulating beams and in the experimental investigation of the mechanism of radiation polarization of beams (1970). He and his colleagues participated in proposing, designing and implementing the method of high-precision measurement of elementary particle masses using the resonance depolarization of electron – positron colliding beams (the first experiments were run in Novosibirsk on the VEPP-2M storage ring in 1975). This technique made it possible to qualify a high-precision mass scale from 1 GeV/c^2 up to the level of 100 GeV/c^2 (100 proton masses) with an accuracy of 3×10^{-6} (in recent measurements on the Novosibirsk VEPP-4 storage ring).

One of the proud chapters in the history of the progress of accelerator physics is the electron cooling method proposed by Budker in 1967. Skrinsky and his colleagues developed the theory of electron cooling, conducted the first experimental verification of the method (1974), established numerous efficient applications of the method in very important areas (1974), and found solutions that permitted radical expansion of accessible energies up to the TeV range in experiments with ions. This technique is widely employed in many laboratories of the world, often with the participation of the G I Budker INP (CERN, GSI Germany, IMP P.R. China).

The physical community is currently working on designing an international superhigh-energy facility based on linear colliding electron – positron beams, the so-called linear collider; the conceptual project of this collider was developed by Skrinsky together with Budker and V E Balakin some 30 years ago.

At the moment, Skrinsky is leading an experimental program on high-energy physics on the existing VEPP-4 setup, and is supervising the launching of a new storage facility, VEPP-2000, with colliding beams that will greatly improve the efficiency of research in the energy range up to 2 GeV and the development of a project on a revolutionary new facility, the Charm/Tau factory, that is currently one of the most ambitious national research programs in Russia in the field of elementary particle physics.

Skrinsky also greatly contributed to the advancement of numerous applications based on fundamental research at the INP. Such has been his work on the application of synchrotron radiation in various fields of science and technology, and on the progress of electron-beam technologies in various branches of industry.

In the field of lasers operating on high-energy electron beams (so-called free electron lasers), Skrinsky and N A Vinokurov proposed a very important modification — the optical klystron (1977) — that is especially well-suited to generation based on electron storage rings. Lasers in many laboratories are built around optical klystrons, and the VEPP-3 storage ring allowed the generation of short-wavelength radiation at 0.24 μm (1988); this achievement remained a record for 10 years (being slightly improved upon only in 1997).

High-average-power free electron lasers based on recuperating accelerators (1994) are especially interesting and promise to become extremely important. A laser of this type with an average power up to 100 kW is being built in Novosibirsk. It will first be applied in photochemistry research and technological development (catalysis free of chemical agents).

The largest and most spectacular recent applications-oriented work of the Institute of Nuclear Physics headed by Skrinsky has been the creation of the record-power terahertz-range free electron laser for the Center of Photochemical Research of the SB RAS.

As from the 1960s, the INP team of researchers began designing muon accelerators and colliders. Skrinsky developed the physics of ionization cooling of muon beams and, on this basis, the conceptual projects of muon colliders and neutrino factories. A research program is being developed actively along these lines.

It is largely owing to Skrinsky's efforts that a number of Russian research institutes adequately participate in large international projects such as the creation of the Large Hadron Collider at CERN (Switzerland), experiments at the B-factories at the KEK Center for High Energy Physics (Japan), and at Stanford (USA).

Skrinsky has authored or coauthored more than 300 publications, about 60 of which have reported work carried out in the last five years; he takes an active role in training brain-power, and we find among his students one Full Member of the RAS, four Corresponding Members of the RAS, and 15 doctors of sciences and 45 candidates of sciences.

Skrinsky is responsible for a huge science-management effort. He sits on the RAS Presidium and the SB RAS Presidium, heads the Section of Nuclear Physics of the RAS Division of Physical Sciences, and in 2001 – 2004 served as a member of the Council for Science and High Technologies for the President of the Russian Federation.

Skrinsky was awarded the Lenin Prize (1967), the USSR State Prize (1989), the Russian Federation State Prize (2001), the Demidov Award (1997), the RAS V I Veksler Gold medal (1991), and the RAS P L Kapitza Gold medal (2004).

In 2001, he received the Robert R Wilson Prize of the American Physical Society for outstanding achievement in the physics of particle accelerators. In 2003, he received the A P Karpinsky Prize of the Alfred Töpfer Foundation (Germany).

In 1999, he was elected member of the American Physical Society. In 2000, he was elected foreign member of the Swedish Royal Academy of Sciences.

He was awarded the orders of The Red Banner of Labor (1975), The October Revolution (1982), Service to the Motherland of Fourth Class (1996), and Service to the Motherland of Third Class (2000).

Skrinsky the scientist enjoys the highest international reputation and sits on a number of Russian and international committees that help define the strategy of the development of high-energy physics throughout the world.

We join numerous colleagues and friends in wishing Aleksandr Nikolaevich Skrinsky on his jubilee a continued long and active creative career and the achievement of new exciting results on both the facilities currently in operation and on accelerators and facilities to be built at his cherished G I Budker Institute of Nuclear Physics.

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