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Vasilii Vasil'evich Parkhomchuk (on his sixtieth birthday)

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Vasilii Vasil'evich Parkhomchuk, Corresponding Member of the Russian Academy of Sciences (RAS), winner of the State Prize of the Russian Federation, head of laboratory at the G I Budker Institute of Nuclear Physics (BINP) of the RAS Siberian Branch, celebrated his 60th birthday on September 1, 2006.

Parkhomchuk chose the path of a scientist owing to a happy combination of circumstances. At the beginning of the 1960s, the Siberian Branch of the USSR Academy of Sciences began to conduct All-Siberia Olympiads for schoolchildren as a way to make scientific careers attractive to talented young people. The information on the Olympiad reached a school in a god-forsaken village in Altai territory where Parkhomchuk was a pupil. He took part in the Olympiad and in 1963, as one of the winners, was invited to the Summer Physics and Mathematics School (FMSh) in Akademgorodok near Novosibirsk. He went through his last school year in Novosibirsk where gifted boys and girls from all over Siberia (and not only from Siberia) were receiving their education at the recently opened physics and mathematics school. In 1964, he graduated from the FMSh and enrolled in Novosibirsk State University at the Department of Physics. While still a student, he made a powerful impression on his future mentor — Academician G I Budker (who later became his research supervisor during his postgraduate years). While still a freshman, Parkhomchuk began working at the BINP of the Siberian Branch of the USSR Academy of Sciences, in B V Chirikov's laboratory.

In 1971, Parkhomchuk joined a team of physicists and engineers who began working on an experimental demonstration of the feasibility of electron cooling of ion beams. To prove the point, a model of an antiproton accumulator (storage ring NAP-M) was erected at the Institute in record time. Parkhomchuk was a very active and very productive member of the team during the building and launching phases, followed by experimental runs at this facility. His outstanding talent as a physics experimentalist and his concentration on obtaining clear-cut results became immediately obvious during the first experiments with electron cooling and helped significantly in achieving success for the entire effort; it also earned Parkhomchuk a place among the leading group of this project. The results obtained with the NAP-M during its first years greatly improved the understanding of the specifics and the efficiency of the electron cooling technique and facilitated the emergence of an adequate theory of this phenomenon. The results obtained remain partly unsurpassed, even though experiments on electron cooling were repeated at both CERN and the Fermi National Accelerator Laboratory (USA) in 1979 – 1982.

To study the kinetics of cooling in strong magnetic fields and to determine the limits achievable with electron cooling, the MOSOL facility was designed and built. It was established that the cooling efficiency is very sensitive to the electron beam formation and transport environment, so a special high-precision system was designed to measure the degree to which the lines of force of the magnetic field are rectilinear. The same facility was used to experimentally examine, for the first time, a substantial difference in the cooling of positively charged ion beams, as compared to beams of negatively charged ions. The role played by Parkhomchuk in this project was also decisive.

Vasilii Vasil'evich Parkhomchuk

Parkhomchuk performed a number of impressive experiments to investigate and compare the potentials of the stochastic and electron cooling and on neutralization of the space charge carried by high-current electron beams and relaxation of electron velocity distribution in such beams. He reported interesting results on coherent stability of the beams at the early stages of cooling. He also discovered the phenomenon of suppression of the intrabeam scattering in ultracold ion beams and formulated a hypothesis for possible short-range longitudinal ordering in the cooled proton beam. These results caused a considerable stir in the international accelerator community and stimulated experimental studies

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and applications to cooling of heavy particles at the leading world accelerator centers.

The impact of this Novosibirsk research was so significant that after 1988 the leading accelerator laboratories over the world started to build ion accumulator facilities with electron cooling (now known as 'coolers') — CERN (1988), Indiana State University, USA (1988), Max Planck Institute, Heidelberg (1988), the University of Tokyo (1989), Uppsala University, Sweden (1989), GSI, Darmstadt (1990), Stockholm University (1992), and the Research Center in Jülich, Germany (1992).

A new phase began in 1996 – 1998 when Parkhomchuk led a project in collaboration with the German Center of Heavy Ion Research, GSI, in which BINP of the RAS Siberian Branch designed and built a new-generation electron cooling system for the SIS synchrotron. It was successfully launched in 1998 and increased the circulating ion current in the synchrotron by a factor of 10 to 20. The sharp improvement in the parameters of 'cooled' beams proved to be so impressive that the Institute of Modern Physics at Lanzhou (China) and CERN placed orders with the Budker INP of the RAS Siberian Branch for construction of similar facilities for electron cooling of ion beams.

In the framework of the BINP – IMP and BINP – CERN Collaborations, Parkhomchuk successfully led the design, construction, and launching of new-generation systems for electron cooling. New brilliant ideas were implemented in the above projects, such as an employment of electron beams with a controlled cross section profile, electrostatic bending segments, and sectional construction of the main solenoid. The facility at CERN was launched this year and is used to store heavy ions for the Large Hadron Collider (LHC).

Parkhomchuk devoted quite a few years to solving problems arising in the development and construction of hadron colliders and storage rings incorporating electron beam cooling. Many elegant solutions found by Parkhomchuk are used in designing new facilities and make it possible to significantly improve the parameters of machines already in operation. We can add to this that Parkhomchuk leads work on applying the method of electron cooling in medical areas and in other areas of nuclear-physics experimentation.

Parkhomchuk's high skills and his ability to find simple and elegant solutions to complex physical and technological problems have made it possible for him to contribute importantly to experimental studies of the effect of weak seismic perturbations on the performance of large modern colliders, to expanding the electron cooling technique to ionization cooling of muons, and to creating high-precision magnetic configurations for charged particle beam transport. He has used the NAP-M facility to conduct ingenious experiments on measuring the Lamb shift in relativistic hydrogen atoms produced by recombination of protons with electrons.

Work on the design and construction of Russia's first accelerating mass spectrometer is being supervised by Parkhomchuk at the BINP RAS Siberian Branch. The complex to be constructed is aimed at measuring ultralow concentrations of isotopes with a relative sensitivity at the level of 10^{-15}. This equipment is required to carry out integrated studies in various fields of science: geology, ecology, archeology, limnology, etc.

Most of the equipment outlined above was created by Parkhomchuk using his two hands or with him taking active part at the display consoles of the facilities. He has held to this style of work regardless of his age. He defines the goal and drives to it, is infinitely faithful to his science, is highly demanding (but applies this to himself first and foremost), and combines these traits with openness, kindness, and impeccable behavior.

Parkhomchuk's inexhaustible energy, his extensive and profound knowledge of physics, his administrative and managerial talents act like magnets for young scientists. For many years now he has combined his research activities with teaching at Novosibirsk State University. Many of his former students are now leading players at the forefront of accelerator laboratories around the world.

Parkhomchuk's achievements in science were rewarded with the Order of Merit for the Fatherland of Second Class in 1999, with the State Prize of the Russian Federation in 2002, and the Order of Friendship of the People's Republic of China in 2004.

We wish Vasilii Vasil'evich Parkhomchuk all the best from the bottom of our hearts on his 60th birthday jubilee and wish him excellent Siberian health, further creative achievements in his multifaceted life, and lots of happiness.

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