

## Vasilii Vasil'evich Vladimirskii (on his eightieth birthday)

Vasilii Vasil'evich Vladimirskii celebrated his eightieth birthday on 2nd August 1995. He is a well-known scientist, a Corresponding Member of the Russian Academy of Sciences who has made a unique contribution to theoretical, experimental, and engineering physics, and he was one of the organisers of the Institute of Theoretical and Experimental Physics. In his very first scientific papers on optics and statistical thermodynamics (1941–42) V V Vladimirskii derived a number of qualitatively new results on the theory of the Rayleigh scattering of light and developed a new method for the calculation of averages of the products of two quantities recorded at different moments in time.

During this period Vasilii Vasil'evich carried out an interesting study in optics which demonstrated that the polarisation vector experiences a pseudoparallel displacement, remaining perpendicular to a bent ray, if a medium is nongyrotropic and its optical properties vary slowly. This work received a new stimulus recently in connection with the problem of a topological phase in electrodynamics and quantum field theory (Berry phase).

During the war V V Vladimirskii participated in the development of important radio engineering equipment and tackled theoretical problems related to radio engineering. He obtained detailed solutions of the problem of propagation of radio waves along a single conductor and of the problem of coupling of cavity resonators through an aperture.

In 1948 V V Vladimirskii was the first to show that the radiation emitted by primary cosmic-ray electrons in the terrestrial magnetic field does not limit significantly the spectrally wide atmospheric showers induced by such electrons.

Vasilii Vasil'evich took a leading part in the calculations, design, and commissioning in 1949 of the first Soviet heavy-water test reactor. He provided scientific management in the design and commissioning of a number of major special nuclear facilities, for which he was awarded the State Prize. He led the team which designed a nuclear power station with a gas-cooled heavy-water reactor of enhanced safety.

The work of V V Vladimirskii in the field of nuclear physics is scientifically important. He made a major contribution to neutron spectroscopy. He proposed a novel mechanical chopper for neutron beams, based on the scattering of neutrons. This made it possible to master a new range of resonance energies in neutron spectroscopy. He guided an investigation of several possible variants of



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the interaction in beta decay of a free neutron with the aid of a new iron-free spectrometer operating in a toroidal magnetic field. Soon after the discovery of the effects associated with parity violation in weak interactions, he proposed (together with V N Andreev) an investigation of parity violation in the fission of heavy nuclei. This violation was later discovered at the Institute of Theoretical and Experimental Physics, in the fission of nuclei by polarised slow neutrons. V V Vladimirskii was the first to suggest a method for the confinement of ultracold neutrons in a magnetic trap. This original method was implemented at the Institute of Theoretical and Experimental Physics.

Vasilii Vasil'evich is blessed with the fortunate gift of a rare combination of skills as a physicist and as an engineer,

which enabled him to head and supervise to completion the commissioning of the first Soviet strong-focusing proton synchrotrons: that operating at 7 GeV at the Institute of Theoretical and Experimental Physics, and the 70 GeV synchrotron at Protvino. The latter delivered the highest energy and intensity of the time. The award of the Lenin prize in 1970 was a deserved recognition of this achievement. Immediately after the publication of the first fundamental work on the strong focusing principle, V V Vladimirskii predicted a dense network of resonances in the stability range of the betatron frequencies. This prediction was confirmed in practice and it was in fact a basic feature in the design calculations of all the succeeding accelerators.

In cooperation with I M Kapchinskii, V V Vladimirskii derived a self-consistent equation for the envelopes of betatron oscillations of particles moving in an arbitrary focusing channel, which took account of forces due to the space charge of the beam. This is now known as the K – V (Kapchinskii–Vladimirskii) equation and is used very widely in the theory of intense charged-particle beams. Vladimirskii, Kapchinskii, and Teplyakov also proposed new accelerating structures for linear accelerators with a remarkable property: the three-dimensional stability of the accelerated particles can be achieved in these accelerators simply by altering the configuration of the accelerating rf field without any additional electromagnetic fields. Such structures have become the basis of a new family of accelerators with rf quadrupole focusing. The rigid rule of awarding the Lenin prize only once prevented Vasili Vasil'evich from receiving it for the second time together with Kapchinskii and Teplyakov.

During the period of intensive search for higher symmetries, V V Vladimirskii proposed an investigation of the symmetries based on the SU(4) group and analysed the representations of this group. The group was subsequently used in the combined description of leptons and quarks.

A team investigating the physics of elementary particles and led by V V Vladimirskii developed an original methodology of magnetic spectrometers with optical spark chambers (subsequently, with wire spark chambers) subjected to a magnetic field. This methodology was mastered in a 6-m spectrometer attached to the U-70 accelerator at the Institute of Physics of High Energies. These spectrometers were used in a major programme of investigations of the processes involving neutral strange particles in the final state and in a search for new exotic resonances.

V V Vladimirskii trained a whole galaxy of scientists working successfully at the cutting edges of modern physics. For 25 years V V Vladimirskii was Editor-in-Chief of the journal *Yadernaya Fizika*, the main scientific journal on the physics of nuclear and elementary particles† in our country. His major experience as leader and scientist, and all his strength and knowledge, are serving our science.

We wish Vasili Vasil'evich most sincerely good health and further creative activities.

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†Translator's note: this journal is available in English translation as *Physics of Atomic Nuclei*, published until 1992 under the title *Soviet Journal of Nuclear Physics*.