
YURI ANATOLIYOVYCH BEREZHNOI
(to the 70th Anniversary of his Birthday)



On May 27, 2006, Professor Yuri Anatoliyovich Berezhnoi — the well-known Ukrainian physicist-theorist, the expert in nuclear physics, head of the theoretical nuclear physics chair at the V.N. Karazin Kharkiv National University — was 70 years of age.

Yu.A. Berezhnoi was born in the family of scientific researchers. Although his education at school fell on hard war and post-war years, his interest to physics and mathematics arose early and brought him, in 1953, to the nuclear department of the faculty of physics and mathematics at the Kharkiv State University. After graduating from the KhSU in 1958, Yu.A. Berezhnoi joined the theoretical department headed by O.I. Akhiezer at the Ukrainian Institute of Physics and Technology (nowadays, the National Science Center “Kharkiv Institute of Physics and

Technology”), where he had been working for more than twenty years. Since 1979, Yu.A. Berezhnoi has been working at the V.N. Karazin Kharkiv National University as the head of the theoretical nuclear physics chair.

Yu.A. Berezhnoi started his scientific activity under the guidance of the outstanding physicist-theorist O.G. Sitenko, in due course the Academician and Director of the Institute for Theoretical Physics of the National Academy of Sciences of Ukraine. His first researches dealt with the development of the approach new at that time to the description of nuclear reactions — the diffraction model of nuclear scattering. By the middle of the 1960s, he had obtained a number of original results in the framework of the theory of diffraction scattering of nucleons and light nuclei, with special attention having been paid to the processes of diffraction interaction of deuterons with, in particular, non-spherical nuclei. Some of these works were carried out in collaboration with the well-known nuclear physicist E.V. Inopin. The papers by E.V. Inopin and Yu.A. Berezhnoi, which were published during those years and where the influence of the smearing of a nucleus boundary on the diffraction scattering had been elucidated, are cited in the literature till now. On the basis of these researches, Yu.A. Berezhnoi prepared and, in 1965, successfully defended his Ph.D. thesis.

During the next decade, Yu.A. Berezhnoi continued the elaboration of the diffraction theory of interaction between complex particles (deuterons and three-nucleon nuclei) and nuclei. In 1965, he began his pedagogical activity: lecturing theoretical nuclear physics at the KhSU and guiding post-graduate students. Within that period, Yu.A. Berezhnoi, together with his disciples M.V. Evlanov, O.P. Soznik, M.A. Shlyakhov, and V.P. Vovenko, obtained a number of new results concerning the theory of deuteron splitting and nucleon transfer reactions and the diffraction theory of the processes with excitation of collective states of

target's nuclei. Some of those works were carried out with the participation of Academician O.I. Akhiezer. Yu.A. Berezhnoi, together with O.P. Soznik, also developed the theoretical models of elastic and inelastic scattering of protons and deuterons with high energies in the framework of the Glauber–Sitenko theory of multiple diffraction scattering (MDS).

In the middle of the 1970s, Yu.A. Berezhnoi began to develop the diffraction theory of polarization phenomena at the elastic and inelastic scattering of nucleons by nuclei which was an actual problem taking into account the progress in relevant experimental researches. The developed approach made it possible to explain the results of numerous polarization experiments.

In 1978, Yu.A. Berezhnoi successfully defended his thesis for a Doctor's degree. In 1983, he was conferred the academic rank of Professor.

At the beginning of the 1980s, Yu.A. Berezhnoi began to study the refractive effects of the nuclear rainbow type which occur at the scattering of light nuclei with intermediate energies. This topic was vital for experimental and theoretical researches that were carried out throughout the world. He engaged his disciple V.V. Pylypenko, as well as nuclear physicist-experimenters A.V. Kuznichenko and G.M. Onishchenko from the KhSU, in the work; and they were among the firsts in the USSR who succeeded in executing the precise measurements of the nuclear rainbow effect in the nucleus scattering cross-sections. Yu.A. Berezhnoi continued to study this problem in the 1980s and 1990s. The *S*-matrix approach for the analysis of the rainbow scattering of nuclei in elastic and quasielastic processes has been developed. In particular, Yu.A. Berezhnoi and V.V. Pylypenko predicted the manifestation of the nuclear rainbow effect in the recharge ($^3\text{He}, ^3\text{H}$) reaction; later on, a similar effect was revealed experimentally by the O.O. Ogloblin's group.

The important direction of Yu.A. Berezhnoi's researches in this period was the development of the microscopic theory of polarization phenomena at elastic and inelastic scattering of high-energy protons by nuclei on the basis of the MDS theory. Together with his disciples O.P. Soznik, G.V. Khomenko, V.V. Pylypenko, O.S. Molev, and I.M. Kudryavtsev, he carried out a number of works dealing with this subject. In those works, the theoretical approach for the quantitative description of the complete set of spin observables in such processes, including various functions of spin rotation and the Wolfenstein parameters, was improved. The relationships between various spin observables were established, and a number

of selection and phase rules for the observables were obtained.

A good number of Yu.A. Berezhnoi's works are devoted to the study of the influence of clusterization in light nuclei on the processes of nuclear scattering, including the polarization phenomena. In these works, Yu.A. Berezhnoi, together with his disciples G.V. Khomenko, V.V. Pylypenko, and V.P. Mykhailyuk, elaborated the microscopic approach, which was based on the alpha-cluster model with dispersion, applicable for several light nuclei. This approach was successfully applied first to describe the scattering of electrons, protons, antiprotons, and pions by ^{12}C and ^{16}O nuclei. For the first time, the influence of alpha-clusterization on spin observables has been revealed. Later on, this approach was applied to analyze both the scattering of protons by other alpha-cluster nuclei (^9Be , ^{13}C , ^{13}N , ^{20}Ne) and the collisions of two alpha-cluster nuclei.

In the 1990s, Yu.A. Berezhnoi returned to the problem of describing the reactions with the participation of few-nucleon nuclei taking into account their internal structure. Together with V.Yu. Korda, he proposed the general theory of diffraction processes, where two- and three-nucleon nuclei and lithium cluster nuclei are involved; the theory took into account the smearing of the nucleus-target's surface and the refraction of scattered waves at it. The classical results of the diffraction theory of the deuteron-nucleus interaction were generalized. It was proved that there exist two mechanisms of the deuteron stripping reaction which correspond to the "opaque" and "transparent" Serber models. The contributions of those mechanisms to the stripping cross-section are close to each other and important for the reproduction of experimental data. Making use of the hyperspherical coordinate method, the analytical expressions, invariant with respect to the nucleon rearrangement, were found for the integrated cross-sections of various processes of diffraction interaction between three-nucleon and other nuclei. Together with O.I. Akhiezer, O.P. Soznik, and his post-graduate student V.A. Slipko, Yu.A. Berezhnoi developed the theory that describes the two- and single-nucleon transfer reactions and the inclusive stripping reactions with participation of three-nucleon nuclei with intermediate energies. Together with V.A. Slipko, this theory was further generalized to describe the polarization characteristics of nucleons which are released in stripping reactions.

Yu.A. Berezhnoi is the author of several monographies and manuals on nuclear physics and

quantum mechanics. Three of them were written in the co-authorship with Academician O.I. Akhiezer.

His contribution to training the Ukrainian physicists-theorists in the domain of nuclear physics is considerable: while working at the KhPTI and the KhSU, he has trained eleven PhD's, six of which became Doctors of science.

In 2000, the scientific works of Yu.A. Berezhnoi were marked by the O.S. Davidov Prize of the NAS of Ukraine. At the end of 2005, in connection with the 201-st anniversary of the Kharkiv National University, the Academic council conferred him the honorary title "Honored Professor of the V.N. Karazin Kharkiv National University".

Besides the works in the domain of theoretical nuclear physics, Yu.A. Berezhnoi, since the 1980s, also publishes works dealing with the philosophy of science and the history of physics. In those articles,

the philosophical aspects of quantum mechanics and the theory of elementary particles and the methodology of scientific cognition are considered. Yu.A. Berezhnoi has deserved authority with the philosophers of the V.N. Karazin KhNU. He is a many-year member of the specialized council on the defense of theses for a doctor's degree in philosophy.

Yu.A. Berezhnoi generalized his huge teaching experience in a number of publications devoted to the technique of teaching physics at the university and the secondary school. He also published a number of popular scientific articles.

We wish you, our dear Yuri Anatoliyovich, good health, the further creative success, happiness with your family, and long years of life!

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