# Venedikt Petrovich Dzhelepov (on his eightieth birthday)

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Usp. Fiz. Nauk **163**, 127–129 (May 1993)

On April 12, 1993 corresponding member of the Russian Academy of Sciences Venedikt Petrovich Dzhelepov, an outstanding physicist and a prominent organizer of science well known for his research in the fields of physics of the atomic nucleus, of elementary particles, the physics and technology of powerful accelerators and their practical applications, celebrated his eightieth birthday.

The path traveled by Venedikt Petrovich in science began 55 years ago. Dzhelepov is one of the graduates of the famous Leningrad Physico-Technical Institute in which he under the guidance of A. I. Alikhanov carried out his first scientific investigations on nuclear physics devoted to the experimental test of the consequences of the Dirac positron theory.

In 1939, he began working with I. V. Kurchatov participating in the commissioning of the first in Europe cyclotron of the Radium Institute, and then, after serving in the army, in work on the construction at the LPTI of a more powerful cyclotron of 12 MeV. The joint scientific activity with I. V. Kurchatov determined Dzhelepov's entire further career. In August 1943, Dzhelepov joined the group of the first staff members of Laboratory No. 2 which is now known as the I. V. Kurchatov Atomic Energy Institute organized by I. V. Kurchatov for solving the uranium problem. Here he carried out research on the processes of fission of different uranium isotopes in order to determine the most important characteristic of the process—the number of secondary neutrons per fission event.

In 1948 Dzhelepov was given by Kurchatov a responsible task. He was appointed as the deputy direction on the scientific work of the new Laboratory being developed in Dubna (later the Institute for Nuclear Problems of the Academy of Sciences of the USSR. Dzhelepov participated directly in the creation in Dubna of the then largest in the world proton accelerator—the five-meter 500 MeV synchrocyclotron. The construction and commissioning in 1949 of this accelerator the energy of which in 1953 was brought up with the participation of Dzhelepov to 680 MeV signified the birth in our country of a new field of fundamental science—the physics of high energy particles. In this new field Dzhelepov demonstrates his great gifts as a scientist and a talented organizer of science.

When in 1956 the first international nuclear center was organized in Dubna—the Joint Institute for Nuclear Research—V. P. Dzhelepov was appointed the Director of the Laboratory for Nuclear Problems of this institute.

Venedikt Petrovich Dzhelepov

Since then in the course of more than 30 years Dzhelepov has been working without interruption as the Director, and during the last 5 years he is the Honorary Director of this Laboratory.

It is difficult to overestimate the contribution made by Dzhelepov to the task of organization and development of the Laboratory of Nuclear Problems. With his characteristic inexhaustible energy and rare capacity for work he manages to find time to familiarize himself with the work of all the scientific and production subdivisions of the Laboratory, and to have wide discussions with the scientific staff the problems of the investigations. He boldly promotes talented young scientists to leading roles in scientific work. The members of the team know well the constant attention of the Director to all their needs and his great benevolence. V. P. Dzhelepov knows how to create in his team a moral atmosphere conducive to fruitful scientific

 1063-7869/93/050447-03$10.00  

work, to the growth of scientific personnel, to the development of new scientific fields. A characteristic feature of the work carried out in the Laboratory is the high reliability and significance of the scientific results obtained. Under his direction the Laboratory for Nuclear Problems became a scientific center with world recognition and with a broad international collaboration.

The direct scientific activity of V. P. Dzhelepov is multifaceted. The important scientific results obtained by him in the course of many years have occupied a prominent place in world science. At the beginning of the 1950's he carried out a series of investigations on the interaction of high energy neutrons with nucleons and nuclei. In these investigations he obtained such fundamental results as the proof of the charge symmetry of nuclear forces at high energies, and the discovery of spin dependence of exchange forces in the neutron-proton system.

Later as a result of his experiments with collaborators on the study of the production of pions in nucleon collisions the hypothesis of charge invariance of nuclear forces was confirmed, and the study of polarization phenomena in double and triple scattering of nucleons made it possible to establish the considerable contribution of tensor forces to the interaction.

Dzhelepov made a significant contribution to the experimental investigation of weak interactions. Under his guidance the fundamental weak process—nuclear capture of muons in ultrapure gaseous hydrogen was investigated and the V-A variant of the Fermi universal theory of weak interactions was confirmed. The electron decay of negative pions was discovered.

To V. P. Dzhelepov belongs the undeniable priority in obtaining many fundamental results in the field of physics of muonic atoms and molecules of hydrogen. He is the initiator of carrying out large-scale investigations of muon catalysis of the reactions of nuclear fusion. Under his direct guidance the discovery was made of the resonance dependence on the temperature of the rate of formation of mesomolecules of deuterium. Subsequent investigations of Dzhelepov and collaborators of the resonance mechanism of the formation of mesomolecules a the Dubna synchrocyclotron confirmed the theoretical prediction of the high efficiency of muon catalysis in a mixture of deuterium and tritium and initiated a wide scale development of such work over the entire world. The aforementioned fundamental results are of interest from the point of view of the possibility in principle of utilizing the phenomenon of muon catalysis in power production. It is therefore not accidental that at the present time work on muon catalysis is in progress at all the meson factories; international conferences are organized, and a specialized journal "Muon Catalysis" is published. For his investigations on muon catalysis and muon-mesoatomic processes in hydrogen isotopes V. P. Dzhelepov was in 1986 awarded the I. V. Kurchatov Gold Medal and Prize of the Academy of Sciences of the USSR.

Dzhelepov is the initiator and pioneer of the development of the new promising direction of accelerator technology—the development of high-current accelerators. With a group of collaborators in 1959 he for the first time produced a cyclotron with a spiral variation of the magnetic field, and in 1967 he commissioned the electron model of a relativistic cyclotron which was used to model the "supercyclotron"—a proton accelerator to an energy of 800 MeV with currents amounting to several tens of milliamperes.

Under the direction of V. P. Dzhelepov in 1980–1985 a new accelerator was built on the basis of the magnetic flux circuit of the JINR synchrocyclotron—the high-current phasotron of 680 MeV with a spatial variation of the magnetic field. The phasotron is working reliably and yields an extracted proton beam intensity greater by a factor of 20.

On Dzhelepov's initiative using the synchrocyclotron and other accelerators of the Institute radiobiological and radiation-genetic investigations were started as a result of which allowable doses of irradiation by high energy particles for the personnel of accelerators and cosmonauts were determined, and the mechanisms of mutogenic action of ionizing radiations were established.

On a proposal by Dzhelepov and under his guidance in 1967 research was started for the first time in the USSR on the use of beams of fast protons for cancer therapy; later using the JINR phasotron there was developed and constructed a six-booth clinical-physical unit with medical beams of particles of various types; protons, negative pions and high energy neutrons. The unit is designed for and is utilized for the treatment of patients with malignant tumors and for medical-biological research.

On Dzhelepov's initiative in 1978 in the Laboratory for Nuclear Problems, a Department was created to study the physics of high-energy elementary particles, within the framework of which extensive work was carried out on the construction of new large-scale experimental facilities for research at the 70 GeV accelerator in Serpukhov and at CERN, and the preparation of the physics program for the accelerator and storage-ring facilities of the Institute for High Energy Physics. In experiments at the 70-GeV accelerator a number of important results has been obtained: antitritium was discovered, excited states of the pion were discovered, the polarizability of the pion was measured for the first time, a significant polarization of nucleons on scattering of hadrons with energies of tens of GEV was discovered, the decay was recorded of 1 $\pi^0$-meson into a gamma quantum and a positronium atom was recorded, and the form-factors were measured for the $K_{e_3}$- decay.

V. P. Dzhelepov devotes much attention to the education of young scientists. Many scientists that were schooled at the Laboratory for Nuclear Problems at present lead teams in other major Russian scientific centers, and also at Institutes of a number of the member countries of the JINR.

Dzhelepov carries out extensive scientific-organizational work. For many years he has been the deputy academician-secretary of the Division of nuclear physics of the Academy of Sciences of the USSR, he has worked as a member of the Committee on future accelerators of IUPAP, he headed the expert commission on physics of

the Higher Attestation Commission of our country. He has been without interruption the chairman of the Specialized council on the defense of doctoral dissertations at the Laboratory for Nuclear Problems; he is a member of editorial boards of the journals JETP and Physics of Elementary Particles and the Atomic Nucleus, and of the international journals "Charged Particle Accelerators" and "Muon Catalysis."

The scientific and the scientific-organizational activity of V. P. Dzhelepov has been widely recognized. Dzhelepov has been awarded two State Prizes of the USSR, has been awarded the Order of Lenin, two orders of the Red Banner of Labor, the Order of the October Revolution, and orders from Bulgaria, Mongolia, Hungary, medals of the USSR and other countries. He holds an honorary doctorate from the Dresden Technical University (FRG) and from the Shafarik University (Slovakia).

The amazing energy, unusual enthusiasm, inexhaustible optimism and rare benevolence of Venedikt Petrovich Dzhelepov evoke sincere admiration of his friends, pupils and collaborators.

We congratulate Venedikt Petrovich on his jubilee, and wish him good health and creative successes.

Translated by G. Volkoff