



JOINT INSTITUTE FOR NUCLEAR RESEARCH

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S. P. Ivanova

**THE JINR EDUCATIONAL PROGRAMME
IN 2003**

Report to the 95th Session
of the JINR Scientific Council
January 15–16, 2004

Dubna 2003

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More than ten years ago, joint Order of the Ministries of Education and Atomic Energy No. 28/33 was signed on January 16, 1991. It was titled "On Providing Staff for Research and Applied Work in Nuclear Physics, Elementary Particle Physics, Condensed Matter Physics, and High-Temperature Superconductivity." This Order initiated the specialized training on the basis of JINR of graduate students from Moscow State University (MSU), Moscow Engineering Physics Institute (MEPI), and, a little later, Moscow Institute of Physics and Technology (MIPT). On the grounds of this Order, the University Centre (UC) was established, whose 10th anniversary was celebrated on March 21, 2001.

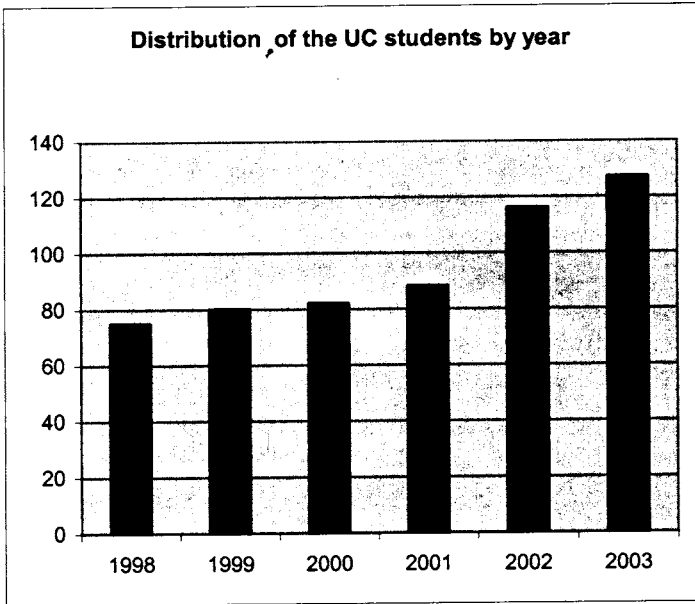
The main aims of the topic "Organization, Maintenance and Development of the University-Type Educational Process at JINR" are the following:

- Development and update of the curricula and programmes for physics students.
- Support of the postgraduate studies.
- Establishment of student and postgraduate exchanges between the UC and universities from JINR Member States and other countries on the basis of Agreements on Cooperation.
- Creation of a system of raising the professional skills of JINR's engineering and technical staff.
- Development of a computing and information technology complex for the university-type educational process and a database of the UC courses.

JINR's educational activities are coordinated by the UC Scientific Council under the chairmanship of the JINR Vice-Director Prof. A.N. Sissakian.

The Seven-Year Programme of JINR's Educational Activity Development is now in force. It is based upon the concept of continuous education, which presupposes that the training of highly skilled young specialists should begin as early as secondary school students being attracted to science by a special school laboratory practicum in physics.

Over the past five years, the UC's total graduate enrolment was more than 600 students from higher education institutions of JINR Member States.



At the UC, students of the fourth, fifth, and sixth years complete their education in the following fields:

- nuclear physics;
- elementary particle physics;
- condensed matter physics;
- theoretical physics;
- technical physics;
- radiobiology.

The specificity of university education is its versatility. It means that the students can choose lectures and lecturers; and a wide range of additional courses, including optional subjects, are available to them.

Below follows the list of some courses given at the UC:

Elementary Particle Physics; Relativistic Nuclear Physics; Theory of Fundamental Interactions, Quantum Chromodynamics, Theory of Nuclear Reactions, Atomic Nucleus Structure; Introduction to the Theory of Accelerators; Experimental Nuclear Physics; Modern Techniques of Detecting Nuclear Reactions and Nuclear Radiation; Programmable Logical Units; Fundamentals of Radio Engineering; Digital Devices and Their Application; Electronic Techniques of Ionizing Radiation Detection; Radiation safety and the Environment Protection; Mathematical Statistics; Object-Oriented Programming in C++; Programming in UNIX; Computing in High Energy Physics; Internet technologies; Computing Facilities in Nuclear Physics (seminar); Telecommunication Systems and World Information Resources; Visualization in Scientific Research; Operating the "Mathematica" System; English for Students; and English for Postgraduates.

Noted should be the active participation of JINR's scientists in the educational process. The UC's teaching staff totals over 50 annually.

The JINR Educational Programme is realized and developed in close cooperation with Russia's leading higher education institution. The UC has agreements on cooperation in education with a number of higher education institutions of Russia and JINR Member States, including the State Universities in the cities of Moscow, Tula, Tver, Voronezh, Belgorod, Kostroma, Saratov, and Yerevan; Ulyanov Chuvash State University; Gomel State University; and Far Eastern State University.

The UC tries to broaden its educational activity. The intensive use of the medical beams at the phasotron of the Laboratory of Nuclear Problems became the ground for establishing MEPI's new graduate department: the Department of Physics Methods in Applied Research and Medicine (No. 45). It is headed by Prof. N.A. Russakovich. At the UC, a branch was also opened of the Department of General Physics and Thermonuclear Synthesis, Moscow Institute of Power Engineering.

In the autumn of 1998, the authorities of JINR and Moscow Institute of Radiotechnique, Electronics, and Automatics (MIREA)

established a JINR-based graduate department: the Department of Electronics and Automatics of Physics Installations (headed by Prof. I.N. Meshkov). In 2001, MIREA's second JINR-based graduate department was established: the Department of Information Technologies for Computational Systems (headed by Prof. I.V. Puzynin). Thus MIREA students attend full-time diurnal programmes at the UC beginning with the first year. Their total enrolment at the UC is now 148. The UC offers them two auditoriums, a computer classroom, and a laboratory. In February 2004, MIREA's Department of Electronics and Automatics of Physics Installations will have its first graduation.

A special laboratory has been created at the UC for the demonstration of experiments in physics to secondary school students. The laboratory is being equipped; the Mechanics I, Mechanics II, and Optics installations have already been received. Classes have already begun.

In 1995, JINR opened its own postgraduate programmes in the following specialties:

01.04.16 – Nuclear and Elementary Particle Physics;

01.04.02 – Theoretical Physics;

01.01.20 – Charged Particle Beam Physics and Accelerator Techniques;

01.01.07 – Computational Mathematics;

01.04.07 – Solid State Physics;

01.04.01 – Physics Experiment Techniques, Instrument Physics, and Physics Research Automation.

In 1998, the following four specialties were added to the JINR postgraduate programmes:

05.13.11 – Mathematical Support of Computers, Computational Complexes, and Networks;

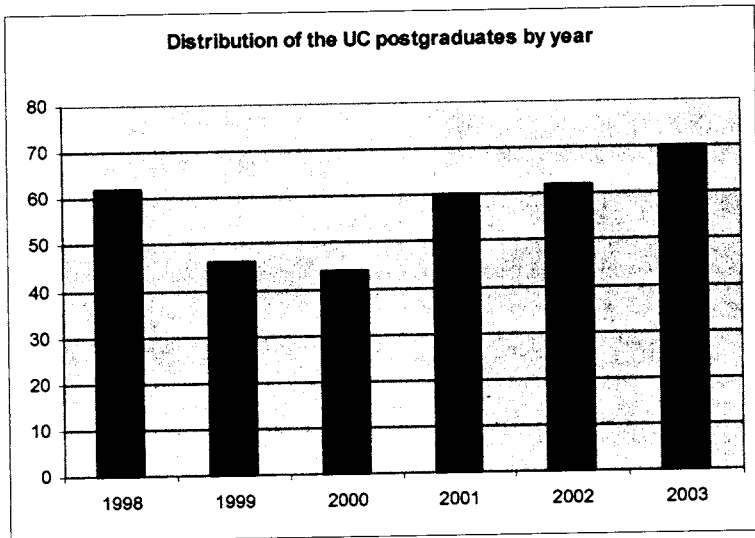
05.13.18 – Mathematical Modeling, Numerical Methods, and Software Complexes;

01.04.23 – High Energy Physics;

03.00.01 – Radiobiology.

This has attracted graduates from both the UC and JINR Member States. In 2003, a license to JINR from the Ministry of General and Professional Education for postgraduate professional educational activities was prolonged.

Up to now, 135 people have completed the JINR postgraduate programmes.



In 1997, the UC started a lecture cycle under the general title "Modern Problems of Natural Sciences." Within this cycle, lectures were given by JINR scientists and invited lecturers from JINR Member States and other countries. The following lecture courses were given in 2003:

- Prof. R. Kragler (University of Applied Sciences, Ravensburg – Weingarten, Germany), "Mathematica Tutorial Course. Part II";
- Prof. E. Kapuscik (Niewodniczanski Institute of Nuclear Physics, Krakow, Poland), "Introduction to the Theory of Open Systems";

- Prof. G. Stratan (Bucharest University, Romania), "Selected Issued of the History of Physics";
- Prof. D.I. Kazakov (JINR), "Supersymmetry in Particle Physics and Astrophysics;
- Prof. A. Sobiczewski (Warsaw, Poland), "Structure and Properties of Superheavy Nuclei".

In 2003, the UC began the practice of bilateral supervision of postgraduates, which means that postgraduates can have two co-supervisors of their dissertation work: a JINR scientist and a scientist of a JINR Member State. Within this system, the first postgraduate came from Poland to prepare her thesis both at the Dzhelapov Laboratory of Nuclear Problems and the Oncology Centre of Poznan.

Keeping in line with JINR's international character, the UC actively develops its international cooperation. Especially busy are the UC's ties with universities the Czech Republic, Poland, and Romania. In 2003, JINR was visited by 50 students from Poland, 17 students from the Czech Republic, 27 secondary school students from Germany, and 10 students from Romania. Besides coming on acquaintance visits to the JINR Laboratories, the students took the physics practicum and participated in research carried out at JINR.

Specially noted should be the development of contacts with Polish universities. The Bogoliubov – Infeld Programme was established to support Polish universities' and JINR's initiatives in working out and realizing educational projects. The UC's and Polish students and postgraduates exchange visits and participate in schools and conferences held both in Dubna and Poland. Especially actively involved in exchange are the universities of Poznan, Wroclaw, and Lodz.

In the first years after the introduction of the Bogoliubov – Infeld Programme, most of the visits by Polish students to Dubna had the character of acquaintance; but in the last two years, most of the visitors perform their diploma work at JINR. The aim of the visits has become more specific and is more closely connected with specific research teams of JINR's Laboratories.

It should be noted that these activities are supported by the plenipotentiaries of the concerned JINR Member States.

In 2003, the autumn Sessions of the JINR Programme Advisory Committee recommended that the topic "Organization, Maintenance, and Development of the University-Type Educational Process at JINR" be continued until the end of 2008 with the first priority, and supported a joint proposal by the UC, a number of Polish institutions of higher education, and the Czech Technical University to organize annual summer student practice in JINR's fields of research.

To provide further development of the specialty "Medical Physics," in November 2003, a workshop was held on the curricula and teaching methodology of this specialty. The workshop was attended by representatives of higher education institutions of JINR Member States and JINR. The concluding recommendations note the importance of such workshops and necessity of their continuation.

The UC actively develops its traditional ties with higher education institutions. In 2003, prolonged was a joint project by the UC and the Institute of Theoretical Physics of Giessen University (Germany), which is supported within the Leonard Euler Scholarship Programme of the German Academic Exchange Service (DAAD). Two postgraduates and a student of the UC specializing in theoretical heavy ion physics had additional scholarship during an academic year and a month's practice at Giessen University. In 2003, on the grounds of this work, a candidate's dissertation was defended and 7 articles were published.

In cooperation with a team of the Bogoliubov Laboratory of Theoretical Physics, JINR, theoretical investigations have been conducted in heavy ion physics. Within the dinuclear system model, the evaporation process in neutron-deficient nuclei was studied and different characteristics of the fission of heavy nuclei – for example, the fine structure of the mass-energy distribution – were calculated. The results allow one to conclude that cluster interpretation is quite helpful in understanding the properties of heavy nuclei. This research has yielded the following publications:

Shneidman T.M., Adamian G.G., Antonenko N.V., Jolos R.V., Scheid W., (2003): Phys. Rev. C 67 014313.
Zubov A.S., Adamian G.G., Antonenko N.V., Ivanova S.P., Scheid W., (2003): Physics of Atomic Nuclei 66, 218-232.
Shneidman T.M., Adamian G.G., Antonenko N.V., Ivanova S.P., Jolos R.V., Scheid W., (2003): Physics of Atomic Nuclei 66, 206-217.
Zubov A.S., Adamian G.G., Antonenko N.V., Ivanova S.P., Scheid W., (2003): Heavy Ion Phys. 18, in print.
Zubov A.S., Adamian G.G., Antonenko N.V., Ivanova S.P., Scheid W. (2003) Acta Phys. Pol. B 34, 2083-2090.
Zubov A.S., Adamian G.G., Antonenko N.V., Ivanova S.P., Scheid W. (2003): Phys. Rev. C 68 014616.
Andreev A.V., Adamian G.G., Antonenko N.V., Ivanova S.P., Scheid W. (2003): Submitted to Phys. Rev. C.

One of the UC's main activities is the organization and conduction of international schools and educational courses.

The Second International Summer Student School in Memory of Bruno Pontecorvo was held on September 7 – 18, 2003, in Alushta, Ukraine. It was attended by 32 participants from JINR, the Czech Republic, Germany, Russia, Ukraine, and Yugoslavia. The lectures were given by 15 prominent scientists of JINR, the Czech Republic, Italy, Japan, Ukraine, and the USA. The School materials, including lecture presentations, are available at the UC site (<http://uc.jinr.ru/iss2003/>).

The Second School on Nuclear Physics Methods and Accelerators in Biology and Medicine, which was organized jointly by the UC and Adam Mickiewicz University in Poznan, Poland, took place on June 19 – 30, 2003, in Poznan. (<http://uc.jinr.ru/2SummerSchool/>). The School's main aim was to acquaint students and postgraduates with the latest achievements and current problems of applied medical physics. The School was attended by students and postgraduates of Moscow State University, Moscow Engineering Physics Institute, and higher education institutions of the Czech Republic, France, Poland,

Romania, and Slovakia – 55 people altogether. The audience included the UC's students and postgraduates. The lecturers came from JINR, the Czech Republic, Poland, and Russia. Traditionally, it is the audience members' sessions of the schools where students give account of their work. Student reports must be considered one of the main successes of the Second School on Nuclear Physics Methods and Accelerators in Biology and Medicine. At the first school, the audience members made 12 reports; at the second school – 32.

The successful conduction of the School was predetermined by the support from the JINR Directorate and plenipotentiaries of the Czech Republic, Poland (the Bogoliubov – Infeld Programme), and Romania.

On April 16 – 19, 2003, Dubna University and the UC held a scientific conference of students and postgraduates. The conference consisted of four sections: physics, biophysics, earth sciences, and information technologies in science. It is planned to hold this conference annually.

In February, two UC students attended the Winter Student School on Theoretical Physics held by the Institute of Theoretical Physics of Wroclaw University, Poland. Their participation in the school was arranged within the education part of the Bogoliubov–Infeld programme.

The UC, jointly with JINR's Laboratories, has a regular practice of sending every year a student or two to participate in the CERN Summer Student Programme. In 2003, three JINR students attended this programme.

In 2003, like before, the UC was performing the training, retraining, and improvement of the qualifications of technical and working staff. The UC organizes and coordinates the training process on the basis of JINR's Laboratories and subdivisions. The training of new workers and training of workers in allied professions are conducted on an individual basis.

JINR's five new staff have been trained in the professions of radio and electronic equipment assembler, mechanical equipment

fitter, and others. Seven JINR staff have been trained in allied professions. 67 have completed the courses of training staff for the installations supervised by the Federal Technical Inspection. At the JINR Training Department, three staff of Dubna's organizations have been trained in professions that are within the jurisdiction of the Federal Technical Inspection.

During 2003, 54 JINR's authorities and leading specialists were trained and certified in industrial accident prevention. 88 JINR staff have been trained and certified in maintaining and operating hoisting mechanisms.

In 2003, 25 students of Technical Schools No. 67 and 95 and three students of higher education institutions and technical colleges had practice at JINR.

A branch of the courses training entrants to Moscow Engineering Physics Institute (MEPI) works at JINR. In 2003, 12 students of the city's secondary schools completed the courses.

In 2003, reports on the JINR Educational Programme were presented at the –

- workshop "On the Experience of Creating and Managing Educational Centres Based on Higher Education Institutions and Institutes of the Russian Academy of Sciences," May 27 – 29, Saratov, Russia;
- 1st Coordination Meeting "Perspectives of Life Sciences Research at Nuclear Centres," September 23 – 29, Varna, Bulgaria;
- EUPEN General Forum EGF2003, Upsala, Sweden, September 2003.

The UC's Internet site (<http://uc.jinr.ru>) has been regularly updated.

Макет Т. Е. Попеко

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