

# UNIVERSITY CENTRE

JINR's educational activities are coordinated by the University Centre (the UC) Council under the chairmanship of the JINR Vice-Director Prof. A. N. Sissakian. 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 the UC physics students.
- Coordination of the functioning of the postgraduate studies.
- Organization of student schools and establishment of student and postgraduate exchanges between the UC and foreign universities on the basis of Agreements on Cooperation.
- Creation of a system for raising the professional skills of JINR's engineering and technical staff.

Over the past five years, the UC's total graduate enrolment was more than 600 students from higher education institutions of JINR Member States (Fig. 1).

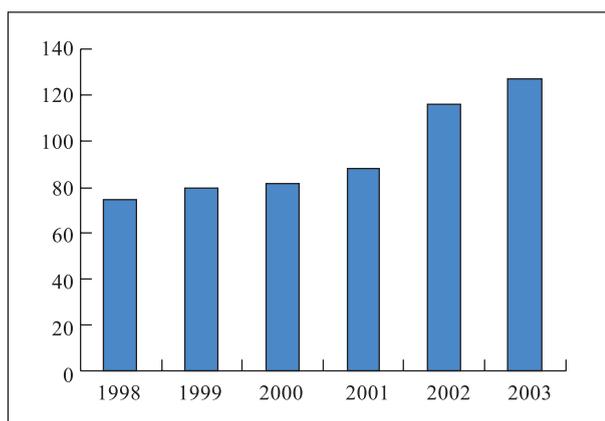


Fig. 1. Distribution of the UC students by year

In 2003, the University Centre had a total enrolment of 275 students of higher education institutions of JINR Member States. The students' curricula had been elaborated jointly with their home institutions, which

sent the students to the UC to complete their graduate programmes. The UC students' breakdown by higher education institution is as follows: 35 of Moscow Institute of Physics and Technology, 16 of Moscow State University, 15 of Moscow Engineering Physics Institute, 12 of Tver State University, 7 of Voronezh State University, and altogether 42 of other higher education institutions of JINR Member States (Armenia, Belarus, the Czech Republic, Georgia, Russia, Slovakia, and Ukraine). Also, 148 students of Moscow Institute of Radiotechnique, Electronics, and Automatics attend the UC-based programmes.

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 Infor-

mation Resources; Visualization in Scientific Research; Operating the «Mathematica» System; English for Students; English for Postgraduates; and Introduction to Object-oriented Analysis Exemplified by the ROOT Framework.

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 institutions. The geography of the UC's ties with Russian higher education institutions is not limited to Moscow; rather, it extends all over Russia. 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, Yerevan, and Gomel; the Far Eastern University, and more.

Within the lecture cycle «Modern Issues of Natural Sciences», the following 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 (University of Bucharest, Romania), «Selected Issues 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».

The list of the UC's publications for its students and postgraduates extended to include the following textbooks:

*Stratan G.* Selected Issues of the History of Physics. Part 1. Dubna: JINR, 2003;

*Krasil'nikov V. V., Kuraev E. A.* Mathematical Physics Equations. Part II. Dubna: JINR, 2003;

*Kuraev E. A. et al.* Statistical Physics. Dubna: JINR, 2003;

*Solovieva T. M.* Introduction to Object-oriented Analysis Taking ROOT Framework as an Example. Dubna: JINR, 2003.

In 2003, the UC continued its postgraduate programmes in the following 10 specialties of physics and mathematics:

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;

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 attracts graduates from both the UC and JINR Member States. In 2003, JINR had its license from the Ministry of General and Professional Education for postgraduate professional educational activities prolonged.

Since 1995, 135 people have completed the JINR postgraduate programmes (Fig. 2). This year, the UC's total postgraduate enrolment has been 70.

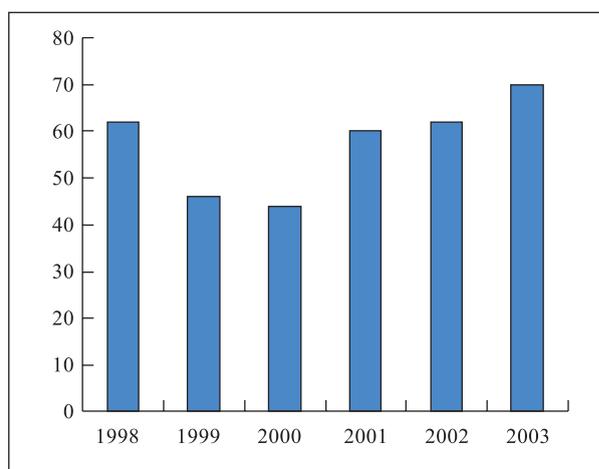


Fig. 2. Distribution of the UC postgraduates by year

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. This year, the first postgraduate from Poland started studies on the basis of both the Dzhelepov Laboratory of Nuclear Problems and Oncology Centre in Poznan.

In 2003, a UC-based elective course of physics for secondary school students started its regular work. The main aims and tasks of the course are the following:

- lending help to secondary school students in studying physics at an advanced level;
- elaboration of methodology and performance of practical exercises in the basic chapters of general physics;
- teaching the techniques of measurements in physics and correct evaluation of measurement errors;
- development of research work elements and their introduction into the students' practical activities.

The course has a special laboratory at the UC, where practical classes are offered in the following fields: mechanics; optics; molecular physics and thermodynamics; and electricity and magnetism.

Keeping in line with JINR's international status, the UC attaches great importance to its international cooperation. Especially busy are the UC's ties with universities of 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 at the UC and participated in research carried out at JINR.

Specially noted should be the development of the UC's contacts with Polish universities. The UC's and Polish students and postgraduates exchange visits and participate in schools and conferences held both in Dubna and in Poland. Especially actively involved in exchange are 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 research teams of JINR's Laboratories.

It should be noted that this activity is supported by the plenipotentiaries of the concerned JINR Member States.

In 2003, the autumn sessions of the JINR Programme Advisory Committees supported a joint proposal by the UC, Moscow Engineering Physics Institute, Moscow Institute of Physics and Technology, 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.

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

The Second International Summer Student School on Neutrino Physics in Memory of Bruno Pontecorvo was held on 7–18 September 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 International Student 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 19–30 June 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 the UC, Moscow State University, Moscow Engineering Physics Institute, and higher education institutions of the Czech Republic, France, Poland, Romania, and Slovakia — 55 people altogether. 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.

On 16–19 April 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's 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 UC's 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 milling machine operator. Seven JINR staff have been trained in allied professions of painter, wood-processing machine operator, mason, and electric and gas welding operator. Sixty-seven have completed the courses of training staff for the installations supervised by the Federal Technical Inspection (the audience included load slingers, high pressure vessel operators, operators of hoists controlled from the floor, and compressed gas balloon operators). 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 in industrial accident prevention and certified as members of the JINR Central Certification Commission and certification commissions of JINR's Laboratories and subdivisions. Eighty-eight JINR staff have been trained and certified in keeping hoists in working order; safe operation of cranes; maintenance and safe operation of high pressure vessels.

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.

In the academic year 2003–2004, the audience of the courses training entrants to Moscow Engineering Physics Institute (MEPI) is 12 secondary school students of Dubna. Twelve graduates of these courses of the previous academic year entered a number of higher education institutions, including MEPI, Moscow State Academy of Instrument Making and Information Technologies, and Moscow Institute of Road Construction.

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). Within this project, 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, and Giessen University, 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 [1–7].

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», 27–29 May, Saratov, Russia;
- the 1st Coordination Meeting «Perspectives of Life Sciences Research at Nuclear Centres», 23–29 September, Varna, Bulgaria;
- EUPEN General Forum EGF2003, September, Uppsala, Sweden.

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

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