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JOINT INSTITUTE FOR NUCLEAR RESEARCH

99-333

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**THE JINR EDUCATIONAL PROGRAMME
IN 1999**

Report to the 87th Session
of the JINR Scientific Council
January 13–14, 2000

Dubna 1999

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In 1999, the University Centre (UC) of JINR continued its activities within the first-priority topic “Organization, Maintenance, and Development of the University-Type Educational Process at JINR”.

Students of the fourth and fifth years complete their university education at the UC in the following areas:

- Nuclear physics;
- Elementary particle physics;
- Condensed matter physics;
- Theoretical physics;
- Technical physics;
- Radiobiology.

In the spring semester (autumn semester in parentheses) of 1999, there were 80 (69) students from Russia and other JINR Member States at the UC.

Below follows a table reflecting the distribution of the UC students over its main institutions of higher education.

Institution	Spring semester 1999	Autumn semester 1999
Moscow State University	14	13
Moscow Engineering Physics Institute	19	19
Moscow Institute of Physics and Technology	18	18
Institutions of other JINR Member States (Armenia, Georgia, Russia, Slovakia)	29	19

30 diploma theses were defended by students of MSU, MEPI, MIPT, and other universities, as well as two Bachelor’s theses by MIPT students. 44 JINR staff members participated in the education process as lecturers and instructors.

In 1998, a new form of tuition was introduced at the UC: the target training of specialists from the JINR Member States. This year, a second group of fifth-year students of Bratislava Technical University (Slovakia) began studying at the UC on the special programme of training specialists for the cyclotron complex in Slovakia. The students have individual curricula coordinated with the Dean's Office of the Faculty of Electrical Engineering and Information Technologies of Bratislava Technical University. The plenipotentiary representative of Slovakia allotted a special grant to the UC in 1999.

In the current academic year, the UC and the Laboratory of Theoretical Physics of JINR announced the enrollment of students in the programme of educating theoreticians in elementary particle physics.

In 1999, the N.N. Bogoliubov Scholarship was established for the most gifted UC students and post-graduates specializing in theoretical physics. The scholarship winners were paid this scholarship for half a year.

The JINR post-graduate studies continued to function in ten specialties of physics and mathematics:

01.04.16 – nucleus 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;

01.04.23 – high energy physics;

05.13.11 – mathematical and software support of computers and computational complexes, systems, and networks;

05.13.16 – computer facilities, mathematical simulation, and mathematical methods in scientific research;

03.00.01 – radiobiology.

In the spring semester (autumn semester in parentheses), there were 46 (44) students in the JINR programmes of post-graduate studies.

The following table reflects the distribution of the UC post-graduates over the JINR Laboratories in 1999.

	Number of post-graduates Spring 1999	Number of post-graduates Autumn 1999
Laboratory of Theoretical Physics	10	9
Laboratory of Nuclear Problems	10	9
Laboratory of Nuclear Reactions	2	2
Laboratory of Neutron Physics	6	5
Laboratory of High Energies	3	3
Laboratory of Particle Physics	6	6
Laboratory of Computing Techniques and Automation	4	7
Department of Radiation and Radiobiological Research	4	2
University Centre	1	1

In June, Yu. Kopach, a scientist at the Department of Nuclear Physics of the Laboratory of Neutron Physics and a member of the first group of post-graduates who had completed their post-graduate studies at the UC, successfully defended his doctoral thesis at a session of the Scientific Council of the Laboratory of Nuclear Reactions and the Laboratory of Neutron Physics. Five post-graduates have already defended their doctoral theses, and they all work at JINR Laboratories.

In 1999, a lecture cycle under the general title "Modern Problems of Natural Sciences" for post-graduates continued at the UC. Given were lectures "Accelerators of Charged Particles and Colliders", Prof. I.N. Meshkov, and "Neural Networks and Cell Automata in High-Energy Physics Experiments", Dr. I.V. Kisel.

On September 26—28, Prof. Robert Kragler, Head of the Computational Centre of the University of Applied Sciences in Ravensburg – Weingarten (Germany), visited Dubna at the invitation of JINR. It was his second visit to JINR. During his first visit, which took place in October 1998, he gave a course of lectures at the University Centre (UC) of JINR on the “Mathematica” computer system. This time, R. Kragler discussed with the Director of the UC the prospects for the co-operation between the two educational institutions with regard to student and faculty exchange.

On June 1, a second group of UC post-graduates, who enrolled in the spring of 1996, had a ceremony of completing their studies. Out of 13 post-graduates who had fulfilled their post-graduate programmes, 12 remained at JINR for further work.

RUSSIA’S PARTICIPATION IN JINR

The JINR educational programme is being realized and developing in close co-operation with Russia’s leading institutions of higher education.

The UC owes its establishment to Russia’s largest institutions of higher education turning out physicists. The order on educating specialists in physics and a number of related specialties was prepared by the State Committee on Education and the Ministry of Atomic Energy and Industry in January 1991 on the representation of the authorities of JINR, MEPI, and MSU.

Noted should be the large contribution of MSU to the education of the staff for JINR, which has been performed since 1961 on the basis of the departments of the Faculty of Physics and the Dubna branch of the Institute of Nuclear Physics of MSU.

After the establishment of the UC, the educational activity of JINR was actively joined by MIPT, and a graduate department of the Faculty of General and Applied Physics of MIPT was established at JINR.

The geography of the co-operation between the UC and institutions of higher education of Russia, however, is not limited to

Moscow. Rather, it extends over all Russia. Fig. 1 shows the cities with whose universities the UC has concluded agreements on co-operation in education.

The target tuition of students, which is a special feature of the UC, has also touched on the institutions of higher education of Russia. In 1999, groups of physics students from Tver State University are studying according to individual curricula and have practice at the Flerov Laboratory of Nuclear Reactions.

In 1998, the joint tuition of first-year students began. At the Moscow Institute of Radio Engineering, Electronics, and Automatics (MIREEA), a department has opened that educates students in the specialty “Electronics of Physics Facilities”. The department is located in Dubna, and tuition is performed at the Dubna branch of MIREEA and at the UC.

The UC has agreements on co-operation in education with many institutions of higher education of Russia and JINR Member States. Among them are I.N.Ulyanov Chuvash State University, Far East State University (Vladivostok), and Omsk, Tbilisi, Tomsk, Tula, Tver, and Voronezh State Universities.



Fig. 1

INTERNATIONAL CO-OPERATION

To keep up the traditional ties in education and to facilitate the training of the staff, the student exchange between the UC and universities of Eastern Europe goes on. It has become a tradition to receive student groups and individual students coming to Dubna with visits of acquaintance. Regularly held are summer courses, schools, and special seminars, which are attended by participants from Russia, countries of Western Europe, and CIS. Especially active in co-operation with the UC are universities of Poland, Slovakia, and the Czech Republic.

In May, a workshop on co-operation in education was held at the UC within the Bogoliubov – Infeld programme. A group of professors from universities of Białystok, Gdańsk, Kraków, Łódź, and Lublin, and Szczecin Polytechnical Institute discussed with the UC authorities the possibilities and areas of the JINR educational programme. The participants of the workshop were acquainted with the scientific programmes of all the JINR Laboratories and visited the basic facilities of JINR. Special attention was paid during discussions to the issues of co-operation with Polish institutes and universities.

The resolution of the workshop notes necessity of the exchange of student group visits, the scientific and lecture programmes of the visits to be prepared in advance; exchange of information on schools, seminars, and conferences for students, post-graduates, and specialists; and mutual participation in them. Specially emphasized is high efficiency of performing the diploma research at the JINR Laboratories and the UC, which is supervised by scientists of Polish universities and JINR Laboratories.

In September, the Fifth School of Young Scientists “Problems of Accelerating Charged Particles” was held in Ratmino. Its participants came from Russia, CIS countries, and Slovakia. The School was supported by JINR Directorate, the UC, the Laboratory of Particle Physics, the Ministry of Science, the Russian Foundation for Basic Research, Moscow Engineering Physics Institute,

Centre of Fundamental Physics in Moscow. The School programme consisted of two parts: 1) Acceleration of heavy ions and their application in nuclear physics and nuclear reactions, and 2) Synchrotron and undulator radiation, and application of synchrotron radiation sources and free electron lasers in physics and adjacent areas of science and industry. The second part of the programme is connected with the training of specialists for the future synchrotron radiation source DELSY. The School participants attended a seminar dedicated to the memory of V.P. Sarantsev.

In October, a group of students of Adam Mickiewicz University (Poznań, Poland) and a group of students and post-graduates from Kraków and Lublin (Poand) visited JINR. Both groups were acquainted with the UC, Laboratory of Computing Techniques and Automation, Phasotron Research Department of the Laboratory of Nuclear Problems, and research performed at the medical beam; they have also visited the Laboratory of Theoretical Physics, Laboratory of Nuclear Reactions, and Department of Radiation and Radiobiological Research. The student and post-graduate student exchange between JINR and Poland is supported within the Bogoliubov – Infeld programme (in its educational part).

Two UC post-graduate students participated in the 35th Winter School on Theoretical Physics “From Cosmology to Quantum Gravity”, which took place on February 2—12, 1999, in Poland.

Within the co-operation between the International Atomic Energy Agency (IAEA) and JINR, a second IAEA nine-week regional course on radiation protection was conducted at the UC, which began on September 13. The make-up of the participants was determined by IAEA and its Member States and represented 11 countries of the region. The main aim of the course consisted in educating young specialists and managers for various spheres of the radiation safety infrastructure of these countries on the basis of international recommendations. The course was conducted on the basis of the University Centre and the Department of Radiation and Radiobiological Research of JINR. Within the course, its partici-

pants attended more than 130 lectures and performed 17 laboratory exercises.

25 young specialists of Armenia, Belarus, Bulgaria, Estonia, Georgia, Kazakhstan, Latvia, Lithuania, Moldova, Ukraine, and Uzbekistan attended the lecture course covering physical and biological fundamentals of radiation protection; radiation detection techniques; radiation magnitudes and units; external and internal irradiation monitoring; biological effects of ionizing radiation; radiation safety of personnel; medical irradiation; radiation protection principles; and engineering-related irradiation of population.

Scientific visits were arranged for the course participants to the basic facilities and the radiochemical laboratories of JINR, the Radiological Clinic and the Whole-Body Counter Laboratory of the Institute of Biophysics (Moscow), and the "Radon" Nuclear Waste Management Enterprise (Sergiyev Posad). The lectures at the course were given by more than 30 leading JINR scientists, and lecturers invited by IAEA

Summing up the results of the course, Mr. A. Bilbao, an IAEA officer and head of an IAEA Department, noted the high professional level of the course and its good organization. In his opinion, JINR's experience in conducting international courses like this, its good educational and organizational potentialities, the availability of highly qualified specialists in all the disciplines taught, and the Institute's unique variety of ionizing radiation sources make the ground for the co-operation between IAEA and JINR in educating specialists in radiation protection for Eastern Europe and Asia becoming permanent.

Within the frames of the programme of the German Service of Academic Exchanges (DAAD) "Leonard Euler Scholarships", a joint project of the UC and the Institute of Theoretical Physics of the University of Giessen (Germany) has been supported. Two UC post-graduates and one graduate student performing theoretical research in heavy ion physics are paid an additional scholarship during the current academic year and will have a month's practice in Giessen.

For the second time, jointly with the Faculty of Physics and Inter-Faculty Centre for Matter Structure and New Materials of MSU, the UC participated in the conduction of student academic practice in medical physics. 18 students of MSU and Voronezh State University, who had completed their fourth year, for two weeks attended lectures, had academic practice, and were acquainted with the JINR Laboratories and basic facilities.

In September 1999, the second conference of the European Physics Society "Trends in Physics" was held in London, Great Britain. The Director of the UC participated in this conference. The UC is a member of the European Physics Education Network (EUPEN).

In early October, the Director of the UC participated in the celebration of the 10th anniversary of the friendship between the sister cities of Dubna and La Crosse (Wisconsin, the U.S.) as a member of the Dubna delegation. The negotiations with the rectorate of the University of Wisconsin - La Crosse (UWL) resulted in signing a new Agreement on Co-operation between UWL and the "Dubna" University. The documents were signed that regulate specific measures within the student exchange programme, which also includes the UC.

In the summer of 1999, 18 students of the Nuclear and Engineering Physics Faculties of Prague Technical University spent two weeks in Dubna. They visited the JINR Laboratories and basic facilities, and participated in the conference "New Physics in Non-Accelerator Experiments". The aim of this visit was to lay the foundation of the co-operation between Prague Technical University and the UC. One of the members of this student group will begin studying at the UC in February 2000.

According to the agreement between Lund University (Sweden) and JINR, a UC post-graduate student participated for three months in the DELPHI experiment as a member of the team of Lund University.

In May 1999, a UC student participated in the 3rd Pontecorvo School on Physics on Capri, Italy. Two UC students participated in the CERN Summer Student Programme.

In August, a UC student participated in a conference of the International Association of Physics Students (IAPS), which was held in Helsinki (Finland). Such conferences are held annually in different countries. Students of physics and chemistry attend these conferences and present their reports on their research. This year, the conference participants came from 38 countries, including Australia, CIS, Portugal, and the U.S. Russia was represented by students from MEPI, MSU.

Since 1999, the UC turns out and retrains workers and improves their qualifications. The UC organizes and controls their training on the basis of JINR Laboratories and divisions. Workers are trained in new and related specialties both individually and in groups. Altogether, 43 people were trained this year, out of whom 34 JINR staff members acquired professions that are within the jurisdiction of the National Technical Inspection. The qualifications of workers are improved by establishing on-the-job training courses and target training courses. 329 people completed such courses during this year.

92 JINR staff members completed the courses of raising the skills of the engineering and technical staff that were conducted at JINR and other educational institutions of Moscow, St. Petersburg, Obninsk, and Dmitrov.

On-the-job practice was organized at JINR Laboratories and manufacturing divisions for 42 students of technical schools and colleges.

Since 1999, a branch of the courses of the tuition of MEPI entrants functions in coordination with the UC. In the academic year 1999—2000, 42 students (in two groups) attend these courses. In November, 30 students of these courses participated in the competition in physics and mathematics hosted by MEPI.

Regularly updated has been information at the UC Web site (<http://uc.jinr.ru>).

In 1999, the reports on the JINR educational programme were presented:

- At the conference of the European Physics Society “Trends in Physics”, in the section of the development of physics

education in Europe, under the title “Organization of Physics Education at an International Scientific Institute (JINR, Dubna)”;

- At the conference “Science Cities: a Dialogue between Science and Education”, under the title “JINR as an Example of a Union of Science and Higher Education”.

Theoretical research into the interaction between heavy ions and nuclei is performed at the UC (G. Adamian, N. Antonenko, S. Ivanova, W. Scheid – Nucl. Phys. A 646, 1999, pp. 29—52; T. Shneidman, G. Adamian, N. Antonenko, S. Ivanova, W. Scheid – Nucl. Phys. A, in print).

Received by Publishing Department
on December 17, 1999.