

# Forty years of the Joint Institute for Nuclear Research

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**Abstract.** 1996 marks the 40th anniversary of the Joint Institute for Nuclear Research — an event which is widely celebrated. For four decades of its existence, the Joint Institute has made a distinguished contribution to the development of science and technology. Since its foundation on 26 March 1956, excellent researches have been performed at JINR in various fields of modern physics, accelerator and reactor techniques and numerous specialists for the Member States have been trained. JINR has at present 18 Member States. Also, the Joint Institute has bilateral agreements with BMBF (Germany) and the Hungarian Academy of Sciences signed at the governmental level. The Joint Institute takes active part in international collaborations at CERN (Geneva), IN2P3 (France), INFN (Italy), BNL, FNAL (USA), and at other scientific centres throughout the world. JINR today is an internationally recognised scientific centre which incorporates the fundamental research of the structure of matter, development and application of high technologies, and university education in the relevant fields of knowledge. The celebrations on the occasion of JINR's 40th anniversary were held at the Institute on 26–27 March 1996. At the 80th session of JINR's international Scientific Council held on 27 March, the Dubna scientists, their colleagues, and partners delivered reports on various activities of this international centre. Some of these reports are published in this issue.

Thinking about what the combination of words, so customary for us, — the Joint Institute for Nuclear Research — means, I answer this question as follows.

It is, first of all, the JINR people who have been working here and laid all their life on its altar.

It is the scientists who are capable of solving the most complicated problems of the physics of microworld. It is the engineers, technicians, and workers who can with their own hands make everything, even a modern superconducting accelerator. It is the office workers of numerous auxiliary services who ensure the well-organized functioning of the Institute.

Physics has always been deservedly called the leader of natural sciences. Soon after it emerged, nuclear physics has found itself in the forefront of physics.

The foundation of JINR fell on the years of rapid development of nuclear physics.

After the end of World War II the world came to realise that nuclear science should not be confined to secret laboratories and that only wide international co-operation could insure progress in this fundamental realm of human knowledge and peaceful utilisation of atomic energy. Fast-growing complexity and intensity of scientific investigations required collaboration not only of separate scientific centres and industrial branches, but also of specialists of different countries. In 1954 the European Organisation for Nuclear Research (CERN) was established near Geneva to unite the efforts of West European countries in studying the fundamental properties of the microcosm. One and a half year later (on March 26, 1956), a similar step was undertaken on the initiative of the USSR government, and the Joint Institute of Nuclear Research was started at Dubna. On the Soviet side, the new centre was patronised by the Ministry of Medium Machine-Building of the USSR, a predecessor of the present Ministry of Atomic Energy of Russia.

It was just upon completing the construction of world's first atomic power station at Obninsk that Professor D I Blokhintsev was elected the first Director of JINR. The first Vice-Directors of JINR were Professor M Danysz (Poland) and Professor V Votruba (Czechoslovakia).

It was just one of the most difficult and crucial periods of Institute's life, the time of its formation, that fell to the first Directorate's lot.

As I noted, CERN and JINR sprang up practically simultaneously.

These centres have much in common and it is significant that they started collaborating very soon after their foundation. There appeared joint experiments, publications, conferences, and schools for young scientists. This collaboration has always been increasingly developing. At present, JINR actively participates in the project of the Large Hadron Collider realised at CERN. This project is meant for decades.

Being in close contacts with each other even in the most gloomy years of the Cold war, scientists from JINR and CERN performed a noble mission promoting mutual understanding among people from different countries. I would like here to recall the wise sayings of the Russian empress Elizaveta Petrovna: "The deeds of mind enlightening root out the evil".

40 years: is it long or not? For a human being this is a considerable period that might cover the whole life of activity. And for an Institute? For science? If we dwell upon the last two words of the JINR name 'nuclear research', we should recognise that vigorous events and revolutionary changes have occurred in that field for the 'period under review'. Let us take, for instance, elementary particle physics.

In 1961, when the JINR prizes were initiated, one of the prizes was awarded to the group of scientists headed by

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The signing of the Convention on the foundation of the Joint Institute for Nuclear Research. Moscow, 26 March 1956.

Vladimir Iosifovich Veksler and Chinese Professor Wang Ganchang for the discovery of  $\bar{\Sigma}$ -hyperon. No one then had doubts that  $\bar{\Sigma}$  is an elementary particle but only several years later it, like the proton, neutron,  $\pi$ -, K-mesons, and other so-called hadrons were denied of being elementary particles. These objects turned out to be composite particles composed of quarks and antiquarks which acquired the right to be called elementary. But how long will it be so? This is another question that may happen to be answered at JINR's next jubilee.

Dubna physicists have much contributed to the understanding of the quark structure of hadrons. They have proposed the concept of color quarks, a quark model of hadrons, the so-called 'Dubna bag', etc. Much can be said about rapid progress in the given field for the past 40 years. Yet, there is an opposite example. 40 years ago, soon upon the foundation of JINR, B M Pontecorvo put forward the hypothesis of neutrino oscillations which are still searched for without success at many laboratories of the world, more and more sophisticated experiments being planned. 40 years turned out in this case to be short.

The JINR became widely known in the very first months of its existence. I remember one of the teachers popular then at the Physics Department of Moscow State University advise students: "Do your best to get in Dubna; Moscow is a province". I followed that advice.

The outstanding scientist Academician N N Bogolyubov worked at Dubna for a long time. His scientific heritage is so great that, I think, the Bogolyubov Symposia held regularly at Dubna are not sufficient to comprehend it. Nikolaï Nikolaevich was Director of the Institute for almost 25 years. Thanks to him and his numerous followers, at present

prominent scientists, Dubna has become a 'scientific Mecca' for the theorists eager to work at the world level.

We are also proud of the Dubna scientific schools founded by D I Blokhintsev, V I Veksler, B M Pontecorvo, G N Flerov, and I M Frank which have been a success for all the decades.

What is JINR today? It is a world-known scientific centre where the fundamental (theoretical and experimental) research is combined with applied investigations and university education. The rating of JINR in the world scientific community is very high.

The Institute has at present 18 Member States: Republic of Armenia, Azerbaijan Republic, Republic of Belarus, Republic of Bulgaria, Czech Republic, Republic of Cuba, Republic of Georgia, Republic of Kazakhstan, Democratic People's Republic of Korea, Republic of Moldova, Mongolia, Republic of Poland, Romania, Russian Federation, Slovak Republic, Socialist Republic of Vietnam, Ukraine, Republic of Uzbekistan. The name of the Institute is written at the entrance to its administrative building 18 times. Participation of Germany and Hungary in JINR's activities is based on bilateral agreements signed at the government's level.

JINR employs over 6,000 people, including 1,000 scientists, about 2,000 engineers and technicians. Among the scientists there are over 200 Doctors of Sciences and 640 Candidates of Sciences. The Institute comprises seven Laboratories, each being comparable with a large institute in the scale and scope of investigations performed.

In Dubna there are accelerators of charged particles and nuclei of widely varying energies. They are unique in their class. Apart from the synchrocyclotron and the synchrophasotron, there are accelerators of heavy ions U-200 and U-400.



N N Bogolyubov and the first director of JINR D I Blokhintsev. Dubna, 1963.

In 1993 a beam of ions was extracted from a new accelerator U-400M. In 1993–1994 a superconducting accelerator of relativistic nuclei, the nuclotron, was put into operation. Research is also carried out with a pulsed fast-neutron reactor IBR-2. In 1994 the project IREN entered the implementation stage, which means construction of a high-current pulsed source of resonance neutrons. Projects of a charm-tau factory (electron and positron storage facility) and of a special synchrotron radiation source are under development at JINR.

JINR is a scientific centre equipped with powerful and fast computation means integrated into the world computer nets.

It is difficult in this article to present all the major scientific results obtained by the JINR scientists.

Instead, I'll present some statistical data. Around 600 preprints and communications are published every year at the Institute. JINR publishes world known journals *Fiz. Elem. Chastits At. Yadra* [*Phys. Part. Nucl.*], *JINR Rapid Communications*, annual reports of the JINR activity, the information bulletin *JINR News*, as well as Proceedings of conferences, schools, and symposia organised by the Institute. The JINR library stock consists of more than 400,000 books and periodicals. About 500 scientific papers and reports are submitted by JINR to editorial boards of journals in many countries and organising committees of conferences every year. JINR publications are sent to over 50 countries. Many first-class achievements belong to Dubna scientists. JINR accounts for a half of the discoveries (around 40) in nuclear physics registered in the USSR.

The world scientific community has recognised the priority of JINR in discovering elements 102–105 of the periodic table and JINR's great contribution to the discovery of elements 106–108. The proposal of the IUPAC to call element 104 'Dubnium' can be regarded as recognition of the outstanding contribution made by our scientists to modern science.



A guest of JINR — the outstanding scientist Niels Bohr. Dubna, 1961.



World-famous physicist and public figure F Joliot-Curie visited JINR in 1958. In the photo (left to right): M Danysz, B Pontecorvo, J Laberrigue, F Joliot-Curie, D I Blokhintsev. Dubna, 1958.



From left to right: P Dirac, D I Blokhintsev, M Danysz, M G Meshcheryakov, N N Bogolyubov, Ya A Smorodinskii. Dubna, 1958.



V I Veksler and a guest of JINR E M McMillan (the USA) at the synchrotron. Dubna, 1959.



On behalf of the Government of the Russian Federation V S Chernomyrdin, Prime-Minister of the Russian Federation, signed the Agreement with JINR on his visit to Dubna, 23 October 1995.

Many of them have been awarded different international and national prizes and state decorations for investigations carried out at JINR.

JINR is situated on the Russian land, and it is therefore not accidental that it has close scientific contacts with famous physics centres of Russia. Important scientific results were obtained in joint investigations with the Institute of High Energy Physics (Protvino), the Russian Research Centre ‘Kurchatov Institute’, the Institute of Nuclear Physics (Gatchina), the Institute of Theoretical and Experimental Physics (Moscow), the Institute for Nuclear Research (Troitsk), the P N Lebedev Institute of Physics of the Russian Academy of Sciences (Moscow), the G I Budker Institute for Nuclear Physics (Novosibirsk), the Research Institute for Nuclear Physics of Moscow State University, etc.

Although Dubna is a small town, it has the status of a metropolis on the world scientific map. This metropolis was visited by many great physicists of the 20th century and distinguished politicians. In October 1995, Prime Minister of the Russian Federation V S Chernomyrdin paid a visit to our Institute, accompanied by President of the Russian Academy of Sciences and a group of officials from Russian ministries and government departments. It was for the first time that an agreement was signed between JINR and its host state, Russia, during that visit. It is difficult to overrate the importance of this event for the Institute.

Celebrating JINR’s 40th anniversary, we should express our sincere gratitude to all Plenipotentiaries of the Member States, both the present ones and those who were appointed in the past years, members of the JINR Scientific Council, and members of directorates of the Institute and its Laboratories for their great contribution to the development of JINR and its successful activities.

I am not pleased to talk about the current problems faced by the Institute. But they do exist. It should be mentioned that JINR has been largely affected by the crisis phenomena which have recently occurred in some of its Member States. Thus, payments of budgetary contributions from them are untimely and incomplete. Of much strain are the problems of inadequate social protection of the personnel. The low salary cannot provide a normal standard of living and the housing problems are acute. All these problems remain in the focus of the JINR Directorate’s attention.

The Joint Institute for Nuclear Research will celebrate its next anniversary in the 21st century.

I believe, we shall approach the next jubilee with new significant scientific achievements, renewed experimental facilities, and with a number of Member States considerably exceeding 18.