



## JOINT INSTITUTE FOR NUCLEAR RESEARCH



In 2006 the Joint Institute for Nuclear Research – an international intergovernmental scientific research organisation – celebrates its 50<sup>th</sup> anniversary.

The Joint Institute for Nuclear Research (JINR) was established through the Convention signed on 26 March 1956 in Moscow by representatives of eleven founding states to unite their scientific and material potential in order to study fundamental properties of matter. It was registered with the United Nations on 1 February 1957. The Institute is situated in Dubna 120 km from Moscow in the Russian Federation.

By the time of the JINR foundation, there had already been the Institute of Nuclear Problems of the USSR Academy of Sciences organised in the late 1940s in the locality of the future town of Dubna. It had launched a wide scientific programme of fundamental and applied studies of properties of nuclear matter at the largest for that time accelerator of charged particles – the synchrocyclotron. At the same time, the Electrophysical Laboratory of the USSR Academy of Sciences (EPhLAN) was set up here where research to develop a new accelerator – a synchrophasotron – was conducted under the guidance of Academician V.I.Veksler. It had record parameters for the time.

By the mid-1950s the world had come to realize that nuclear science could not be locked in secret laboratories and that only wide international co-operation could ensure progress in this fundamental realm of human knowledge and peaceful utilization of atomic energy. In 1954 the European Centre for Nuclear Research (CERN) was established near Geneva to unite the efforts of West European countries in studying the fundamental properties of the microcosm. About the same time, under the stimulus of the USSR Government, the countries then belonging to the socialist world took a decision to establish the Joint Institute for Nuclear Research on the basis of the INP and EPhLAN. After the Agreement for the JINR foundation was signed, specialists from all the Member States came to Dubna. The town became international. Research in many fields of nuclear physics, which were of interest for scientific centres of the JINR Member States, was launched here.

Professor D.I.Blokhintsev was elected the first director of the Joint Institute. He had just accomplished the development of the first in the world atomic electric power station in Obninsk. The first JINR vice-directors became Professors M.Danysz (Poland) and V.Votruba (Czechoslovakia). The first JINR directorate led the Institute through one of the most difficult and crucial periods in its life – the time of its establishment.

The history of JINR is associated with such outstanding scientists as N.N.Bogoliubov, L. Infeld, I.V.Kurchatov, H.Niewodniczanski, A.M.Petrosiants, E.P.Slavsky, I.M.Tamm, A.V.Topchiev, H.Hulubei, L.Janossy, and many others.

The Institute and the main scientific branches were developed by the following outstanding physicists: A.Baldin, Wang Ganchang, V.Veksler, N.N.Govorun, M.Gmitro, V.P.Dzhelepov, I.Zvara, I.Zlatev, D.Kiss, N.Kroo, J. Kožešnik, K.Lanius, Le Van Thiem, A.A.Logunov, M.A.Markov, V.A.Matveev, M.G.Meshcheriakov, G.Nadzhakov, Nguyen Van Hieu, Yu.Ts.Oganessian, L.Pal, H.Pose, B.M.Pontecorvo, V.P.Sarantsev, N.Sodnom, R.Sosnowski, A.Sandulescu, A.N.Tavkhelidze, I.Todorov, I.Ulegla, I.Ursu, G.N.Flerov, I.M.Frank, Kh.Khristov, A.Hrynkiwicz, S.Titeica, F.L.Shapiro, D.V.Shirkov, D.Ebert, E.Janik.

Nuclear research has been marked by dramatic events and crucial changes for the past 50 years. In 1961 the JINR Prizes were instituted, and a group of physicists headed by Vladimir Veksler and the Chinese Professor Wang Ganchang was awarded for the discovery of antisigma-minus-hyperon. Nobody doubted that this particle was elementary. But a few years later, this particle, as well as the proton, neutron,  $\pi$ -meson and other so-called hadrons “lost” their elementary quality – these objects turned out to be complex particles which consisted of quarks and antiquarks. The latter now have obtained the “right” to be called elementary. Dubna physicists have clarified to a great extent the concept of the quark structure of hadrons. Among the latest research are the ideas of colour quarks, the hadron quark model, which is called “the Dubna bag”, etc.

Much can be said about the rapid progress in the discussed theme for the past 50 years. However, there is another, quite an opposite example – the research which was far ahead of its time. 50 years ago, soon after JINR had been established, Bruno Pontecorvo suggested a hypothesis about neutrino oscillations. It took scientists dozens of years to find an experimental confirmation of one of the central issues of the modern physics of weak interactions – neutrino oscillations. In January 2005 at the 97<sup>th</sup> session of the JINR Scientific Council the B.Pontecorvo Prize was conferred to the director of the SNO project (Sudbury Neutrino Observatory), Professor of Physics at Kingston Royal University, Canada, Doctor A.Macdonald for the evidence of solar neutrino oscillations in the SNO experiment.

JINR today is a world-known centre where the fundamental research (theoretical and experimental) is successfully integrated with the new technology work-out and application of the latest techniques and university education. The prestige of JINR in the world scientific community is very high today.

JINR has at present 18 Member States: Armenia, Azerbaijan, Belarus, Bulgaria, Cuba, Czech Republic, Georgia, Kazakhstan, D. P. Republic of Korea, Moldova, Mongolia, Poland, Romania, Russia, Slovakia, Ukraine, Uzbekistan, and Vietnam. Participation of Germany, Hungary, Italy and the Republic of South Africa in JINR activities is based on bilateral agreements signed on the governmental level.

JINR is a genuine international institution. Its supreme governing body is the Committee of Plenipotentiaries of all 18 member states. The research policy of JINR is determined by the Scientific Council, which consists of eminent scientists from the Member States as well as famous researchers from France, Germany, Italy, the USA and the European Centre for Nuclear Research (CERN).

The main fields of JINR’s activity are theoretical and experimental studies in elementary particle physics, nuclear physics, and condensed matter physics. The research programme of JINR is aimed at obtaining highly significant results of principal scientific value.

The Joint Institute possesses a remarkable choice of experimental facilities for physics: the only in Russia superconducting accelerator of nuclei and heavy ions Nuclotron, the U-400 and U-400M cyclotrons with record beam parameters for experiments on the synthesis of heavy and exotic nuclei, the unique neutron pulsed reactor IBR-2 and the proton accelerator phasotron which is used for ray therapy. JINR also has powerful and fast computing facilities which are integrated into the world computer net.

Since the moment of JINR organisation 50 years ago, a wide range of research has been elaborated and scientific personnel of highest qualification have been trained for the Institute’s Member States. Among them are presidents of national academies of sciences, leaders of large nuclear centres and universities in many JINR Member States.

JINR Director is RAS Academician V.G.Kadyshevsky, Vice-Directors are Professors Ts.Vylov and A.N.Sissakian. The latter is elected new JINR Director, coming in the capacity from 1 January 2006.

JINR comprises eight Laboratories, each being comparable with a large institute in the scale and scope of investigations performed. The Laboratories are headed by A.N.Sissakian, A.I.Malakhov, A.G.Olchevski, V.D.Kekelidze, M.G.Itkis, A.V.Belushkin, V.V.Ivanov,

E.A.Krasavin. The Institute employs over 6000 people, including more than 1000 scientists, among whom there are full members and corresponding members of national academies of sciences, more than 260 Doctors of Science and 630 Candidates of Science and about 2000 engineers and technicians.

Splendid conditions for training talented young specialists have been established at JINR. Its University Centre organises a practicum annually at the Institute's facilities for the students from higher education institutions of Russia and other countries. In 1994, on the initiative of the JINR Directorate and with active support of the Russian Academy of Natural Sciences, the town and the Moscow region administrations established the International University of Nature, Society and Man "Dubna". There are dozens of JINR staff members - world-known scientists - among the University staff. The University educational base is actively developed on the territory of JINR. Dubna has become the town of not only physicists but also students.

For 50 years JINR has been a bridge between the West and the East promoting the development of wide international scientific and technical cooperation. It collaborates with nearly 700 research centres and universities in 60 countries of the world. Only in Russia – the largest JINR partner – the cooperation is conducted with 150 research centres, universities, industrial enterprises and firms from 40 Russian cities.

A bright example of this fact is the cooperation of the Joint Institute with the European Centre for Nuclear Research (CERN). It facilitates the decision of many theoretical and experimental tasks in high energy physics. JINR participates in the realisation of the LHC project (Large Hadron Collider) – it takes part in the work out and development of parts for the ATLAS, CMS, ALICE detector systems and LHC itself. On the basis of its supercomputer centre the Institute takes part in the development of the Russian regional centre for processing experimental data from LHC which is planned to be a part of the project "HEP EU-GRID".

More than 200 scientific centres, universities and enterprises from 10 CIS countries participate in the implementation of the JINR scientific programme. The Institute may be regarded as a joint scientific centre for the CIS countries which is successfully functioning on the international scale. The immense positive experience accumulated at JINR for mutually profitable scientific and technical cooperation on the international scale could be a discussion topic at the meeting of CIS leaders in Dubna in the frames of a summit of the officials of the CIS members.

JINR maintains mutually beneficial contacts with IAEA, UNESCO, the European Physical Society, and the International Centre of Theoretical Physics in Trieste. Annually, above a thousand scientists from the states which are JINR partners visit Dubna. JINR grants scholarships to physicists from developing countries.

JINR researchers are constant participants of many international and national scientific conferences. In its turn, the Institute annually holds up to 10 large conferences and more than 30 international workshops, as well as traditional schools for young scientists.

Each year the Institute assigns more than 500 scientific papers and reports written by about 3000 authors to the editorial offices of many journals and organising committees. JINR publications are distributed in more than 50 countries in the world. About 600 preprints and communications a year are issued. JINR publishes the world known journals "Physics of elementary particles and atomic nucleus", "Physics of elementary particles and atomic nucleus, Letters", the annual report on JINR activities, the information bulletin "JINR News", as well as proceedings of conferences, schools, and meetings organised by JINR.

A half of discoveries (about 40) in nuclear physics registered in the former USSR were made in JINR. The decision of the General Assembly of the International Committee of Pure and Applied Chemistry to award the name "Dubnium" to element 105 of the Periodic Table may be regarded as recognition of the achievements of JINR's staff of researchers and their contribution to modern physics and chemistry.

In the late 1990s a concept of the JINR development as a large multidisciplinary international centre for fundamental research in nuclear physics and related fields of science and

technology was adopted. It was based on the efficient use of results of the methods and applied research at JINR in the field of high technology through their application in industrial, medical and other technical elaborations to provide additional sources of financing fundamental research and organisation of new working places for specialists who are occupied with side topics at the Institute. There are plans to assist JINR member states to develop new facilities and scientific programmes for them (a cyclotron centre in Bratislava, the Slovak Republic, the DC-60 cyclotron in Astana, Kazakhstan and others).

The Joint Institute has entered the 21<sup>st</sup> century as a large multidisciplinary international scientific centre where fundamental research is conducted in the fields of the structure of matter and is integrated with the work-out and application of new science-intensive technology and the development of university education in the related fields of science.

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