

Report by JINR Director A. Sissakian at the Ceremonial Meeting of the JINR Committee of Plenipotentiaries and Scientific Council dedicated to the 50th anniversary of JINR on 26 March 2006

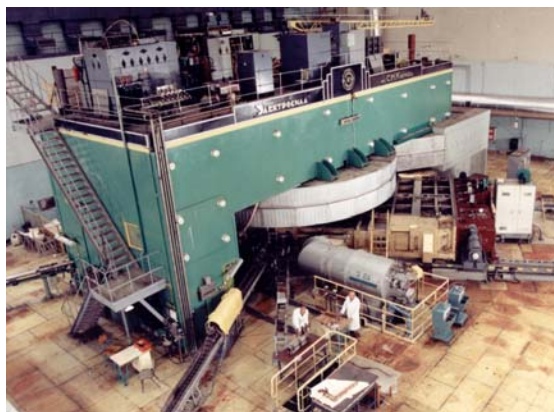
**Dear participants of the meeting,
Ladies and gentlemen:**



26 March 2006 marks the 50th birthday of the Joint Institute for Nuclear Research! It can be stated with confidence on this occasion that the experiment, unique in its conception and scale, which started half a century ago to establish this international physics centre, has proved to be a success. Bright and irrefutable evidence of it is the fact that the ideas and goals which formed the basis for JINR activities in the mid-1950s have withstood the test of time, including political upheavals and the severe economic crisis of the 1990s. The Socialist camp which actually fathered the Institute has disintegrated: the Council for Mutual Economic Aid (COMECON), the Warsaw Pact and the USSR no longer exist, while the Institute has not only managed to survive but is dynamically developing.

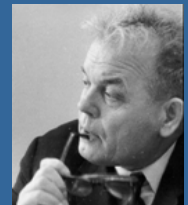
In this way, the example of JINR as an international model of cooperation among scientists has demonstrated to the world the irresistible power of scientific knowledge and the unparalleled bonds that unite men of science!

We remember and treasure in our memory the remarkable pleiad of scientists and organizers of scientific research to whom we are obliged for the establishment of JINR based on two Soviet research institutes. The year 1946 can be regarded as the starting point of the formation of scientific Dubna, when, on the initiative of I. Kurchatov, the government of the Soviet Union took a decision to build, near the village of Novo-Ivankovo, a proton accelerator – the Synchrocyclotron for an energy of 680 MeV. This project was implemented in record time, and the accelerator was successfully launched by the end of 1949.



Synchrocyclotron

The first research centre established in the village of Novo-Ivankovo was the Hydrotechnical Laboratory of the USSR Academy of Sciences (a branch of Laboratory No.2 of the Russian AS headed by I. Kurchatov). Its Director and Deputy Director were M. Meshcheryakov and V. Dzhelepov. In 1953 it was renamed as the Institute of Nuclear Problems of the USSR AS.



M. Meshcheryakov



V. Dzhelepov

In the early 1950s, one more laboratory was established in the same area. It was the Electrophysical Laboratory of the USSR Academy of Sciences (EFLAN) where work was started to construct a new accelerator with unique parameters at that time – the proton Synchrophasotron with an energy of 10 GeV. These activities were headed by V. Veksler, with vigorous support of both the Academy of Sciences and the atomic industry of the Soviet Union.



The phase stability principle was discovered by V. Veksler in 1944. Since then it has been at the basis for construction of all high-energy cyclic accelerators.



The Synchrophasotron for 10 GeV was launched in 1957.



D. Skobeltsyn



M. Markov



I. Chuvilo



A. Baldin

In 1959, a Lenin Prize was awarded for the construction of the Synchrophasotron to :

**V. Veksler
L. Zinoviev
A. Mints
M. Rabinovich**

**F. Vodopyanov
A. Kolomensky
N. Monoszon
S. Rubchinsky**

**D. Efremov
E. Komar
V. Petukhov
A. Stolov**

It was by the mid-1950s that the world scientific community came to the conclusion that large nuclear physics projects should be organized internationally as the development of giant accelerators required joint economic and intellectual efforts. The international character in this context was regarded as the only reliable guarantee of peaceful uses of the achievements of nuclear science.

As a result, the European Organization for Nuclear Research (CERN) was established in 1954 near Geneva, and a year and a half later, initiated by the government of the USSR, the East European block took a decision to establish the Joint Institute for Nuclear Research. The same year, in 1956, the small scientific town of JINR together with the village of Bolshaya Volga was reorganized into a city which was christened as Dubna.

I would like to mention that the author of the epigraph to this slide is the outstanding French physicist Frédéric Joliot-Curie. Like many other famous scientists, he visited Dubna on numerous occasions.

“Science is necessary to people. A country which does not develop it turns inevitably into a colony”.
F. Joliot-Curie



26 March 1956, Moscow
Conference Hall of the Presidium of the USSR Academy of Sciences

12 hours 45 minutes. The fourth session of the Academy meeting adopted **“The final communiqué about the meeting concerning the issue of the organization of the Joint Institute for Nuclear Research”.**

It reads: “... The Convention envisages the establishment of an international scientific research organization entitled «The Joint Institute for Nuclear Research» located in the USSR...”

Dear colleagues! It is remarkable that the time of our jubilee meeting coincides with the date of the historical meeting of the USSR Academy of Sciences on the establishment of JINR 50 years ago.

Science city Dubna

What it looked like in the 1950s



What it looks like today



At the moment of its establishment, our Institute united 11 founding countries. Later, in September 1956, the Democratic Republic of Vietnam and, in 1976, the Republic of Cuba joined the Member States.

“Science cannot be national, in the same way that a multiplication table cannot be national. If a science becomes national it ceases to be a science”.

A. Chekhov



A special role in the formation of the Institute was played by its first directors – the outstanding scientists D. Blokhintsev and N. Bogoliubov.



Nikolai Bogoliubov headed the Institute for about 25 years; he left us a great heritage — glorious traditions and classical works on physics, mathematics and mechanics.

The first period of the Institute’s development was also greatly influenced by such prominent scientists and organizers of scientific research from JINR Member States as E. Slavsky, A. Topchiev, I. Tamm, L. Infeld, H. Hulubei, L. Janossy, H. Niewodniczański and others.

The basis for the development of JINR and its pride are its world-class scientific schools in theoretical and experimental physics. They gave rise to research directions at the Institute and led to developing its own unique experimental facilities and original experimental techniques. It is important to stress here that the solid traditions of scientific schools kept the Institute up and afloat during the challenging time in the last years of the twentieth century.



E. Slavsky

A. Topchiev

I. Tamm

L. Infeld

H. Hulubei

L. Janossy H. Niewodniczański

An entire cohort of outstanding physicists from various countries contributed greatly to establishing the scientific research directions at the Institute in different periods.

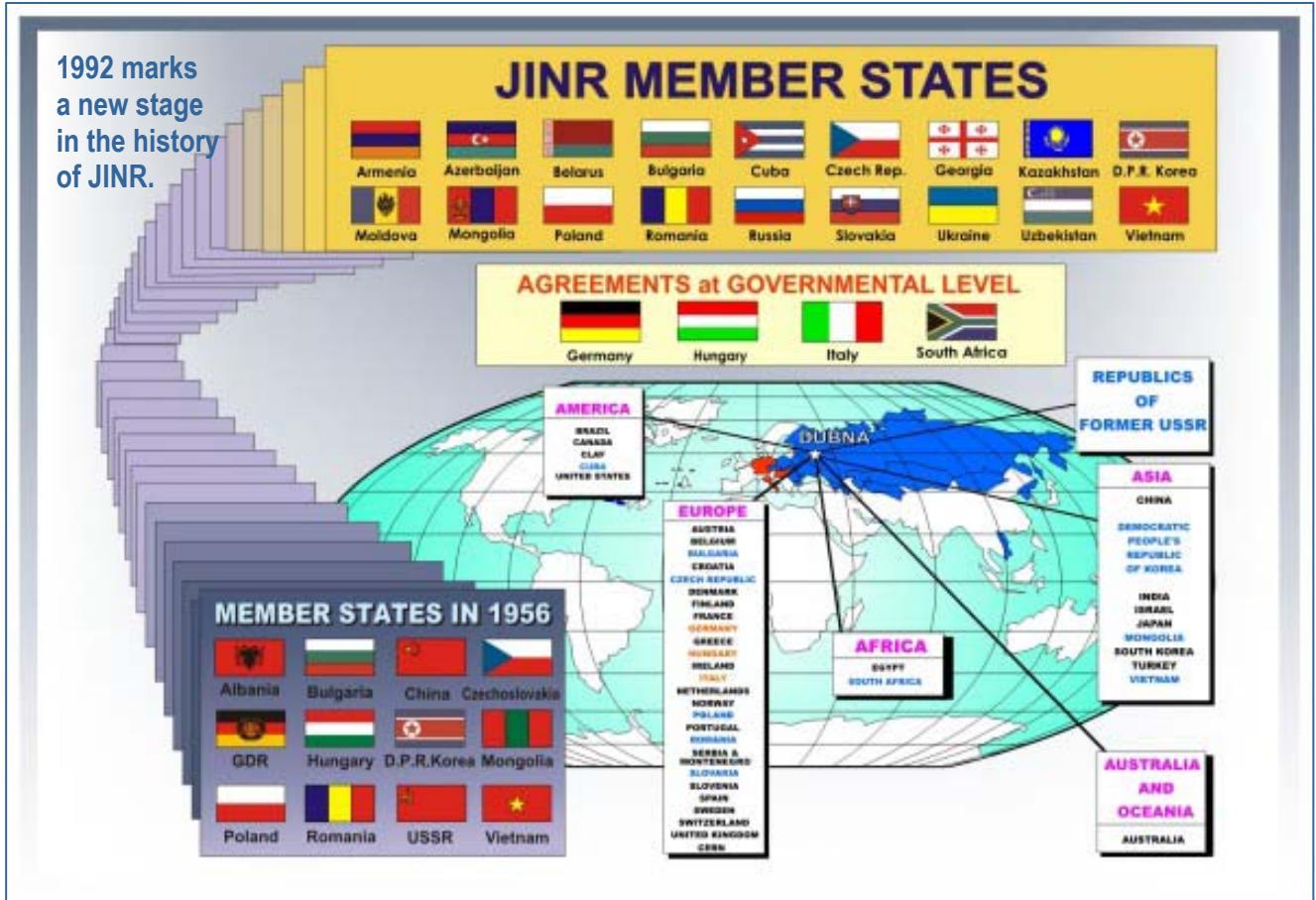
Among them are

N. Bogoliubov
D. Blokhintsev
A. Baldin
D. Chultehm
M. Danysz
V. Dzhelepov
D. Ebert
G. Flerov
I. Frank
S. Gershtein
M. Gmitro
N. Govorun
H. Hristov
A. Hryniewicz
J. Janik
V. Kadyshevsky
D. Kiss
J. Kožešnik
N. Kroo
K. Lanius
Le Van Thiem
A. Logunov
M. Markov
V. Matveev
M. Meshcheryakov
I. Meshkov
V. Moskalenko
G. Nadjakov
Nguyen Van Hieu



Yu. Oganessian
L. Pal
V. Petržilka
B. Pontecorvo
H. Pose
A. Săndulescu
V. Sarantsev
F. Shapiro
D. Shirkov
Č. Šimane
N. Sodnom
V. Soloviev
R. Sosnowski
A. Tavkhelidze
Ş. Țițeica
I. Todorov
I. Ulehla
I. Ursu
V. Veksler
V. Votruba
Wang Ganchang
I. Wilhelm
B. Yuldashev
Zhou Guangzhao
I. Zlatev
I. Zvara
and others.

The namelist of our famous scientists is very long. On the one hand, it is evidently not easy to refrain from citing them, and on the other hand, many of the outstanding scientists remain off screen. I would like to express my apologies to those people and to the memory of those scientists whose names have not appeared in my report.



The year 1992 marked a new development stage in the history of the Institute. 18 independent states, including 9 republics of the former USSR, became its Member States. In addition, agreements at governmental level were signed for cooperation with Germany, Hungary, Italy, and recently with the Republic of South Africa.

The international contacts of the Institute are widening. Today we cooperate

with more than 700 organizations in 60 countries of the world and participate in dozens of joint projects.

Despite many difficulties, the Institute has kept on developing in recent years. Its international status was strengthened when a new membership of the JINR Scientific Council was formed to include outstanding scientists not only from the Member States but also from large physics centres of other countries.



The Scientific Council, established by the Committee of Plenipotentiaries on 17 March 1993

An important factor in stabilizing the situation at the Institute was the signing of the agreement between JINR and the Government of the Russian Federation which was ratified in 2000. The Agreement confirms the legal guarantees which correspond to the generally accepted international norms. Thus, it can be affirmed that **JINR today is a truly international project in the territory of Russia.**

The problems of that period were overcome owing to the highest quality of scientific research, the extensive international cooperation and the dedicated work of the Institute's international staff.



I would like to emphasize the special role played by Vladimir Kadyshevsky who was successfully leading the Institute during that difficult period of time.

Периодическая таблица элементов Д.И.Менделеева

группы элементов

105 Дубний Db [262] Dubnium

The 'science city' Dubna (2001) is the only Russian city whose name was perpetuated in the D. Mendeleev Table of Elements.

Российская газета

ЧЕТВЕРГ,
6 ЯНВАРЯ
2000 ГОДА
№ 4 (2368)
WWW.RG.RU



газета

On Ratification of the Agreement between the Government of the Russian Federation and the Joint Institute for Nuclear Research on the Location and Terms of Activity of JINR in the Russian Federation

The Agreement was signed by V. Putin on his first working day as Acting President on 2 January 2000.

I wish also to express my gratitude to the members of the Committee of Plenipotentiaries, the Financial Committee, the Scientific Council and the Programme Advisory Committees of JINR for their continued scientific and moral support. It is very important that in 2003 the Scientific Council approved the 7-year scientific programme of the Institute's development.

The JINR Committee of Plenipotentiaries and the Financial Committee have accomplished a large amount of work to stabilize our economic position.

Dubna physicists have obtained many first-class results. More than 40 discoveries in nuclear physics, particle physics and condensed matter physics have been made at JINR laboratories. The Institute scientists have received prestigious academic and state prizes.

Many fundamental studies conducted by Dubna theoreticians are acknowledged as classical. The schools on theoretical physics established by N. Bogoliubov, D. Blokhintsev, and M. Markov enjoy international recognition.

Each of the developed scientific themes is a bright page in the history of Science. In recent years, our theoreticians have been more and more actively involved in educational and experimental projects at JINR.

Contributions of JINR scientists to theoretical studies



V. Matveev, R. Muradian

- New quantum number “colour” (*Lenin Prize, 1988*)
- Quark “bags”
- Quark counting rules

- Demonstration of dispersion relations
- Quasipotential approach
- Equations for photoproduction processes (*USSR State Prize, 1973*)



A. Logunov, N. Bogoliubov,
A. Tavkhelidze

- Spontaneous symmetry violation
- Microscopic theory of superfluidity and superconductivity (*Lenin Prize, 1958*)
- Method of quasiaverages
- Superfluidity of nuclear matter
- Basic concept of the Interacting Boson Model

- Inclusive and semiinclusive processes, and scale invariance (*Lenin Prize, together with IHEP, 1986*)
- Very high multiplicity physics



D. Shirkov



Nguyen Van Hieu

- Renormalization group method (*USSR State Prize, 1984*)

- Geometric approaches in QFT

- Spin physics in QCD

- ...

Relativistic nuclear physics is a new scientific trend established in Dubna under the guidance of A. Baldin. A special-purpose accelerator of atomic nuclei with superconducting magnets, the Nuclotron, was designed and successfully commissioned at JINR in 1993 to study high excitation states of matter at small distances. By launching this machine, we substantially enlarged our scientific

programme.

It is very important that the basic research conducted at the Nuclotron finds its applications in many areas, including ground testing of space equipment, radiobiology and space biomedicine, transmutation of radioactive wastes and electronuclear method of energy generation, and medical use of nuclear beams.

Relativistic Nuclear Physics at JINR



A group of participants of the discovery of the antisyigma-minus hyperon: A. Kuznetsov, M. Soloviev, A. Nikitin, E. Kladnitskaya, N. Viryasov (SSSR); V. Veksler, Ding Dacao (PRC), Kim Hi In (DPRK), Nguyen Dinh Tu (DRV), A. Mihul (SRR). Shown in front of the microscope is a photograph of an event of production of the antisyigma-minus hyperon.



- **Discovery of the antisyigma-minus hyperon**
- **Discovery of the phenomenon of potential scattering of high-energy protons**
- **Discovery of the decay of the phi-zero meson into an electron-positron pair**
- **Discovery of the nuclear cumulative effect**
- **Observation of the channeling effect in a bent crystal (*Russian State Prize, 1996*)**
- **Observation of the phenomenon of full disintegration of nuclei induced by high-energy particles (1980)**
- **Commissioning of the Nuclotron (1993)**
- **Polarized deuterons at the Nuclotron (2002)**
- **Extraction of a Fe ion beam from the Nuclotron (2003)**
- ...

“Whatever the “fundamental” truth is, our goal is to understand the basic principles of how Nature is organized as it is... Studies of elementary particles are the only right, and, possibly, the sole way for today to perceive the fundamental laws of Nature”. I believe that these words by the famous physicist Steven Weinberg characterize most precisely the significance of this field of science.

Among the theoretical studies and ideas that appeared to be much ahead of time, I would like to note the prediction made by Bruno Pontecorvo about the

existence of neutrino oscillations. It took scientists many decades to find experimental proof of this key postulate in modern physics.

JINR scientists take part in experiments not only at Dubna accelerators but in numerous international collaborations in different research laboratories of the world. These are, for example, the Institute for High Energy Physics (Protvino), CERN, the Fermi National Accelerator Laboratory and the Brookhaven National Laboratory (USA), DESY and GSI (Germany) and many others.



Particle Physics

- Evidence of the charge independence of nuclear forces and other investigations at the Synchrocyclotron (*USSR State Prize*)
- Discovery of the pion beta decay
- Neutrino physics (*Lenin Prize, 1963*)



jointly with IHEP

- Observation of the significant contribution of spin effects to the amplitude of hadron-hadron scattering at high energies
- Observation of radial excitations of hadron systems

jointly with CERN

- Experimental confirmation of the existence of only three generations of the neutrino
- Precision measurements of the masses of the W and Z bosons

jointly with Fermilab

- High-precision measurement of the top quark mass

Particle Physics



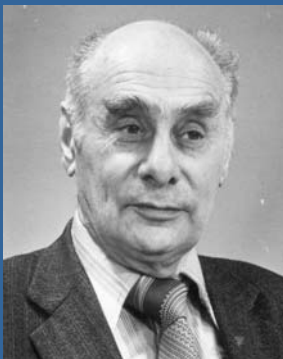
Due to its wide cooperation, Dubna scientists have been involved practically in all large international and national nuclear physics projects of the second half of the last century and of the beginning of this century.



- Idea of collective acceleration of particles
- Development of the technique of thin and jet targets inside an accelerator
- Discovery of the Coulomb-nuclear interference in elastic pp scattering at high energies
- Discovery of angular distribution cone shrinking in elastic pp scattering (*USSR State Prize, 1983*)
- Precision measurements of nucleon structural functions, determination of the contribution of quarks and gluons to the proton's spin, confirmation of QCD and of the Bjorken, Gerasimov – Drell-Hern fundamental sum rules
- Observation of direct violation of CP invariance, observation and precision measurements of rare kaon decays
- ...

JINR is an internationally recognized leader in the synthesis of superheavy elements. Thanks to the excellently-organized experimental research programme, the predictions of theorists about the existence of “the stability island” of transuranium elements have been confirmed. In the period 1999–2005, five new elements of the Mendeleev Table were synthesized.

JINR Achievements in Nuclear Physics



- Discovery of new types of radioactive decay:
 - spontaneous fission from an isomeric state
 - proton radioactivity
 - beta-delayed fission
- discovery of a new class of nuclear reactions - deep inelastic transfer reactions (*USSR State Prize, 1975*)
- Discovery of transfermium elements (*Lenin Prize, 1967*)
- Discovery (synthesis) of superheavy elements



- Physics of ultracold neutrons
- Discovery of superheavy He-8
- Nuclear spectroscopy with proton beams (*Gold Medal of the USSR AS and I.Kurchatov Prize*)
- Discovery of antitritium
- Mesoatomic studies
- Discovery of μ -catalysis



Map of “the stability island”

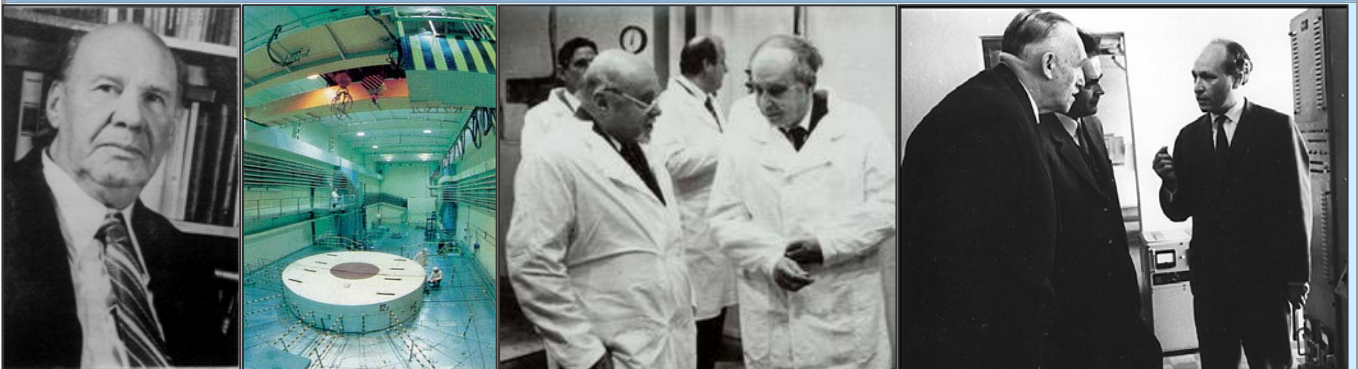


Physics of condensed matter using various nuclear methods is also developing vigorously in our centre. The basic facility for these studies is the unique pulsed neutron reactor IBR-2. By its parameters it is one of the best machines in the world, and it is not accidental that this reactor has been included in the 20-year European strategic programme of neutron scattering research. During the period of its modernization we intend to participate actively in the studies at the synchrotron source of the Kurchatov Institute.

Condensed Matter Physics

"I admire the courage of the people who dared construct such a remarkable machine".

Niels Bohr (about IBR, 1961)



The IBR-2 reactor is included in the 20-year European strategic programme of neutron scattering research.

- **New methods of structural TOF neutronography**
(Russian State Prize, 2000)
- **Percolation nature of the metal-insulator transition in materials with giant magneto-resistance**
- **Experimental determination of the universal constant of interactions of randomly interacting surfaces**
- **Prediction and observation of non-mirror reflection of neutrons from a magnetic media**

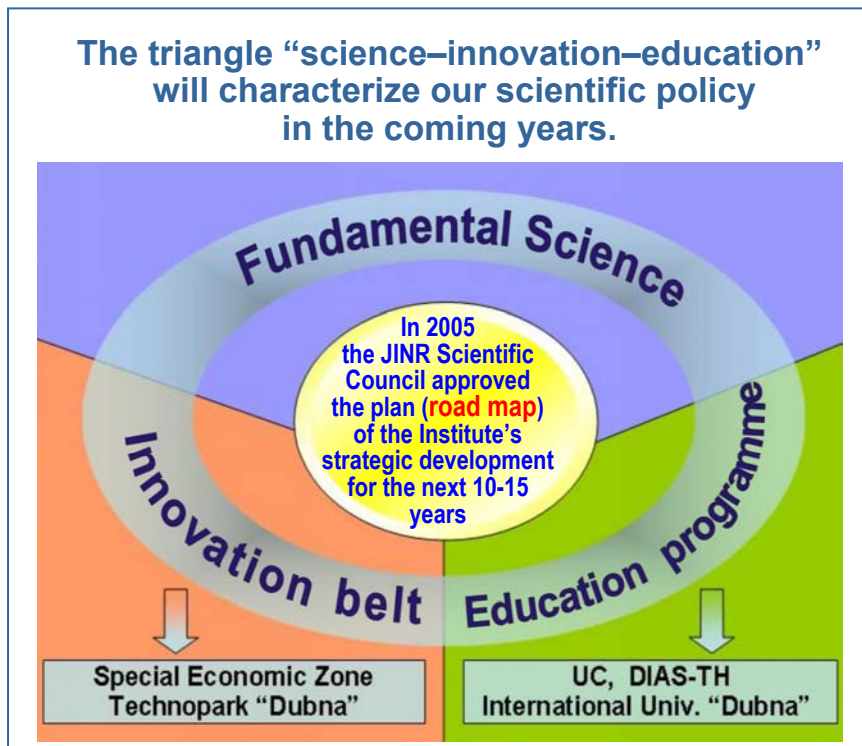
Physics of high-temperature superconductors

Properties of multilayer nanostructures

Studies of geological rock texture

Fullerenes and biopolymers

And now I would like to make a brief review of our plans. Along with the current 7-year programme of the Institute’s development for the years 2003–2009, we have another programme concerning the strategic development of JINR (the road map) for the next 10-15 years which has been recently worked out and approved by the JINR Scientific Council. This programme takes into account both the world tendencies in science development and the interests of our Member States. This document is of great importance to us as it is aimed at concentration of our human and financial resources for realization of ambitious projects. The role of JINR as a “cluster” centre (a coordinator of research at laboratories in Member States) is due to increase.

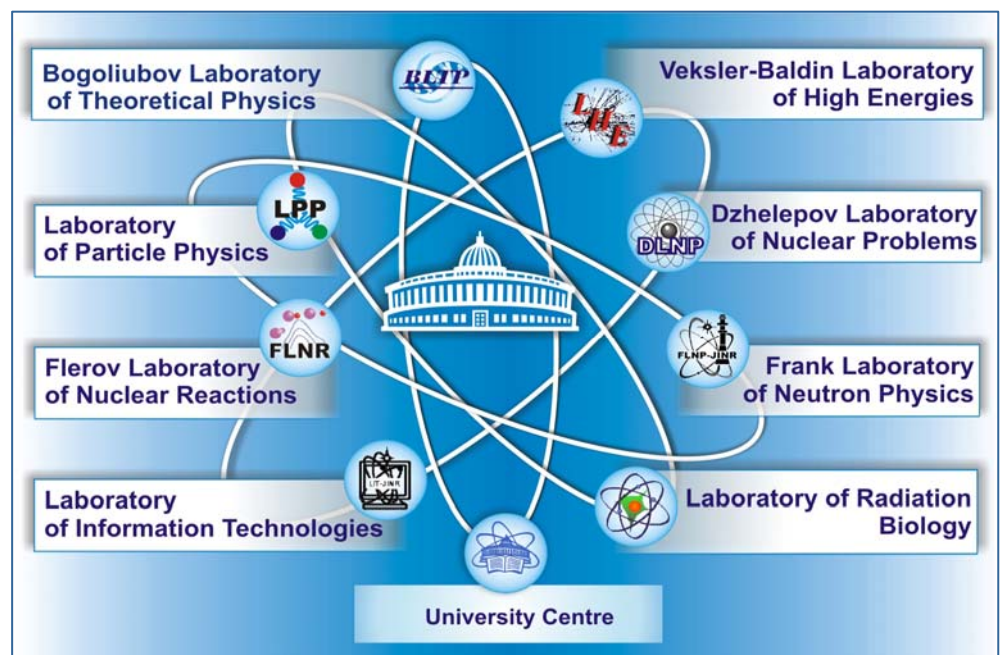


Achievements of JINR scientists in fundamental research will find a wider practical use. That is why we intend to undertake an intensive effort to create an innovation belt around the Institute.

The role of the educational programme will be further enhanced. Special attention will be given to the young staff programme and to the solution of social tasks at the Institute.

The road map has defined three major directions of research at the Institute laboratories:

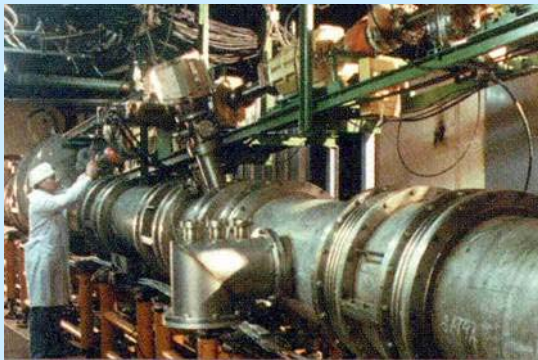
- **High-energy physics**
- **Low- and intermediate-energy physics**
- **Condensed matter physics**



JINR is proud not only of its scientific schools but also of its suite of basic and instrumental facilities. We have worked out unique experimental methods that serve as the basis for developing precision detectors. The Institute possesses powerful, high-performance computing

facilities integrated into the world computer nets. By 2009, we plan to modernize completely the park of our facilities and also take part in a number of international projects. It will make us a more competitive and attractive research centre.

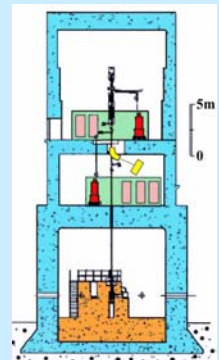
Suite of Basic Facilities by 2009



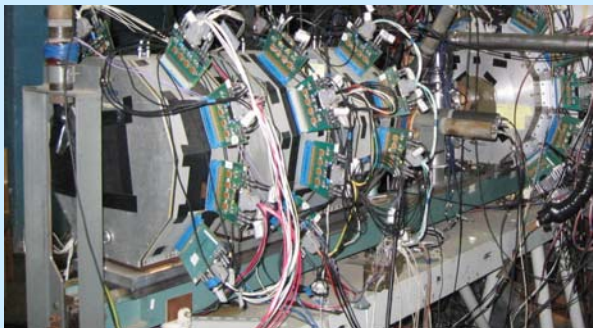
Modernized Nuclotron



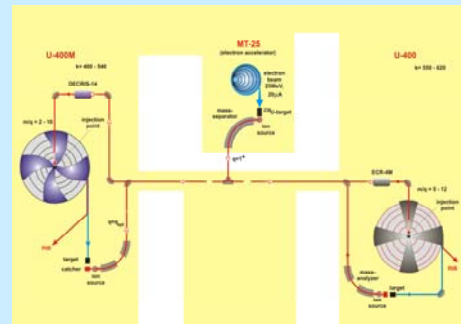
Modernized IBR-2



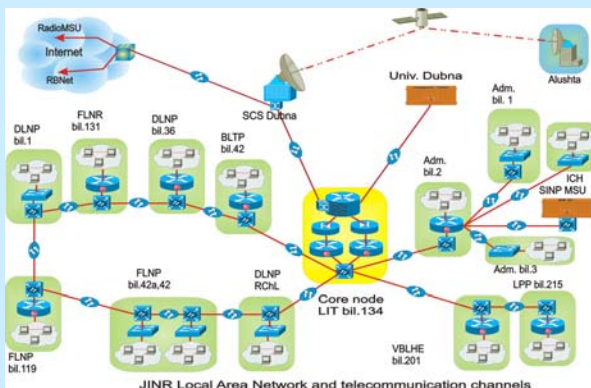
IREN



R&D activities, detector construction



Modernized cyclotron complex



JINR networks, including GRID technology

Accelerator Physics and Engineering.

Prizes received during 50 years

- Lenin Prize
- International Prize "Atom for Peace"
- Six USSR and RF State Prizes
- Prize of the European Physical Society

JINR is a school of excellence for the Member States!

JINR is justly called a school of excellence. For the past 50 years, an extensive educational programme has been developed at the Institute, and numerous specialists have been trained for the Member States. Many outstanding scientists and organizers of scientific research began their professional careers in Dubna.



V. Matveev, A. Logunov, A. Tavkhelidze



M. Mateev



I. Wilhelm



Zhou Guangzhao



Nguyen Van Hieu



B. Yuldashev



The educational programme will continue to be based on the JINR University Centre, the International University “Dubna”, and on specialized chairs of MSU, MEPI, MIPT, MIREA and other higher education institutions in Member States.

JINR UNIVERSITY CENTRE






More than 300 students and postgraduates from Member States are trained at the University Centre.

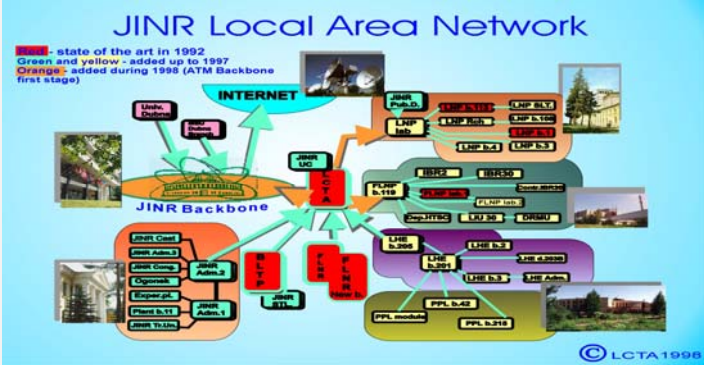


International University for Nature, Society, and Man "Dubna"

We attach particular importance to the development of information technology at the Institute as research at physics centres is impossible without it, in particular high-speed processing of experimental data. It is appropriate to mention here that the Internet, which is widely used all over the world, was invented in CERN. This Laboratory is our major partner with which we have been fruitfully collaborating for nearly half a century, including the years of the "cold war".


Information Technology



JINR Local Area Network

Legend:
■ state of the art in 1992
■ Green and yellow - added up to 1997
■ Orange - added during 1998 (ATM Backbone first stage)



A high-speed (2.5 Gbps) data communication channel was commissioned in Dubna in November 2005.

The JINR functional subdivisions and infrastructure facilities play also an important role in our work. We plan to further stimulate their development.

JINR Experimental Workshop

JINR Functional Subdivisions and Infrastructure Facilities



Holiday hotel "Dubna" in Alushta



Health hotel "Ratmino"



Hotel complex



Swimming-pool "Archimedes"



As I have already mentioned, building a well-developed innovation belt around JINR is an important direction of activity within the concept of the Institute's advancement. Some elements of it have already been established in recent years. About 50 projects today are ready to be implemented in the Special Economic Zone of Dubna.

On 21 December 2005, M. Fradkov, Prime Minister of the Russian Federation, signed Resolution No.781 on the establishment of a technological-and-innovative Special Economic Zone (SEZ) in the territory of Dubna.

I would like to express my gratitude to the Government of the Russian Federation, especially to Ministers A. Fursenko, G. Gref and L. Reinman, to the Governor of the Moscow region, B. Gromov, for their support of Dubna as a city chosen for establishing a Special Economic Zone in its territory. We keep close contacts with the administration of Dubna and business partners in our effort to develop an efficient innovation policy.

JINR is an international organization; therefore the Special Economic Zone "Dubna" will also have international features.

Special Economic Zone in DUBNA

Nanotechnology



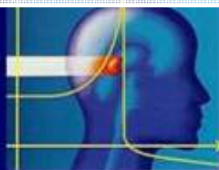
IT & Telecommunications



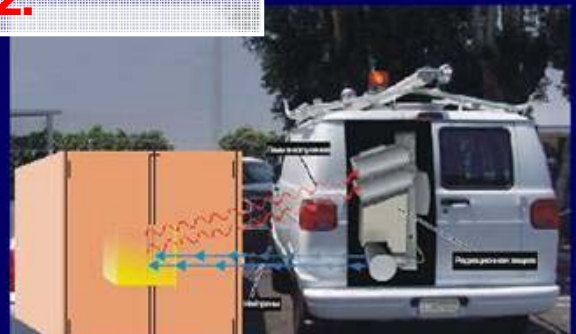
More than 50 innovation projects have been prepared for the SEZ.



Medical accelerator



Hadron therapy



Safety

Concluding my presentation, I would like to extend my cordial congratulations to the entire international staff of the Institute, our veterans, and to all those present in this hall on the jubilee of the Joint Institute for Nuclear Research. As Professor J. Niewodniczański said, Dubna is our common home on the bank of the Volga River. We love our home and have every reason to look forward with optimism!



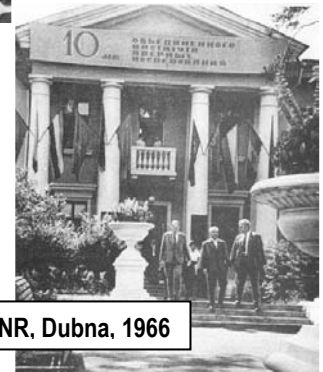
Moscow, 26 March 1956



JINR, Dubna, 1976



JINR, Dubna, 1986



JINR, Dubna, 1966



JINR, Dubna, 1996

JINR, Dubna, 2006



Detailed information about JINR
is available on the Web site: www.jinr.ru

