Joint Institute for Nuclear Research

International Intergovernmental Organization

The Science Policy of the Joint Institute for Nuclear Research

. issakian

irector

JOINT INSTITUTE for NUCLEAR RESEARCH

1956


Albania


Bulgaria


China


Czechoslovakia


GDR


Hungary


D.P.R.Korea


Mongolia


Poland

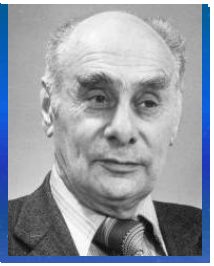

Romania


USSR


Vietnam

The agreement on the establishment of JINR was signed on 26 March 1956 in Moscow

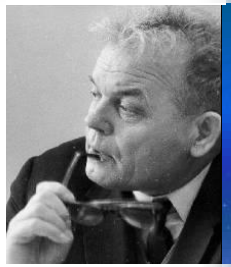
Founders



G.Flerov

V.Veksler

I.Frank



M.Meshcheryakov

V.Dzhelepov

N.Bogoliubov,
D.Blokhintsev

B.Pontecorvo

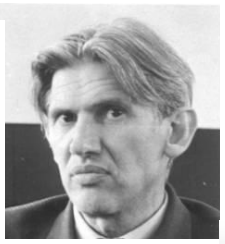
A.Baldin

L.Infeld

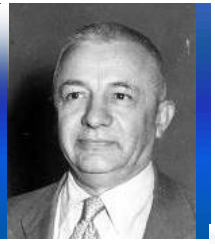
H.Hulubei

Wang Ganchang

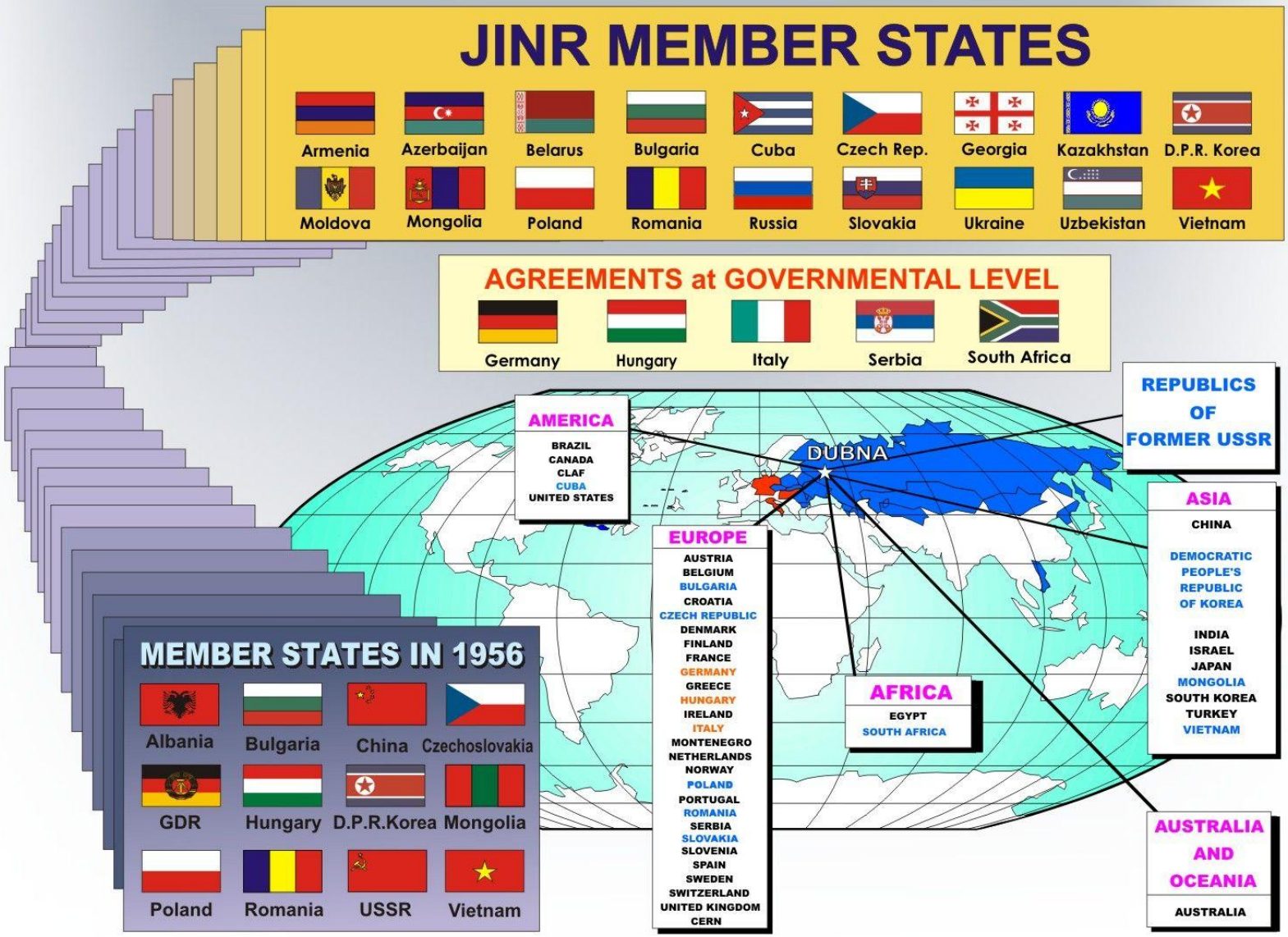
H.Niewodniczanski



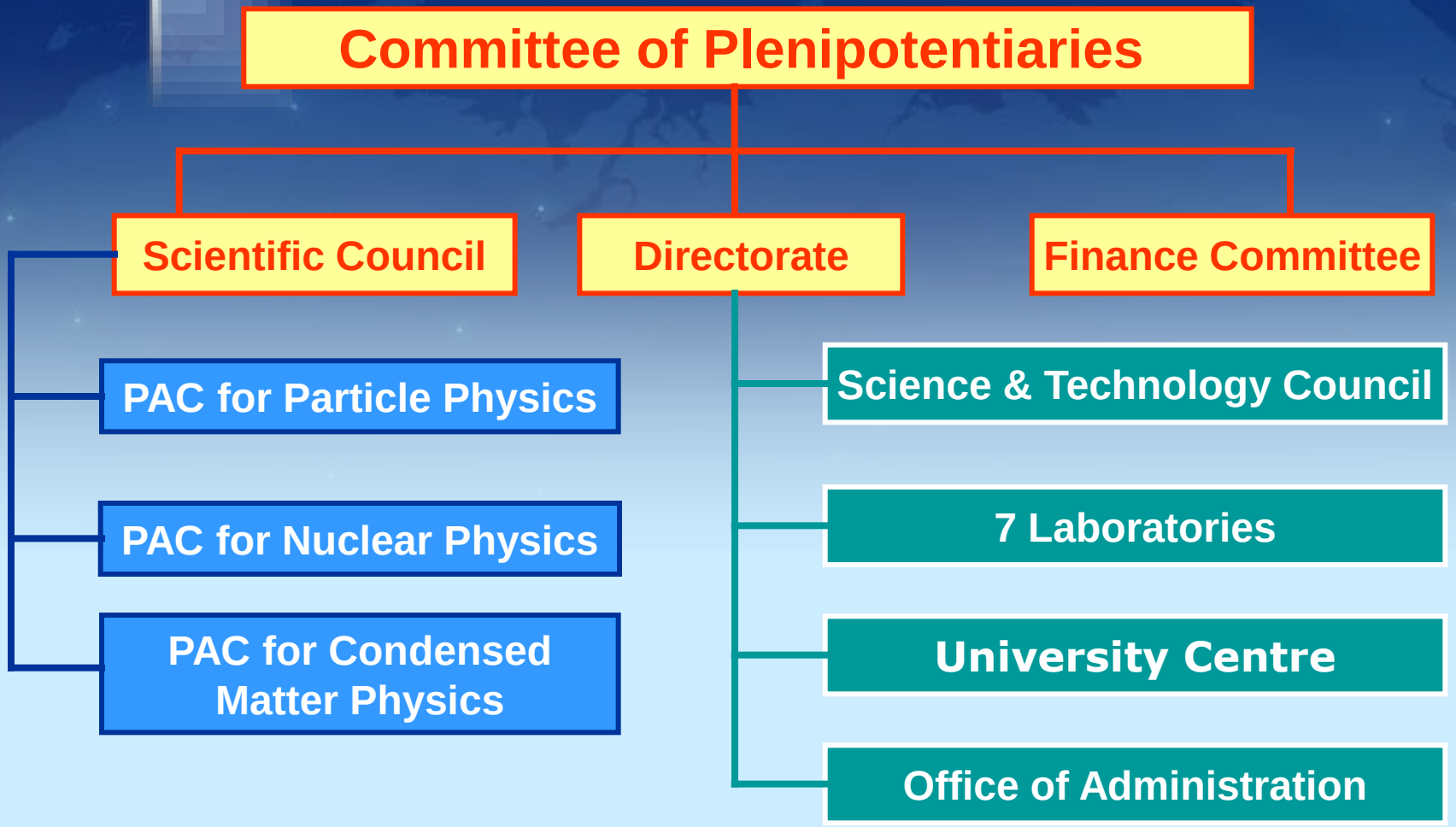
L.Janossy



G.Najakov


JINR MEMBER STATES
Armenia
Azerbaijan
Belarus
Bulgaria
Cuba
Czech Rep.
Georgia
Kazakhstan
D.P.R. Korea
Moldova
Mongolia
Poland
Romania
Russia
Slovakia
Ukraine
Uzbekistan
Vietnam
AGREEMENTS at GOVERNMENTAL LEVEL
Germany
Hungary
Italy
Serbia
South Africa
MEMBER STATES IN 1956
Albania
Bulgaria
China
Czechoslovakia
GDR
Hungary
D.P.R.Korea
Mongolia
Poland
Romania
USSR
Vietnam
AMERICA
BRAZIL
CANADA
CLAF
CUBA
UNITED STATES
DUBNA
EUROPE
AUSTRIA
BELGIUM
BULGARIA
CROATIA
CZECH REPUBLIC
DENMARK
FINLAND
FRANCE
GERMANY
GREECE
HUNGARY
IRELAND
ITALY
MONTENEGRO
NETHERLANDS
NORWAY
POLAND
PORTUGAL
ROMANIA
SERBIA
SLOVAKIA
SLOVENIA
SPAIN
SWEDEN
SWITZERLAND
UNITED KINGDOM
CERN
AFRICA
EGYPT
SOUTH AFRICA
REPUBLICS OF FORMER USSR
ASIA
CHINA
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA
INDIA
ISRAEL
JAPAN
MONGOLIA
SOUTH KOREA
TURKEY
VIETNAM
AUSTRALIA AND OCEANIA
AUSTRALIA

Governing Bodies & Structure



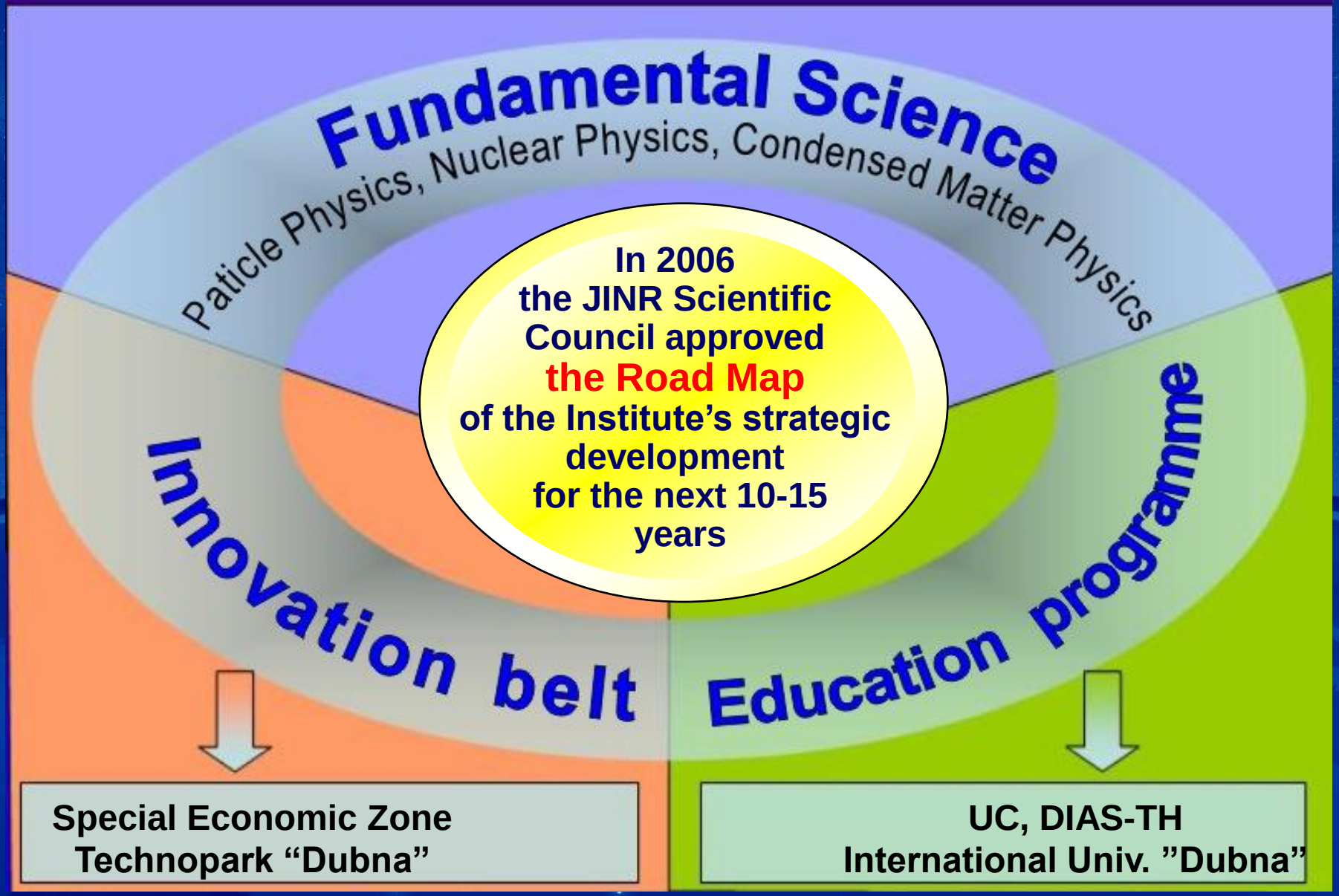
JINR in figures

JINR's staff members ~ 5500
researchers ~ 1300
including from the Member States ~ 500
(but Russia)

Doctors and PhD ~ 1000

II. Scientific & Innovative Activities

JINR's Science Policy Today and Tomorrow



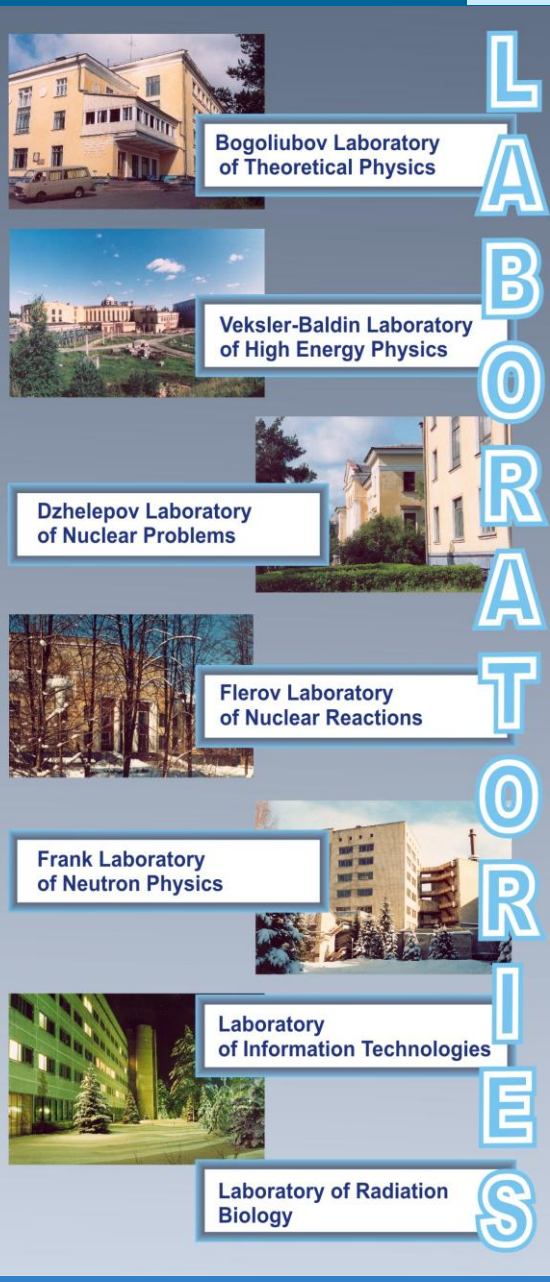
The elaborated Road Map determined three major research directions at JINR:
- high energy physics
- nuclear physics
- condensed matter physics

Main Supporting Activities:

- Theory of PP, NP, CMP
- Networking and computing
- Physics methods
- Training of young staff

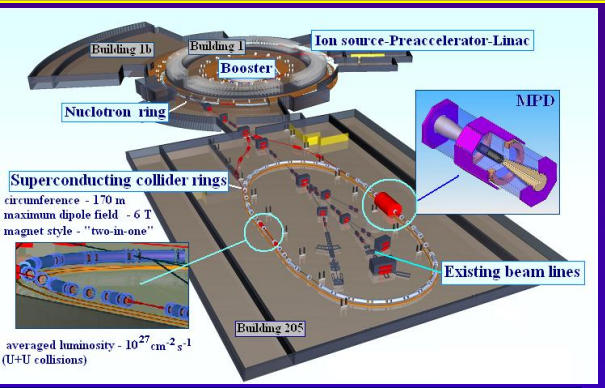
JINR's research niche offered by home facilities

- **Heavy-Ion Physics:**
  - at high energies (up to 5 GeV/n) (in future $\sqrt{s_{NN}}$ = 9 GeV, NICA facility)
  - at low and intermediate energies (5 – 100 MeV/n)
- **Condensed Matter Physics** using nuclear physics methods



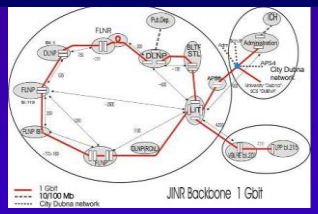
JINR Dubna

Upgrade of JINR Basic Facilities

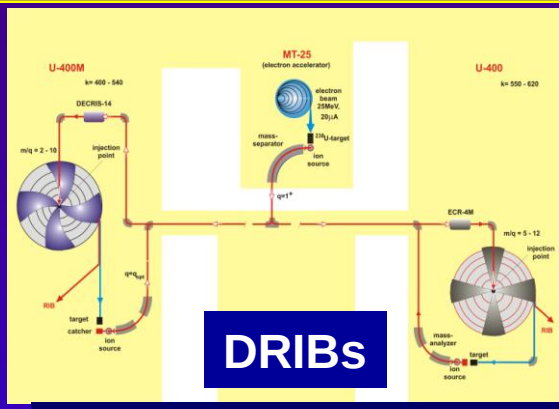


Upgraded Nuclotron-M (2009) + NICA (2013-2014)

Telecommunication channels:
10 Gbps – July 2008,
40 Gbps – 2010,
100 Gbps by the year 2015

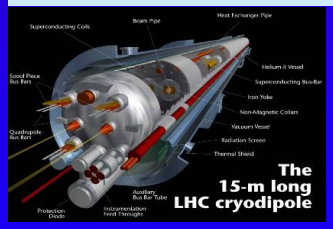


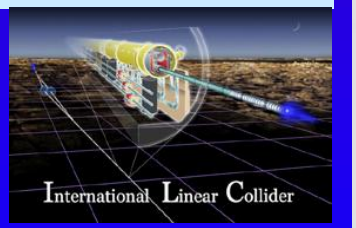
JINR networks, including GRID technology



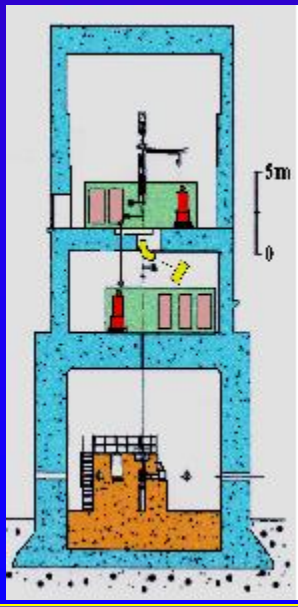
second phase 2009

Participating in LHC, RHIC, TEVATRON…
In future: FAIR, ILC …





New reactor IBR-2M 2010



IREN-I 2008

“Road Map” in the field of High Energy Physics

Priority tasks:

- origin of mass: electro-weak symmetry breaking (Higgs mechanism), etc.
- properties of strong interactions, including properties of nuclear matter (search of the mixed phase)
- neutrino physics and properties of neutrinos, dark matter, dark energy
- spin physics
- origin of the matter-antimatter asymmetry in the
- Universe
- unification of particles and forces, including gravity
- physics beyond the Standard Model (SUSY, Extra Dim, etc)

…

High Energy Physics

Nuclotron is superconducting synchrotron for heavy ions

(has been operating since 1993).

The main home facility (today): Nuclotron complex of VBLHEP (upgrade till 2009).

Future plan: creation of NICA/MPD – Nuclotron-Based Ion Collider Facility and Multipurpose Detector (2014).

HEP at JINR

NUCLOTRON & accelerator complex:

Stages of the Nuclotron development:

1. upgrade of the Nuclotron to achieve its project parameters **(A ~ 200, 5 GeV/n for heavy ions, polarized beams)**
2. conceptual project: creation of Nuclotron-based Ion Collider Facility (***NICA/MPD***)

$\sqrt{s_{NN}} = 9$ GeV

Participation in the external experiments:

CERN – the main partner in PP (participation in more than 20 projects)

Russia: IHEP, INR RAS, BINP SB RAS, …

Germany: GSI, DESY, …

USA: FNAL, BNL, LLNL, …

France: IN2P3/CNRS, …

Italy: INFN, …

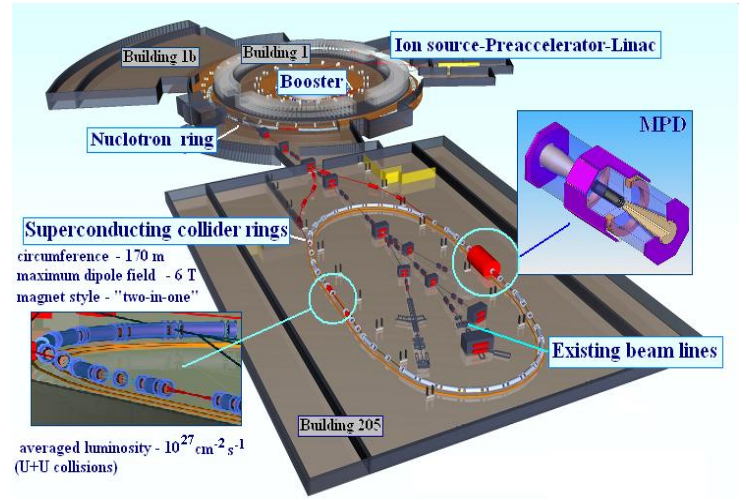
Japan: KEK, RIKEN…

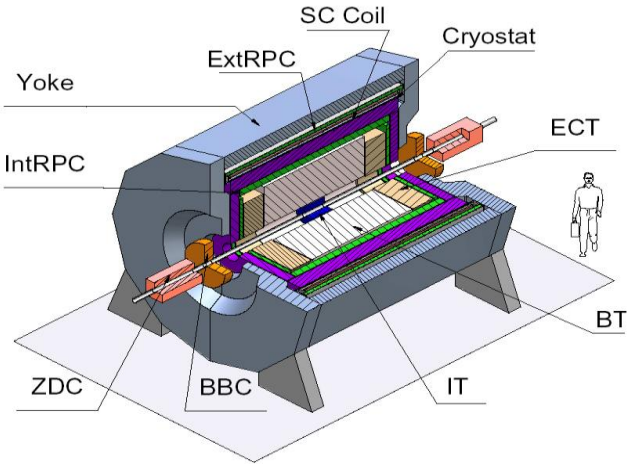
China: IHEP CAS, CIAE, …

…

The new flagship of JINR: Nuclotron-based Ion Collider fAcility and MultiPurpose Detector (NICA / MPD)

The main goal of the NICA/MPD project is to start in the coming years experimental study of hot and dense strongly interacting QCD matter and search for a possible manifestation of the mixed phase formation and critical endpoint in heavy ion collisions.





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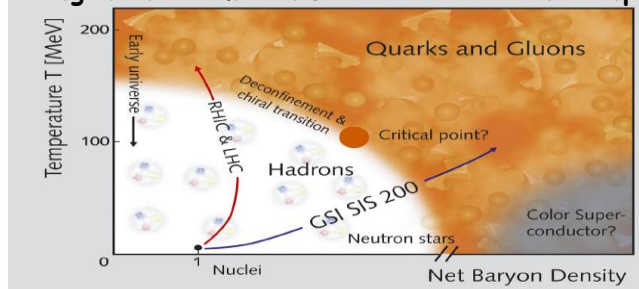
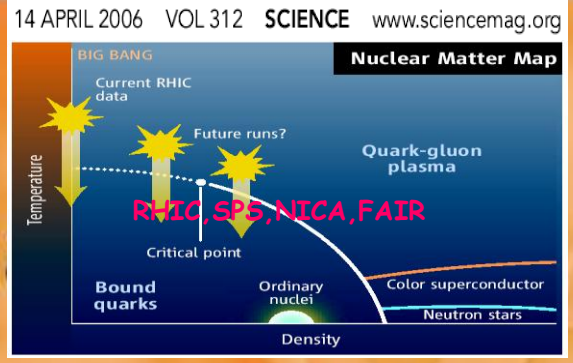
www.gsi.de/documents/DOC-2004-Mar-196-2.pdf





Quarks and Gluons

Early universe

Critical point?

Deconfinement and chiral transition

Mixed phase

Hadrons

RHIC, LHC

FAIR SIS 300

NICA

Neutron stars

Color Super-conductor?

N_B

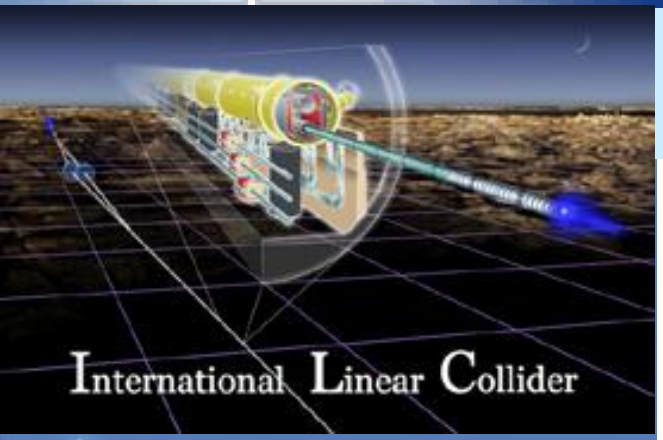
Round Table Discussion

Dubna, July 7-9, 2005

http://theor.jinr.ru/meetings/2005/roundtable/

A.N.Sissakian
A.S.Sorin
M.K.Suleymanov
V.D.Toneev
G.M.Zinovjev
nucl-ex/0511018
nucl-ex/0601034
nucl-th/0608032

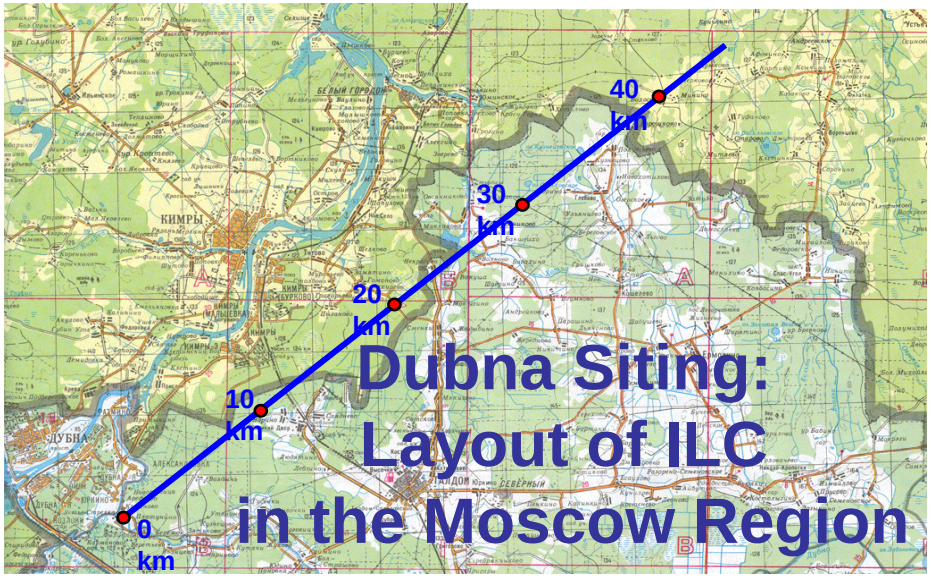
International Linear Collider



The activities at JINR on Physics and Detector for ILC is underway and will be continued in order to provide JINR's visible participation in this ambitious project.

Challenging tasks

- Factory of the Higgs boson
- Supersymmetry
- Dark matter, dark energy
- …



Dubna Siting: Layout of ILC in the Moscow Region

"Road Map" – in the field of Nuclear Physics:

- Heavy Ion Physics at Low Energies
- Low and Intermediate Energy Physics
  Nuclear Physics with Neutrons

The main home facilities (today):
Cyclotrons U400MR and U400,
accelerator complex DRIBs-I (Dubna Radioactive Ion Beams), Phasotron.

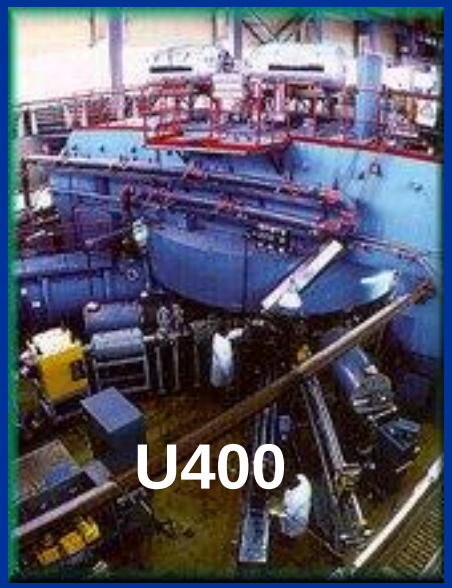
Future plans:

- **U400R, accelerator complex DRIBs-II (2009)**
- **construction of the IREN-I facility (2008)**

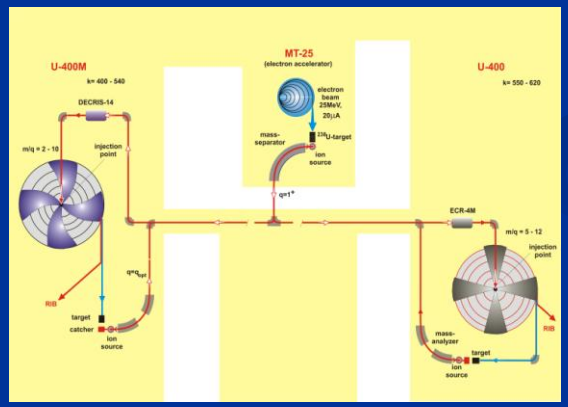
Low Energy Heavy Ion Physics

The main home facilities (today):
Cyclotrons U400 and U400MR,
accelerator complex DRIBs-I

Future plans:
- U400R, accelerator complex DRIBs-II



(in operation since 1979)



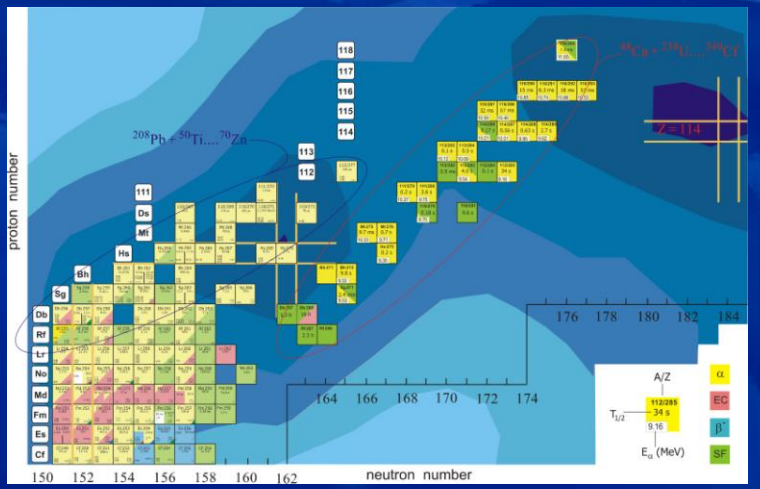
DRIBs –
Dubna Radioactive
Ion Beams

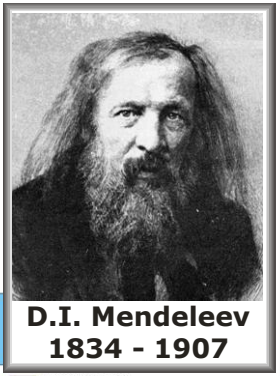
(in operation since 1993)

Priorities in Heavy Ion Physics

- Physics and chemistry investigations of the superheavy nuclei with Z ≥ 112; structure and properties of the neutron-reach light exotic nuclei
- Accelerator technology
- Heavy ion interaction with matter; applied research.

To accomplish these tasks, the FLNR Cyclotron Complex will be upgraded for producing intense beams of accelerated ions of stable (^{48}Ca, ^{58}Fe, ^{64}Ni, ^{86}Kr) and radioactive (^{6}He, ^{8}He) isotopes.





D.I. Mendeleev
1834 - 1907

s-элементы
p-элементы
d-элементы
f-элементы

112
Chemical identification in 2006

113
Discovered at JINR in 2003

114
Discovered at JINR in 1999

115
Discovered at JINR in 2003

116
Discovered at JINR in 2000

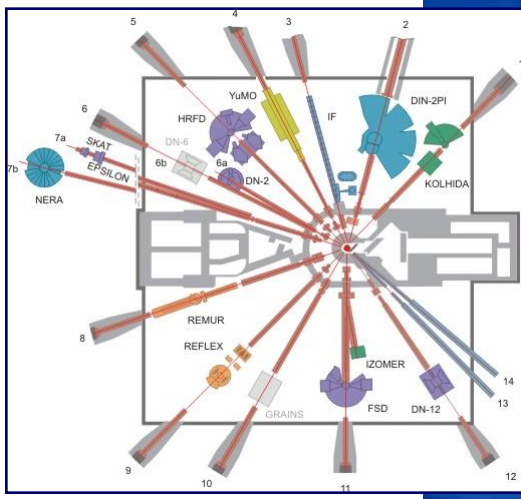
118
Discovered at JINR in 2001

"Road Map" – in the field of Condensed Matter Physics

The main home facility:
reactor IBR-2 (now under the reconstruction)

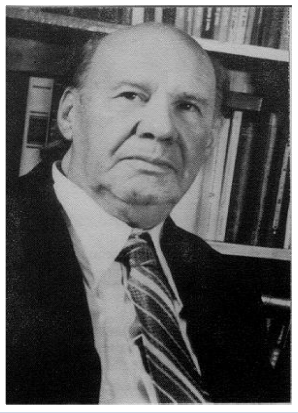
Plans:

- **upgraded reactor IBR-2M (2010)**
- **creation of a complex of modern neutron spectrometers around the modernized reactor (2011-2015)**

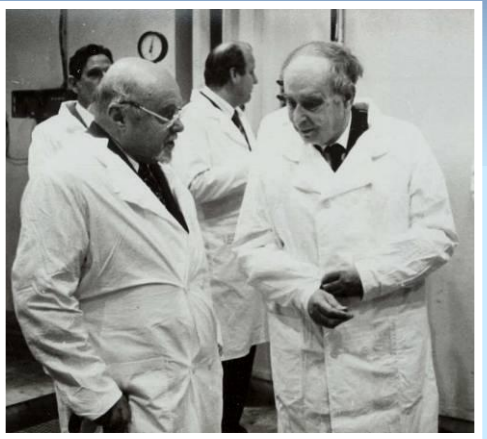


Neutron Reactor IBR-2

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



D. Blokhintsev



N. Dollezhal and I. Frank

operating since 1984

Parameters of Source

Power: mean 2 MW,
in pulse 1500 MW

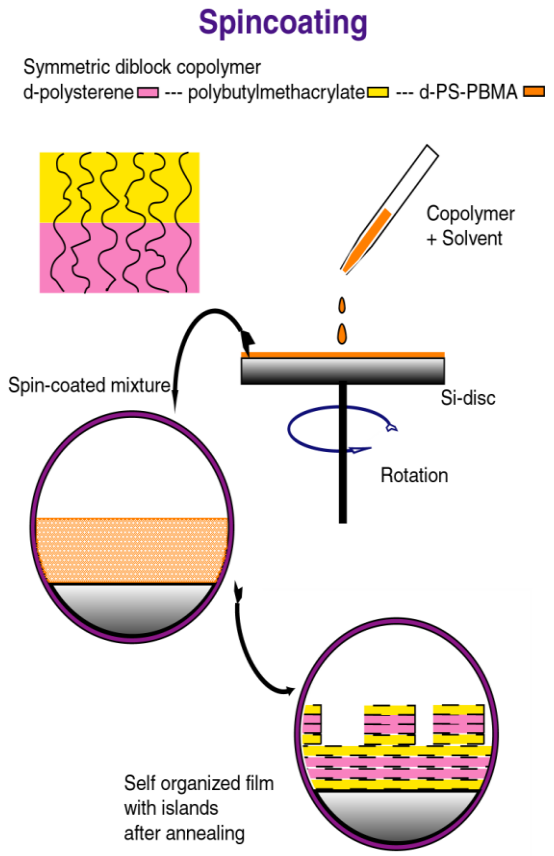
Pulse freqency: 5 Hz.

Neutron flux in pulse 5 x 10^{15}

Neutron pulse width: 320 μs

Priorities in the field

- Neutron investigations of the structure and dynamics of Condensed Matter
- Development and creation of elements of neutron spectrometers for condensed matter studies
- Radiation and Radiobiological investigations



III. Education Programme and Innovation activities

A vitally important task is attracting of young people from all the Member States to science

EDUCATIONAL PROGRAMME

JINR UNIVERSITY CENTRE

More than 300 students and postgraduates from Member States are trained at the UC

Chairs: MSU | MIPT | MEPI | MIREA | others

JINR is a school of excellence for the Member States!

"Dubna" International University

DIAS - TH

Dubna International Advanced School on Theoretical Physics

The UC offers graduate programmes in the fields of:

- Elementary Particle Physics
- Nuclear Physics
- Theoretical Physics
- Condensed Matter Physics
- Technical Physics
- Radiobiology

Innovation Activities

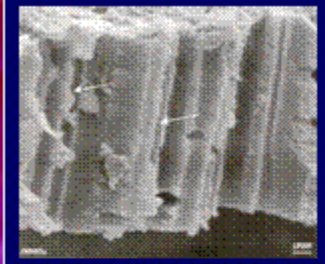
Special Economic Zone in DUBNA

On 21 December 2005, the Prime Minister of the Russian Federation M.Fradkov signed Resolution № 781 on the establishment of a Special Economic Zone in the territory of the town Dubna.

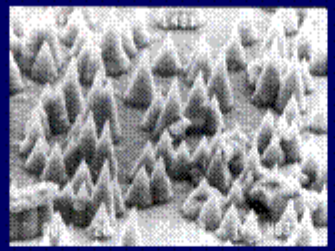
First Resident - «Dubna-Sistema Inc.»

SEZ main specialization

Nanotechnologies

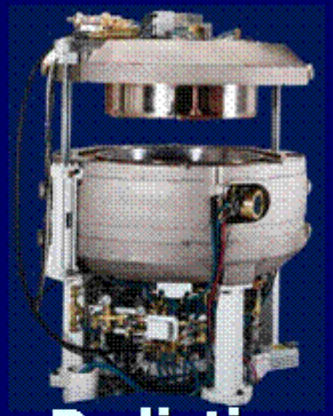


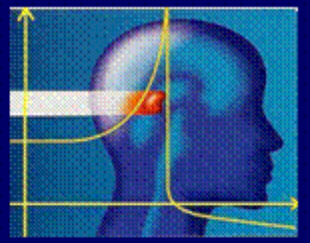
COPPER MICROTUBES



METALLIC NEEDLES

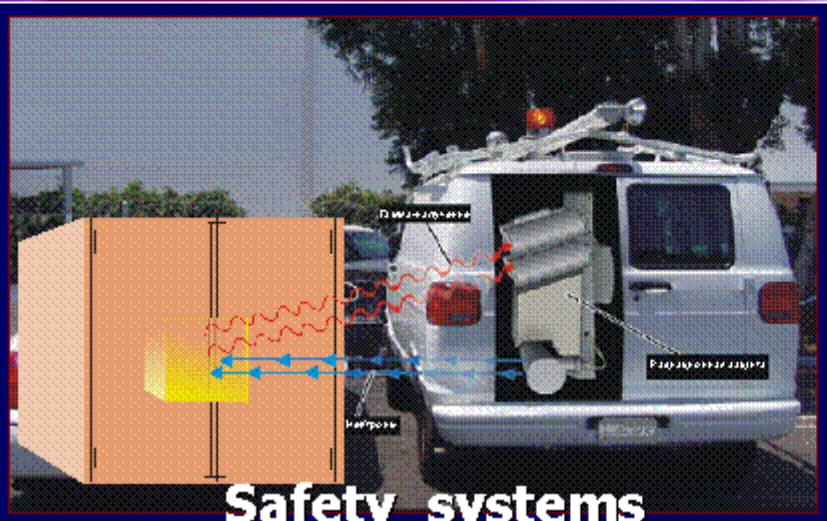
Radiation medicine



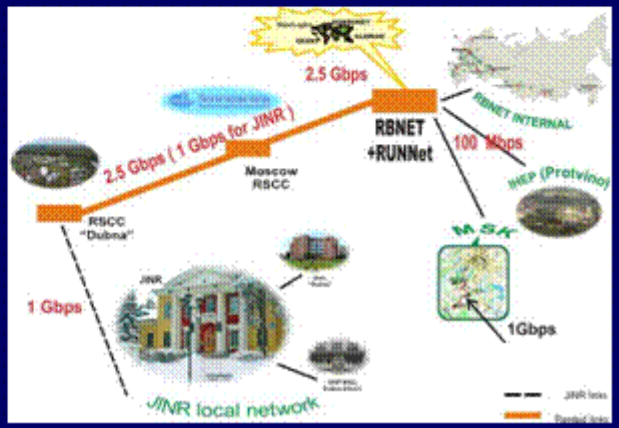


Hadron therapy

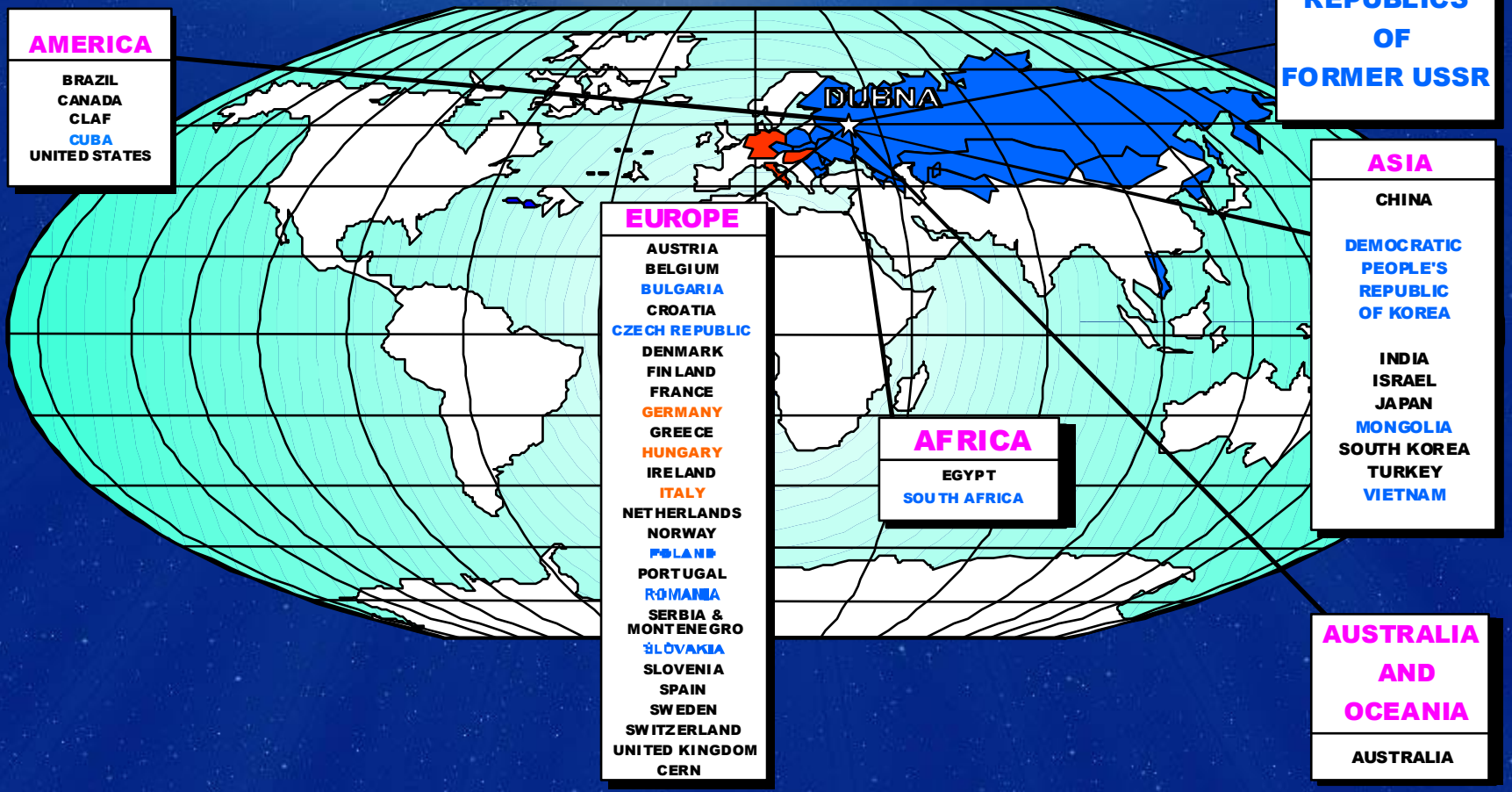
Safety systems



IT and Telecommunication



International Cooperation



JINR's partners are about 700 institutions located in 60 countries

Cooperation with Germany

- Location of centres collaborating with JINR

- **JINR's partners are**
  - 71 institutions located in 45 cities
- Research activities are regulated by the Agreement between BMBF and JINR concluded in 1991
- About 300 joint publications annually

JINR-USA Cooperation

Main Scientific Partners

Institutions:

- Fermi National Accelerator Laboratory
- Brookhaven National Laboratory
- Lawrence Berkeley National Laboratory
- Lawrence Livermore National Laboratory
- Argonne National Laboratory
- Los Alamos National Laboratory
- …

At present, JINR collaborates with 75 U.S. scientific centres and universities

Dr. J. Marburger at JINR, Dubna, 3 June 2002

synthesis of superheavy elements

CDF II

DZero

STAR

Visit of the President of the RF D.Medvedev to Dubna (JINR)

18 April 2008

Welcome to JINR (Dubna)