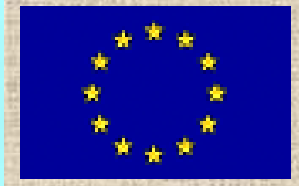
FP7 Information Day



July 22, 2011
National Research University Higher School of Economics, Moscow

Research Infrastructures in Russia

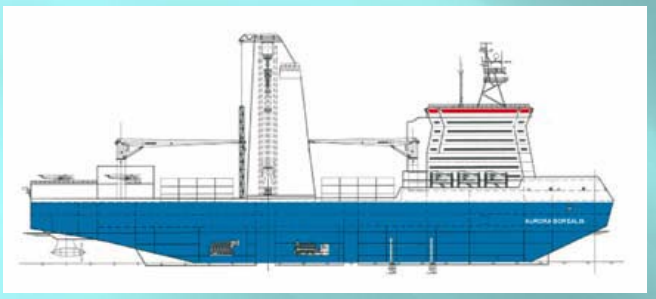
Evgeny Levashov, Kirill Albokrinov
NCP "Research Infrastructures"

National University of Science and Technology "MISIS"

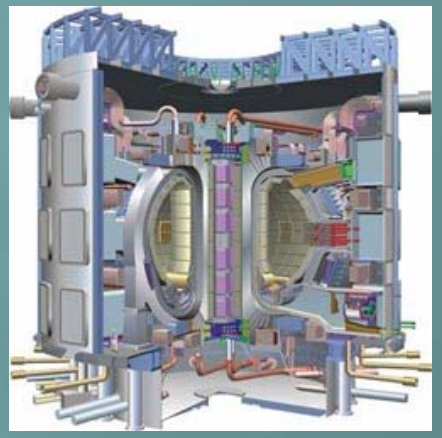
Definition of Research Infrastructures (RIs)

- **Facilities, resources, and related services of a unique nature that has been identified by pan-European research communities to conduct top-level activities in all field**
  - ➔ Conducting leading-edge research
  - ➔ Knowledge transmission, knowledge exchanges and knowledge preservation
- **Includes**
  - ➔ Major scientific equipment
  - ➔ Scientific collections, archives and structured information
  - ➔ ICT-based infrastructures
  - ➔ Entities of a unique nature, used for research

Knowledge Triangle
to be used for strong universities, research institutes and innovative companies



Innovation



Education

Research

Significance of Infrastructure for S&T

- RIs are **THE basement** for successful development in the fields of S&T.

- Thus Research Infrastructures are highly important for the improvement of S&T capacities and the European Research Area itself which should build on the existence, development and efficient access to the Research Infrastructures.

Joint Use Centers (JUCs)

History

- 1980s-2002: Work on creation of the National Network of JUCs started and continued with participation of Russian Foundation of Basic Research
- 2002-2005: New impact in the frame of the Federal Task Scientific and Technical Program "Researches and Developments in Priority Areas of the Science and Technology" for 2002-2006 (FTSTP) under guidance of the Federal Agency for Science and Innovations (FASI)
- since 2005: the development supported in the frame of implementation of the measure "Assistance in the Development of Joint Use Centers of Scientific Equipment" of FTSTP

Now

- National network consist of **74** Joints Use Centers created in 7 federal districts of Russia
- accumulated **1 725** units of scientific equipment (total cost over 800 M€, i.e. about 7.0% of the cost of the national research equipment stock)
- renewing the centers' instrumentation by 19% in 2008 and by 25% in 2009-2010 as to compare 2006

Joint Use Centers become the key carrier units in country's regions providing frontier research, integrated developments, implementation of significant innovative projects

Key Instruments for Involvement of Russia into European Research Infrastructure

1. Large Scale Joint Use Centers (JUCs)

- List of JUCs is available on the Russian RIs NCP website (www.fp7-infra.ru)
- Establishing virtual links between JUCs working on similar research fields in order to allow mutually beneficial distant experiments and gather a database

2. Unique Scientific Equipment & Complexes (USE&C)

Such as:

- SKIF Cyberia of Tomsk State University
- Federal Research and Clinical Centre of Pediatric Hematology, Oncology and Immunology of Russian State Medical University
- Federal State Unitary Enterprise Central research institute of structural materials “Prometey”
- Innovative technological center “Technopark Perspektiva”
- Center of Synchrotron Irradiation of Russian Research Center "Kurchatov Institute"
- Center of Beam Investigations Based on Isochoric Cyclotron of Russian Research Center "Kurchatov Institute“
- MSTU "STANKIN"
- Novosibirsk Free Electron Laser (NovoFEL) of Budker Institute of Nuclear Physics
- Scientific-Educational Center “Nanomaterials and Nanotechnologies” of National University of Science and Technology “MISIS”
- Joint Use Center for Vibroseismic Sources of Kuban’ State University
- Pushchino Radio Astronomy Observatory
- Plants for Renewable Feedstock Conversion of Breskov Institute of Catalysis
- Research Center for Surface and Vacuum of National Research University “Moscow Institute of Physics and Technology”
- Ural Joint Use Center “Modern Nanotechnologies” of Ural State University
- Others

RI Work programme objectives of FP7 Integrating activities

- => to bring together and integrate, on a European scale, key research infrastructures in a given field, in order to promote their coordinated use and development

- => to provide researchers with a harmonised and optimised access to the best research infrastructures of a given field, independent of where the research infrastructures are located and by whom they are operated

- => to create the basis for a more rapid advancement of science in Europe, enabling the development of new advanced technologies and the associated growth of the European technology market as well as the creation of a new generation of researchers, ready to exploit in the best way all the essential tools needed for their research

- => Lastly, by integrating major scientific equipment (telescopes, synchrotrons, research vessels, etc.) or set of instruments (sensors, microscopes, radars, etc.), as well as knowledge basedresources(collections, archives, structured scientific information, data infrastructures, etc.), integrating activities harmonise and organise the continuous flux of data collectedor produced by these facilities and resources.

Integrating activities in the frame of new FP7 Calls
INFRA-2012-1.1.1 - INFRA-2012-1.1.27 announced July 20, 2011
Total amount: 30 000 000 EURO, Deadline: November 23, 2011

- *Social Sciences and Humanities*

- o INFRA-2012-1.1.1. Research infrastructures for the study of poverty, working life and living conditions (*bring together research infrastructures serving European and international research in the fields of poverty, working life, including safety and health at work, and living conditions – to contribute to understanding how vulnerable groups face economic changes and cope with it)*

- o INFRA-2012-1.1.2. Research infrastructures for the assessment of science, technology and innovation policy (*Existing infrastructures are fragmented and uncoordinated. There is need for improved European data infrastructure. The aim is to bring together organizations and institutions with different expertise and data in the field of science, technology and innovation (including social innovation) - it will work as a catalyst for improving the data quality)*

Integrating activities in the frame of new FP7 Calls
INFRA-2012-1.1.1 - INFRA-2012-1.1.27 announced July 20, 2011

- *Social Sciences and Humanities*

- o INFRA-2012-1.1.3. Research infrastructures for archaeological datasets and related technologies (*focus upon integrating datasets and facilitating cooperation pertaining to all fields of archaeology (from prehistory to contemporary society) and including the archaeology of Europe, as well as European archaeology abroad. The action should promote closer collaboration between researchers, policy makers, and other stakeholders by providing a framework for dialogue on key archaeological, conservation and heritage issues)*

Integrating activities in the frame of new FP7 Calls
INFRA-2012-1.1.1 - INFRA-2012-1.1.27 announced July 20, 2011

- *Life Sciences*

- o INFRA-2012-1.1.4. Mouse archives and centres for phenotyping mouse models (*aim at integrating key European mouse archives and phenotyping centres. The project must facilitate the access of researchers to mouse lines and data (including from phenotyping)*

- o INFRA-2012-1.1.5. Facilities for translational research in medicine (*aim at integrating and facilitating access to the key European research infrastructures dedicated to translating basic discoveries into clinical practice)* **(FRC-PHOI)**

- o INFRA-2012-1.1.6. Bioligical Resources Centres for micro-organisms (*provide and facilitate access to the key micro-organism resources in Europe. Collections concerned will range from virus archives, bacterial collections (including cyanobacteria), to fungi collections)*

Integrating activities in the frame of new FP7 Calls
INFRA-2012-1.1.1 - INFRA-2012-1.1.27 announced July 20, 2011

- *Life Sciences*

- o INFRA-2012-1.1.7. Experimental facilities for animal disease infectiology (*provide and facilitate access to the key experimental facilities in Europe for animal and zoonotic infectious diseases. It will also include key collections of samples necessary for research on animal and zoonotic infectious diseases)*
- o INFRA-2012-1.1.8. Stem cell banks (*aim at integrating, updating and standardising existing and new stem cell banks and registries to create at the European level a stem cell resource that will catalyse research in this field)*
- o INFRA-2012-1.1.9. Large-scale prospective cohort studies (*aim at better coordinating the largest European prospective studies, i.e. comprising or aiming at hundreds of thousands of subjects, recording lifestyle and environmental information, recording medical history over several decades, and storing bio-specimens)*
- o INFRA-2012-1.1.10. Plant Genetic Resources Centres (*aim at integrating and facilitating access to the key European research infrastructures for holding genetic resources from crops and wild plants. It would cover native seed banks, gene and DNA banks and germplasm collections as well as related data resources)*

Federal Research and Clinical Centre of Pediatric Hematology, Oncology and Immunology (FRC-PHOI)

- established: 1991 as Research Institute of Pediatric Hematology on the base of the largest national teaching hospital (Russian Children's Clinical Hospital)
- NOW: the most important research and clinical facility in the field of pediatric cancer in Russia
- clinical branch: 10 departments of pediatric and adolescent hematology, oncology and immunology of 5 major hospitals of Moscow region
- coordinates research and clinical efforts of pediatric cancer departments in 80 regions of the country
  - unique base for conducting multi-center clinical trials
  - due to large referral area encompassing the whole country the institution is able to gather information on rare cancers, inherited immune and metabolic disorders and bone marrow failure syndromes on large groups of patients, which is not always possible in this scale at single centers in Europe

Integrating activities in the frame of new FP7 Calls
INFRA-2012-1.1.1 - INFRA-2012-1.1.27 announced July 20, 2011

- *Environmental Sciences and Earth Sciences*

- o INFRA-2012-1.1.11. Fixed point open ocean observatories (*integrate and improve access to the key infrastructures in Europe which make sustained time series observations in the open seas and ocean at fixed critical locations. These infrastructures should support fully multidisciplinary research on the entire oceanic environment, from sea floor to the air-sea interface, including carbon fluxes)*

- o INFRA-2012-1.1.12. Research Vessels (*aim at integrating and improving access, on basis of scientific excellence, to the key European research vessels and associated heavy equipment, in particular those that are sailing on all world oceans, including polar regions, but not commonly available at the national Level)*

- o INFRA-2012-1.1.13. Research Aircrafts *(integrate key research aircrafts and improve their availability to European researchers from larger multidisciplinary scientific communities. Improve research services for users of instrumented research aircrafts and relating research infrastructures, e.g. in the field of remote sensing*

Integrating activities in the frame of new FP7 Calls INFRA-2012-1.1.1 - INFRA-2012-1.1.27 announced July 20, 2011

- *Environmental Sciences and Earth Sciences*

- o INFRA-2012-1.1.14. Atmospheric simulation chambers (*integrate ke instrumented environmental chambers and improve access to them for atmospheric research, including model development, while expanding to larger scientific communities and interdisciplinary research fields)*

- o INFRA-2012-1.1.15. Research Infrastructures for Climate Earth System modelling *(integrate the research infrastructures used by the climate modelling community in Europe and promote the development of a common distributed modelling research infrastructure)* **(Kuban State University)**

- o INFRA-2012-1.1.16. Natural History Collections (*integrate and improve access to key European Natural History collections and to their related instrumentation facilities)*

Joint Use Center for Vibroseismic Sources of Kuban State University

- Joint Use Center for Heavy Vibroseismic Sources was established in 2000.

  The Association for Seismic Protection of the Black Sea Economic Cooperation Member States was founded the same year and took this Center as Joint Used.

- American 30-t experimental Y-3000 geoseismic vibrator, donated by Tengasco, an American oil company

American 17-t A- 1100 geoseismic vibrator, one of two vibrators donated by Tengasco, an American oil company

KubSU testing ground. Heavy TV-100 geoseismic vibrators with a dynamic force of 100 tons

10-t CT-10 geoseismic vibrator.

Integrating activities in the frame of new FP7 Calls INFRA-2012-1.1.1 - INFRA-2012-1.1.27 announced July 20, 2011

- *Energy, Engineering, Material Sciences and Analytical Facilities*

- o INFRA-2012-1.1.17. Research Infrastructures for Solar Energy: Concentrating solar power (*bring together the key European research infrastructures in solar concentrating systems (solar concentrators and relating research infrastructures) for carrying out energy- and materials research and research in other fields using the extreme temperature conditions in solar concentrators)* **(GIREDMET, MIET, etc)**

- o INFRA-2012-1.1.18. Carbon Capture and Storage (CCS) facilities for energy research (*aim at integrating the key research infrastructures in Europe for all aspects of Carbon Capture, Sequestration and Storage as well as of CCS facilities from large point sources such as fossil power plants and storage)* **(Institute of High-Temperature Electrochemistry UB RAS, etc)**

- o INFRA-2012-1.1.19. Research Infrastructures for Distributed energy resources – smart electricity grids (*bring together key research infrastructures for research in the field of distribute energy resources and Smart Energy Networks)* Institute of Catalists SB RAS, etc.

Integrating activities in the frame of new FP7 Calls INFRA-2012-1.1.1 - INFRA-2012-1.1.27 announced July 20, 2011

- *Energy, Engineering, Material Sciences and Analytical Facilities*

- o INFRA-2012-1.1.20. Infrastructures for studying turbulence phenomena and applications (*need for detailed understanding of turbulence phenomena; aim at bringing together key facilities addressing the turbulence phenomena in various areas of science and technology)* (**FIAN - Pushchino Radio Astronomy Observatory, Inst. of Hydrodynamics SB RAS, etc)**

- o INFRA-2012-1.1.21. Research infrastructures for integration of processing, analysis and characterisation of nano-scale materials and structures (*aim at integrating nano-science laboratories (foundries, nano-fabrication) with colocated large scale facilities for fine analysis (nano-characterisation laboratories, synchrotron radiation sources, neutron sources, free electron laser sources and advanced modelling simulation facilities)* (**Kurchatov Institute, MISIS, Ural State University, and many others)**

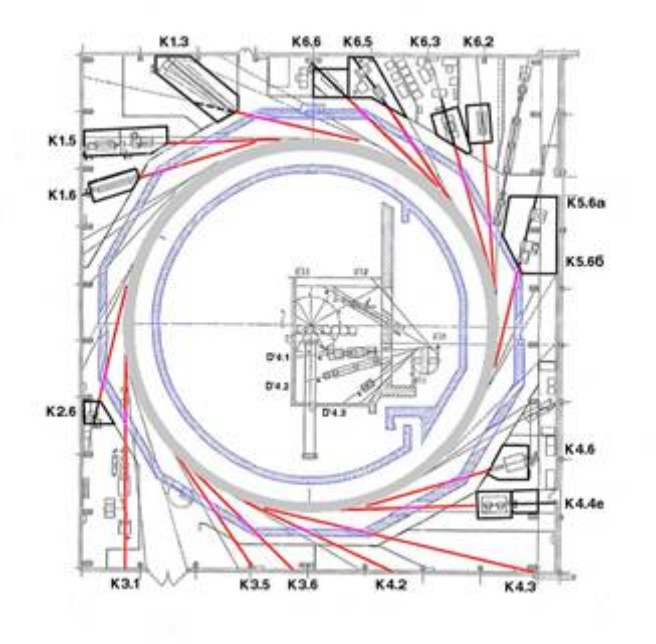
- o INFRA-2012-1.1.22. Imaging, Diffraction and Spectroscopy using Electrons (*integrate key facilities and state-of-the-art technologies in the field of electron-based analytical approaches)* (**Institute of Spectroscopy of RAS, A.V.Shubnikov Institute of Crystallography RAS)**

- o INFRA-2012-1.1.23. Synchrotron radiation sources and Free Electron Lasers (**Kurchatov Institute, Budker Institute of Nuclear Physics of SB RAS(NovoFEL)**

Kurchatov Synchrotron Radiation Source

The Kurchatov Synchrotron Radiation (SR) Source is the first dedicated SR facility in Russia for the production and use of synchrotron radiation. The combination of specific properties of synchrotron radiation like high flux, collimation and polarization, temporal structure and a wide wavelength range from infrared to the hard X-rays makes the source a powerful tool for the research in physics, chemistry, biology, materials science, micro-and nanotechnology

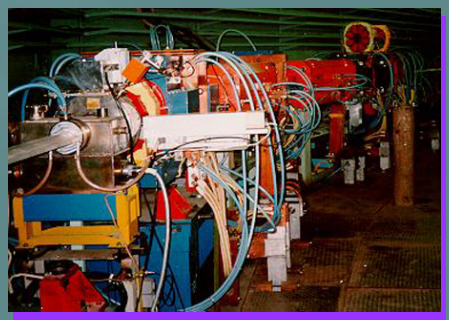
Kurchatov Synchrotron Radiation Source



Linear Accelerator (injector)

Large Storage Ring (X-rays)

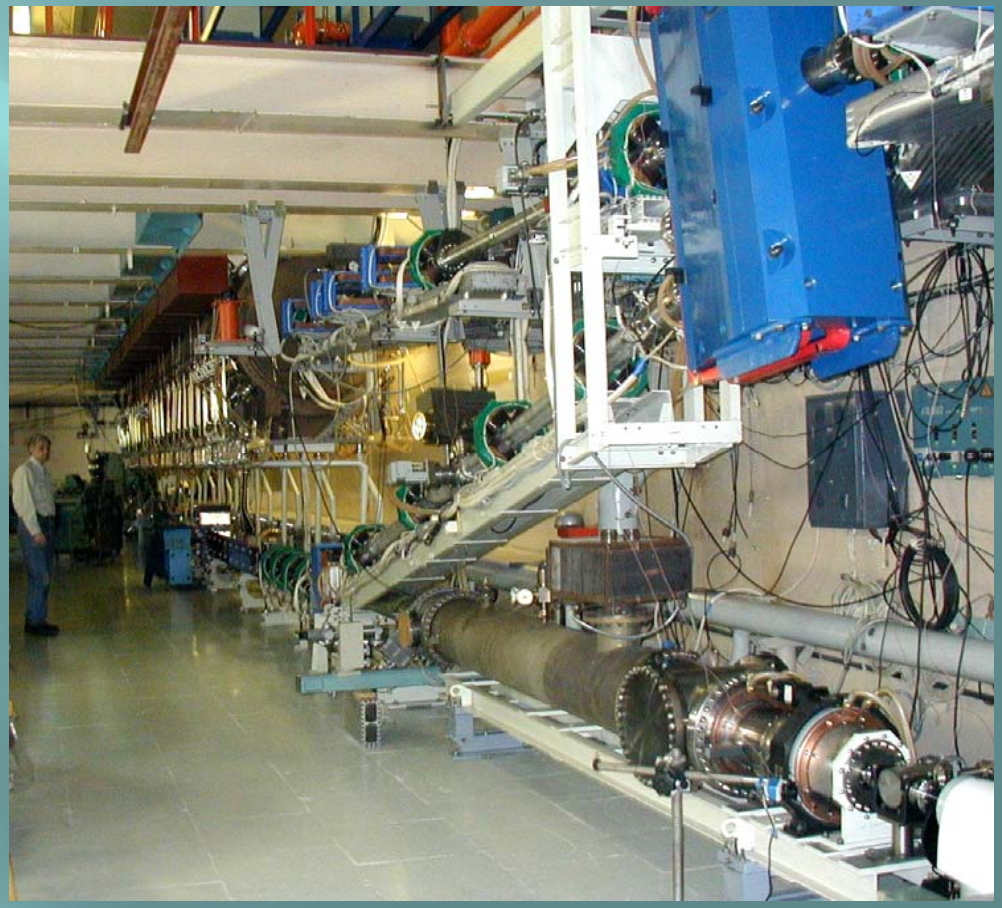
Small Storage Ring (booster, VUV)



Control Room

NovoFEL

Developed at the Budker Institute of Nuclear Physics the Novosibirsk Free Electron Laser (NovoFEL) is at the present time **the most powerful worldwide**



The scientific and technological applications of this unique installation can vary in a wide range: from separation of isotopes and mass producing of stable isotopes (e.g. 28Si, 15N, 13C) up to treatment of polymer surfaces (aiming changes in their mechanical and chemical properties) and even energy transfer to space.

Integrating activities in the frame of new FP7 Calls
INFRA-2012-1.1.1 - INFRA-2012-1.1.27 announced July 20, 2011

- Physics and Astronomy

- o INFRA-2012-1.1.24. Accelerator physics (*facilitate access to state of the art facilities to develop new techniques for improving the performance of existing and future accelerators)* **Joint Institute for Nuclear Research (Dubna), Kurchatov Institute, ets.**

- o INFRA-2012-1.1.25. Research Infrastructures for optical/IR astronomy (*provide and facilitate access to the key research infrastructures in Europe for optical and infrared astronomy. It should aim to integrate these facilities and resources with a long term perspective)* **(FIAN - Pushchino Radio Astronomy Observatory)**

Integrating activities in the frame of new FP7 Calls INFRA-2012-1.1.1 - INFRA-2012-1.1.27 announced July 20, 2011

- Physics and Astronomy

- o INFRA-2012-1.1.26. Research Infrastructures for High-Resolution Solar Physics (*aim at integrating key research infrastructures in the field of high resolution solar physics. It should contribute to the realisation of the future large European ground- and space-based solar telescopes and to a Solar Virtual Observatory)* **(FIAN - Pushchino Radio Astronomy Observatory)**

- o INFRA-2012-1.1.27. Research Infrastructures for space weather (*aim at integrating the key research infrastructures in Europe for the observation and study of the ionosphere and magnetosphere. Infrastructures of relevance include the European Incoherent Scatter radar system (EISCAT) and other incoherent scatter radar systems, satellites, solar ground based-observatories, ionospheric sounders, Global Navigation Satellite Systems (GNSS) receivers and ground magnetometers)* **(FIAN - Pushchino Radio Astronomy Observatory)**

Pushchino Radio Astronomy Observatory

is the main radio astronomy center in Russia

45 astronomers and over 60 engineers and technicians are working in PRAO at the present time.

RT-22 is 22-meter full-steerable Dish λ_{min}=8mm

3 large radio telescopes in PRAO:

DKR-1000 is a wide-band (30-120 MHz) Cross-type Meter- wave-lengths Radio Telescope. Two arms of 40m x 1 km.

BSA is a large phased array of 16384 full-wavelength (λ = 2.7 m) dipoles. Total size is 187mx384m

Pushchino Radio Astronomy Observatory

The observatory embodies the achievements of the Russian school of Astrophysics. A number of outstanding Soviet and Russian scientists worked here in over 50 years of institutions history.

Some of the extraordinary research results:

- ⇨ Discovery of the solar super corona and elongated in radii magnetic field inhomogeneties
- ⇨ First estimate the age of the radio galaxy
- ⇨ Determination of temperature and pressure at the Venus surface
- ⇨ Measurements of the solar wind velocity
- ⇨ Cosmological evolution of the quasars and radio galaxies radio spectra

At present PRAO, a division of the **Astro Space Center** (ASC) of the **Lebedev Physical Institute**, in fact represents a **Joint Use Center**, considering all applications the observation time on its radio telescopes irrespective of, in what country or what establishment the author of the corresponding proposal works

- 4th International Workshop
- "EU-Russian Open Days"
- Vienna, 24-25 October 2011
- Russian Centre of Science and Culture
- 4, Brahmsplatz 8

High Potential Research and Research Infrastructures in the Area of

Nano- and Environmental Sciences

NCP “Research Infrastructures” Russia

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