

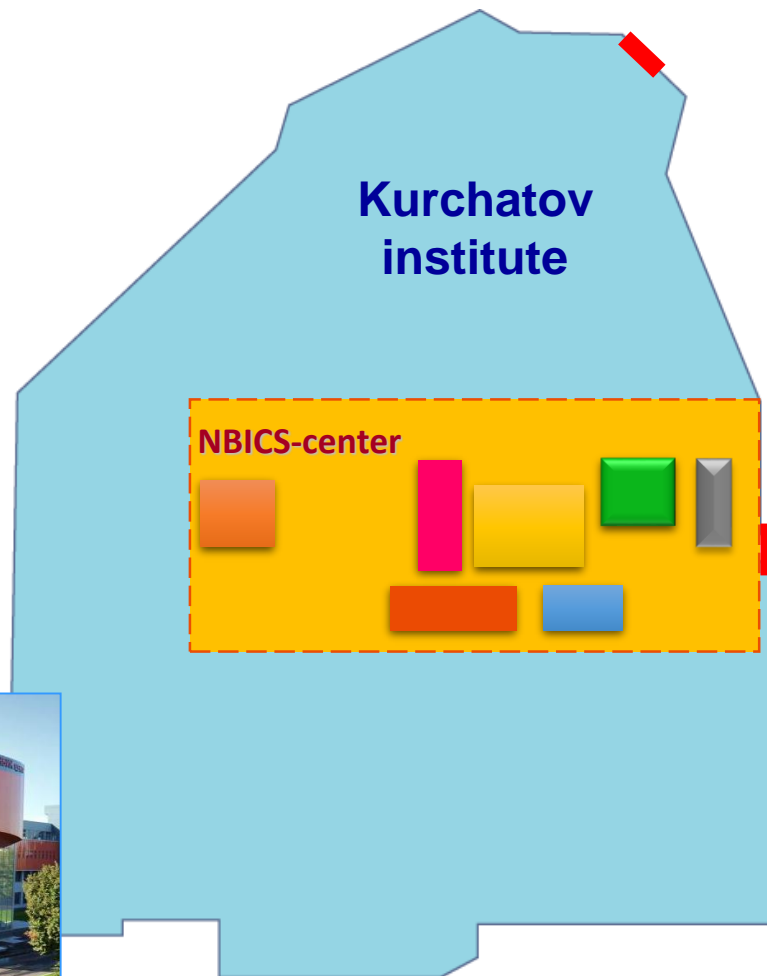
# **Kurchatov complex of synchrotron and neutron research: current status and prospects**

# Constructive interference between synchrotron radiation and neutrons

Kurchatov complex of synchrotron and neutron research is of the few places in the world where a neutron source is placed **on the same ground** as a synchrotron.



# Convergence of sciences and technologies



Large-scale facilities surrounded by scientific laboratories of NBICS center makes Kurchatov institute a really **unique place** in the whole world **for fundamental and applied interdisciplinary researches**

# History of the Kurchatov synchrotron radiation facility



The Kurchatov synchrotron foundation laying  
(December 1985, Soviet Union)



First building of the Kurchatov synchrotron  
(1999-2007, Russian federation)

# Kurchatov source of synchrotron radiation



The area of 17 000 m<sup>2</sup>

# Experimental hall

## Beamlines:

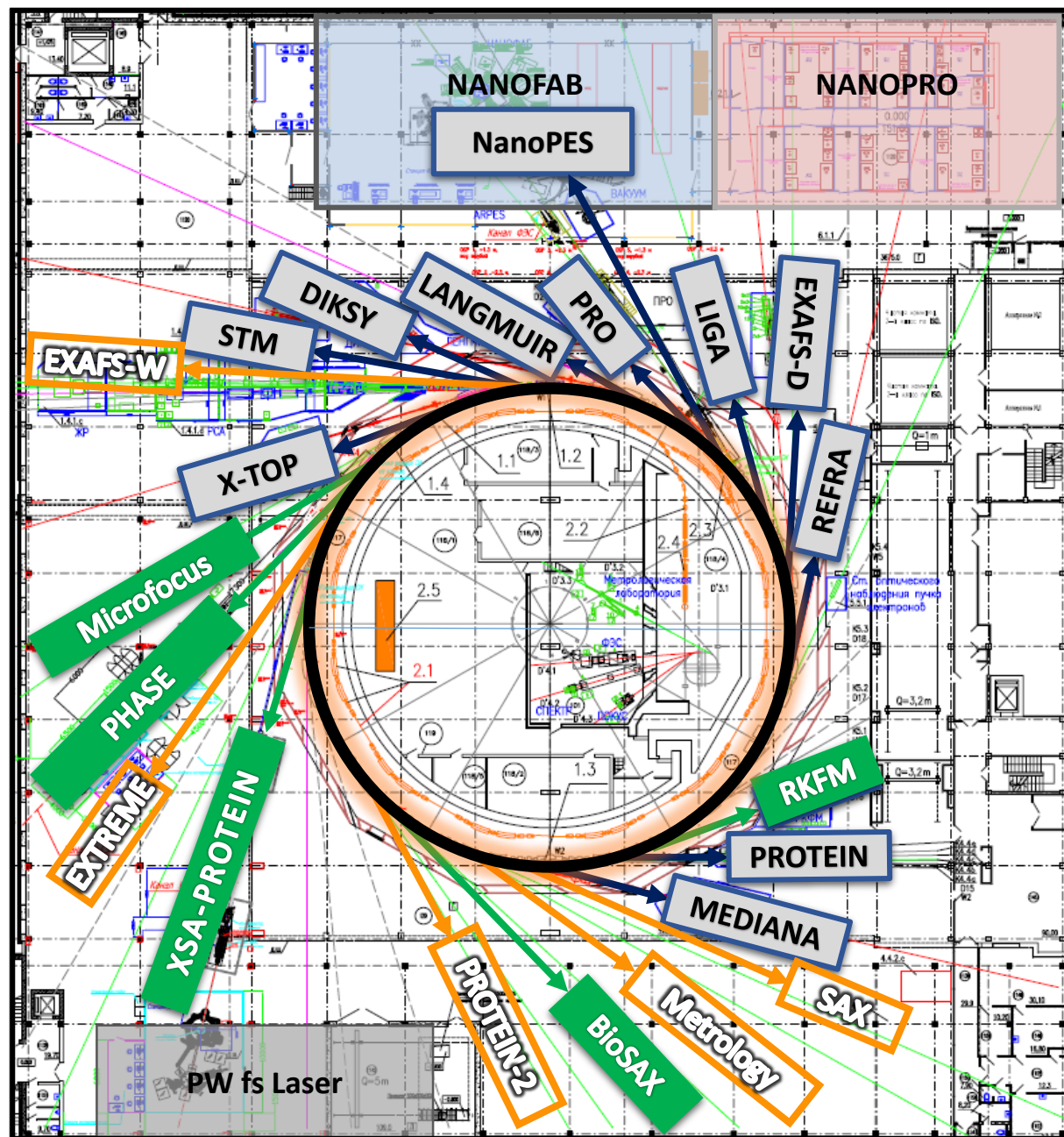
Operating (16)

incl.

New 2015-19r (5)

Under constructing (5)

100 m

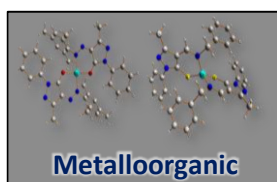
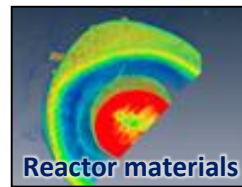


# New beamlines



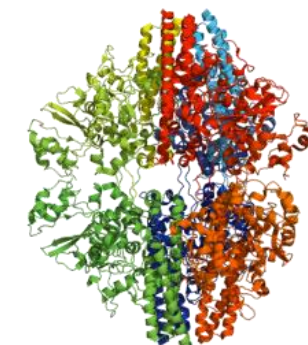
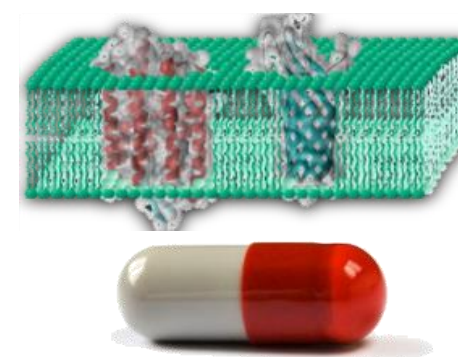
## Crystallography, material science, structural chemistry

- STM
- DIKSY
- XSA
- X-TOP



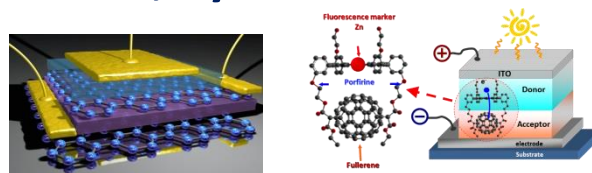
## Protein crystallography, molecular biology, medicine

- PROTEIN
- DIKSY
- Langmuir
- Mediana

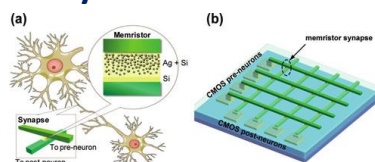


## Micro- and Nanoelectronics, hybrid materials

- PHASE
- RKFM
- NanoPES
- Langmuir

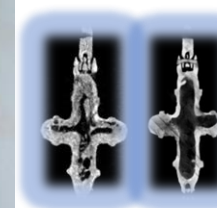
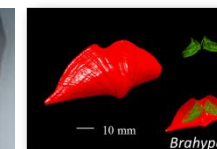


Organic and hybrid multilayer systems



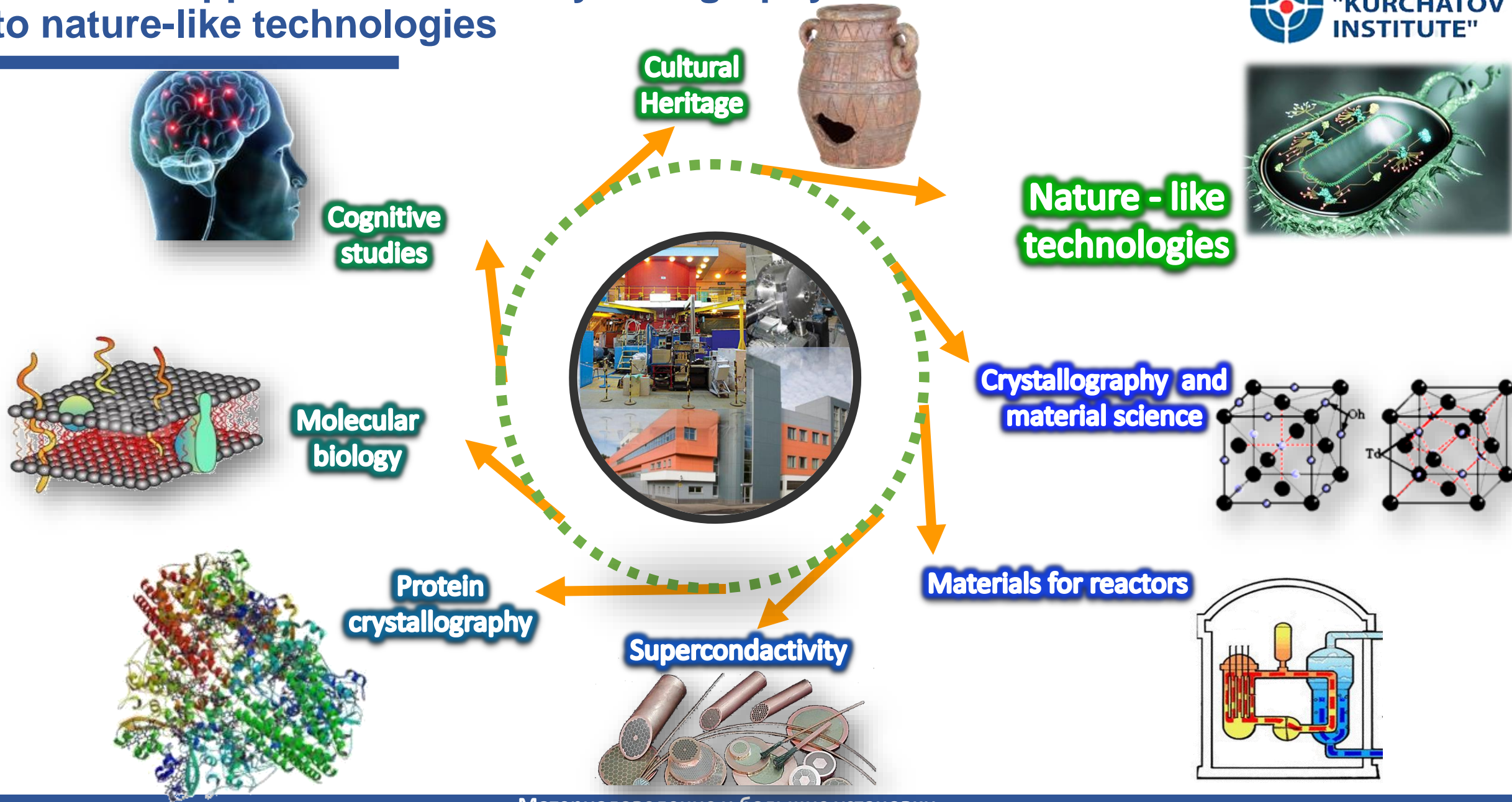
## Cultural heritage

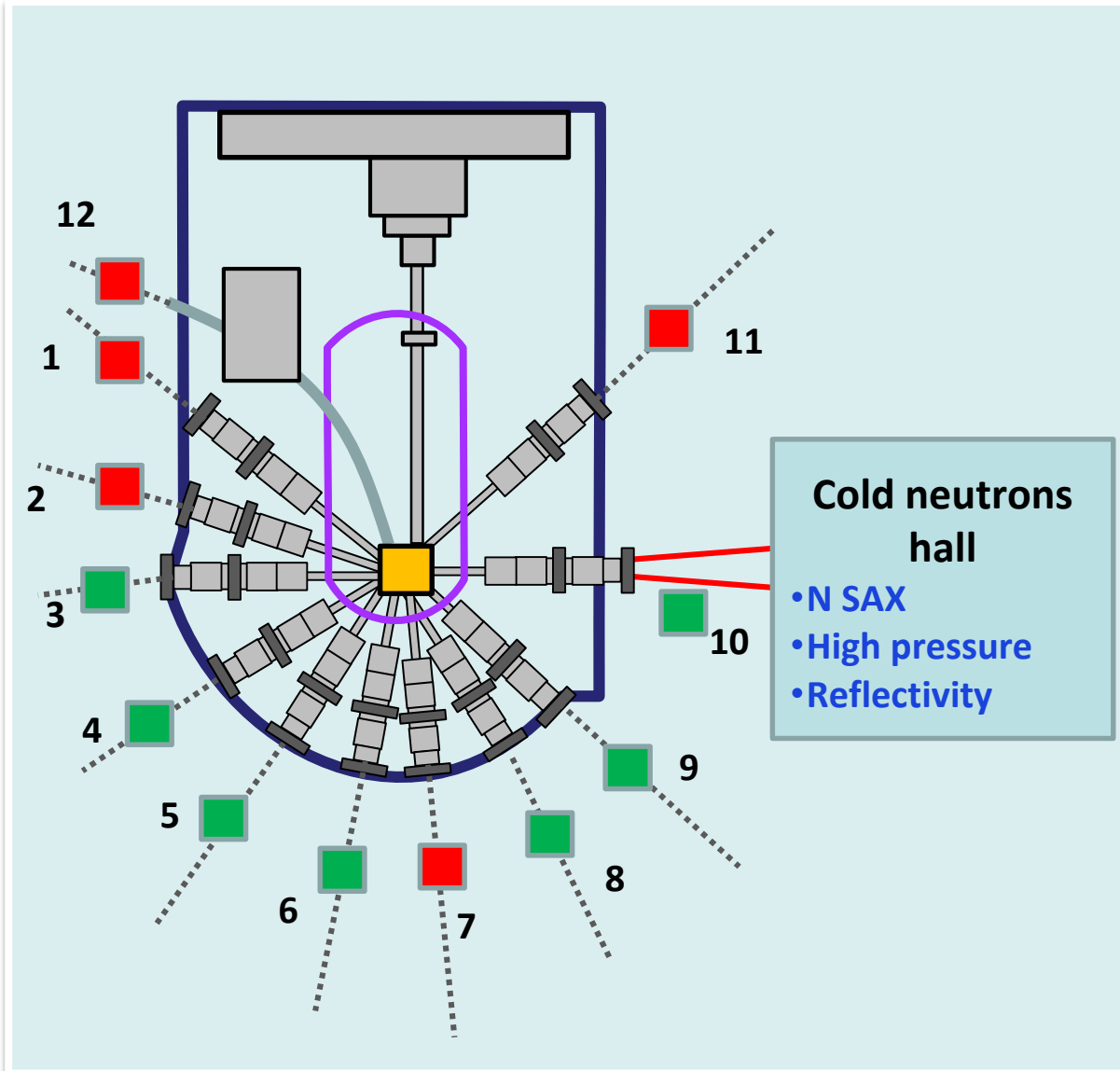
- REFRA
- STM
- DIKSY
- RKFM
- Mediana





# Scientific applications: from crystallography to nature-like technologies





■ Nuclear-physics channels

■ Experimental channels

1 – Ultra cold neutrons

2 – Nuclear spectroscopy

3 – Stress analysis

4 – Single crystals

5 – Inelastic scattering

6 – High pressure

7 – Capillary optics

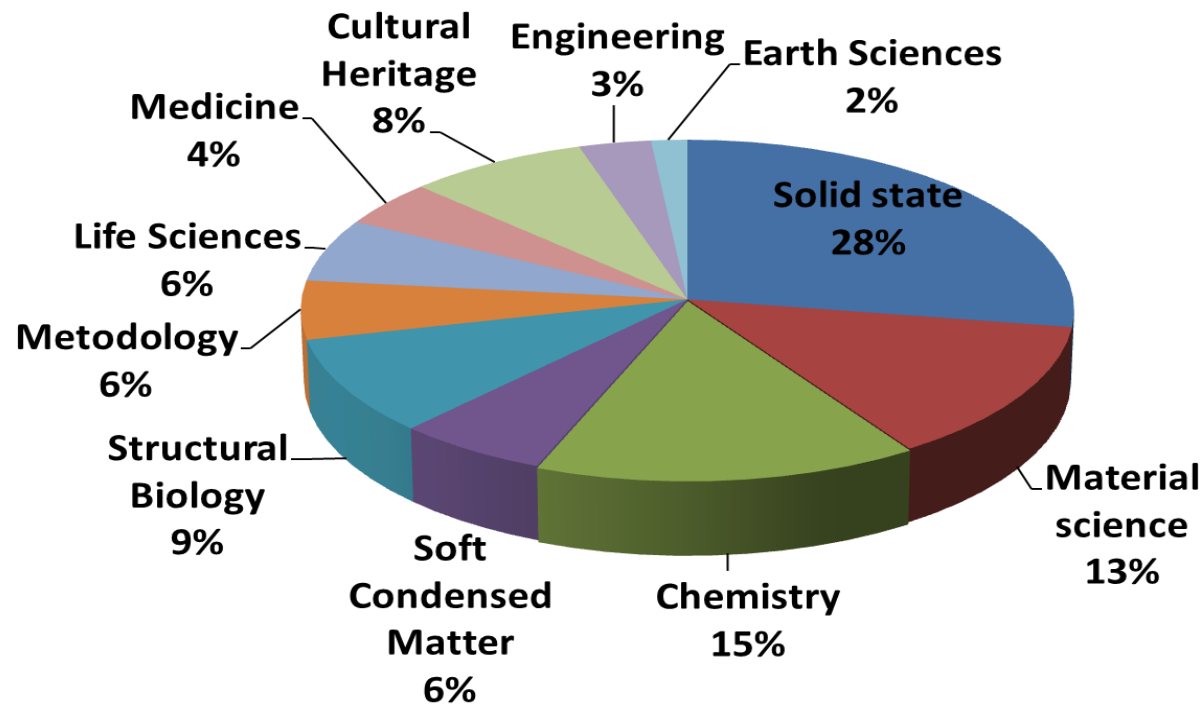
8 – n,  $\gamma$  –radiography

9 – Small angular scattering

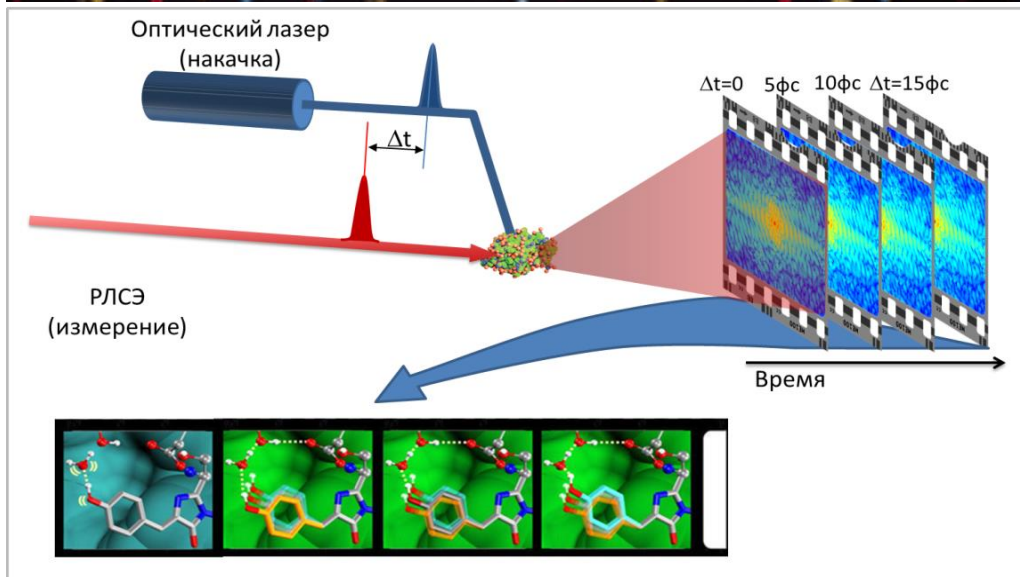
10 – Cold neutrons source

# Statistics (average per year)

- > 300 accepted proposals (~ 60 organizations)
- > 120 user groups
- > 3 500 hours of experimental time
- > 25 000 hours total time of beamlines operation
- > 150 publications Web of Science



# Laser-Synchrotron complex



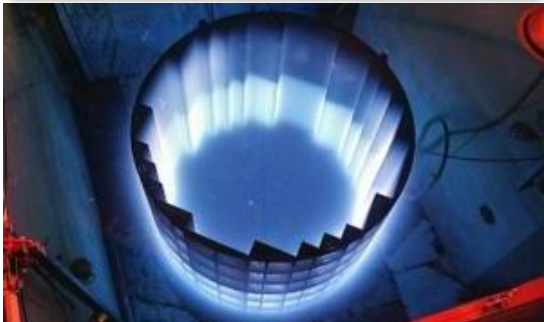
# Synchrotron and Reactor IR-8 modernization

## Engineering systems



## Vacuum system

## Active zone



## Beryllium reflectors

2.5 GeV current 150 mA

Energy:

25 eV– 150 keV

Photon fluence:

$10^{14}$ - $10^{12}$  ph/c · mm<sup>2</sup>

Synchrotron and reactor IR-8 systems modernization

The neutron flux at the end of the horizontal channel

$10^{10}$  n/s · cm<sup>2</sup>

## Magnetic and HF systems



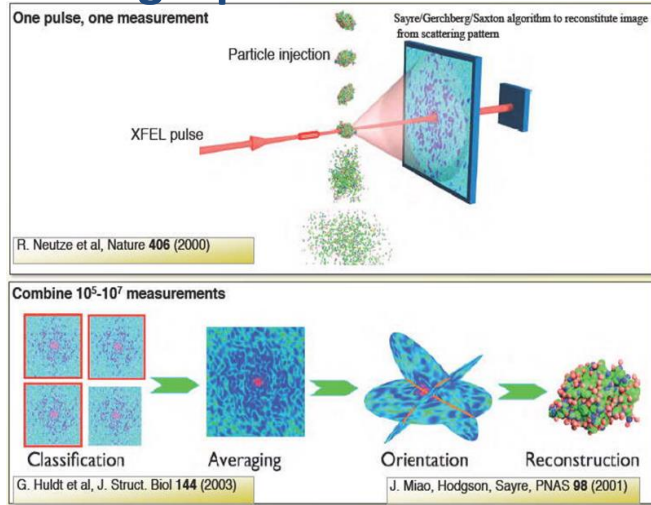
## SC wigglers

## Protection system

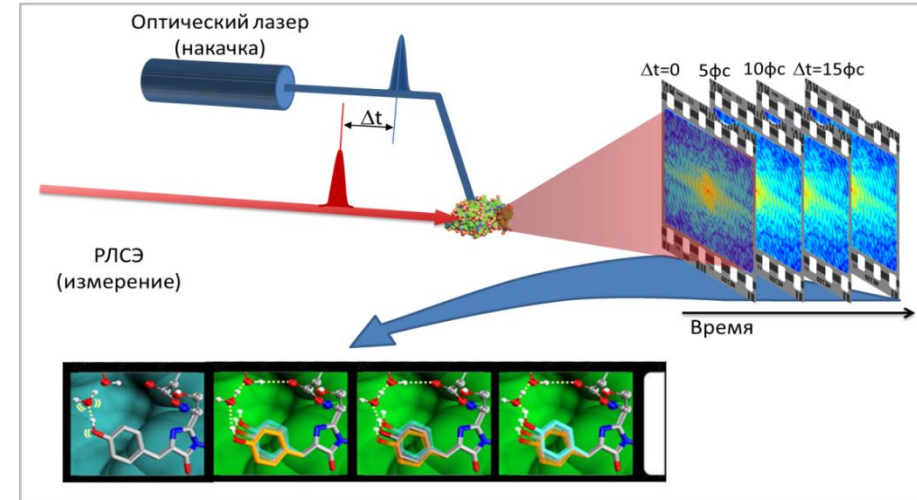


## Control system

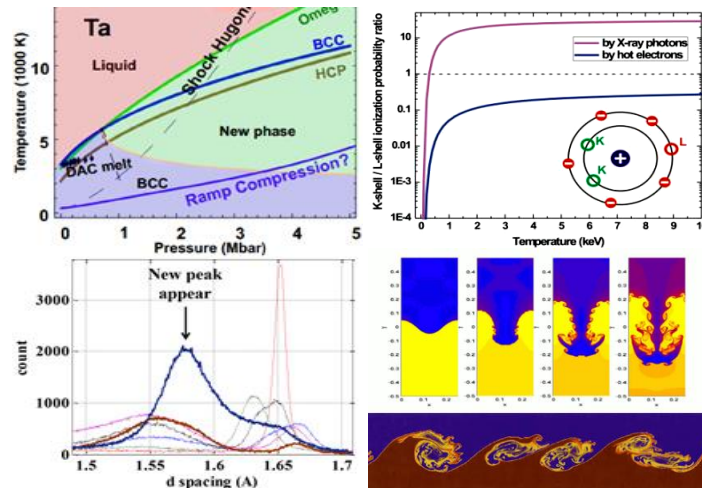
## Single partials structure



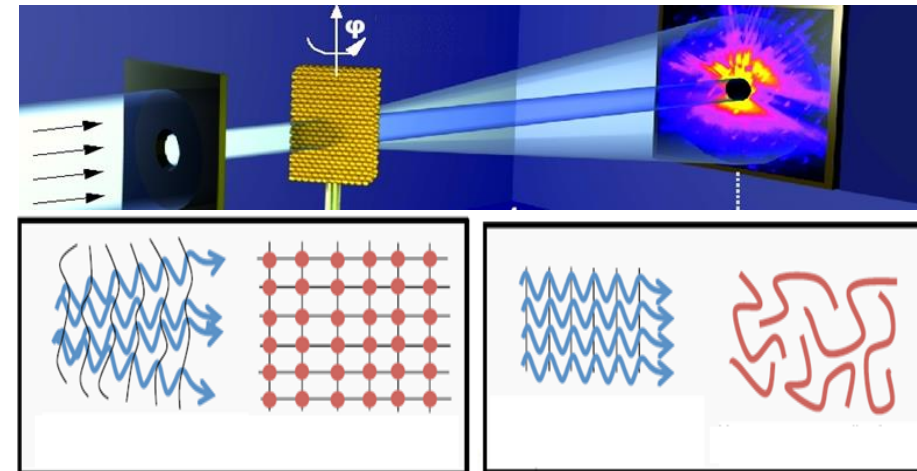
## Chemical reactions "movies"



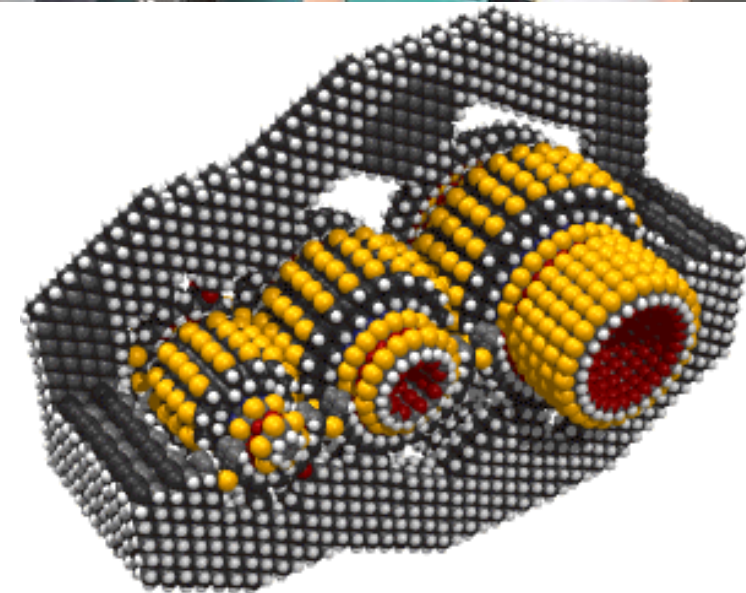
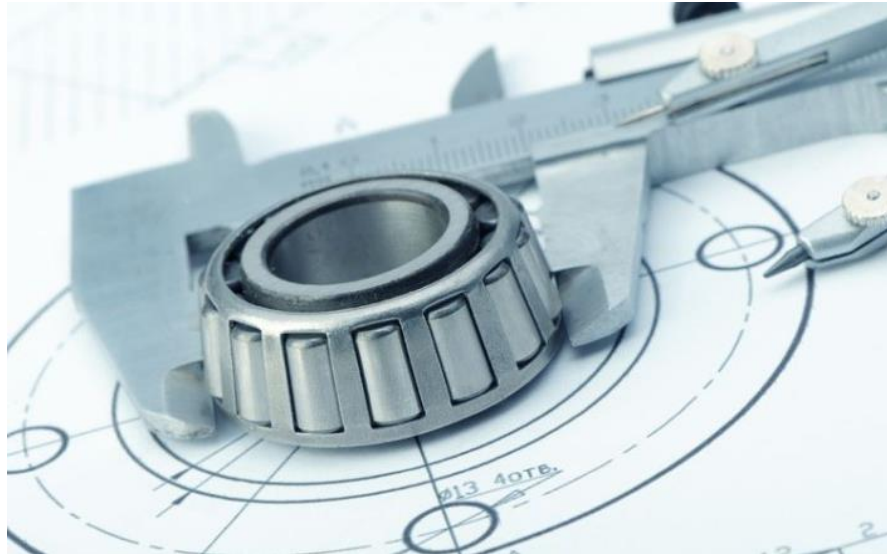
## Exotic state of the matter



## Coherent applications



# Megascience – metrology for modern technologies





## # NEW MATERIALS AND DIGITAL ECONOMY

- Structure and properties of functional materials;
- Additive technologies;
- Materials for microelectronics, spintronics, straintronics.



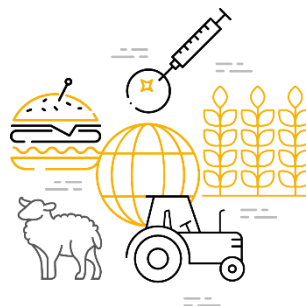
## # DEMOGRAPHY AND MEDICINE

- Protein crystallography;
- Structure of membranes, viruses;
- Molecular mechanisms of drug action;
- Structure of polymers;
- Development of systems for targeted drug delivery.



## # NATIONAL SECURITY

- Materials for sensors and detectors;
- Fast processes of combustion;
- Cultural heritage.



## # FOOD

- Molecular and supramolecular structure of foodstuffs
- Denaturation of plant and animal proteins;
- Visualization of seeds of various crops.



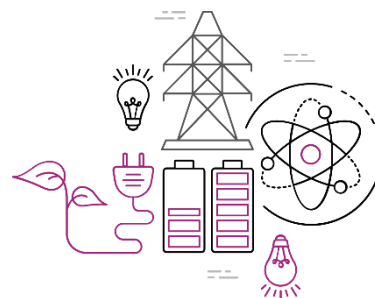
## # TERRITORY CONNECTIVITY AND SPACE EXPLORATION

- Construction materials for extreme conditions;
- Non-destructive weld inspection.



## # HUMAN, NATURE AND TECHNOLOGIES

- Metrology for nature-like technologies;
- Diagnostics of components of adaptive neuromorphic systems and memristic materials;
- Micro- and mesoporous systems and materials;
- Structure diagnostics of biotechnologies;
- Ecological monitoring.



## # ENERGETICS

- Superconductors and thermoelectric materials;
- Catalysis and chemical processes of energy generating;
- Materials for nuclear energy.



КЦНИ панель



Марченков  
Никита  
Владимирович

Online

НАВИГАЦИЯ

- Личный кабинет
- Мой профиль
- Личные сообщения
- Режимы накопителей

Панель управления Control panel

Создание заявки

Начало



**Общая информация:** укажите общие сведения о проводимом исследовании

Название проекта

ID заявки

Предыдущая заявка

-- Найти --



**Содержание проекта:**

**Научное содержание**

Например:

Научная новизна настоящих исследований определяется как получением новых высококачественных

**Обоснование важности**

Например:

Реализация работы возможна на специализированной станции КИСИ: СТМ (К1.3b) структурное мат

**Стратегия проведения исследования**

Например:



**Условия проведения исследования**

**Метод исследования**

-- Выбрать --

**Станция**

-- Выбрать --

Доп.инфо



**Запрашиваемые параметры исследования**

**Требуемое пучковое время:**

Требуемое пучковое время

**Энергия:**

Энергия

**Размер пучка:**

Размер пучка

**Разрешение:**

Разрешение

**Особые требования:**

Особые требования...



**Проектная команда:** кто участвует в исследовании?

Список участников



Thank you for attention!



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[synchrotron@nrcki.ru](mailto:synchrotron@nrcki.ru)