

KFKI RESEARCH INSTITUTE  
FOR PARTICLE AND NUCLEAR PHYSICS  
OF THE HUNGARIAN ACADEMY OF SCIENCES  
Budapest, Hungary



Presented by Prof. Zoltán Szőkefalvi-Nagy (director)  
[sznagy@rmki.kfki.hu](mailto:sznagy@rmki.kfki.hu)



## HISTORY

The KFKI Research Institute for Particle and Nuclear Physics (RMKI) of the Hungarian Academy of Sciences became an independent legal entity on 1st January 1992.

Earlier, in the 1975-1991 period, RMKI, as an institute with the same name as today, worked within the framework of KFKI (Central Research Institute for Physics of the Hungarian Academy of Sciences). At that time KFKI comprised five, later four research institutes. The KFKI itself was founded in 1950.



## Prof. Károly Simonyi 1916 - 2001

Builder of the first particle  
accelerator in Hungary  
initiator of nuclear physics  
research in KFKI

(His son, Dr. Charles Simonyi  
is a dominating person of the  
contemporary „software world”  
and the 5th „space tourist”)



## MISSION OF KFKI RMKI

Experimental and theoretical basic research in high energy and heavy ion physics, plasma physics, atom optics, space physics, nuclear solid state physics, nuclear materials science and application of physics in bioscience

Development in the fields of laser physics, fusion technology, nuclear analysis, space technology, fast data processing and evaluation, spectroscopy, dedicated electronics and software

Operation of the accelerator complex composed of the 5 MV Van de Graaff and the 500 keV Heavy Ion Cascade accelerators and the Molecular Beam Epitaxy (MBE) device

Operation and developing of the computer network for the whole KFKI Campus, operating of the LHC Grid node

# RESEARCH ACTIVITIES



## High Energy and Heavy Ion Physics

major experiments with KFKI RMKI participation NA49, LHC ALICE and CMS (CERN), RHIC PHENIX (Brookhaven), the LHC Grid project; engineering: fast data links

## Nuclear Solid State Physics

fundamental research on condensed-matter systems of potential technological application utilising nuclear methods, methodological development of nuclear techniques for solid-state physics and materials sciences

## Theoretical Physics

high energy heavy ion collisions, theory of gravitation, field theory and particle physics,

## Plasma Physics

tokamak edge plasma physics, plasma diagnostics (ITER) (host of HAS-EURATOM Association), laser physics, atom optics

## Space Physics

solar wind interactions with planets and solar system bodies, the physics of the geospace, spacecraft instrumentation for several international space missions (Rosetta,

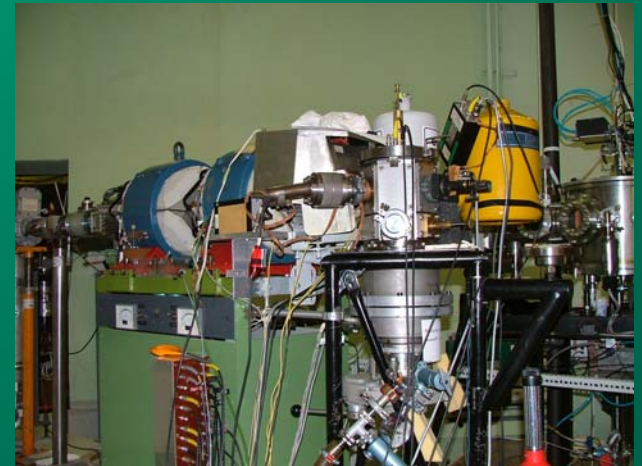
## Biophysics

computational neuroscience  
elemental analysis of biological and environmental samples, non-destructive analysis of art and archaeological objects

## Computer Centre

Internal and Campus network, LHC Grid node

# THE ACCELERATOR COMPLEX



# THE MOLECULAR BEAM EPITAXY MACHINE





## MAIN STATISTICAL DATA

Staff: 213 (including ~ 149 research fellows)

Annual budget (2007): 1332 million HUF (5.3 million EUR)

core funding from HAS: 904 MHUF

EURATOM: 228 MHUF

National Research Fund: 63 MHUF

contracts (tenders): 137 MHUF

Number of publications in SCI journals (2006): 161

Staff members teaching in universities: 40



# RESEARCH INSTITUTE for SOLID STATE PHYSICS and OPTICS



# RESEARCH INSTITUTE for SOLID STATE PHYSICS and OPTICS

## MISSION

### Basic research

- theoretical and experimental *solid state physics* and *materials science*,
- theoretical and experimental *optics*.

### Applied research

*laser application, optical crystals and thin films,*  
*soft magnetic metallic glasses,*  
*material testing with neutrons (Budapest Neutron Centre).*

# SOLID STATE PHYSICS and MATERIALS SCIENCE

## THEORY

- strongly correlated systems
- electronic states in solids

## EXPERIMENTAL

- synthesis and characterization of *fullerenes* and related systems, *carbon nanotubes*, *amorphous carbon coatings*,
- studies on *magnetic nanocomposites* (granular and sandwich structures),
- structure studies on *liquids, glasses and soft matters*,
- *liquid crystals* (pattern formation and instabilities).

## METHODS

*X-ray diffraction, X-ray holography, NMR, Mössbauer spectroscopy, infrared spectroscopy, neutron diffraction and scattering (SANS).*

# OPTICS

## THEORY

- nonlinear and quantum optics (quantum information, teleportations, laser induced dynamics of atoms).

## EXPERIMENTAL

- interactions of *intense laser fields* with matter,
- development and application of *femtosecond lasers*,
- development of equipment for *aerosol detection*,
- *hollow cathode lasers*,
- growth and characterization of *oxide single crystals* with nonlinear optical properties.

**FURTHER INFORMATION:** <http://www.szfki.hu>

*Solutions for Nanotechnology*



**Hungarian Academy of Sciences**  
***Research Institute for Technical  
Physics and Materials Science***



ISO 9100:2001

[www.mfa.kfki.hu](http://www.mfa.kfki.hu)

*Solutions by Nanotechnology*

MFA 2007



## Mission of the institute



- **Interdisciplinary research on complex functional materials and *nanometer-scale* structures, exploration of physical, chemical and biological principles, their exploitation in *integrated micro- and nanosystems*, and in the development of characterization techniques.**
- **Dissemination of the results in international programs, education and industrial R&D, with special attention to the needs of SME-s.**

**Total staff: 150**

**Researchers: 90**

**PhD students: 23**

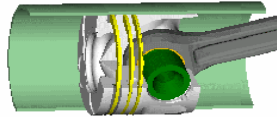
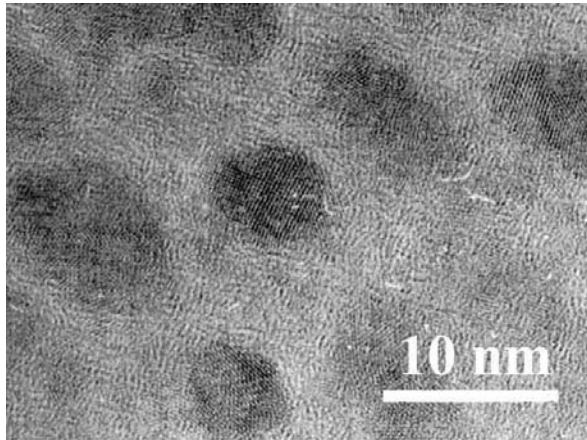
**Total budget: €6 M (2006)**

**Subsidy: 34%**

**Spin-offs: 3**

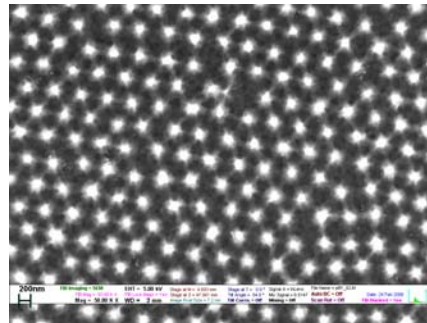
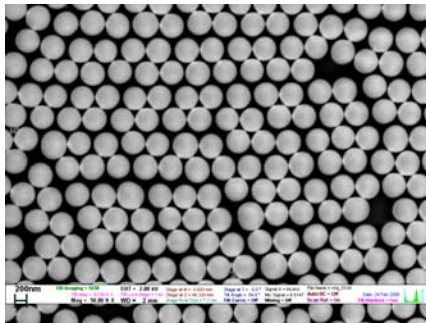
**ISI papers published: 95/year**

## Thin-films – structural research



TEM characterisation of novel dual function nanocomposites: Cr-C, Cr-B-N wear resistant coatings for low friction

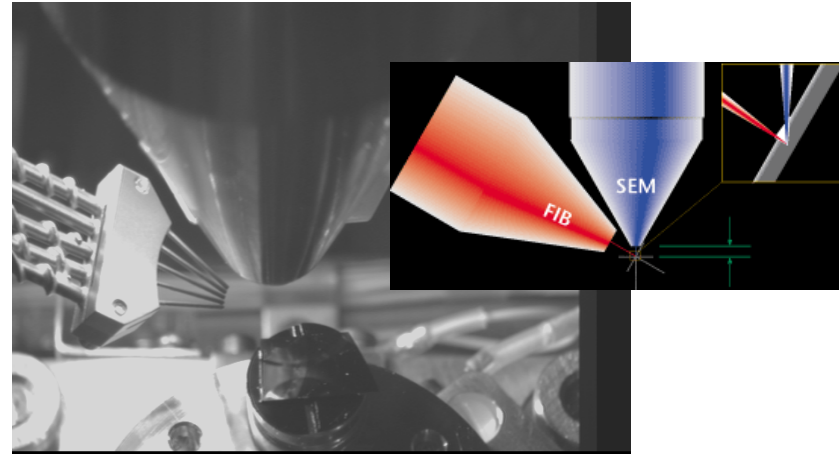
## Photonics



Anodized p-Si, implanted by B<sup>+</sup> trough  
Langmuir-Blodgett silica nanoparticle layer  
for photonic crystals

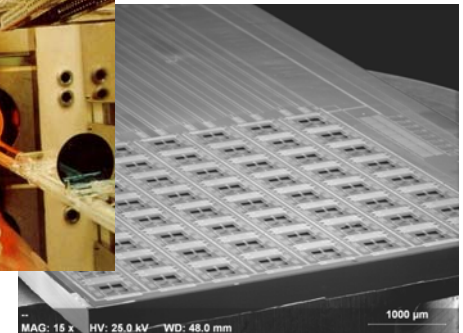
MFA 2007

## Nanostructure research



Nanofabrication in a LEO crossbeam system with five gaslines for etching and IBAD formation of insulators, conductors

## Microtechnology



Clean room processing of integrated CMOS compatible MEMS/NEMS



# KFKI Atomic Energy Research Institute

**Dr. János Gadó**

**Director**

**[gado@sunserv.kfki.hu](mailto:gado@sunserv.kfki.hu)**

# MISSION

- **To assist the country in adapting nuclear technology of Soviet origin for nuclear power production satisfying the internationally accepted safety requirements.**
- **To maintain competence in the nuclear safety field.**
- **To apply nuclear energy for peaceful uses other than energy production.**

# MAIN ACTIVITIES

- **Experimental and theoretical R&D in the nuclear energy field with strong international cooperation**
- **Safety assessment, consultancy for Paks NPP**
- **Technical support organization of HAEA**
- **Research reactor operation**

# FINANCING DATA

(all data in MForint  $\approx$  5000 USD  $\approx$  4000 Euro)

<b>HAS (state budget):</b>	<b>700</b>
<b>HAEA (state budget):</b>	<b>60</b>
<b>Other state budget:</b>	<b>140</b>
<b>EU grant systems:</b>	<b>50</b>
<b>Contracts - Paks NPP:</b>	<b>400</b>
<b>Contracts - others:</b>	<b>50</b>
<b>Total</b>	<b>1400</b>