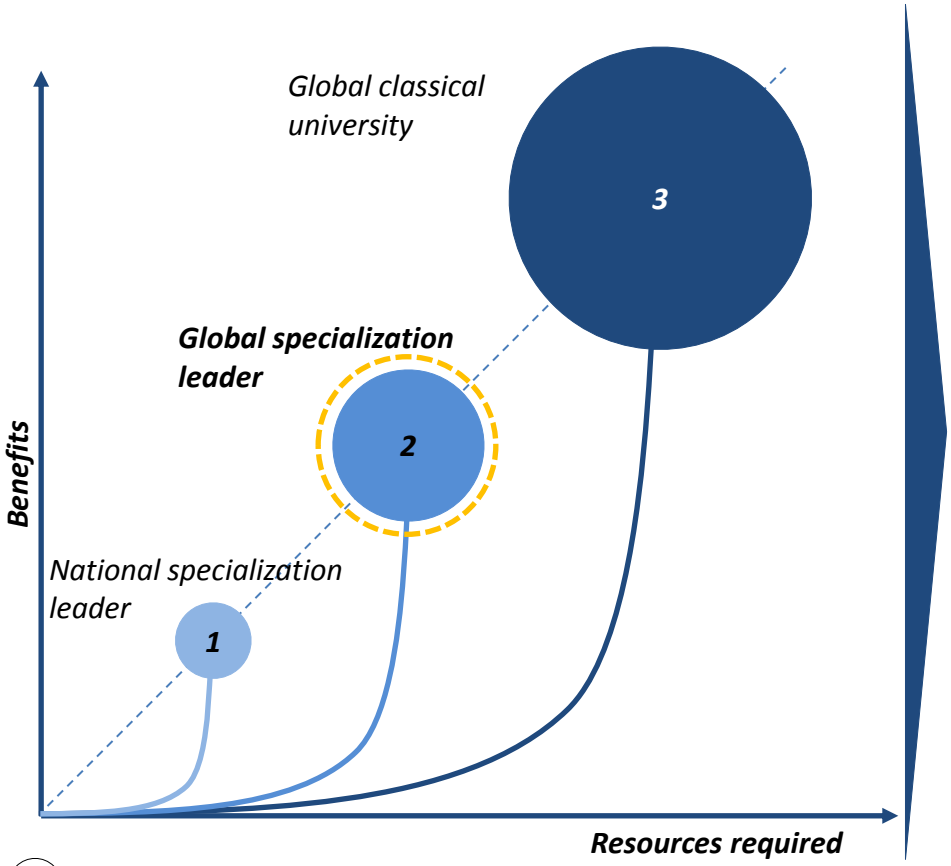
Roadmap implementation plan for increasing international competitiveness of National University of Science and Technology «MIS&S»

Moscow, 2013

MIS&S vision

Target model of MIS&S for 2020: global specialization leader



MIS&S target model of the **global specialization leader** envisions several key features:

- Recognized leader in several specialization areas
- Highly ranked in the international rankings
- Center of gravity for top research money and top talent from all over the globe in key areas of competence
- Producer of high-impact, value-added innovation

Degree of uncertainty in reaching the target model

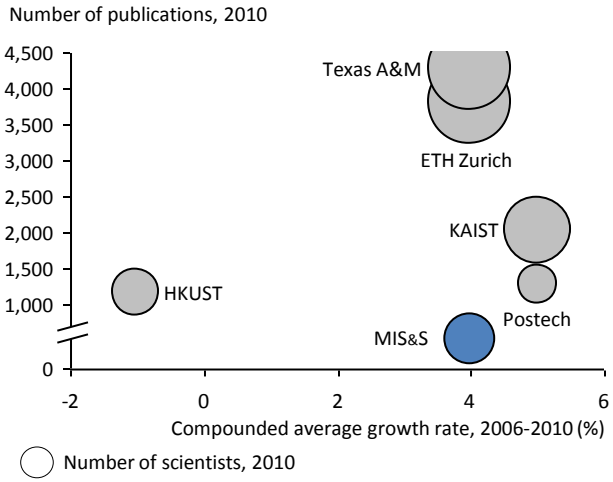
1 **Today:** national leader in metallurgy, material science and nanotechnology

2 **In future:** global leader in metallurgy, mining, material science and nanotechnology, with strong competencies in IT

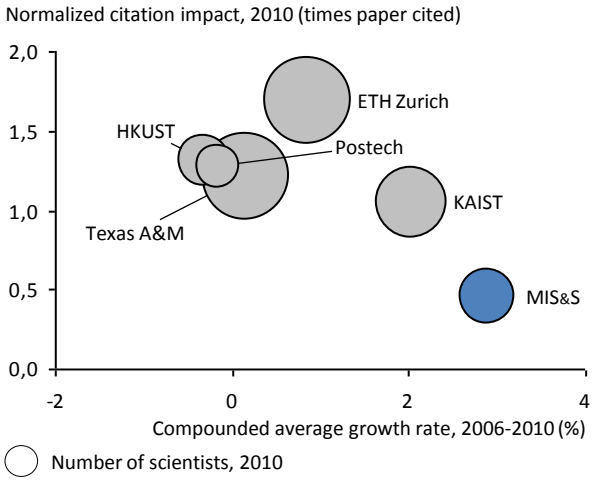
Gaps to cover for achieving a target model

Benchmarking MIS&S with reference group: ETH Zurich, Postech, KAIST, HKUST, TEXAS A&M

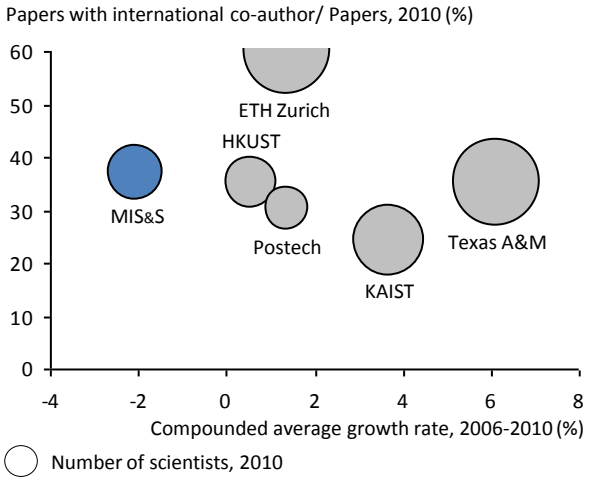
Publications



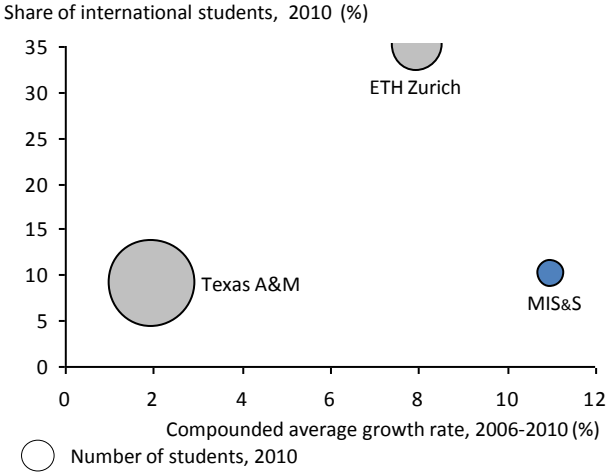
Normalized citation impact



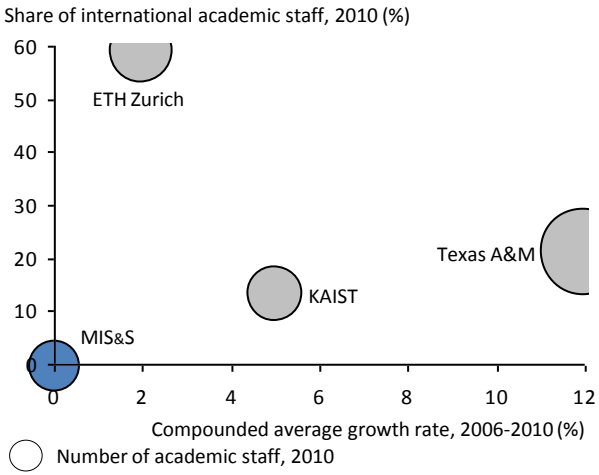
Papers with international co-author



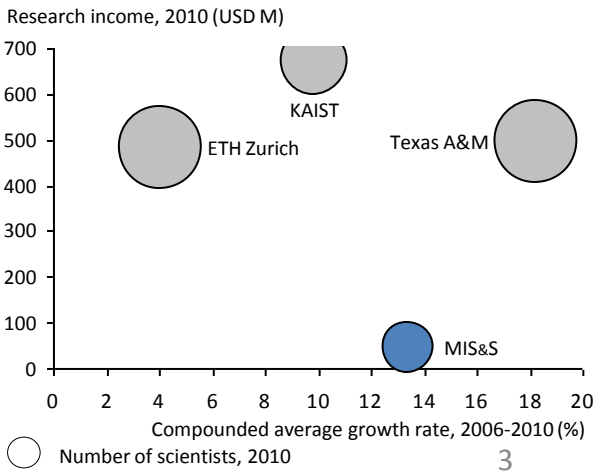
International students



International academic staff



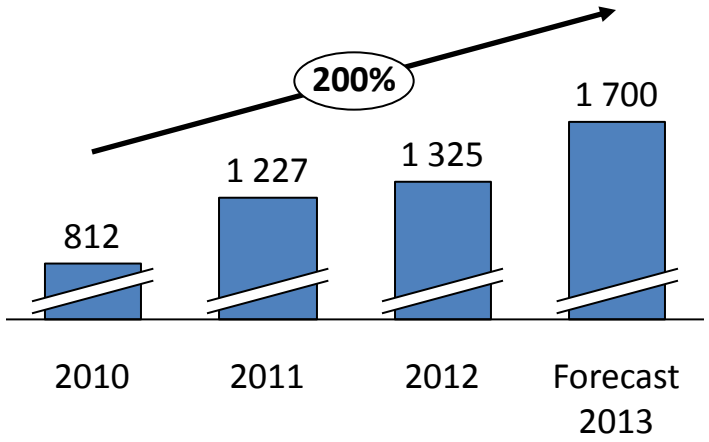
Research income



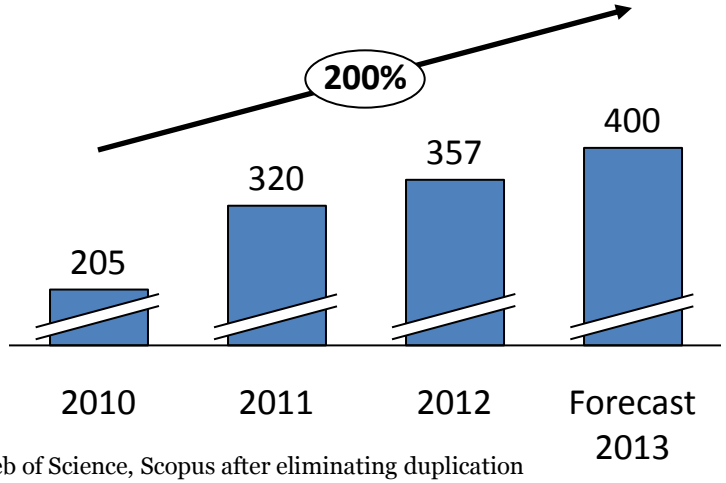
Source: InCites

Major indicators

R&D revenue doubled in three years (RUB MLN)

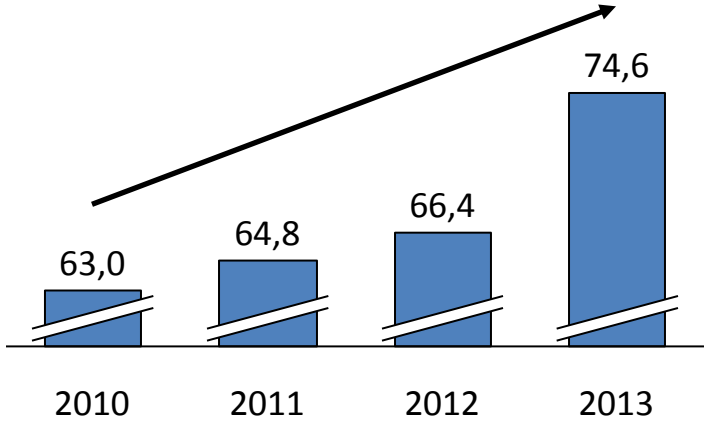


Number of publications in WoS and Scopus doubled in three years* (publications)

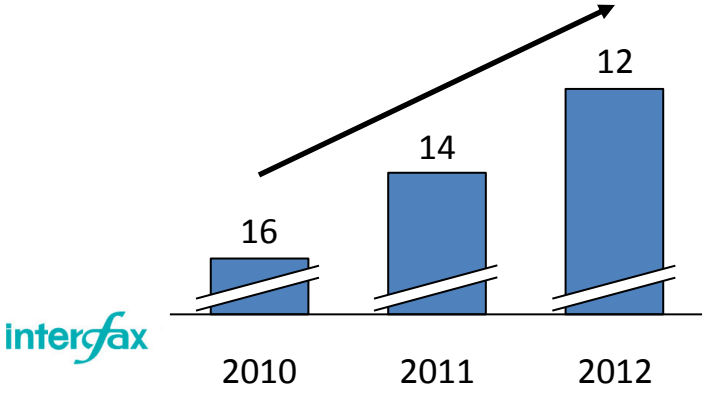


*Web of Science, Scopus after eliminating duplication

MIS&S students' average Uniform State Exam score gained 12 points in 3 years (points)

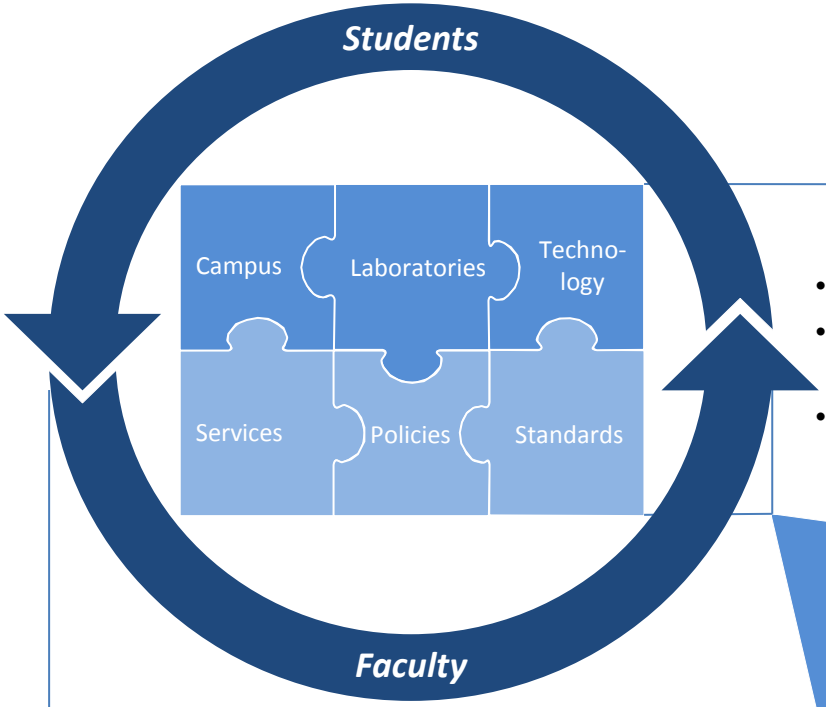


National ranking confirms MIS&S advance (position)



Approach to Roadmap development

The main focus of the subsidy is human capital; in order to attract and retain the best people appropriate prerequisites must be in place



Required Foundation

- Is considered a **"must-have"** – not a differentiator any more
- Is achieved through a **disciplined, routine** work of the University's administration
- Is still a ***high priority*** area for most Russian universities

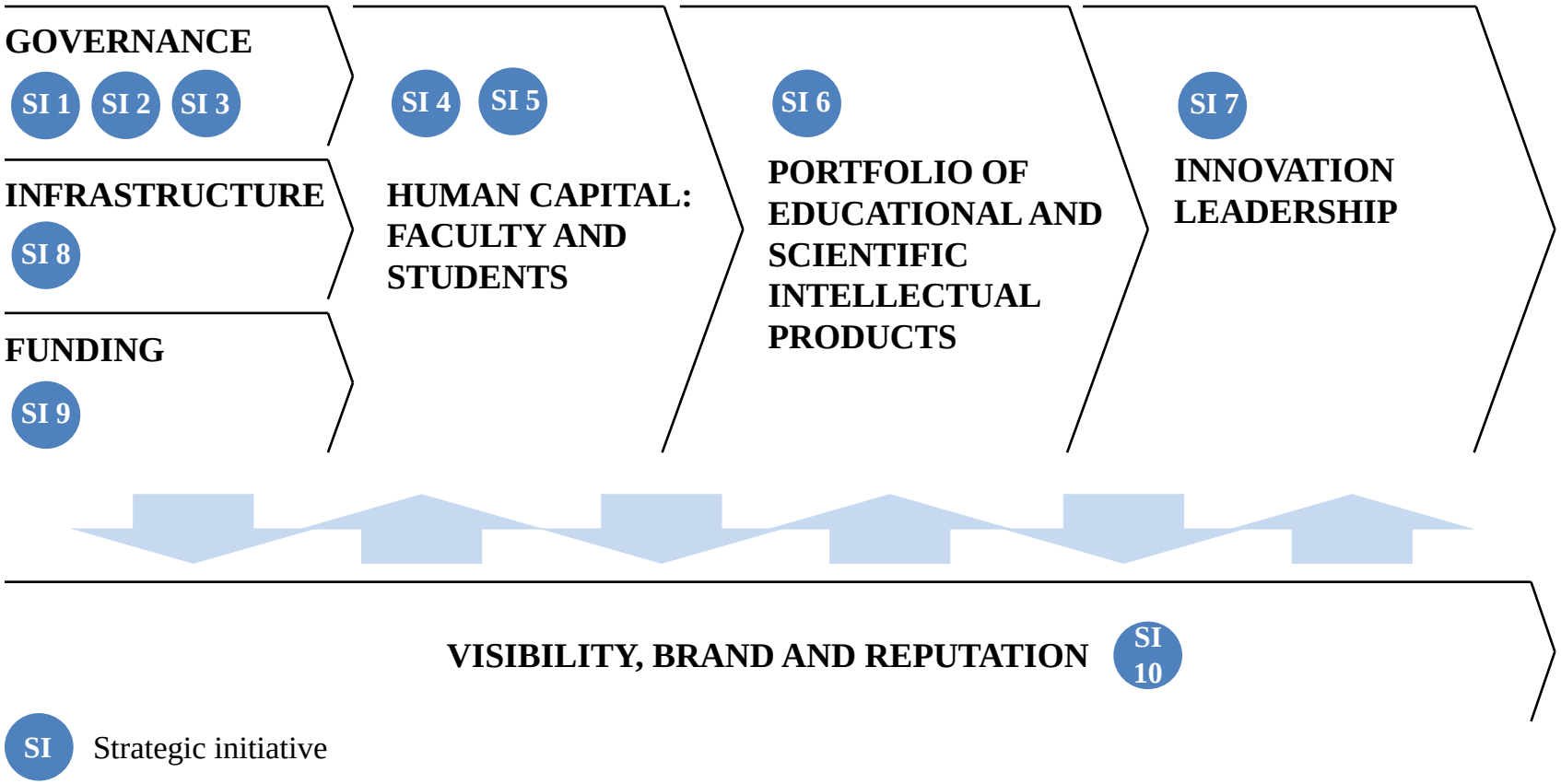
Human Capital

- *Is a **key area*** for exerting efforts
- *Requires **creative and innovative*** approaches
- *Benefits from **additional*** levers and resources (e.g., state funding, industry sponsorship)

ONLY THE COMBINATION OF REQUIRED FOUNDATION AND HUMAN CAPITAL GRANTS A CHANCE TO CREATE A WORLD CLASS UNIVERSITY

Approach to Roadmap development

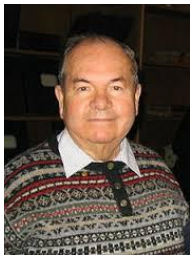
The Roadmap has been designed to cover virtually every important facet of MIS&S. There are in total 10 strategic initiatives, about 25 tasks and 75 measures at the high level. At the detailed level there are in excess of 480 actions



International Scientific Council

The International Scientific Council is being established to raise MIS&S international profile and exposure to external expertise

Several profiles of Council members…



Alexey Abrikosov

Nobel Prize In Physics, 2003

Dan Shechtman

Nobel Prize in Chemistry, 2011

Börje Johansson

Nobel Committee member

h-index 80

Richard Miller

h-index 45

Alexander Lichtenstein

h-index 53

Harry Bhadeshia

h-index 51

Ruslan Valiev

h-index 71

… representing top world universities

International Scientific Council will oversee a science foresight in 2014 to specify priority research areas for MIS&S

Recruitment of accomplished scientists

Distinguished scientists with international exposure to head the newly established laboratories

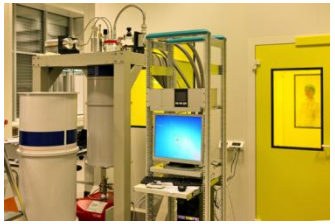
Dmitry Goldberg

h-index 67

- University of Tsukuba, Center of materials, Japan
- “Inorganic nanomaterials” laboratory
- RUB 200 MLN investment

Alexey Ustinov

h-index 31

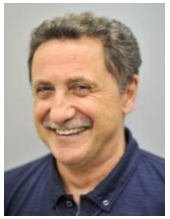


- Karlsruhe Institute of Technology, Germany
- “Superconducting metamaterials” laboratory
- RUB 200 MLN investment

Yuri Estrin

h-index 41

- Monash University, Australia
- “Hybrid nanostructured materials” laboratory
- RUB 120 MLN investment



Alexander Mukasyan

h-index 22

- University of Notre Dame du Lac, USA
- “Structural ceramic nanomaterials” laboratory
- RUB 90 MLN investment

Prospective recruitment of accomplished scientists

MIS&S

MIS&S is also in advanced stages of negotiations with 11 more renowned scientists

Igor Abrikosov

- Linköping University, Sweden
- Research interests: Theoretical Physics
- **h-index 39**

Timothy Deming

- University of California, Los Angeles, USA
- Research interests: Chemistry and Biochemistry
- **h-index 38**

Kainuma Ryosuke

- Tohoku University, Japan
- Research interests: Chemistry and Biochemistry
- **h-index 44**

Konstantin Efetov

- Ruhr University Bochum, Germany
- Research interests: Theoretical Physics of Solids
- **h-index 43**

Sergey Sukharev

- University of Maryland, USA
- Research interests: Biology, Chemistry and Biochemistry
- **h-index 29**

Yuri Kazakevich

- Seton Hall University, USA
- Research interests: Electrochemistry
- **h-index 21**

Andrey Varlamov

- Istituto Nazionale per la Fisica della Materia, Italy
- Research interests: Theoretical Physics
- **h-index 27**

Michael Fistul

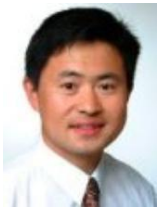
- Ruhr University Bochum, Germany
- Research interests: Material Science
- **h-index 20**

Forsund Finn Ragnar

- University of Oslo, Norway
- Research interests: Economics
- **h-index 18**

Dmitri Louzguine

- Tohoku University, Japan
- Research interests: Materials, metallic glasses
- **h-index 22**



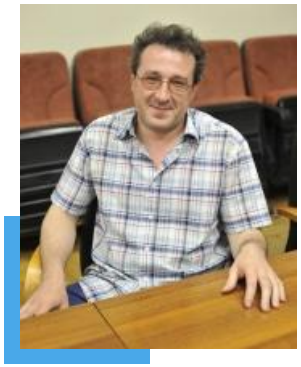
Hua-Xin Peng

- Bristol University, UK
- Research interests: Materials, Composite/multiphase materials
- **h-index 20**

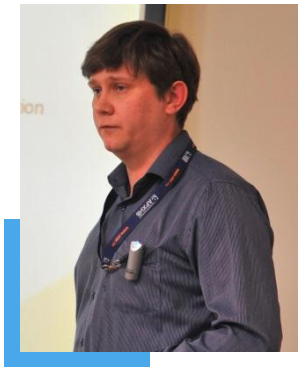
Recruitment of promising young scientists

In 2013 MIS&S has successfully implemented recruitment practices to acquire promising young scientists

Pilot projects in recruiting young scientists with international exposure helped MIS&S to gain necessary experience in international hiring



Larionov Igor Aleksandrovich
Institute for Theoretical Physics, University of Zurich; research projects in Italy, Germany, USA



Sokolovskiy Vladimir Vladimirovich
University Of Duisburg-Essen, Germany

Arup Ratan Mandal
PhD, University of Visva-Bharati, India

- Participants of the Postdoc Research program became efficient contributors to MIS&S community: they participated in the five research projects, wrote 16 articles (WoS, Scopus)
- In 2014 MIS&S will scale up the Postdoc Research program and bring 10 more young scientists with international experience to the campus

Attracting international students

MIS&S has already implemented a number of pioneer initiatives to create a comfortable environment for foreign students and faculty at the University; other initiatives will follow soon

International students and faculty members

1 Foreign office for administrative and legal support to foreign students and academicians:

- To establish the new structure the University has hired Timothy Schmidt, an international specialist who has organized foreign offices in number of US institutions

2 Master programs in English:

- Master program "Multicomponent nanostructured coatings. Nanofilms" attracted students from France, China, Iran, Algeria, Zambia
- International specialist Tony Hall is hired to support the expansion of education in English

3 Boosting the English language knowledge of students and professors:

- By 2015 20% of teaching staff will take exam for TOEIC certificate
- By 2015 40% of students will take exam for IELTS certificate

4 International accreditation and modern educational standards:

- "Physics of nanosystems",and "Multicomponent nanostructured coatings. Nanofilms» are accredited by ASIIN
- 8 master programs will receive accreditation from ASIIN and ABET in 2014
- New master program CAD2PART based on CDIO standards for engineering has been launched in 2013
- International specialist Eric Landell is hired to implement world's best teaching methods

5 The educational center "Russian as a foreign language for engineering disciplines" is to be founded

Building up MIS&S international reputation

Representatives of the world's top-100 universities participate in the events hosted by MIS&S in October-November 2013

Neil Gershenfeld,

Director of Center of Bits and Atoms, MIT

International conference «Digital Fabrication: Getting Personal—Fab Lab 1.5»

Daniel Schechtman,
Nobel laureate 2011

Festival of Science

Börje Johansson
KTH, Stockholm Sweden
A. Lichtenstein
Max-Planck-Institute

Congress of Theoretical Physics

International conference «Endowment Funds of Russian Universities: Problems and Solutions»

International conference «Russian Universities in International Rankings»

Consolidation with Moscow State Mining University (MSMU)

Consolidation with MSMU opens up new opportunities for MIS&S

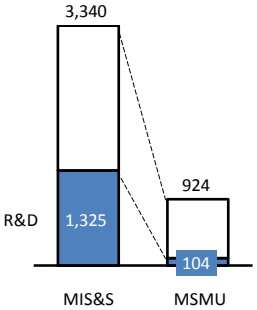
+ 4.2 thousand students

+ 593 academic faculty

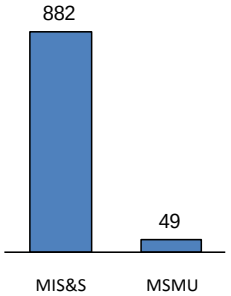
+ 140 thousand square meters for research and academic activities

MIS&S enhances competences in metallurgy and mining, creates new opportunities for cooperation with business community

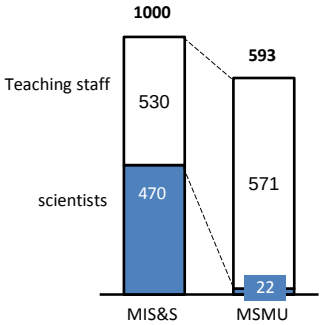
Income structure, 2012 (RUB MLN)



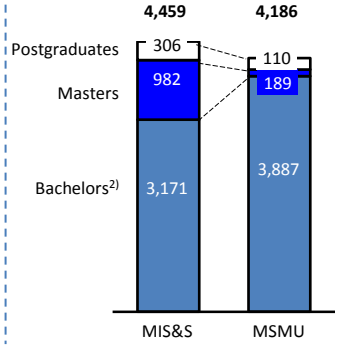
Number of publications, WoS and Scopus*, 2010-12 (publications)



Faculty, 2012 (FTE)



Students, 2012 (FTE)



1) Web of Science, Scopus after eliminating duplication
2) Including specialists

New campus

Construction of a state-of-the-art campus will advance MIS&S international standing and scope of operations even further

- Construction is to start in 2015
- The campus project is designed by Dutch architectural Bureau «Mecanoo Architecten»
- MIS&S already invested in the campus project RUB 1 BLN

Competitive advantages of MIS&S

Key success factors

1. ***Strong management team***, which has recognized the need for change early on and works with sense of urgency and commitment: MIS&S together with the external consultants has developed a Strategy a year ago and is implementing it currently

2. ***Proven ability to attract global talent:*** successful hands-on experience of employing world class scientists and management, both repatriates and internationals. A procedure for hiring postdocs has been tested and is in use

3. ***Successful alumni***, at top-management positions in governmental bodies and businesses: 5 alumni are on the Forbes list with a combined net worth of about USD 37.5 BLN

Roadmap project team

Participants of the Roadmap presentation

Alevtina Chernikova
Rector, MIS&S

Igor Isayev
Vice-Rector, MIS&S

Tim O'Connor
Vice-Rector, MIS&S

Mikhail Filonov
Vice-Rector, MIS&S

Yuri Estrin
Director of Hybrid Nanostructured Materials Laboratory, MIS&S

Vladimir Sokolovskiy
Postdoc Research program, MIS&S

Christian Scharff
Partner, PwC Luxembourg

Vladimir Bulat
Director, PwC Russia

Thank you!

International Scientific Council

MIS&S

Currently MIS&S holds a number of preliminary agreements with distinguished international scientists

Börje Johansson (Sweden)

- Nobel Committee member, Royal Swedish Academy of Sciences member
- Research interests: Physics
- Workplace: Department of Materials Science and Engineering, KTH, Stockholm Sweden
- One of the most distinctive scientists in the Physics of Solids and Materials Theory
- **h-index 80, citation index 63 673**

Kathryn A. Atchison (USA)

- President of the American Association of Public Health Dentistry
- Research interests: Medicine
- Workplace: Professor of Dentistry in the Division of Public Health and Community Dentistry UCLA Vice Provost of Intellectual Property and Industry Relations
- **h-index 21, citation index 1 509**

Harry Bhadeshia (UK)

- Tata Steel Professor of Metallurgy
- Director, SKF Steel Technology Centre
- Research interests: Materials
- Workplace: Professor, Department of Materials Science & Metallurgy, University of Cambridge
- **h-index 51, citation index 10 249**

Herbert Gleiter (Germany)

- Senior Member, Institute of Nanotechnology Karlsruhe Institute of Technology
- Research interests: Nanotech
- Workplace: Professor, Karlsruhe Institute of Technology
- **h-index 54, citation index 14 137**

Lindsay Greer (UK)

- Head of the Department of Materials Science & Metallurgy, University of Cambridge
- Research interests: Materials
- Workplace: Professor, Department of Materials Science & Metallurgy, University of Cambridge
- **h-index 19, citation index 1 653**

Joseph Shinar (USA)

- Chair, Department of Physics and Astronomy
- Research interests: Materials
- Workplace: Professor of Condensed Matter, Iowa State University
- **h-index 37, citation index 5 104**

Dan Shechtman (Israel)

- Nobel Prize in Chemistry, 2011
- Research interests: Chemistry and Physics
- Workplace: Distinguished Professor, Materials Science and Engineering department, Technion
- **h-index 21, citation index 5 266**

Harry E. Ruda (Canada)

- Stan Meek Chair in Advanced Nanotechnology
- Director, Centre for Advanced Nanotechnology
- Research interests: Materials
- Workplace: Professor, Department of Materials Science & Eng. University of Toronto
- **h-index 26, citation index 2 291**

Alexandra Navrotsky (USA)

- Director, NEAT ORU, Edward Roessler Chair in Mathematical and Physical Sciences
- Research interests: Physics and Materials
- Workplace: Interdisciplinary Professor at the University of California
- **h-index 61, citation index 15 869**

Richard K. Miller (USA)

- President Franklin W. Olin College of Engineering
- Research interests: механика инженерии
- Workplace: Professor, Franklin W. Olin College of Engineering
- **h-index 45, citation index 7 400**

Louis P Halamek (USA)

- Stanford University Director, Center for Advanced Pediatric Education
- Research interests: Medicine
- Workplace: Professor of Pediatrics - Neonatal and Developmental Medicine
- **h-index 12, citation index 711**

Jörg Neugebauer (Germany)

- Director Max-Planck-Institut für Eisenforschung Computational Materials Design
- Research interests: Physics
- Workplace: Max-Planck-Institut
- **h-index 57, citation index 14 156**

International Scientific Council

MIS&S

Currently MIS&S holds a number of preliminary agreements with distinguished international scientists

Alexander Lichtenstein *(Germany)*

- Director, Max-Planck-Institut für Eisenforschung Computational Materials Design
- Research interests: Physics
- Workplace: Professor, PhD in Physics and Mathematics , Theoretical Physics Institute, Hamburg University
- **h-index 53, citation index 14 156**

Stan Veprek (Germany)

- Research interests: Materials
- Workplace: Professor, Chemistry Department, Technocal University of Munich
- **h-index 48, citation index 9 746**

Jan M. van Ruitenbeek (Netherlands)

- Ex-director, Kamerlingh Onnes laboratory, Leiden Physics Institute
- Research interests: Semiconducting Materials
- Workplace: "Atomic and Molecular Conductors" group head
- **h-index 40, citation index 7 348**

Emeritus Elazar Y. Gutmanas (Israel)

- Research interests: Materials
- Workplace: Professor, Department of Materials Science & Engineering, Technion
- **h-index 17, citation index 818**

Wolfgang Bleck (Germany)

- Head of Ferrous Metallurgy Department RWTH Aachen University
- Research interests: Metallurgy
- Workplace: Professor, RWTH Aachen University
- **h-index 19, citation index 1 175**

Ruslan Valiev (Russia)

- Director, Institute of Advanced Materials Physics
- European Academy of Sciences member
- Research interests: Materials
- Workplace: Head of the Nanotech department, Institute of Advanced Materials Physics
- **h-index 71, citation index 19 746**