CONTENT

INTRODUCTION

TODAY MEPhI IS:

One of the world leading universities in nuclear education, which makes a significant contribution to the creation of an international system for the accumulation and development of nuclear knowledge accredited by the IAEA

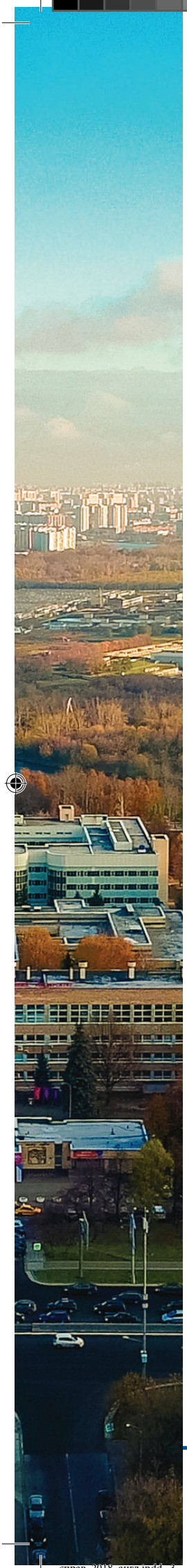
One of the leaders among Russian universities actively participating in the international research collaborations (more than 50), conducting a complex of fundamental and applied scientific research

World-class education centre focusing on the development of unique competencies and expertise in the breakthrough areas of the science and technology

All-Russian scientific and educational institution having branches in all regions of the Rosatom State Corporation presence. Partnership with Rosatom determines the importance of both participation in fundamental and target oriented research

Network of world-class research centers and laboratories lead by acclaimed Russian and foreign scientists, including one from the USA, France, Italy, and Spain

An active supporter of the continuous education ideology



MEPhI IS AMONG THE BEST RUSSIAN UNIVERSITIES, working on the increase the prestige of engineering specialties, generation, promotion, application and accumulation of scientific knowledge aiming to address global challenges of the XXI century

THE MISSION OF MEPhI

— to facilitate development of the new trends in education and research agenda together with its partners. The University is expanding cooperation with scientific and business organizations through the creation of industrial research consortia, alliances, and participation in regional clusters. In addition, the University creates a system of strong and long-lasting international relations with specialized foreign universities and research organizations aimed for the joint development and promotion of educational programs covering new and promising technologies.

MEPhI ESTABLISHES

its educational agenda, focusing on the future, bringing together educational programmes addressing industry demands. Its programs allow students to plunge into real scientific research; engineering component is introduced from the first year of study, which advances during their study. Success of this task is assured by the "student-centered" principle: modular training, flexibility of the educational trajectory, which is formed by the student together with the tutor, and the ability to change a speciality within the first two years of general professional training.

THE UNIVERSITY

is not only educational but also an advanced research centre. Strong experimental and research infrastructure, scientific and educational schools, involvement of world-class scientists, form the base of a balanced complex of five collaborative institutes (StrAUs) which adapt multidisciplinary approach and addressing modern challenges in breakthrough areas: safer nuclear energy and technology; advanced laser and plasma technologies of the future; biomedicine and digital medical engineering; nanotechnology in electronics, spintronics and photonics; advanced IT technologies and cybersecurity for "digital society".

MEPhI – IS AS A PLATFORM FOR MULTILATERAL ENGAGEMENT

Transformation of the University for long-term sustainable development

2013

Transitional structure of the University is based on the coexistence of the **faculties and centers of excellence**, aiming to consolidate best practices and expertise accumulated at the university

2016

Strategic Academic Units (StrAUs) have been formed. Among others, one of the StrAU's founding principle is interconnection between education, research and innovation activities in systematic and target-oriented manner

INPhE
Institute of Nuclear Physics and Engineering

NESPI
Institute for Nanoengineering in Electronics, Spintronics and Photonics

ICIS
Institute of Cyber Intelligence Systems

PhysBio
Institute for Engineering Physics for Biomedicine

LaPlas
Institute for Laser and Plasma Technologies

Alignment of the research and education agenda

1. Education

- Student-oriented model of education
- Flexible learning tracks
- Micro module approach
- Collaboration with leading international research and educational (R&E) centers
- Export of educational programs

2. Research

- Addressing global challenges and socially important issues
- Diversification of the traditional research agenda
- Breakthrough research areas where MEPhI has gained unique expertise and competitive edge

3. Innovation

- Student-oriented model of education
- Implementation of the "open innovation" principles
- Effective collaboration with industrial partners

2017

Re-evaluation of the research agenda principles with **focus on the multidisciplinary approach**. Diversified finance sources. StrAUs autonomy and strategic alignment with the University's development plan.

2018

MEPhI is at the stage of the sustainable development. **University is regarded as a platform** and designed to meet market demand **enabling a new degree of engagement** between parties. System engineering approach is adapted to find solution for projects with different scale and degree of complexity. Expansion of MEPhI's industrial partnership network. Direct export of education to foreing markets.

Strategical alignment of the StrAUs development plans allows MEPhI as a whole to ensure its leading position at the national and global levels.

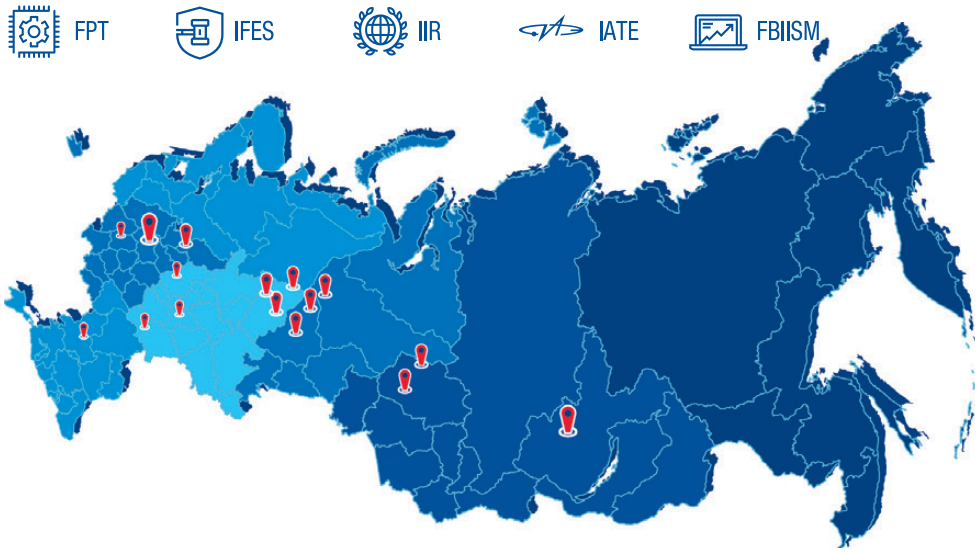
UNIVERSITY STRUCTURE

MEPhI today has 17 branches, among those 11 are offering higher and 6 secondary educations.

SCIENTIFIC AND EDUCATIONAL STRUCTURE OF MEPhI

INPhE PhysBio NESPI LaPlas ICIS

FPT IFES IIR IATE FBIISM



ELITE STATUS:

- High average score (>90) of the Unified State Exam by single subject
- TOP-100 at the key subject Rankings
- Total number of students is more than 7000. Master/Bachelor students' ratio is 1:2.3

GLOBAL POSITIONING:

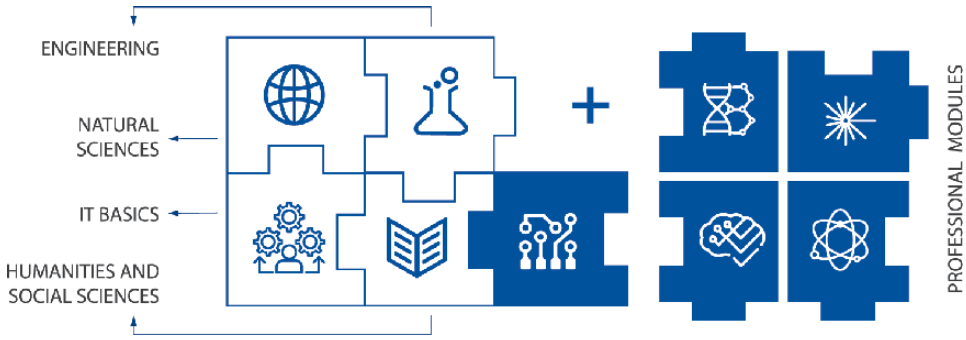
- **23,6%** international students at MEPhI by 2020
- **20%** international academic staff share by 2020
- Students from **57** countries at MEPhI now

SASTAINABILITY:

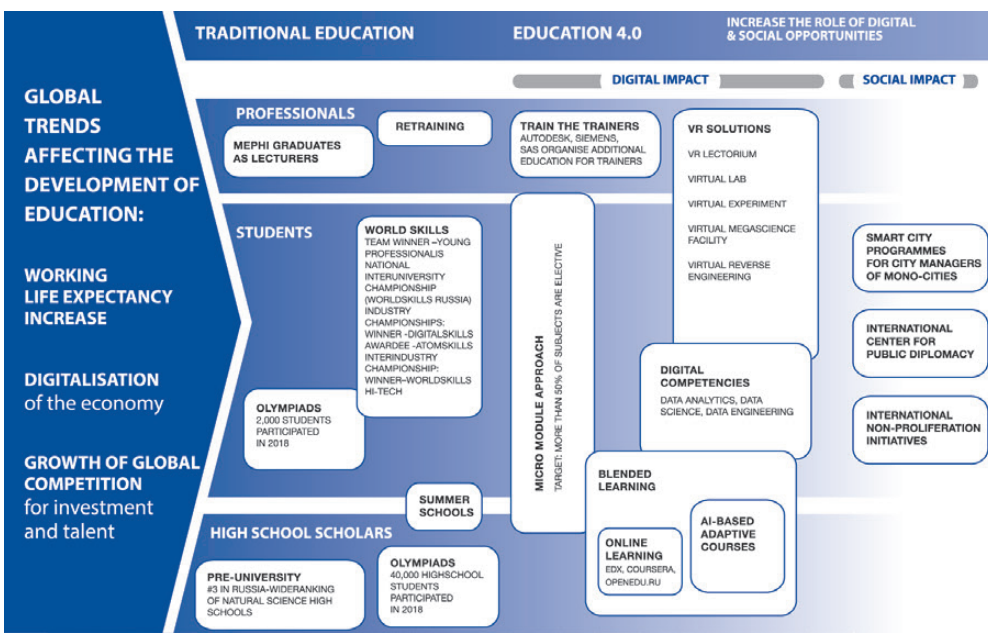
- Diversification of the R&E agenda
- New formats of partnership
- Optimisation university governance system and the operating cost
- Diversifying finance sources

EDUCATION IN MEPhI

MICRO MODULES



MEPhI APPROACH TO EDUCATION



BACHELOR PROGRAMS

Institute of Undergraduate Study, 2 years

NATURAL SCIENCES

TECHNOLOGIES

HUMANITIES AND SOCIAL SCIENCES

IT BASICS

Strategic Academic Units (StrAUs), 3 years

- Institute of Nuclear Physics and Engineering
- Institute for Laser and Plasma Technologies
- Institute for Engineering Physics for Biomedicine
- Institute for Nanoengineering in Electronics, Spintronics and Photonics
- Institute of Cyber Intelligence Systems

MASTER AND PHD PROGRAMS:

Strategic Academic Units (StrAUs)

Industry

- Institute of Nuclear Physics and Engineering (INPhE)
- Institute for Laser and Plasma Technologies (LaPlas)
- Institute for Engineering Physics for Biomedicine (PhysBio)
- Institute for Nanoengineering in Electronics, Spintronics and Photonics (NESPI)
- Institute of Cyber Intelligence Systems (ICIS)

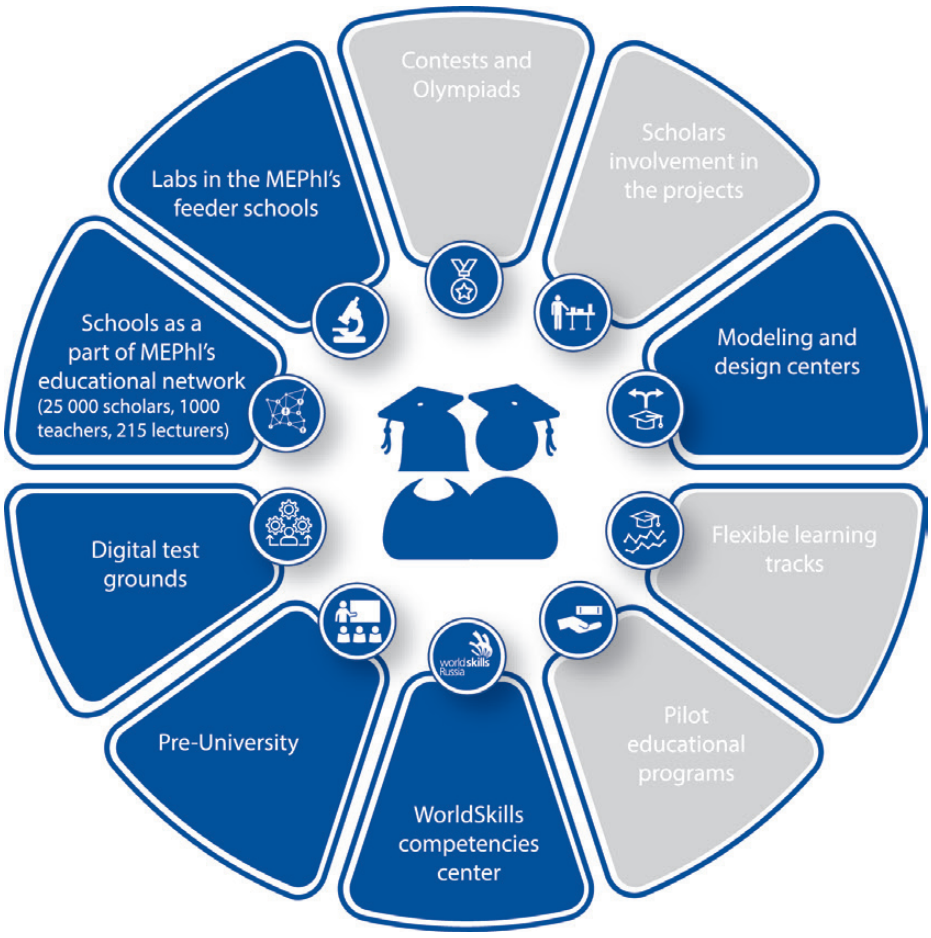
Science

MScEng

MSc + PhD

MEPhI IS RE-ENGINEERING EDUCATION

TALENTED STUDENTS ARE DRIVING UNIVERSITY DEVELOPMENT



UNIFIED STATE EXAM SCORE

86 — 2013

92,3 — 2018

TALENTED SCHOLARS AT THE MEPhI'S PRE-UNIVERSITY

TOP 20 among best schools in Moscow

TOP 200 among best schools in Russia

RAEX

MEPhI's Pre-University secured **3rd** position among best schools **in Russia** and the **1st among** the schools of the **5-100 Universities** in the category "Technical, Natural and Exact Sciences".

ONLINE AND BLENDED LEARNING AT MEPhI

MOOC-COURSES
Massive open online courses

edX coursera Открытое образование УНИВЕРСАРИУМ CLP4NET

> 160 000
registered students from

153
countries

SOCIAL IMPACT AND OPPORTUNITIES

Computer literacy for senior citizens (retirees)

Extended life-span. Development of the modern methods for earlier cancer diagnostics and therapy

Digital medical engineering

International center for public diplomacy

SKILLS AND KNOWLEDGE FOR THE JOB OF THE FUTURE

2013

Traditional research areas

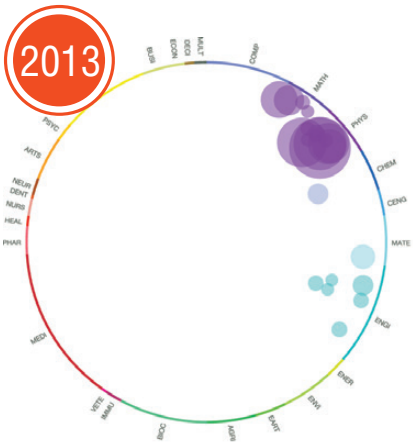
- nuclear and radiation technologies
- high energy and elementary particles physics
- laser and plasma physics
- nanoelectronics
- information technology

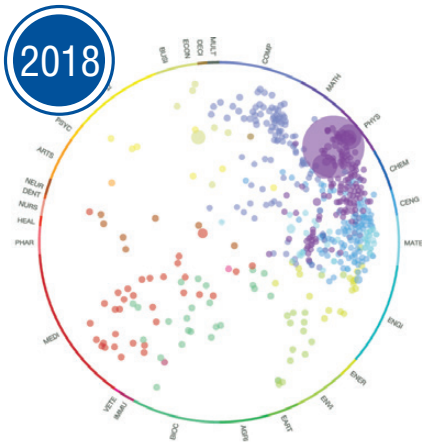
2018

Interdisciplinary areas that diversify and complement the traditional research agenda in order to address global challenges

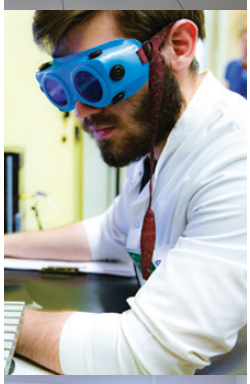
- design and modeling of the full life cycle of complex objects
- biomedical technologies
- laser and information technologies for industries
- electronics, spintronics and photonics
- information security of critical infrastructure
- systems engineering
- “smart” robotics
- new materials with desired and controlled properties

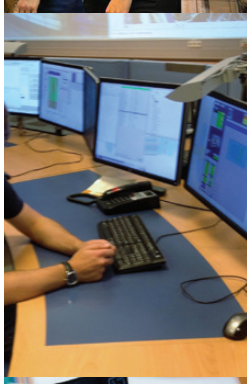
Building up recognition through expertise





COMP	Computer Science
MATH	Mathematics
PHYS	Physics and Astronomy
CHEM	Chemistry
CENG	Chemical Engineering
MATE	Material Science
ENGI	Engineering
ENER	Energy
ENVI	Enviromental Science
EART	Earth and Planetary Sciences
AGRI	Agricultural and Biological Sciences Sciences
BIOC	Biochemistry, Genetics and Molecular Biology
IMMU	Immunology and Microbiology
VETE	Veterinary
MEDI	Medicine
PHAR	Pharmacology, Toxicology and Pharmaceutics
HEAL	Health Professions
NURS	Nursing
DENT	Dentistry
NEUR	Neuroscience
ARTS	Arts and Humanities
PSYC	Psychology
SOCI	Social Science
BUSI	Business, Management and Accouting
ECON	Economics, Econometrics and Finance
DECI	Decision Sciences
MULT	Multidisciplinary


PROFESSIONAL SKILLS AND COMPETENCIES

Since 2017 MEPhI is an active member of the WorldSkills movement. The university team secured first position by the total number of medals won in the WorldSkills Russia finals. MEPhI employees are also winners of the industry championship WorldSkills Hi-Tech 2017.

MEPhI is among TOP-15 of practice-oriented universities in the ranking. The recent victories are: 1st place in the technical case championship Changellenge Cup Technical-2017, the 2nd and 4th places in the case championship Changellenge Cup Moscow -2017.

For the past 11 years MEPhI has been actively involved in organizing and conducting the "Umnik" contest in collaboration with the Foundation for Assistance to Small Innovative Enterprises in Science and Technology. In 2017 the Foundation approved 10 youth innovation projects for funding.

PROFESSIONS OF THE FUTURE

LIFE - SCIENCE

- Bioinformation scientist
- IT-Medic
- Pharmaceutical drug designer
- Personalized medicine expert

NEW MATERIALS

- "Smart" material designer
- Security specialist for nanoindustry

INTERNET OF THINGS

- Information systems architect
- "Smart" environment cyber-technician
- Neural interface systems designer

ENERGY FOR LIFE

- Manager for modernization of power generation systems
- Microgeneration system developer
- Portable power generating station designer

EXPORT OF EDUCATION

	2013	2018
Number of foreign students at MEPhI	448	1530
Geography of the admission, countries	14	57
Share of foreign student	5,1%	21,6%
International faculty share	0,4%	17,1%
Programmess in English	—	38

PRESENCE IN THE GLOBAL EDUCATION MARKET

2017
SLUSH Singapore

2018
Universities of Indonesia

2018
Internship in the Samsung Skills Centre (South Korea)

2017-2021
Intergovernmental bilateral Human Resource Program for Monodukuri Engineer in Japan and Russia together with Kindai University, Osaka, Japan

Bilateral Internship and student exchange program with Tokyo University of Technology, Japan

2018
Internship in the Institute of High Energy Physics (IHEP) of the Chinese Academy of Sciences (CAS), Beijing, China

Hangzhou Dianzi University, China

University of Turin, Italy — Advanced Theoretical and Astrophysics

Polytechnic University of Valencia, Spain — Advanced Semiconductor Lasers and Technology

Istanbul Technical University, Turkey — Advanced nuclear energy and technology

University at Buffalo (SUNY), USA — Biomedical Nanotechnologies

13

Programmes at foreign host universities

- Energy Science & Technology, Istanbul Technical University
- Nuclear Reactor Physics, Higher University of San Andrés
- Nuclear Engineering, University of the Witwatersrand (Johannesburg)
- Non-energy Application of NuclearTechnologies, Ain Shams University
- Nuclear Fuel Cycle, Bangladesh University of Engineering & Technology

MEPhI Uzbekistan Branch

6 MEPhI Educational Programs, **500+** Students by **2022**

ACTIVE PARTICIPATION IN THE INTERNATIONAL NUCLEAR EDUCATION NETWORK

There are about 200 Universities worldwide, that are offering nuclear related education

INMA International Nuclear Management Academy

International Nuclear Management Academy (INMA) facilitated by the International Atomic Energy Agency (IAEA)

Programs at MEPhI with IAEA approval

Medical Physics of Radiation Therapy
and
Radiology Physics in Nuclear Medicine

The total number of graduated in nuclear related areas (all levels of education) worldwide is between 3000 – 5000 graduates per year.
MEPhI's contribute about 4% to the total number of graduates

European Nuclear Education Network (ENEN)

Asian Network for Education in Nuclear Technology (ANENT)

Regional Network for Education and Training in Nuclear Technology (STAR-NET)

Nuclear Energy Agency NEA/OECD

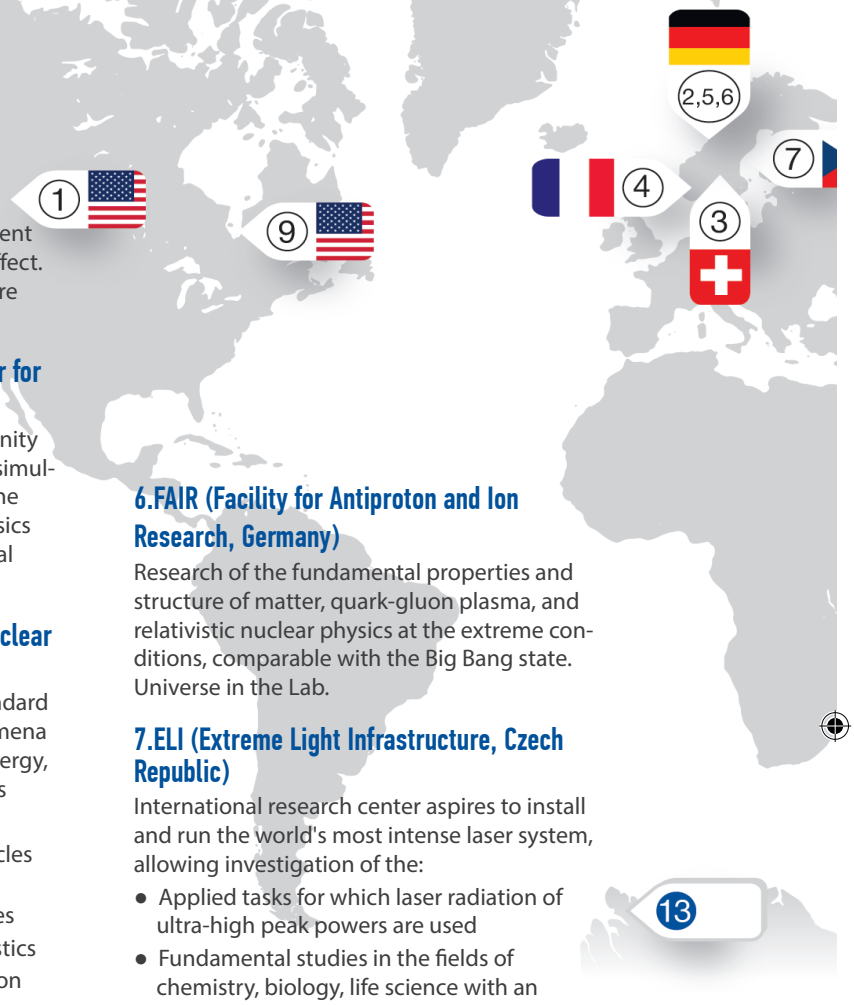
Vienna International Nuclear Competence-Centre (VINCC)

World Nuclear University (WNU)

"Atom-CIS cooperation"

«Consortia of SC Rosatom base universities»

MEGASCIENCE COLLABORATIONS AND APPLIED INTERNATIONAL PROJECTS



1.COHERENT (USA)

- Experimental validation of the coherent heavy-nucleus neutrino scattering effect. The phenomenon was predicted more than 30 years ago.

2.PHELIX (Petawatt High-Energy Laser for Heavy Ion Experiments, Germany)

- The facility provides unique opportunity to use highly intense laser radiation simultaneously with heave ions beam in the fields of plasma physics, nuclear physics as well as interdisciplinary and natural sciences.

3.CERN (European Organization for Nuclear Research, Switzerland)

- Investigation and verification of Standard Model predictions, as well as phenomena beyond the Standard Model: dark energy, dark matter, and neutrino oscillations
- Search for new principles in physics
- Detection and identification of particles by transition radiation
- Exploration of multi-charged particles
- Study of the Higgs Boson characteristics
- Search and registration of quark-gluon plasma signals
- Analysis of strong interaction physics at extreme nuclear matter densities at the Large Hadron Collider.

4.ITER (International Thermonuclear Experimental Reactor, France)

- Demonstration of the viability to use thermonuclear reactor and possibility to address physical and engineering problems of the new energy sources and technologies.

5.XFEL (European X-Ray Free-Electron Laser Facility, Germany)

The facility allows a broad range of the experiments in the fields of fundamental and applied sciences:

- Novel materials
- New stable energy sources
- Smart and eco-friendly (green) materials and technologies.

6.FAIR (Facility for Antiproton and Ion Research, Germany)

Research of the fundamental properties and structure of matter, quark-gluon plasma, and relativistic nuclear physics at the extreme conditions, comparable with the Big Bang state. Universe in the Lab.

7.ELI (Extreme Light Infrastructure, Czech Republic)

International research center aspires to install and run the world's most intense laser system, allowing investigation of the:

- Applied tasks for which laser radiation of ultra-high peak powers are used
- Fundamental studies in the fields of chemistry, biology, life science with an improved temporal and spatial resolution, overcoming the limitations of the picosecond barrier.

8.High Energy Accelerator Research Organization (KEK, Japan)

- Particle accelerator for research activities in the areas of applied physics, biology and medicine. As well as the optimization of current security systems (e.g. at the custom, transport and cargo terminals and public places) by implementation of THz imaging technology.

9.BICA Society (Biologically Inspired Cognitive Architectures Society, USA)

- Society with an aim to encourage and create conditions for the interdisciplinary study of biologically inspired cognitive architectures (BICA) ranging from AI, neurotechnology and machine learning to creation of digital assistant for the creative profession.

10. TAIGA (Tunka Advanced Instrument for cosmic ray physics and Gamma Astronomy, Russia)

- Addressing fundamental issues of gamma-astronomy and high energy cosmic ray physics
- Gamma radiation point sources trecking.

11. Scientific and Educational Centre NEVOD (MEPhI, Russia)

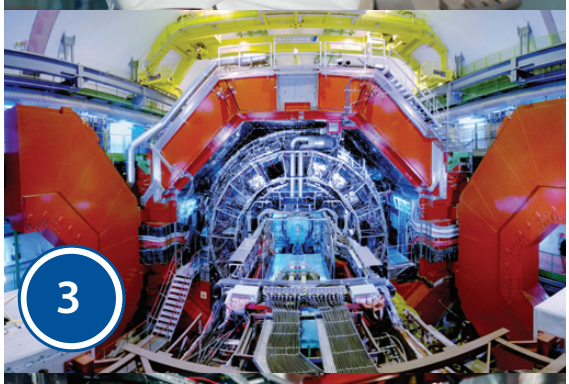
- Study of energy spectrum, mass composition and interaction of cosmic rays
- Investigation of active processes in the heliosphere, the magnetosphere and the Earth's atmosphere with the muon diagnostics methods.

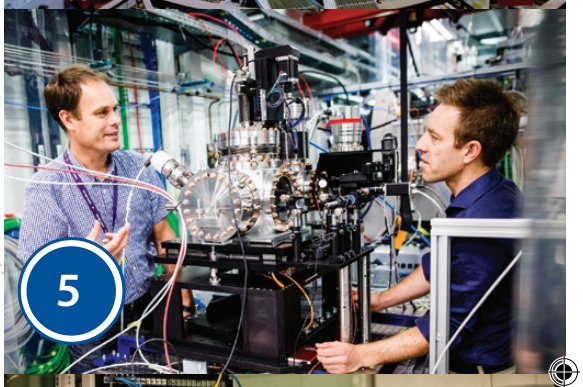
12. IceCube (the Antarctic)

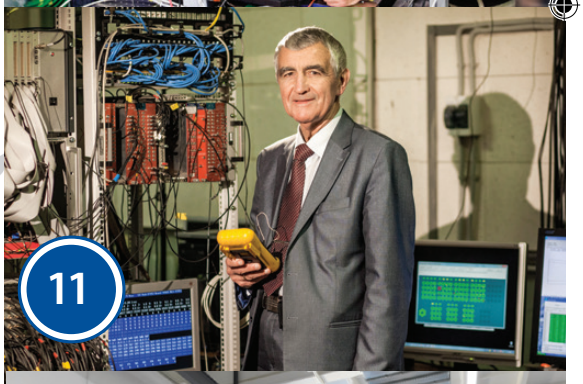
- Study of muons and ultrahigh energy neutrinos generation processes to identify theirs origins.

13. NICA (Nuclotron-based Ion Collider fAcility, Russia)

- The unique facility that enables investigation of the highly compressed baryonic matter phase diagram at the laboratory conditions. Highly compressed baryonic matter is only present in the celestial objects such as neutron stars and in the core of supernovas.







EXPANSION OF MEPhI`S INDUSTRIAL PARTNERSHIPS

ROSATOM

ROSCOSMOS

RUSNANO

Rostec

BIOMEDICINE

ROSATOM HEALTHCARE

AstraZeneca

KPC
Nonprofit partnership

novo nordisk®

DIGITAL AND ENGINEERING SOLUTIONS

АСЭ·ASE

FUEL COMPANY OF ROSATOM
TVEL

ABBYY®

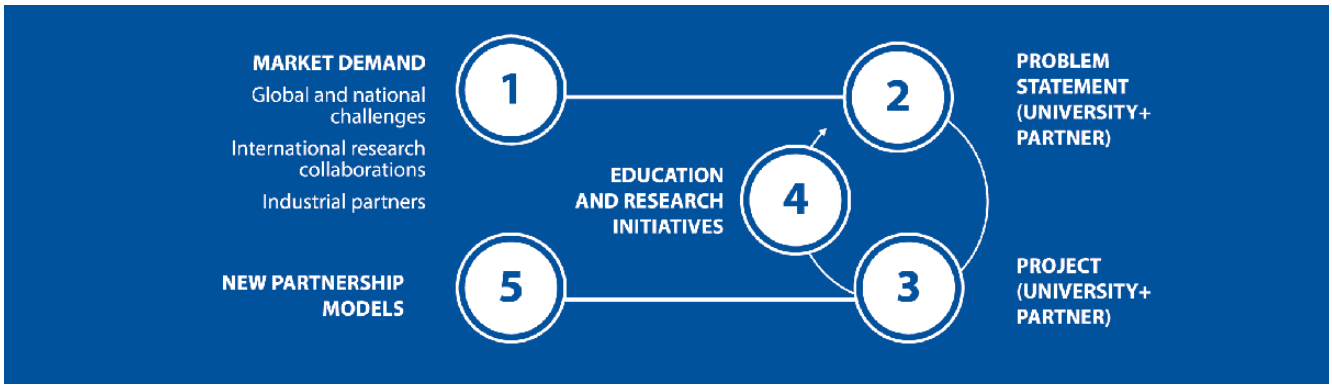
AUTODESK.

THE WORLD UNIVERSITY INDUSTRY INCOME RANKING

22 — 2014

20 — 2016

TOP-11 — 2018



NANOENGINEERING AND ELECTRONICS

- РОСЭЛ
- РТИ
- mikron ОАО «НИИМЭ и Микрон»
- GS GROUP

LASER & PLASMA TECHNOLOGY

- LASSARD systems
- IPG IRE-POLUS
- PILKINGTON
- VARTON
- RÜBIG DRIVING SUCCESS
- SuperOx

INFORMATION TECHNOLOGY AND CYBERSECURITY

- KASPERSKY lab
- Bank of Russia
- СБЕРБАНК ТЕХНОЛОГИИ
- @mail.ru group
- SAP
- NEOSECURE
- SIEMENS

ACADEMIC REPUTATION

INTERNATIONAL RANKINGS

THE WORLD UNIVERSITY RANKINGS	QS WORLD UNIVERSITY RANKINGS	RUR ROUND UNIVERSITY RANKING
EURASIA RANKING 8	EECA UNIVERSITY RANKINGS 23	
EMERGING ECONOMIES UNIVERSITY RANKINGS 19	BRICS UNIVERSITY RANKINGS 30	NATURAL SCIENCES 52
PHYSICAL SCIENCES 89	PHYSICS & ASTRONOMY 51-100	WORLD UNIVERSITY RANKINGS 224
COMPUTER SCIENCE 201-250	NATURAL SCIENCES 146	
WORLD UNIVERSITY RANKINGS 351-400	WORLD UNIVERSITY RANKINGS 329	

THE WORLD UNIVERSITY RANKINGS

Phil Baty, Editorial Director of THE Global Rankings, called the progress of MEPhI in THE World University Ranking "striking gains" that directly linked to the improvements of MEPhI's teaching, research and internationalization performances.

ACADEMIC RANKING OF WORLD UNIVERSITIES SINCE 2003

PHYSICS
151-200

BEST GLOBAL UNIVERSITIES U.S.News & WORLD REPORT 2018

PHYSICS
90

MosIUR
THE THREE UNIVERSITY MISSIONS

MOSCOW INTERNATIONAL RANKING "THE THREE UNIVERSITY MISSIONS"
131

NATIONAL RANKINGS

2
интерфакс INTERFAX
National University Ranking

1
Социальный навигатор | РОССИЯ СЕГОДНЯ
Demand at the Labor Market among Russian Engineering Universities

3
RAEX ЭКСПЕРТ
National University Ranking

3
SuperJob
IT graduates income between Russian Engineering Universities

1
Социальный навигатор | РОССИЯ СЕГОДНЯ
Students Feedback among Russian Universities

3
Forbes
TOP-3 in the Quality of Education between Russian Universities

FIGURES AND FACTS

761 — 2013
2553 — 2017

Total number of publications per year, Scopus

MEPhI received the Web of Science awards 2017

in the nomination **"Best publication strategy"**. Selection criteria include that major part of the publications are submitted and accepted by the high-impact journals and the number of such publications has improved significantly

30% — **Top-10, number of articles**

19,8 — 2013
52,5 — 2017

5-year citations per faculty FTE (WoS)

13,7% — 2013
27,4% — 2017

Publications in Q1 (Scopus)

79 faculty members with H-index of 30 and above

Academic-corporate partnership publications in 2018, % (SciVal)

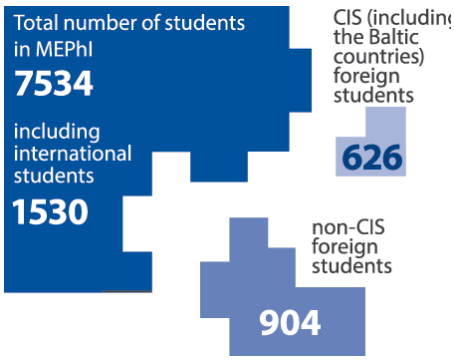
6,5%	5,5%	5,3%	5,2%	4,5%	4,3%
Tokyo Institute of Technology Japan	Technical University of Munich Germany	(MEPhI) Russia	MIT USA	Delft University of Technology The Netherland	ETH Zurich Switzerland

MEPhI's news and press-releases, number of countries

4 — 2013

50+ — 2017

Over 40 000 scholars participated in the MEPhI's Olympiads, including 2 000 foreigners



39,5% — Faculty with foreign PhD

35 International laboratories

38 Programs in English

26 Engineering programs with international accreditation (FEANI)

The first graduation class of the INMA program under the IAEA (September 2018)

As part of the joint programs with foreign universities, the academic mobility has increased significantly: **in 2017** MEPhI's staff visited **over 20** countries with lectures, the planned geography of academic mobility number **by 2025 is 100 countries**.

Income from R&D (non-budget) per faculty, thousand rub.

1936 — 2013

2610 — 2016

3200 — 2020

Presence in the global subject ranking

1 — 2013

15 — 2018

EXPERTS ABOUT MEPhI

YUKIYA AMANO

IAEA General Director

If countries choose nuclear power, our work is to help them use it in a safe, reliable and sustainable way.

JULIEN FUCHS

Research Director of CNRC, Ecole Polytechnique, France

Your facilities give unique opportunities to expand knowledge in the field of laser and plasma physics in high-pressure and high-power modes.

PARAS N. PRASAD

Director of the Institute for Lasers, Photonics, and Biophotonics, University at Buffalo (SUNY), USA
Chairman of the International Council of PhysBio Institute, MEPhI

MEPhI is in a unique position possessing various aspects of physics, nuclear technologies and biomedicine. MEPhI is able to influence the development of biomedicine not only in Russia, but all over the world.

PATRICK HASPEL

Head of Global Academic Partnerships and University Programs at Cadence Design Systems Inc.

MEPhI is a recognized international university in the field of electronic technology. Graduates of MEPhI are competent in using innovations in practice, which is an important criterion of success. It makes them valuable employees, especially at Cadence.

BART PRENEEL

Full Professor of the Electrical Engineering Department of the Katholieke University Leuven, Belgium
International Association for Cryptologic Research (IACR) President

Students of MEPhI have a solid scientific basis to become experts in cybersecurity. I am sure they will become excellent professionals.

EXPERTS ABOUT MEPhI

YURI OGANESSIAN

Academician of the Russian Academy of Sciences, head of the Flerov Laboratory of Nuclear Reactions at the Joint Institute for Nuclear Research in Dubna, graduate of MEPhI's ALUMNI-1956

I'm grateful to MEPhI that gave me a lot throughout the years of my formation, during my study at the University and later on when I started to work independently. Today MEPhI can offer even more. It's a leading national university and Im very pleased and I am very pleased that the people who have received a broad education here are primarily focused on working in Russia, applying their knowledge, strength and ability for the benefit of their country.

MIKHAIL KOVALCHUK

President, National Research Center "Kurchatov Institute"

The fact that MEPhI employs faculty members with unique knowledge and experience and that it has extensive cooperation with leading universities and scientific organizations helps to train high-quality engineering and physics personnel for different branches influencing economy of Russia being it fundamental science, atomic or other HiTech areas.

ANDREY KAPRIN

Director General, Federal State Budgetary Institution National Medical Research Radiological Center of the Ministry of Health of the Russian Federation

Nowadays MEPhI is recognized as a specialized Scientific clinical center which is engaged in the development and the implementation of advanced medical technologies. The University's research activities are distinguished by broad coverage of scientific and technological problems, abilities to find brave and extraordinary solutions and brilliant implementation. Currently oncological and radiological centers of Russia are staffed with high quality specialists in nuclear medicine trained in MEPhI.

ANTON FOJTÍK

Professor, Czech Technical University in Prague

The prospects of the Institute of Engineering Physics for Biomedicine of MEPhI are significant. I am positive that in Europe there is no institute with the same potential and capabilities. We – foreign professors – work in Russia to share knowledge from our institutions, as well as to contribute to the development of nanotechnology and to enhance MEPhI's image abroad.

GEORG KORN

Head of Department of Experimental Programs and System Engineering компании "ELI-Beamlines"

For many years we have been cooperating with MEPhI in the field of theoretical and experimental laser science. The impact of the MEPhI researchers in the successful performance of the ELI in the field of laser and plasma physics is really remarkable. We are very proud of this collaboration and we will be fostering it in the future.

EXPERTS ABOUT MEPhI

ZHANGBU XU

The head of the international STAR collaboration

Finally I got it. I visited Dubna, than MEPhI. We've met with the Russian participants of the collaboration, discussing business issues. I cooperate with scientists and students of MEPhI. They work hard and are high professionals.

FEDERICO ANTINORI

The head of ALICE Collaboration

Russia has one of the best students in the world, and MEPhI has made a great contribution to the development of the ALICE experiment. Russian scientists from MEPhI have been participating in it since the very beginning, from the very first stages, when the possibility of creating an experiment with heavy ions at CERN was only discussed. We can say that without Russian scientists, ALICE would not exist in the version in which it is now. For us Russia and MEPhI are one of key collaboration participants.

NATALIA NIKIPELOVA

President of JSC "TVEL" Fuel Company

TVEL Fuel Company has a long-time collaboration with MEPhI aimed for development of the industry-oriented science and technologies with focus, among others, on the advanced nuclear technologies. TVEL company values and encourage MEPhI's development and transformation which accommodates implementation of the best practice and latest trends in to formation of the scientific and engineering agenda as TVEL Fuel Company will always need highly qualified staff.

VLADIMIR UIBA

Director of the Federal Medical-Biological Agency of the Russian Federation

Academic and research and management staff of the MEPhI are working continuously to bring the quality of the education to the next level, adopts creativity as a search of meaning and closely cooperated with leading national research centers.

MIKHAIL EREMETZ

Head of laboratory at the MPI of Chemistry, Mainz (Germany). Included in the 2016 list of the 10 most known scientists by the Nature journal

I graduated from the Solid State Physics Department of MEPhI in 1973 and can admit that the Department still shows the highest level ofof students training and scientific research. It can be proved by the unique experiment that we conducted in collaboration with European Synchrotron Research Facility (ESFR, Grenoble, France) in summer 2018. The great expertise in synchrotron research gained by the Solid State Physics and Nanosystems Department of MEPhI, LaPlas allows for better understanding of the very nature of high-temperature superconductivity. Issues addressed by the MEPhI approach the very frontier of world science. That's why I always recommend those keen on physics to choose this University.

ADDITIONAL MATERIALS

MEPhI

eng.mephi.ru

youtube.com/watch?v=DIAecuWlDGA

STRATEGIC ACADEMIC UNITS (StrAU)

INPhE	Institute of Nuclear Physics and Engineering
LaPlas	Institute for Laser and Plasma Technologies
PhysBio	Institute for Engineering Physics for Biomedicine
NESPI	Institute for Nanoengineering in Electronics, Spintronics and Photonics
ICIS	Institute of Cyber Intelligence Systems

MEPhI ON THE GLOBAL SCENE

Collaboration of MEPhI with Japanese universities to enrich science of two countries

The first international graduates of Nuclear Technology Management Program approved by IAEA

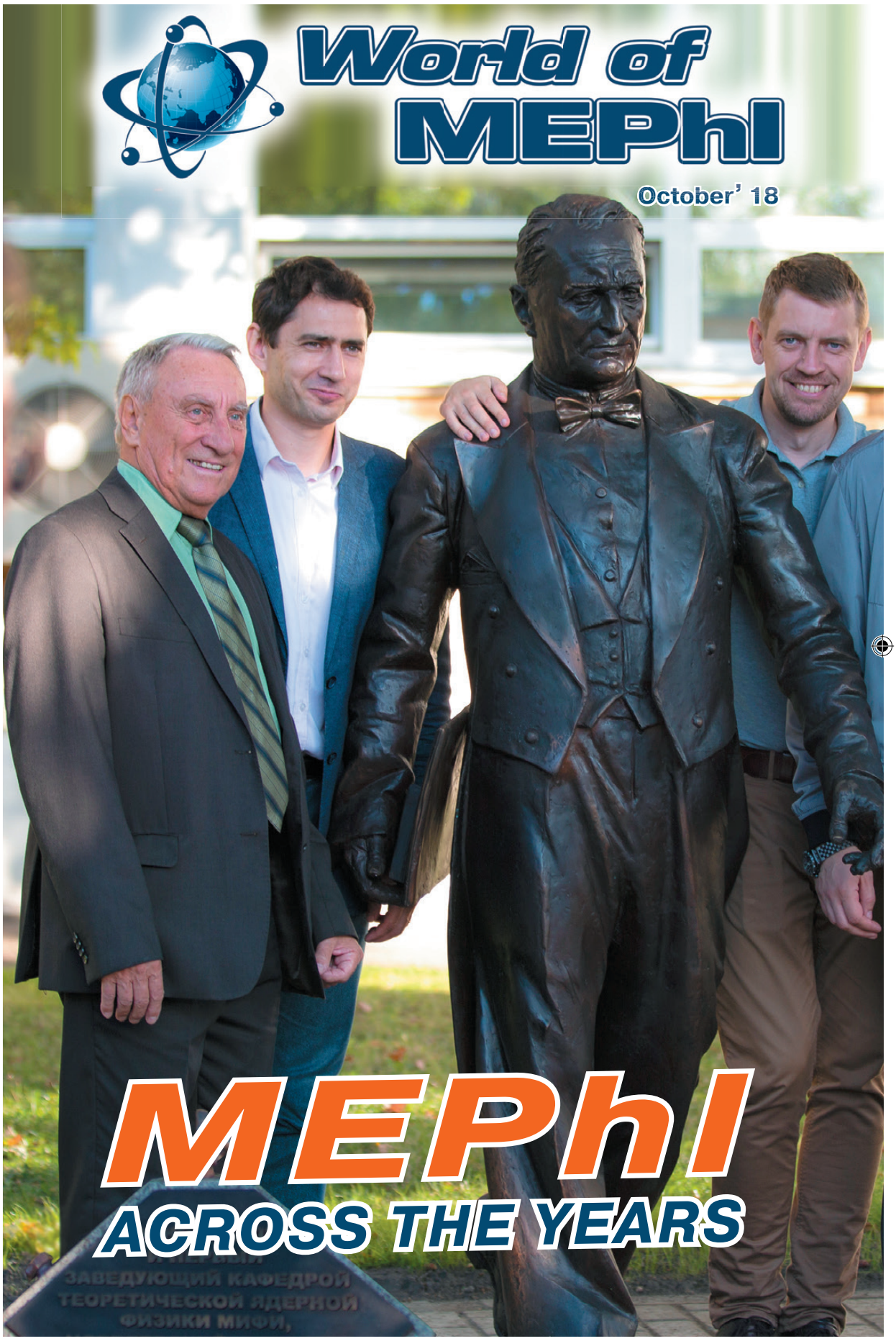
MEPhI opens its branch in Uzbekistan

INDUSTRIAL PARTNERSHIP

MEPhI signs cooperation agreement with Aeroflot

MEPhI and Rostechnadzor concludes Agreement on scientific and technical cooperation

Strategic Partnership With RosAtomin education, innovations and research.



A series of Alumni meetings dedicated to the 75th anniversary of National Research Nuclear University "MEPhI" was held in September 2018. During these days MEPhI welcomed more than 3000 guests. Among most celebrated and anticipated guests were very first graduates who laid the foundation and good traditions of MEPhI; those who became witnesses and contributors of the great victories achieved at the good times and the times of the hardship; those who graduated at the edge of the era of change; and the new generation graduates, who now proudly carrying on and adding to the glory of the Alma mater.

MEPhI ACROSS THE YEARS

Graduates of the legendary engineering university have something to be proud of! Many of them have become worldwide renowned scientists, academician, founders of new scientific schools and research areas, winners of national and international awards, directors of research centers and institutes.

MEPhI took the preparations for the meeting seriously, trying to make this day festive and memorable. An exhibition with exclusive archive photographs reflecting the glorious history of the University has been displayed during the event. These images have brought out many memories and emotions. Forgotten faces, names and events have surfaced from the depth of visitors' memories. Many have found themselves young in these pictures.

Mikhail Viktorovich Kirillov-Ugryumov, a graduate of 1977, Department "T":

I was not going to be a physicist, but for my father the basic principle in life was that a man must be a physicist and a communist. I was not a communist, so it was an obvious choice for me to become a physicist. Actually I consider myself as person with a humanitarian mindset, but I do not regret becoming a physicist.

Education in MEPhI of that time was the best in the world; it was structured and made it possible to navigate through the huge array of knowledge. On one hand, there was an intensive curriculum, many disciplines, especially in theoretical physics. On the other hand, there was an amazing dialog and communications – there was no difference between lecturers and students, it was a kind of a fellowship in the name of science. But no one ever crossed the line of respect to backslapping.

We had not only science at a high level, but also versatile education in arts – the great screenwriters and poets were frequent visitors at MEPhI, the students were accustomed to the be a part of such a creative environment.

Yury Nikolaevich Barmakov, a graduate of 1955, Department of Instrument Design, winner of the Lenin and State Prizes:

After graduating from MEPhI, I got a position in the laboratory headed by Alexander Ivanovich Belonosov and worked all the way up from being a young specialist to the Director of All-Russia Research Institute of Automatics named after N.L. Dukhov. At present, I'm the first deputy scientific supervisor and at the same time I'm engaged in the human capital development and personnel training. At first, MEPhI had three basic departments, and now we formed new institute - the Institute of Physical and Technical Intellectual Systems, where I'm director. I happy to be back at MEPhI, we will make every effort to ensure that our alma mater is not only the best in the country, but also the best in the world. And that's not difficult!

Soon the University will have an alley of honor, with the statues of six Nobel laureates who worked in MEPhI which should have a great educational effect on students, including foreign ones. These are the people who laid the basics not only of the educational activities of our University, but also developed teaching methods of fundamental and theoretical physics in the country. At present, one can see two monuments near the main building of the University – Nikolai G. Basov and Igor E. Tamm. Monumental images of great scientists were created by the sculptor Alexander Mironov.

GREAT SCIENTIST...

Everyone who comes to MEPhI sees a monument to Nikolai G. Basov on a bench near the main entrance. Nikolai Basov was a great scientist, Nobel prize winner, MEPhI graduate and a wonderful person who acomplished a lot both for our country and University.

Nikolai Basov was among the discoverers of a principle of amplification and generation of electromagnetic radiation, which allowed to create the first quantum generator – MASER – in 1954. In 1962 ideas of Basov and other Russian physicists led to the creation of the first injection laser. He is the author of fundamental works that formed the basis of laser physics, for which he received the Nobel Prize in 1964 (jointly with A.M. Prokhorov and American physicist Charles H. Townes). In 1978 N. Basov founded the Department of quantum electronics at MEPhI, which later was renamed as the Department of laser physics.

The rector of MEPhI M.N. Strikhanov believes that "the heroic biography of Nikolai Gennadievich Basov can serve as an example for both young people and recognized scientists. Starting as military paramedic during the WWII, Nikolai Basov had become a great physicist and the founder of a completely new scientific area and novel technology, which determined the future".

...WITH MEDAL IN HAND

In September 2018 MEPhI the inauguration of the memorial to one of the leading scientists of the Soviet atomic project, the founder and the first head of the Department of theoretical nuclear physics at MEPhI, Nobel prize winner and academician Igor Yevgenyevich Tamm was held at MEPhI'a campus.

The monument reflects the real moment in the life of the scientist, when in 1958 he received the Nobel Prize in physics "for the discovery and interpretation of the Cherenkov effect". Igor Yevgenyevich is in a tailcoat, he holds a medal of the Nobel laureate.

According to the Director General of the Rosatom State corporation A.E. Likhachev, Igor Tamm is not just a name, it's his achievements and projects, conducted in Sarov, furthermost study of the thermonuclear reaction and a number of technical solutions: "It sets a good tradition that students will attend lectures and seminars walking along the alley of honor and see monuments to these great people. This is a part of the "atomic code" (work ethic), part of our community and a guarantee that not only technical ideas and solutions as well as the discovery of fundamental properties important for the entire global nuclear industry, but also the spirit of these people, their approach will be in the great demand and will be taken over further by future generations of Russian nuclear scientists."

JOURNEY TO VICTORY

Most recently, the Russian Science Foundation has announced the results of the 2018 open call for grants "Research in the breakthrough areas by young scientists" of the Presidential program aimed to support research projects by leading scientists, including young one. MEPhI received financial support for 7 projects, including 5 that were submitted by the young scientists of the Institute for Laser and Plasma Technologies (LaPlas).

The winner of the open call is a young scientist of the Plasma physics Department at the LaPlas Institute at MEPhI Stepan Krat shares why he decided to devote himself to science and what makes a scientist's life attractive.

– Tell us about your project.

– The topic of my project is "Characterisation methods of lithium coatings on different substrates". Generaly speaking, the lithium is a very important material in solving the problem of controlled thermonuclear fusion – the energy of the future, so it is necessary to conduct a lot of related research.

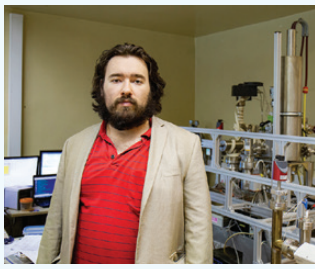
Every study requires method of diagnostics. For example, in order to know what the weight of the object is, it is necessary to develop scales, and in the case when it's impossible, you should think of a way how to measure the mass of the object by indirectly. Just like in my proposal. It is necessary to develop methods for lithium coatings characterisation (composition, thickness and other parameters). This is not a trivial task, given the chemical activity of lithium, small atomic number and other characteristics. I have proposed several potential methods of lithium coatings characterisation, this topic caught an interest of the experts, and they allocated funds to continue this study.

– How will the results of the project help in solving the problem of controlled thermonuclear fusion?

– My project relates to the development of instruments for characterisation, so the scope of its application can be quite broad. I cannot say how big my contribution will be, but the significance of my work is beyond doubt for me and for colleagues around the world.

– Why did you choose to become a scientist?

– Good question, it was a process with several iterations.



For the first time I had an idea in the 5th grade at school, I've always been a techie. The decision crystallised when I was a scholar at the Pre-university of MEPhI, a time when I had my first scientific project. But beyond my natural predisposition, I've always been driven by scientific altruism. There are always enthusiasts who will move science forward.

– What the excitements are in the life of a young scientist?

– I can say that science, that my colleagues and I are engaged in, is a fundamental good the whole mankind can benefit from it. In addition, there are no typical tasks in the open-end research and exploratory study. Yes, we stand on the shoulders of giants, yes, we develop existing topics, but each new problem requires solutions that are not existed before, so the routine does not threaten us. I do not treat my work as an obligation, for me it is a paid hobby

MEPhI STUDENTS AMONG WINNERS OF ATOMSKILLS-2018

More than 900 participants and experts representing 78 enterprises and base universities of the State Corporation Rosatom have competed in 27 key competencies at the Third Rosatom championship of professional skill – AtomSkills-2018.

The championship has become a real professional festival and a major career-oriented event. Hundreds of scholars and students of Yekaterinburg and nearby cities visited AtomSkills-2018 venue and received an opportunity to participate in interactive activities and glanced at the professions of the nuclear industry.

To become a participant at the AtomSkills-2018 the representatives of the most popular profession of Rosatom went through a strict selection and had an intensive training throughout the year at their enterprises. The championship was carried out in the condition close to and sometimes even more complicated, then a real industrial environment. Organizers installed high-precision industrial equipment. A strict time limit was set to find solution for the high complexity tasks. Many aspects of the upcoming tests were announced to the participants only upon arrival on site.

For the first time MEPhI's students participated in the championship on equal terms with professionals. Our team was the fourth (out of twelve) by the number of participants and the second by the number of competencies, where team members competed. For students, participation in such championships is an opportunity to test their professional knowledge level, and for faculty – to become part of the industry expert community, to improve their professional skills and gain recognition as highly qualified specialists.

Despite the complexity of the championship for newcomers, MEPhI students won prizes in three competencies: they received 3 silver and 1 bronze medal.

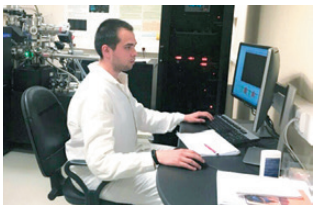
Congratulations to MEPhI's team and first of all to the prize-winers of the Championship with a brilliant result!

RESEARCHERS TO EXTEND SERVICE LIFE OF NUCLEAR REACTORS AND IMPROVE THEIR SAFETY

Cooperating with students from the National Research Nuclear University MEPhI, scientists from the Kurchatov Institute has analyzed the structural condition of the VVER-440 reactor core using the new technology, which should extend the service life of the reactor up to 45 years, saving the cost of dismantling the old vessels. The results of the research were published in the Journal of Nuclear Materials.

The water-water energetic reactor vessel (the most popular type of reactor in the world) VVER-440 is one of the most important units in a nuclear power plant. Its safety and operating efficiency largely define the safety level of the nuclear plant.

When operating, a reactor vessel is subject to fast neutron exposure, which results in radiation hardening



(loss of plasticity) in the reactor's base metals due to the formation of nano-scale radiation-induced defects and phases. Due to reactor vessel exposure to radiation and operating temperature (~ 300oC), segregations of impurity elements are formed on grain boundaries, which results in a reduced strength of these grain boundaries. The formation of harmful impurity segregations in grain boundaries results in reduced crack resistance in the metals.

This limits the life cycle of the reactor vessel, as the probability of a brittle fracture upon reflooding it with cold water in case of emergencies is increasing over time. In 1991, in order to extend the service life of the VVER-440 reactor vessel, scientists conducted a recovery annealing process on a number of these vessels, thus extending their service life up to 45 years.

The technology for recovery annealing was developed and patented at the Kurchatov Institute. It requires a certain temperature, holding time, a rate of heating to different annealing temperatures required for different stages, and a cooling rate. The method is based on the scientists' cutting out samples, or templates, from the inner surface of functional VVER-440 vessels, and conducting comprehensive studies, re-annealing and restudying of these templates.

"It is essential to conduct this procedure so we can give recommendations on further extending the service life of the reactor vessel and determine the rate of post-annealing radiation embrittlement", said Yevgeniya Kuleshova, Professor at MEPhI Institute of Nuclear Physics and Engineering.

Researchers claim that this new method can extend the service life of these reactors up to 60 years thus saving the considerable cost of dismantling old reactors and building new ones.

"The participation of MEPhI students in this research showcases the connection Russian students have with real science and the economy, which allows them to work on scientific developments and solve large-scale problems while they are still studying at the university", Kuleshova said. "This increases their knowledge and competence levels, and benefits the country's economy".

RUSSIAN SCIENTISTS DEVELOP UNIQUE "TRAP FOR LIGHT"

Based at the National Research Nuclear University MEPhI, a research team led by Prof. Yuri Rakovich has developed a tunable micro-resonator for hybrid energy states between light and matter using light to control the chemical and biological properties of molecules.

An article on research results has been published by Review of Scientific Instruments in the Editor's Pick column.

The micro-resonator is a two-mirror trap for the light, with the mirrors facing each other within several hundred nanometers. A light quantum caught in the trap would form a localized state of an electromagnetic wave. By modifying the resonator's form and size, operators can control the spatial distribution of the wave, as well as the duration of the photon's life in the resonator.

The new invention makes it possible to control chemical and biological properties of molecules with the help of light. The practical importance of this research is largely due to the uniqueness of the resultant construction. The micro-resonator can serve as the basis for new-generation instruments that can be used in biological and chemical sensing as well as to control the speed of chemical reactions and energy transfer efficacy.

The high marks given to the instrument are explained by its novelty, effectiveness, universality, and uniqueness as a research tool.

The resonance interaction between quantum emitters and a localized electromagnetic field is of interest primarily because it provides an opportunity to control the properties of light-matter hybrid states. The light and matter in these systems form an intermediate state with changed properties which are controllable with the help of optical emission (light). One of the ways to induce these states is to place emitting or absorbing molecules in a resonator.

According to the scientists, their tunable micro-resonator will substantially simplify and extend relevant research by making it possible to analyze light-matter interactions in both strong and weak communication modes for samples of practically any matter in the UV-IR spectrum.

The instrument is a Fabry-Perot micro-resonator (λ2) consisting of mirrors, one flat and one convex, that secure plane-parallelism at least in one point on the surface of the latter, thus minimizing the mode volume. This is a light trap of two mirrors placed in front of each other within less than a light wave length, said Prof. Yuri Rakovich, a leading researcher at the MEPhI Laboratory of Hybrid Photon Nano-Materials.

MONTERO DE PEDRO: MEPhI MASTER'S DEGREE PROGRAM OFFERS SCIENTIFIC TOPICS WHICH ARE OF HIGH INTEREST FOR ME

Less then 10 years had passed since MEPhI has opened its doors to international students. Nevertheless, it has already become one of the most international universities in Russia. Why a graduate of a European University should choose the master's degree program in a Russian nuclear University? Are stereotypes and cliché about life in Russia true? A point of view from the master's degree student at MEPhI - Iker Montero de Pedro (Spain).

– Iker, why did you decide to do master's degree in Russia after receiving a bachelor degree in Spain?

– When I become a student at the University of the Basque Country, I was interested in two areas: Material engineering and Energy. As a result, I decided to specialize in materials engineering. But here, at MEPhI, I found an opportunity to combine both of my main fields of interest.

In addition, Russia is one of the leading countries in the field of energy, including nuclear. So I decided to come here. Now I am finishing the first year of the master's degree, one more year to go.

– What is the difference between universities in Spain and Russia?

– I think the educational process doesn't differ a lot. There are lectures at the university and the topics for self-study. Both are standard practices in Russia as well as in Spain.

One of the main differences is the performance evaluation system. For example, there are no credits like «passed - not passed» at the universities in Spain, students have only exams with scores. Everything else is quite similar.

As for the size of a group, I have an advantage as I'm a student of the English-speaking group with fewer students compares to Russian-speaking group. For comparison, in my group at the University of the Basque Country we had 70 people, in another group – 100 people.

– Do you plan to learn Russian?

– I'm already doing it; Russian language is included in the

master's program. My language group includes one student from Egypt and five from Nigeria.

– What can you advice to those who decide to get higher education in Russia?

– Try to learn basic Russian prior arrival. I did, and it helps me in daily activities. Of course, you cannot expect that you will come to Russia and start to speak in Russian immediately. You should spend at least three months learning the language before coming to Russia.

THROUGH THE PHOTOMASTER LENS

Famous journalist James Hill had visited MEPhI in 2018. The photographer graduated from Oxford University, as well as the London College of Printing. In 1995, he became a correspondent for The New York Times and collaborated with many well-known publishing houses.

James Hill covers events in Russia, the CIS countries, Europe, implements his own independent projects and is widely known for his reports from hot spots from around the

world. Since 2003, the photographer lives in Russia.

Currently he is working with a publishing house that is preparing a book on the history of Soviet mosaic in Moscow. James Hill visited MEPhI to take a picture of three mosaic relief images of the artist M. Schwartzmann that adorn the university walls on both sides of the main building lobby and in the library.

James Hill's photographs are part of the Pushkin Museum collection as well as the Moscow House of Photography, the Houston Museum of Fine Arts and in several private collections. His portfolio includes many prestigious awards, for example, he won the international award World Press Photo.