World of MEPhI

October' 18

MEPhI
ACROSS THE YEARS

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

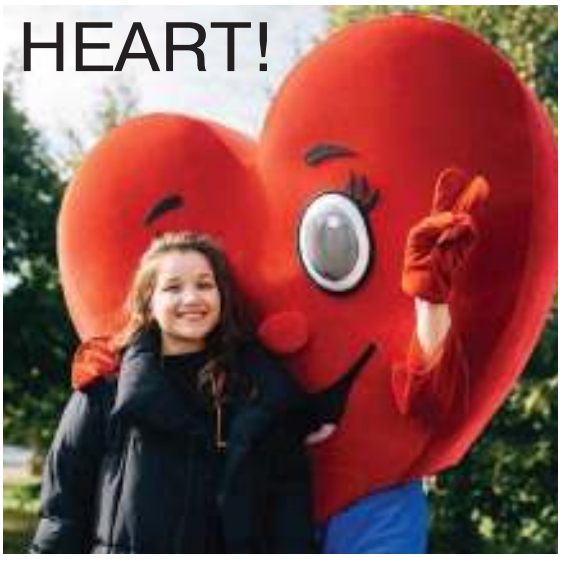
Famous journalist James Hill had visited MEPhI in 2018. The photographer graduated from Oxford University, as well as the London College of Printing. In 1995, he became a correspondent for The New York Times and collaborated with many well-known publishing houses.

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.

FROM HEART TO HEART!



On September 30th the kindest and brightest event of the autumn, the charity festival "From Heart to Heart", has been held at the nature reserve and museum Kolomenskoye. For the seventh time, students prepared an art and performance entertainment program for guests of the festival including concerts, children's animation and master classes.

Guests of the event tried science-inspired nitrogen-cooled ice cream, learned how does the Foucault pendulum works, and become a cheerful audience of the soap bubble show. And this just a few examples on the program! The sports ground was in high demand among participants of the festival: they could enjoy different activities (trampolines, bumper ball, field hockey) regardless alone or with their friends! For music and dance lovers there was a concert program including professional and amateur performance groups.

Photographers took shots of the guests with a big and kind Heart, as a symbol and gesture of appreciations for people who are not indifferent to social problems.

This year, funds raised were sent to the "Podsolnuh" (sunflower) foundation that helps people with immunity disorders.

In numbers:
1 park;
8 sites;
200 organizing students;
4 000 guests;
158 000 rubles;

Millions of shining eyes and smiles!