World of MEPhI

April' 19

OUR FOUNDERS

MEMORY

OUR FOUNDERS

AT MEPhI OPENED A MONUMENT TO THE NOBEL PRIZE WINNER, MEPhI CHEMICAL PHYSICS DEPARTMENT FOUNDER NIKOLAY NIKOLAYEVICH SEMENOV

The opening ceremony began with the words of the rector of the National Research Nuclear University MEPhI Mikhail Nikolayevich Strikhanov. From childhood the name of Nikolai Semenov sounds to us like the name of a prominent scientist, and to achieve a little part of his success is a great honor. He was the founder of a galaxy of outstanding scientists. We are proud that six Nobel Prize winners participated in the creation of MEPhI. This is a solid and very worthy foundation, and we all take advantage of the great breakthrough that these people made to found our university, Mikhail Nikolaevich emphasized. In his speech, he also drew attention to the interesting biography of the scientist and expressed the idea that current students, walking past the established monuments, can feel the continuity of generations and their connection with the names of these great people.

Mikhail Nikolayevich turned the floor over to Vyacheslav Alexandrovich Pershukov, representative of Rosatom State Corporation. In the 70s, when I was studying, everything that was taught to us at the university was somehow connected with the name of Nikolai Nikolaevich Semenov. He noted his life by creating an entire school of Soviet scientists and MEPhI - one of his brainchildren. It is true that the university continues to honor its teachers and founders, pays tribute to them and immortalizes in bronze. Let present and future students know about the history of MEPhI! - said Vyacheslav Alexandrovich.

The opening was attended by a relative of Nikolai Nikolaevich Semenov - Oleg Igorevich Shevaleevsky, the chairman the Russian Academy of Sciences Commission for the development of the scientific heritage of Academician N.N. Semenov. He expressed great gratitude for the erection of the monument on the territory of MEPhI and once again recalled the merits of the Nobel laureate: Nikolai Nikolaevich was a great man, he had a strong scientific intuition. He became the first and only Soviet Nobel laureate in chemistry. Thank you that we can honor his memory in this way.

The history of the Institute of Chemical Physics of the USSR Academy of Sciences, which now bears his name, is closely connected with the name of Nikolai Nikolaevich Semenov. At the opening of the monument, the Deputy Director of the Institute of Chemical Physics of the Russian Academy of Sciences Grishin Maxim Vyacheslavovich made a speech: On this day I want to say that Nikolai Nikolaevich was not only a great scientist, but also an excellent teacher and manager. He taught at many higher educational institutions of our country, he raised many students, and a large part of them continued to study at the Institute of Chemical Physics, where a whole galaxy of first-class scientists came from. I would like to remind everyone of this facet of his talent, summed up Maxim Vyacheslavovich.

Another representative of the Institute of Chemical Physics of the Russian Academy of Sciences, Doctor of Physical and Mathematical Sciences Frolov Sergey Mikhailovich delivered an address: In my opinion, Nikolai Nikolaevich Semenov is one of the greatest scientists of the 20th century around the world. He left a vibrant scientific school, all modern science: physics, chemistry, biology, as it seems to me, is actually based on his ideas. It is impossible to overestimate the dignity of this person.

In 1951, at the initiative of Nikolai Nikolaevich Semenov, the Department of Explosion Physics was founded at MEPhI, which is now the Department of Chemical Physics. Today, this department is headed by Sergey Alexandrovich Gubin, he also made a solemn speech at the opening of the monument: Semenov's figure stands out against other Soviet scientists. It is noteworthy that he made his discoveries very quickly and received an excellent result, because he always worked with students. I am sure that the Nobel laureates in front of the main building of the university will inspire our students.

Architect Alexander Alexandrovich Mironov also delivered a speech: I want to thank everyone for trusting my taste. I am infinitely proud of this project, thank you for giving me the opportunity to bring it into reality. The prototype of the monument was a really existing photograph of the academician, however, there is a bit of fiction in it: notes were put into Nikolai Nikolaevich's hands, they aren't on the photo. You can very easily find this photo, just search in the popular search engine "Nikolai Nikolaevich Semenov", the photo will be one of the first. When I saw it, I realized immediately that it was necessary to make the monument just like that, the sculptor said.

The ceremony ended with the laying of flowers. People were not leaving for a very long time, because everyone wanted to remember once again and talk about the great scientist about whom, probably, no student of MEPhI can speak indifferently.

For reference:

Academician Nikolai Nikolaevich Semenov (1896-1986) worked at MEPhI from 1951 to 1960.

The main scientific achievements of N.N. Semenov - development of a quantitative theory of chemical chain reactions, the theory of thermal explosion, the theory of combustion of gas mixtures. He also improved the method of quasi-stationary concentrations of Bodenstein, discovered the ion-heterogeneous type of catalysis, and built the theory of heterogeneous catalysis.

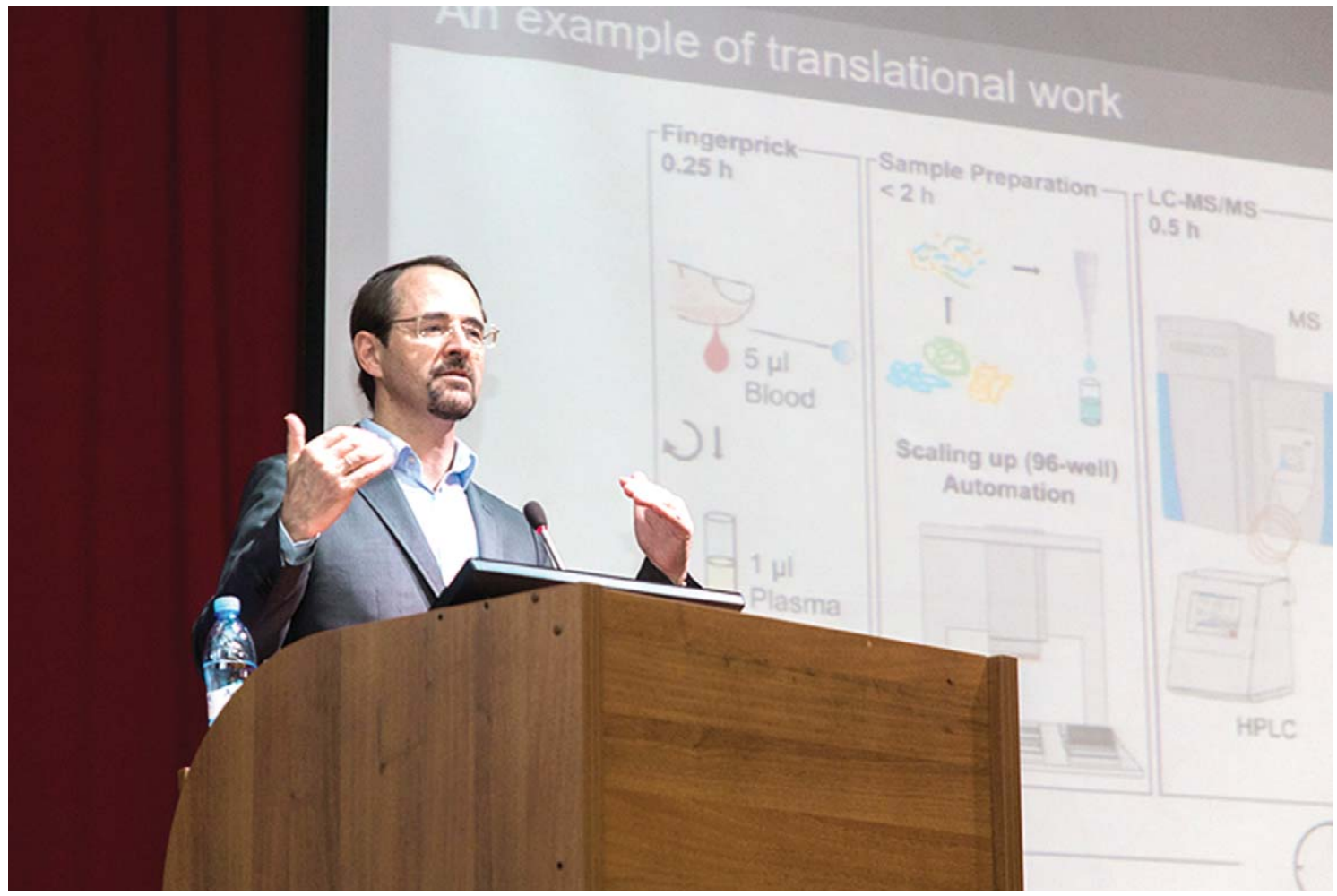
Together with P.L. Kapitsa in 1920 he calculated the deflection of a beam of paramagnetic atoms in an inhomogeneous magnetic field, what led to the idea of spatial quantization. In 1924, N.N. Semenov and Yu.B. Chariton discovered critical density and condensation temperature; later, critical phenomena that set the limit of the course of a chemical reaction were discovered in the oxidation processes of a number of substances.

The most famous are Semyonov's works on the theory of chain reactions, the discovery in 1928 of branching chain reactions characterized by exponential acceleration and subsequent ignition. Then he showed the radical mechanism of the chain process, substantiated all its main features. This has opened up broad prospects for chemical processes controlling. In 1963, together with A.E. Shilov established the role of energy processes in the development of chain reactions at high temperatures.

For developing the theory of chain reactions in 1956, while working at MEPhI, Semenov was awarded the Nobel Prize in chemistry (along with Cyril Hinshelwood). Six Nobel Prize winners studied or worked at MEPhI: N.G. Basov, N.N. Semenov, P.A. Cherenkov, I.E. Tamm, A.D. Sakharov, I.M. Franc. Three of them (N.G. Basov, N.N. Semenov and P.A. Cherenkov) received the Nobel Prize during their work at the university.

OUR GRADUATES

Alexander MAKAROV:
THE MOST IMPORTANT IS TO DO WHAT YOU LOVE, AND THE REST WILL FOLLOW



The author's lecture of the graduate of 1989, the founder of the scholarship program for students of the National Research Nuclear University MEPhI, the inventor and founder of the Arbitrary Mass spectrometry, the Director of Science in the Field of Mass spectrometry for Life Sciences at Thermo Fisher Scientific (Bremen, Germany) and Professor of the University of Utrecht (Netherlands) Makarov Alexander Alekseevich took place at MEPhI. He talked about work, research and studies at MEPhI.

- How often do you visit MEPhI and do you collaborate with a university?

- Every few years I make a presentation at MEPhI. At the moment, we are cooperating with the Institute of Problems of Chemical Physics of the Russian Academy of Sciences, also with the Institute of General Physics of the Russian Academy of Sciences, therefore, it is likely that we will cooperate with MEPhI on one of our projects.

- What impression does the university make on you today?

- Outwardly, the university has become more smart, but the main indicator of the quality of the university is how people feel here. To understand this, you need to talk with interested students and staff to help them and indicate development paths. In the modern world there are so many opportunities, you need to teach students to see them and use them. Students need to be motivated, to show that they will be supported in any initiative.

In foreign universities which I worked with, if you come up with an idea, offices for technical support and intellectual advancement immediately attack you. They are interested in: what does a student or employee need to implement his project, they offer money, equipment, and other help that is small in size, but appropriate for the purpose. I am convinced that this approach is necessary to be applied in Russia. And, of course, if not at MEPhI, then where else to invent and promote high technologies? A person who, thanks to his knowledge, invents in the future a product that is in demand on the market, that's what the goal should be.

- How can a students determine their scientific interests?

- As for me, being in my second year and not having any special knowledge, I came to the department at the invitation of the National Research Nuclear University MEPhI Professor Alexander Alexeyevich Sysoev, it was he who told me: Don't worry, here is a field of activity for you. Everyone starts small, the main thing is to start. So I felt support, they gave me a try in what I wanted. Then they showed me the experiments that were being carried out, introduced me to the existing programs and allowed me to try and choose everything. I could decide if I like programming, working on settings or soldering electronics. Learning with a free choice of courses allowed me to balance between different areas. This gave me the opportunity to integrate these different areas of knowledge and come up with new combinations. Probably, I was the first student from the F [Physics and Technology] faculty who was allowed to attend courses of other faculties, for example, A [Faculty of Automatics and Electronics] and T [Faculty of Experimental and Theoretical Physics]. I think that students should study in different directions during practice, this is the surest way to find their calling.

- How the knowledge gained at MEPhI helped you in building career?

- I was qualified as a physical engineer in molecular physics and always worked in my specialty. I used absolutely everything in the activity, even the knowledge that I received in courses of other faculties. For example, Alexander Alekseevich highly recommended to take a course on personal computers. Then I did not really understand why I needed it, it was 1985, but later this knowledge proved to be very useful to me. I can say that even military training turned out to be useful. Mechanical design, electronic design - all this in varying degrees was useful to me in life.

- What is the role of self-education in your life?

- Self-training took place on the example of some specific tasks. For example, when I came to the department, I didn't know most of the devices, so when I attend courses on these devices, I had a completely different motivation to study. When I saw real prototypes or some effects, then I immediately understood what and why I was doing. Of course, I also spent time in libraries, for example, in Leninka [former Lenin State Library of the USSR] and the Library of Patent Literature. The connection with practice was very important for me: if I did not see real examples, the theoretical material remained for me somewhere on the surface.

Based on international experience, I can say that when people are sent to renowned high-tech firms as interns, this greatly increases students' motivation. Interns see the application of their capabilities and gradually acquire the necessary skills for further training and work. However, it is necessary to choose places of practice carefully so that people become really trained, but not demotivated, because if a person comes for practical experience, and he or she is instructed to deliver yogurt, it kills motivation.

- What are you working on at Thermo Fisher Scientific?

- We produce devices that are used by specialists for many applications, for example, to study the interaction of proteins in the development of diseases such as cancer. We only supply tools, and the research itself is carried out by specialists in biological laboratories. Since the late 2000s, Orbitrap has become the main tool for such research. The progress of the last five years in immunotherapy is also associated with the fact that you can quickly determine how certain drugs work, and all this is done on mass spectrometers with liquid chromatography, now this is a standard procedure. For example, not far from MEPhI and the metro station Kashirskaya there is the National Medical Research Center for Oncology named after N.N. Blokhin. Since 2009, it has been using Orbitraps for cancer research. Every couple of years we bring to the market new models with a multiple improvement in parameters. Every 5-7 years, we reduce the size of our device by half, and, in principle, could reduce prices if there was sufficient competitive pressure.

- Are there any MEPhI students among the interns in your company?

- We have only a few interns, but among them there are no MEPhI students because of visa problems, but they can be often met as workers in permanent positions. Four graduates of the MEPhI are actively working in our group, and they are valuable specialists. If we take into account that only graduates of a university from neighboring Hamburg (which is also noticeably larger than MEPhI) are superior in the number of MEPhI students, this shows the MEPhI students as competitive specialists.

- Is it worth it to start working as a student?

- Personally, I came up with this rule: to work only according to one's vocation (therefore, by profession in the broad sense of the word). I graduated MEPhI in difficult times for the country, and it was not easy, but it gave me new experience. Simultaneously with postgraduate education, I worked at the Institute of General Physicists and several other small firms. This allowed me to see real-life problems, focus on my field and move towards the enrichment of experience, acquire complementary abilities in order to generally strengthen my potential. The main thing is to do what you love, and the rest will follow. It was hard to believe in myself, when earnings were only enough for food for the family, but I did not deviate from my beliefs, which is why everything, in the end, worked out.

SCIENCE

WITH THE HELP OF MRI CANCER WILL BE NOT ONLY DIAGNOSED BUT ALSO TREATED

Scientists at the National Research Nuclear University MEPhI have developed a new type of contrast agents for magnetic resonance imaging (MRI) based on biodegradable silicon nanoparticles, which can be used both for diagnosis and for the treatment of cancer. The research results are published in the Journal of Applied Physics.

MRI is a powerful biomedical diagnostic technique that typically uses nuclear magnetic resonance from hydrogen atoms (protons). During the operation of the tomograph, a magnetic field is created that builds the protons of hydrogen atoms in the magnetic field during exposure to radio waves.

Some studies require the use of contrast agents to improve image accuracy and informational value. The contrast signal in MRI depends mainly on the degree of change in the longitudinal or transverse relaxation times. Relaxation time is the time during which protons return to an equilibrium state. It depends on the molecules and atoms surrounding the proton and is different in healthy and diseased tissues.

In some cases, pathology can be determined thanks to contrast agents that alter locally the relaxation times of diseased tissue. The combination of MRI and contrast agents increases the ability to image inflammations, such as tumor angiogenesis in oncology.

The National Research Nuclear University MEPhI has developed a new type of contrast agent based on silicon nanoparticles, which allows to combine therapy and diagnosis. According to the Professor of National Research Nuclear University MEPhI Institute of Engineering Physics for Biomedicine and Lomonosov Moscow State University Viktor Timoshenko, this is an example of the nanoteranostics development - a combination of diagnostic methods and therapy on a nanoscale.

Theranostic agents for MRI involve a combination of contrast agents with therapy, which is carried out by isolating nanocapsulated drugs and/or additional exposure to physical fields or radiation. Since MRI is widely used in oncology diagnostics, the development of a new type of contrast agent, which can

also be used for gentle therapy oncological diseases, is very important for modern medicine, says Viktor Timoshenko.

Nanoteranostics materials must be non-toxic and compatible with the human body. Another necessary property is invisibility for the immune system - otherwise it will simply destroy them. Neither can nanoparticles accumulate in the body, nor their surface should get dirty.

According to the Institute of Engineering Physics for Biomedicine Laboratory of Nanoteranostics of the National Research Nuclear University MEPhI representatives, the use of silicon nanoparticles for the detection of affected cells is one of the most promising methods of cancer nanoteranostics. Such nanoparticles are not harmful to the body, but can heat up to temperatures of about 42° C (this is called hyperthermia) under the influence of radio waves, which ensures local destruction of cancer cells.

RUSSIAN SCIENTISTS CREATED UNIQUE NPP SAFETY CONTROL FACILITIES

Scientists from the National Research Nuclear University MEPhI proposed a new approach for monitoring the state of the fuel elements cladding (nuclear fuel element) of nuclear power plant reactors, what allows to predict the state of nuclear fuel.

The fuel elements cladding in which the nuclear reactor fuel pellets are enclosed is the first safety barrier preventing the release of radioactive fission products of nuclear fuel into the coolant circulating through the nuclear power station reactor core. Therefore, maintaining the leakproofness of the fuel elements cladding is one of the most important tasks.

According to the project manager, Professor of the National Research Nuclear University MEPhI Eugene Kudryavtsev, the university created a set of facilities for non-destructive testing of the fuel elements claddings. Scientists have proposed a new way of ultrasonic resonance spectroscopy, he noted.

The technique is based on the excitation of local circumferential vibrations of the claddings (or segments of claddings) and registration of their parameters - resonant frequencies and their Q factors (half-width of resonant peaks). Scanning the claddings allows to identify areas of corrosion damage on the outer and inner surfaces, to determine the type of corrosion and its parameters, the scientist explained.

Specialists are also developing a facility that implements a version of the so-called highly sensitive multi-frequency eddy current control, based on the analysis of the interaction of an external electromagnetic field excited by a specially designed coil with the electromagnetic field of eddy currents induced in the fuel cladding by this field. This technique makes it possible to identify defects such as internal and external cracks, magnetic phase precipitates, discontinuities in the fuel kernel, mass transfer of fuel, and local sections of its melting.

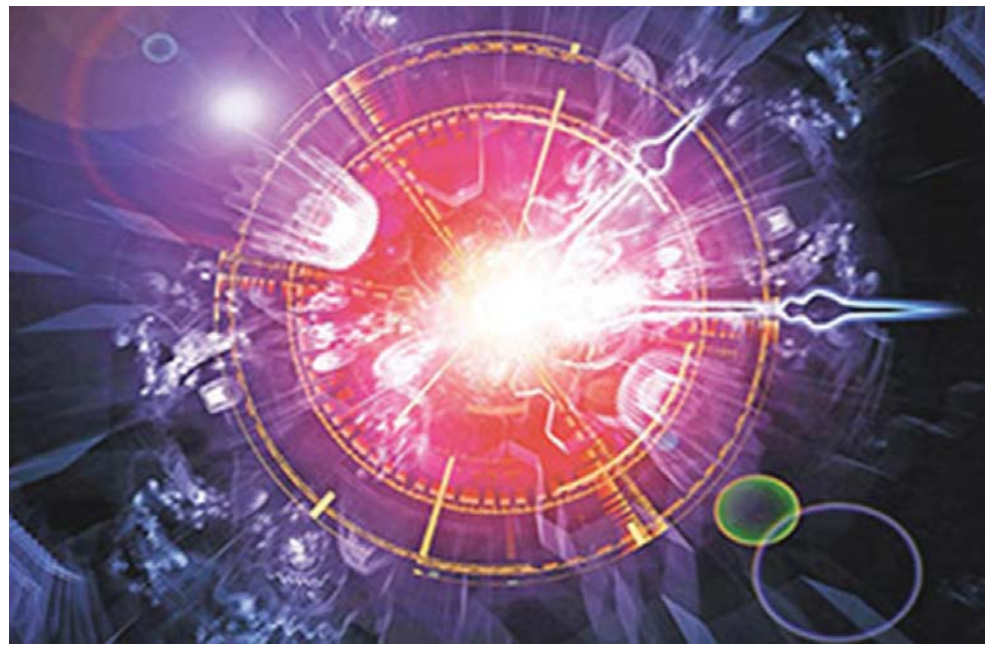
The results of the development work are confirmed by further studies using a destructive method - metallography, scientists noted.

The application of the developed techniques and facilities will allow us to identify areas of corrosion damage at the stage of initial non-destructive testing, reduce the proportion of labor-intensive metallographic studies, expand the capabilities of the experimental equipment of "hot chambers"and increase the reliability of the results, said one of the study participants Ilya Rodko, an employee of the National Research Nuclear University MEPhI.

The work was carried out with financial support from the Ministry of Science and Higher Education of the Russian Federation.

SCIENCE

SCIENTISTS WILL SET THE WORLD TO A NEW TIME



In the late 80s and early 90s of the twentieth century, American physicists discovered an extremely unusual property in the thorium-229 core. It turned out that the ground state of this core is a doublet of levels spaced apart by only a few electron volts.Thus, the first excited state in the thorium-229 core has a completely atomic energy value, which, according to the latest data, is equal to 7.8 +/- 0.5 electron-volts. This amazing feature can be used for technological purposes. For example, develop based on thorium-229, a new nuclear time and frequency standard, and with its help to increase the accuracy of measuring time intervals in comparison with existing atomic clocks by about an order of magnitude. One of the main factors hindering the experimental implementation of the nuclear frequency standard is the lack of a method for exciting the nuclear isomeric transition in the Th-229 isotope and, as a result, the lack of reliable data on the exact value of its energy and lifetime.

In Russia, where the idea of using the excited state of thorium-229 as a time and frequency standard arose, experimental work in this direction is carried out only at the National Research Nuclear University MEPhI and the Lebedev Physical Institute of the Russian Academy of Sciences. The Russian Science Foundation supported the project Development of a time and frequency standard based on a unique optical transition in the thorium-229 core and a corresponding grant was allocated.

The head of the work on this grant is the National Research Nuclear University MEPhI Professor, Head of the Laboratory of the Research Institute of Nuclear Physics of Moscow State University Eugene Viktorovich Tkalya - theorist and author of the idea of using cores to create watches. The cares of the executive officer on the implementation of the experimental part of the project are assigned to the young Associate professor of the National Research Nuclear University MEPhI Peter Viktorovich Borisyuk.

- Eugene Viktorovich, as I understand it, thorium-229 is interesting, first of all, because of the atomic core transition energy properties. What kind of energy is this?

- The transition energy is the difference in the energies of two quantum states between which an atomic or nuclear transition occurs. So, for example, light is born: an atom passes from an excited state to the ground one or, which is the same thing, an electron jumps from an excited level to a level with lower energy. In this case, a photon is emitted - the light that we see. If the process goes in the opposite direction, light is absorbed.

- Scientific research has been going on for three decades. What did we learn about the properties of thorium-229?

- We already know a lot, mainly thanks to theorists. What we still have a poor idea of is the exact value of the transition energy. You see, the situation is strange. We do not see the transition, that is, we do not see photons, and therefore we can neither excite this level, nor fix its decay. Moreover, we know a lot about it thanks to theoretical calculations. For example, we understand well what the channels of level decay are, the approximate lifetime of an excited nucleus, and there are still many nuances.

- And when will the time come for experimental research?

- Fortunately, for several years we have been actively cooperating with the Department of Metrology of the National Research Nuclear University MEPhI. This was a huge success: since 2013 we began to interact, considering all sorts of tasks, and hold workshops.

- Is experimental work primarily conducted on a facility?

- Yes, it is, and it takes money and time. The technology that MEPhI has has been around for decades. You still need to learn how to work with it - this is the culture of the experiment. It is good that at the time of our acquaintance, the university was almost ready - the installation was created for completely different purposes, but became useful for the project. Now Peter Viktorovich has a whole team at MEPhI, young and active, says Eugene Viktorovich Tkalya with a smile.

- Ten people are permanent staff: graduate students, young employees, and about 20 part-time workers, makes it clear Peter Viktorovich Borisyuk. - The conditions of the grant determine the number of participants: at least 20, but not more than 30.

- Do young people enjoy working on the project?

- Sure. They finish their undergraduate or graduate programs and are thinking of moving on to Yandex, Mail.ru, Kaspersky Lab, or, for example, staying at MEPhI. We are trying to attract them with the opportunity to defend a thesis and interesting topics. The students know that our scientific group is accepted into the international community, is known and respected in world science. And Eugene Viktorovich as the author of this line of research is generally out of competition. Naturally, young people are interested in working with us. Also they have good earnings.

- Thanks to the grant?

- These grants are very helpful for us, admits E.V. Tkalya. - Most recently, the three-year grant of the Russian Science Foundation has ended, which was devoted to thorium, too. And the current one is a continuation of those promising studies. But I want to emphasize: do not have MEPhI the corresponding installation - a Paul trap (there are only two of them in Russia), as well as other necessary equipment - and this is a whole complex of an electron gun, a powerful pulsed laser, vacuum chambers, various manipulators, measuring sensors and other things - it would not be worth starting.

- And what can Paul traps do?

- The Paul trap was developed in the 1980s and is now actively used among spectroscopists for precision measurements of the properties of atomic states. We have two concepts, says the scientist. - The first is solid-state, in which thorium ions are implanted into a matrix of a transparent crystal with a large band gap, or, as we say, a wide-gap dielectric. The second is when ions are trapped by electric fields.

- Where did you start work on the project at MEPhI?

- At one time, we were supported by Rosatom, they gave money for an ion trap. We did it. We received two patents in 2012-2013, says Peter Viktorovich. - The ion trap is a complex tool in itself. But the trick is that for our current goals we also need a tunable ultraviolet laser. This would allow to take precise measurements, exciting a low-lying nuclear level. This task is akin to finding a needle in a haystack.

- For you to imagine, the width of the laser line is about ten in minus the eighth degree of electron volts, adds Eugene Viktorovich. - And with this unusually narrow beam, you need to go through a range of the order of one electron-volt, irradiating thorium-229 core at each step for about 30 minutes. This is a process for years. The grant has two directions, but in general there are about ten of them. It is interesting that we ourselves came up with all these directions. But it is difficult to fulfil them, we can not compete with American and European physicists in terms of money, equipment or the number of researchers. This is now the situation of science in the country.

- And what direction do you consider the most important?

- The stated goal of the project is to create a new time and frequency standard based on the thorium-229 core. A laboratory ion trap is a fairly large device; you cannot put it on an airplane. Such a model of watches, of course, will be low-transportable, explains Eugene Viktorovich. - And to make a compact transported watch, you need a crystal. Hence the so-called solid direction: we introduce a thorium ion into a dielectric with a large band gap, and then we work with it in a crystal. In addition to the nuclear clock, a second non-trivial and very interesting prospect opens up here - the development of a laser at the nuclear transition, that is, in our case, an optical range gamma laser. In general, if the first succeeds, the second will succeed. The two devices considered - a nuclear clock and a laser at a nuclear transition - can affect the level of technological development of mankind. For the better, I hope.

- Could you be more specific from now on?

- The device we hope to make will have incredible accuracy in time resolution. In addition, the outside of the atomic core is protected from the influence of the external environment by the atomic shell, and therefore the clock at the nuclear transition will turn out to be more noise-resistant than atomic ones - a pleasant prospect, which physicists in different countries strive for today.

- In other words, we are talking about fundamental and applied research?

- Let's just say this: I am engaged in purely fundamental research. And my work on thorium-229 was also exclusively scientific in nature. A clock and a laser are, so to speak, a byproduct of these studies. But, fortunately, these side results are of separate value and have practical value.

- Is introduction to production expensive? Who will create the applied technology?

- Watches will not be expensive, answers E.V. Tkalya.

- There is the State Service of Time and Frequency - the only organization that carries out verification, metrological certification and other procedures related to specific technological applications, explains P.V. Borisyuk. - In Nizhny Novgorod there is a company called Vremya Ch, which produces hydrogen masers. Probably the best hydrogen watch in the world. There are the Lebedev Physical Institute of the Russian Academy of Sciences, Russian Space Systems, GLONASS and other organizations and departments that will find application to those chronometers that will be made based on the results of our work.

- When will this new watch appear?

- Today, the main problem is that no one knows exactly the transition energy, Eugene Viktorovich clarifies. - And this, oddly enough, is great luck for us. As soon as someone in the world (including our competitors) manages to measure energy up to thousandths of an electron-volt, a watch in the USA and Europe will be created in about ... in a month or two. Technically, we are now noticeably behind our Western colleagues - they constructed their traps back in 2008-2009. Our team is trying to close this gap. Due to advanced ideas as well. And the Russian Science Foundation grant helps us turn these ideas into reality. For example, no one can yet excite the thorium-229 core. And it is necessary. And here we were the first to invent and conduct the excitation of thorium-229 in a laser plasma. We managed to excite a very large number of cores without even knowing the exact value of their energy. A scientific article on this topic has already been prepared today. One of the 45 that we must publish under the terms of the current grant.

- Did you make the hardware for the facility?

- The ion trap is completely ours, the chamber was welded to us at the Vekshinsky Scientific Research Institute of Vacuum Technology, - says P.V. Borisyuk.

- We bought the lasers to hold thorium ions in New Moscow, in Troitsk, where they were made by one commercial company, adds E.V. Tkalya. - In Russia, the industry for the production of devices seems to have died, but there are some firms with competencies in the production of one or another scientific equipment. The equipment has to be searched all over the country - from the Caucasus to Siberia and the Far East. It is not very convenient, but it works!

- However, we use an imported spectrometer for laser implantation, recalls P.V. Borisyuk. - But we adapted it for research. As the result we got a good spectra hemispherical energy analyzer. In short, 90% of the hardware is made in Russia.

- How much money did the Russian Science Foundation promise in four years?

- 30, 28, 26 and 24 million rubles, respectively. There should also be the contribution of an industrial partner, Avesta LLC, a research and production company engaged in the production of laser equipment for ultrafast spectroscopy and microprocessing of materials, based in the Troitsk Technological Park of the Lebedev Physical Institute of the Russian Academy of Sciences.

- Paperwork is exhausting, isn't it?

- In comparison with the grants of the Ministry of Science and Higher Education of the Russian Federation, the Russian Science Foundation grant is just a gift. But there is still enough paperwork.

- How do you interact with colleagues from other institutions?

- In Russia, we are working with the Lebedev Physical Institute of the Russian Academy of Sciences and the Institute of Laser Physics, Siberian Branch of the Russian Academy of Sciences. To put it mildly, it is difficult to collaborate with foreign colleagues We are in contact with almost everyone. We exchange information limitedly. The fact is that in the Soviet scientific tradition, the publication of results was usually preceded by their discussion at various scientific seminars, where the work was subjected to very serious consideration by colleagues. And that was considered perfectly normal. Western scientific tradition allows discussion with outsiders only already published results. This is partly why the priority of watches is western, although they were invented in Russia.

INTERNATIONAL COOPERATION

MEPHI GRADUATE FROM TURKEY TELLS ABOUT HIS EDUCATIONAL AND CAREER PATH

The construction of the first nuclear power plant continues in Turkey. The Akkuyu NPP is being created by the Russian State Atomic Energy Corporation Rosatom. Nuclear engineers who will be hired at the station are trained in Russia. Musa Oğuzhan Demir is one of such young specialists; he studied nuclear engineering at the National Research Nuclear University MEPhI for six and a half years and after completing his studies began working at a design company building the Akkuyu NPP.

What distinguishes Demir from other graduates of this program is that he will use his education in Mersin, a city where, on the one hand, he was born and raised, and on the other, the Akkuyu NPP will be built.

Demir, who graduated from a Russian university in March last year, began working in the licensing and government relations department at the Ankara office of the project company Akkuyu Nuclear JSC. I, as a native of Mersin, made such a decision in order to be able to serve my city, my country, and at the same time because I believe in the grandeur of the project, says Demir. - I am happy to be involved in the creation of the station in the city where I was born and raised. The station is being built next to our house. This makes me very happy and encourages me to work even more selflessly.

Demir studied in the Russian city of Obninsk, where the world's first nuclear power plant is located. According to him, one thing a newspaper ad changed his life. Telling his educational and career path from Mersin to Russia, and from Russia to Akkuyu NPP, Demir notes: In 2011, when I was in my second year at the Faculty of Mathematics at Mugla Sitki Kocman University, I saw one ad in the newspaper. It reported on the recruitment of students for university studies in nuclear engineering in Russia, followed by employment at a nuclear power plant to be built in Mersin. I went to Ankara for an interview. After the interview and a serious exam, I ended up in the first group of students who went to Russia. Learning was difficult, but I had the opportunity to develop comprehensively. To get an education in Russia was a unique chance for us. We are talking about the country that built the world's first nuclear power plant, has been using and improving nuclear technology for over 70 years. At first, it was not easy for us to adapt to such complex studies. New culture, new language, relations with teachers, adaptation to the exam system. Over time, we saw our forward movement, and this inspired us with a new determination. After all, we are responsible for the development of nuclear technology in Turkey. Our task is to bring these technologies to Mersin, Turkey and pass them on to future generations. There were 50 of us who traveled to Russia from Turkey, and together we tried to endure all difficulties persistently. The motivation for me was to serve my country and at the same time the city in which I was born and grew up, Mersin. I am very happy that I was able to do this.

Parents of Musa Oğuzhan Demir Muhammet and Fatma Demir live in Mersin and are proud of their son. When my son said that he would go to Ankara for an interview in order to work at the Akkuyu NPP, of course, I supported him and wished him good luck, recalls Muhammet Demir. I asked him what he really wanted. "I really want this, dad," the son replied. And he went. I think our son will be useful to our country and our hometown. A special pride for us is that he is one of the first nuclear engineers in Turkey.

Fatma Demir says: I am proud of Musa. He studied so well. But it's good that he decided to try then. I am proud that my son is the first specialist to work at the Akkuyu NPP.

CULTURE

THE YOUTH ACADEMICAL MEN'S CHOIR AND THE CHAMBER CHOIR CARPE DIEM - LAUREATES OF THE IST DEGREE OF THE STUDENT CHOIR SPRING FESTIVAL

The Youth Academical Men's Choir of the National Research Nuclear University MEPhI and the Chamber Choir CARPE DIEM of the National Research Nuclear University MEPhI took part in the 39th Moscow festival Student Choir Spring. According to the results of the performance, they became laureates of the first degree! The jury members noted the high performing level of the choirs and unanimously awarded them the highest number of points.

REGIONS

STUDENTS OF THE SAROV STATE PHYSICS AND TECHNICAL INSTITUTE OF MEPHI - WINNERS AND PRIZE-WINNERS OF THE ACADEMIC COMPETITION I AM A PROFESSIONAL

Students of the Faculty of Physics and Technology of the Sarov State Physics and Technical Institute Ivan Smagin (group quantum electronics-27), Alexander Egorov and Oleg Kuzikov (group quantum electronics-45), Alexander Burkatsky (group applied mathematics and physics-45) became successful participants of the final stage of the Student Academic Competition I am a Professional in 2019.

I am a professional is a large-scale educational competition of a new format for students of various specialties: technical, humanitarian and natural sciences. Tasks for the participants are given by experts from leading Russian universities and major companies. It is not abstract erudition that is tested, but professional knowledge. The best participants receive cash prizes, benefits for admission to a master's programme or graduate school, and also recommend themselves in the best way to employers. According to the rules of the academic competition, undergraduate, specialist and graduate students, as well as recent university graduates, are invited to participate in it.

The qualifying round of the academic competition was held at the end of 2018. Its participants, including students of the Sarov State Physics and Technical Institute, went through an online qualifying round in November and December. Limited time was assigned to the tasks, but our students were able to get high scores and were invited to the final stage.

The academic competition was held in 54 areas. In the second season of the I am a Professional competition, students of Russian universities submitted over 523,000 applications for participation. More than 73,000 participants completed tasks of the qualifying stage. 10 886 finalists reached the final stage. 3 472 students and graduates became winners of the competition diploma, including 106 gold, 139 silver and 190 bronze medalists, 952 winners and 2085 prize-winners.

The final stage of the academic competition in the format of full-time participation took place from January to March 2019 at the large universities in different regions of the country. Four Sarov State Physics and Technical Institute students participated in competitions of the academic competition in two Moscow universities in three areas: Physics - at the Moscow Institute of Physics and Technology, Photonics and Nuclear Physics and Technology - at the National Research Nuclear University MEPHI.

The Sarov State Physics and Technical Institute students results are:

- Alexander Burkatsky - prize-winner (Nuclear Physics and Technology);
- Ivan Smagin - winner in two nominations (Physics, Photonics);
- Alexander Egorov - prize-winner (Nuclear Physics and Technology);
- Oleg Kuzikov – prize-winner (Nuclear Physics and Technology).

Alexander Burkatsky: The academic competition in nuclear physics and technology was held in two days. On the first day, a theoretical tour with tasks (maximum 80 points), on the second day, a practical tour - modeling in the software product LOGOS, provided by the All-Russian Scientific Research Institute of Experimental Physics (maximum 20 points). On the second day, the participants were divided into teams of three people, the distribution was built randomly, it was necessary to be able to competently interact in a team with completely strangers. Express training in the software package and expert support were provided by specialists of the All-Russian Scientific Research Institute of Experimental Physics Institute of Theoretical and Mathematical Physics and by professors of our university D.N. Kidyamkina and V.A. Glazunov.

Ivan Smagin: The final stage of the academic competition in Physics was held on January 28. Participants were offered 5 tasks of 20 points from various sections of physics. We were given 4 hours to solve problems. The final

stage in Photonics took place after a fortnight - February 15. The competition task consisted of two parts. The first part was rated at a maximum of 80 points and was a set of 30 tests and tasks. Tasks were performed using a special computer interactive system developed at the ITMO University. The second part was estimated at 20 points, it was necessary to choose one of three tasks, the solution of which must be submitted in writing. Three hours were given for the solution of all competitive tasks.

Alexander Burkatsky to the question What should students strive for? answers this way: I strongly recommend all students to strive to be active and not be afraid of challenges, since this is the mistake of many young people. In 2017, a friend suggested that I participate in the competition "I am a professional," but then I refused, I thought there would not be enough strength and knowledge. I had to try. Our Sarov State Physics and Technical Institute is an institution of opportunities, the leadership always meets students, pays for trips to competitions, contests, academic competitions, conferences, participation in various events, gives a chance to "pump over" their skills, compete with students from other universities and levels of training, make new acquaintances and completely find and prove yourself.

Congratulations to the four brave the Sarov State Physics and Technical Institute students with brilliant victories!

THE TRYOKHGORNY TECHNICAL INSTITUTE OF MEPHI HELD A PHYSICAL AND MATHEMATICAL SCHOOL OF ARCHIMEDES

For the fifth year in a row during the spring school holidays, the Department of Physical and Mathematical Disciplines of the Tryokhgorny Technical Institute of the National Research Nuclear University MEPhI organizes and conducts the physical and mathematical School of Archimedes for students of 6 classes in the city of Tryokhgorny. The primary task of the school is an in-depth study of the disciplines of the physical and mathematical cycle, getting acquainted with the basics of electronics and programming.

The School's program included practical laboratory classes of physics, entertaining experiments in chemistry, review of the resistance of materials and the manufacture of improvised sound speakers. In addition, the program included practical exercises aimed at introducing breadboard models and the basic elements of circuits and electronics.

Each student assembled an electric circuit from fruits and vegetables, constructed a real battery from plasticine, experimentally measured the mass of air, got acquainted with qualitative reactions to various ions, studied the movement of bodies on an air cushion, built a tower of marshmallows and pasta; created a solid bridge made of paper, determined the radiation background of electrical appliances and materials using a dosimeter.

For several years in a row, the School of Archimedes has been in demand among schoolchildren and parents of the city of Tryokhgorny. Classes are held using mobile equipment, systems and kits.

All students of the School of Archimedes received personal certificates, diplomas and souvenirs from the university.

THE LESNOY TECHNICAL INSTITUTION OF MEPHI - THE MOST POPULAR SITE OF TOTAL DICTATION 2019 IN LESNOY

On April 13, the traditional All-Russian campaign Total Dictation was held at the Lesnoy Technological Institute of the National Research Nuclear University MEPhI.

In 2019, the dictation took place simultaneously at 3,100 sites around the world, covering 772 settlements in Russia and 340 cities in 79 countries. The Lesnoy Technological Institute of the National Research Nuclear University MEPhI together with the City Education Department held a campaign for the sixth time in Lesnoy. In addition to the institute, schools No. 75 and No. 67, as well as the Bazhov Central City Library were sites of the project.

In 2019, 93 people wrote a dictation at the Lesnoy Technological Institute, of which 5 people chose this site for the sixth time. Among the participants of the campaign are adults and children, workers and pensioners.

Teachers of the Russian language from Lesnoy schools, Kostina Irina Anatolyevna and Koptelova Svetlana Vladimirovna, were the speakers of the text. This year, the author of the text was writer and literary critic Pavel Basinsky. As a dictation text was selected the passage Simple Heart on the characters of the heroes of the poem Dead Souls by N. Gogol. According to the results of checking the text, 4 people got excellent, and 20 people got good.

We are very pleased that our institute has become the most popular site for writing Total Dictation by the residents of the city, and among the participants there are traditionally many of our students. We will continue to support actively this project for the development of literacy and a culture of speech, said the director of the Lesnoy Technological Institute of the National Research Nuclear University MEPhI V.V. Ryabtsun.

A photo zone was organized for all participants of the Total Dictation in the hall of the Lesnoy Technological Institute of the National Research Nuclear University MEPhI, where everyone could make a memorable photo.

CITIUS, ALTIUS, FORTIUS!

STUDENT TTI MEPhI - WINNER OF THE EUROPEAN POWERLIFTING CUP

On April 13-14, Yekaterinburg hosted one of the largest Strength Sports Festival in Russia and Europe Russian Spring IV. The competition was attended by over 800 athletes, as well as about 2,000 spectators.

A student of the Tryokhgorny Technical Institute of the National Research Nuclear University MEPhI, Kirill Puzyn, won the competition. The athlete showed his strength in the European Cup in powerlifting in a non-equipping division in the bench press as an amateur. Kirill performed in the category of up to 110 kg in the junior age group, with a result of 210 kg.

Student of the Tryokhgorny Technical Institute of the National Research Nuclear University MEPhI took 1st place in the individual standings and 2nd place in the overall standings, among all participants of the age group. As part of the festival, national and international champions, record breakers, world-class masters of sports, the elite of Russian and international sports came to the competition.

MEPhI RUGBY PLAYERS CONQUERED SILVER AT THE MOSCOW CHAMPIONSHIP

Last weekend, April 20 and 21, 2019, in Zelenograd, the final games of the Moscow Rugby-7 Championship took place as part of the XXI Moscow Student Sports Games.

The second team of the National Research Nuclear University MEPhI in the match for third place in the second division was not able to defeat students from the Agricultural Academy and, as a result, they are fourth.

According to the results of all three rounds of the championship, the first team of our university took the second place and won silver medals in the Moscow championship. Based on the results of these competitions, three teams won the right to represent our capital in the final of the All-Russian Rugby-7 Student Competition at the end of May in St. Petersburg. These are Moscow Aviation Institute - the champions of Moscow, the National Research Nuclear University MEPhI and RUDN University, who are bronze medalists of past competitions.

Training at the training camp in the Volga camp and the final tournament in St. Petersburg are ahead.

Congratulations to our students and the coaching staff with deserved success and good luck in the finals!

MINI FOOTBALL TOURNAMENT ON THE LAPLAS INSTITUTE CUP

In the summer of 2018, the World Cup was held in Russia - a real sport festival that brought together people from all over the world. In the wake of the football mood, the Institute of Laser and Plasma Technologies decided to organize its own mini-football tournament.

Not only students and graduate students of the Institute responded to the call. It turned out that the sports initiative is also a successful platform, which allows to involve university graduates in the sports movement. As a result, two teams of the institute departments graduates joined the five student teams. The tournament opened in late autumn 2018. The group stage was completed before the most test session of the fall semester. The results of the playoff stage were summed up in March 2019.

And here is the finale! Last Sunday the last games of the tournament took place. In total, during the time of the competition, they played 21 matches in which they scored 180 goals. Following the results of the playoff games, the following teams became winners:

1st place - M4 team (undergraduates of the LaPlas Institute). Team: captain - Shamil Ismailov, goalkeeper - Vyacheslav Stepanishchev, players - Maxim Lednev, Ilya Utkin, Evgeny Pesterev, Vladimir Yubko.

2nd place - Old Boys team (graduates). Team: captain - Sergey Ryabtsev, goalkeeper - Evgeny Filippov, players - Gennady Lizyakin, Kirill Borodako, Daniel Bulgadaryan, Alexander Kaplevsky, Vladislav Kostyushin, Dmitry Abin.

3rd place - Impulse team (bachelors of the LaPlas Institute). Team: captain - Dmitry Petrunya, goalkeeper - Roman Nemchenko, players - Maxim Guzov, Oleg Deryabochkin, Vadim Telyatov, Egor Andreev.

All players of the prize-winning teams were awarded with diplomas and medals. The M4 team became the owner of the LaPlas Institute Cup, and all of its players will be awarded with jackets with unique symbols of the tournament and university. The three top scorers of the tournament included the player of the Impulse team Egor Andreev (group S14-201) and the player of the FC Gussi team Ivan Pimenov (group B17-212).

And the best player of the tournament was Maxim Lednev (group M18-203), the player of the M4 team who scored the most goals. For high performance, technicality and the will to win, Maxim was awarded the ball with a personal signature of the legendary Soviet hockey player, two-time Olympic champion, nine-time world champion, multiple champion of Europe, Honored Master of Sports of the USSR, Honored Trainer of the RSFSR, head of the Department of Physical Education of the National Research Nuclear University MEPhI Vyacheslav Ivanovich Starshinov.

At the solemn award the acting Director of the LaPlas Institute A.P. Kuznetsov thanked all participants for their interest in sports, the will to win, wished new achievements and handed prizes to the winners.

This tournament opened a new page for supporting sports in the student community in the history of the LaPlas Institute. We are ready to take the initiative in holding a mini football tournament for the University Cup and invite teams of other institutes of the National Research Nuclear University MEPhI to participate, A.P. Kuznetsov concluded the solemn event with these words.

The LaPlas Institute thanks the administration of the Department of Physical Education No. 15 for their assistance in holding the tournament, as well as the judges and medical staff who accompanied the event.