Skoltech

Skolkovo Institute of Science and Technology

April 2016

NEWSLETTER
www.skoltech.ru

Another school year at Skolkovo Institute of Science and Technology is drawing to a close, and we are here to tell you what's happening on our campus. This time, we are happy to present you four very interesting interviews prepared by our colleagues from the Skolkovo Foundation and the sk.ru magazine. Alexander Kuleshov, Skoltech's new President, speaks about knowledge and his conviction that "the study of fundamental science should continue until one is able to study at all." Irina Dezhina, who heads the institute's scientific and industrial policy group, shared her thoughts on the results of extensive research on academic staff mobility and talked about the barriers that impede mobility of Russian scientists. In June 2016, Skoltech will host the first photonics conference of BRICS countries, and we are happy to share with you an interview with Ildar Gabitov, Director of the Skoltech Center for Photonics and Quantum Materials, who spoke about this field's development at Skoltech and about the role photonics play in our everyday life. Finally, we are proud of the opportunity to introduce you to cosmonaut Sergei Krikalev, Professor of Practice at Skoltech Space Center.

Skoltech is expanding to new areas of cooperation such as 3D modelling, oil and gas production, and collaboration with the Russian Federal Agency for Scientific Organizations. This year's open air startup competition Statup Village 2016 is less than two months away, and our team continues to travel across Russia with the Startup Tour in search of the participants.

Skoltech students lead busy lives outside the classrooms. We'll tell you about this winter's Future Biotech science winter school that was organized with the help from Skoltech PhD students and included lectures by several of our professors. There is a story about parliamentary debate tournament that took place at Skoltech, and about our very own Discussion Club organized by the students.

Report on the ***Skoltech: Point of Access*** conference of the Russian-speaking Academic Science Association; news from Skoltech researchers who received grants for their work; announcement of the presentation of the International Proof of Concept Centers Association that was established with active participation from our own Center for Entrepreneurship and Innovation – all of this and more inside.

ENJOY YOUR READING!

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ACADEMICIAN KULESHOV ON SKOLTECH'S FUTURE, VIEWS ON EDUCATION, AND MUCH MORE

In the interview with sk.ru magazine academician Alexander Kuleshov, Skoltech's new President, said that he has no plans for a revolution, but intends to set the priorities somewhat differently – where he feels the need to do so. In the eternal controversy over the value of knowledge vs. skills, he fully sides with knowledge. Asked directly whether it even makes sense to teach fundamental sciences to Skoltech students, each of whom is a graduate of some elite school, Alexander Kuleshov answers in the affirmative. "The study of fundamental science should continue until you have the ability to study at all," Skoltech President insists.

ON THE FOUNDING OF SKOLTECH

In Russia, we had to build something from scratch. Why couldn't Skoltech be created on the foundations of the Moscow Institute of Physics and Technology or Moscow State University or another existing university, since we have some excellent institutions of learning? For precisely the same reasons that Peter the Great did not found his army on the foundations of the Streltsy [guardsmen] regiments, but launched his own regiments. The reason is quite obvious: there are certain umbilical cords that connect us with the past. The fewer there are of them, the greater the chance of achieving success.

ON HIS PLANS FOR THE PRESIDENCY

I want to say right away that there will certainly be no revolution. A huge amount of work has been done, and I believe the first stage of Skoltech's development has been successfully completed. Naturally, as with anything, there are certain questions, some glitches, some things that need to change: that's a completely normal working process.

ON SUCCESS

What success means in Skoltech's case is absolutely clear. In the last 25 years, our [Russia's] education, and, to some extent, science, has undoubtedly suffered some serious deterioration and has even found itself in a dead-end of sorts. In the 1950s and '60s, we had the best education in the world, everyone remembers how [U.S. President Dwight D.] Eisenhower, in response to the launch of Sputnik [in 1957], announced the overhaul of the American education system. And that was a natural response, because everything hangs on education, including science. Of course, science and education are inseparably linked, but education is primary. Though it's true that there can be no education without science.

Interview@Skoltech

ON THE U.S. EXAMPLE

What was done, was done, despite a lot of criticism, and this criticism of Skoltech was largely objective. I myself was known to criticize certain aspects of it. We wanted to take the American education system, using [Skoltech's partner university], the Massachusetts Institute of Technology, as an example, and to transfer it fully onto Russian soil. Maybe that's not the right thing to do. Of course, the basic parameters have to be adopted, the key approaches, the main basic principles, but perhaps it's not worth trying to transfer everything 100 percent. But this only became clear when theory was put into practice.

ON THE AIMS OF A UNIVERSITY

What is the task a university should aim to accomplish? That's the eternal question: what's more important, skills or knowledge? What proportions should they be assigned in? I've always had a clear answer on this issue: we need to teach a maximum of knowledge with a minimal focus on skills. Experience has shown that people with an extensive degree of knowledge and minimal skills can pick up other skills quite quickly, but not, unfortunately, the other way around.

ON THE AGE OF LEARNING

It's a strange thing: people learn until the age of 25. No matter what is said about this, the fact is that people learn serious, fundamental things before the age of 25. Physicists have a saying: if you don't understand quantum physics before the age of 20, you never will. And this, unfortunately, is true.

ON TALENT IN THE REGIONS

If previously, Moscow sucked up all the best scientists like a giant vacuum cleaner, now that's not the case at all. It's important to look at the provinces. In Moscow, the prestige of science has fallen dramatically, but the situation is better in the provinces. We need to refocus, and stop looking only at Moscow, St. Petersburg and Novosibirsk, and we are already taking steps to correct this. We have connections with Ufa, with the Far East, with Krasnoyarsk, Novosibirsk, St. Petersburg, in particular with Zhores Alferov's academic university and so on. Incidentally, [Nobel laureate] Zhores Alferov's saying that "Skolkovo is not the territory, but the ideology" has a lot of truth in it. The state gave Skoltech a lot, and we have to use that not just to create a small quantity of elite graduates, but to spread the new ideology of how to build the educational process.

That's very important. And to make it happen, we can't just sit here inside these walls. We have to attract people here, we have to go out there ourselves – that's a very large part of our work.

ON THE MAGIC COMBINATION FOR INNOVATION

Engineers and scientists really should live side by side. Only out of this union does anything new appear. All of our [Russia's] biggest projects that remain a source of pride to this day – our atomic industry, space exploration and so on – they were successful because engineers and scientists worked on them together.

ON WHAT SKOLTECH LACKS

What does Skoltech lack? That, which is usually called a Centre of Advanced Studies: a small group of people who really are at the top of their field; genuine stars who nurture a small number of smaller stars around them. This would provide a certain flavour, benchmarking for the university as a whole. It's a very important component, we will work on this.

Interview taken by Mikhail Baklanov

Alexander Kuleshov, Russian mathematician, PhD, expert in information technologies and mathematical modelling. Academician of the Russian Academy of Sciences, President of the Skolkovo Institute of Science and Technology

News@Skoltech

Skoltech and C3D Labs begin a 3D modelling partnership

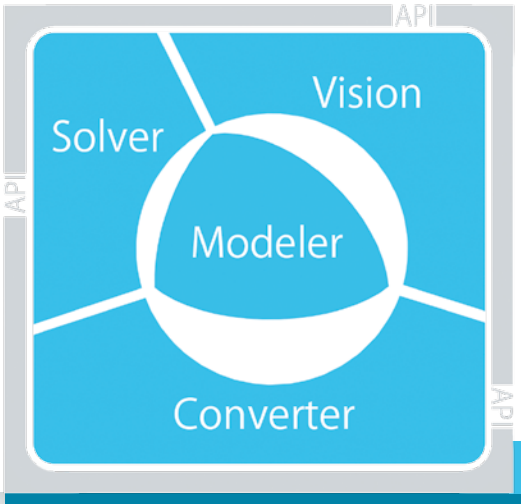
In December of 2015, students of the Skolkovo Institute of Science and Technology spent a day with the staff from C3D Labs in order to learn how to use the C3D platform for science-oriented software development. After the seminar, C3D Labs offered Skoltech an opportunity to join C3D ELP educational program and to begin developing their applications using C3D Labs' 3D-technology. Skoltech has all the essential resources for this, including a perfectly equipped Concurrent Engineering Design Laboratory (CEDL). Now C3D technologies may be used for the students' scientific and commercial IT projects.

"Our partnership with Skoltech started with an invitation to C3D Labs to attend a seminar on new production technologies. There, Skoltech professors presented a master students training concept in the relevant field of study, developed in cooperation with MIT. It was interesting to learn about this thing. Since it was the first time we visited the Skolkovo Institute of Science and Technology, we were given a tour around the classrooms and labs, and we got to meet some talented students. I liked the creative environment that Skoltech has been able to create for the development of scientific potential in young people," said Arkadiy Kamnev, C3D Product Manager at C3D Labs.

The C3D Labs develops high-end technologies in the field of 3D modelling. This company has been a resident of Skolkovo IT cluster since 2012. C3D toolkit is the only geometric kernel available today for commercial use, which was developed in Russia.

Skoltech students began testing C3D's functions in March, and, based on results of the testing, decision will be made on the research projects best suited to employing software components from C3D Labs.

C3D Labs is a resident of the Skolkovo innovation center. In November 2012, the mathematical division of ASCON became a separate company, and was named C3D Labs. It was assigned the task of developing the C3D geometric modelling kernel as a standalone product, and of introducing it to the market internationally. Nikolay Golovanov, PhD, heads the group of highly qualified specialists working on the mathematical and software parts of the C3D kernel. All of them are graduates of leading universities and institutes, and were selected following strict competitive testing for their knowledge in relevant disciplines, as well as their mastery of practical programming skills. The C3D Labs team continuously improves the way that geometric models are constructed and computed. The team promotes a customer-centric approach to working on projects and offers flexible licensing terms of C3D components that take into account the customers' unique business models.



C3D platform for engineering software developers

News@Skoltech

Alexander Kuleshov and Mikhail Kotyukov sign the agreement

Skoltech signs a 5-year agreement with FASO

Skoltech signed a 5-year collaboration agreement with the Russian Federal Agency for Scientific Organizations (FASO) during the Krasnoyarsk Economic Forum-2016. The sides agreed to work together in searching for, selecting and implementing promising projects and programs in such fields of research as energy systems and technology, IT, biomedicine, and advanced manufacturing and materials. The agreement was signed by Skoltech President Alexander Kuleshov, and FASO Director Mikhail Kotyukov in the presence of Arkady Dvorkovich, Deputy Prime Minister of Russia and Head of Skoltech Board of Trustees.

The agreement envisions joint operation of existing scientific infrastructure and unique scientific equipment both at Skoltech and within the FASO system. The sides will facilitate the establishment of labs for scientific and technological research.

After signing the agreement, Kuleshov said: "Skoltech needs to establish closer collaboration with FASO institutes, as they have really operating labs. Exchange of equipment, experience and knowledge between the academic system and the universities is an absolute must. I believe that this is the proverbial first step that will disrupt the institutional disunity."

"We're continuing the systematic work on strengthening collaboration between academic scientific organizations, universities and institutes of development, – said Mikhail Kotyukov. – It's important for us that the scientific infrastructure, which exists in our system, works in its most effective way and is accessible to a wide range of researchers. I am sure that very soon we will have joint laboratories and joint educational programs that will help to attract more young people to different projects, including those with international participation."

Moreover, the sides agreed on joint development of educational programs geared towards preparation of world-class specialists.

Participants to the agreement will also coordinate their activities on practical implementation of the achieved results.

Collaboration will be overseen by the Advisory Group established for these purposes.

News@Skoltech

Skoltech presents a program for cooperation in prospective areas of research to LUKOIL

On March 10, the Skolkovo Institute of Science and Technology hosted a joint meeting of the representatives of Skoltech and LUKOIL oil company to discuss the opportunities for cooperation in the development and launch of advanced exploration technologies and recovery of tight and unconventional hydrocarbons.

Academician Alexander Kuleshov, Skoltech President, greeted the guests from LUKOIL, LUKOIL-Engineering and RITEK. In his opening remarks he outlined the goals and objectives of Skoltech's emergent Center for Hydrocarbon Recovery and expressed his confidence that the meeting would be a prelude to a successful and mutually beneficial cooperation between Skoltech and LUKOIL.

Mikhail Spasennykh, Director of Skoltech Center for Hydrocarbon Recovery, provided more details about the main research vectors. In particular, he emphasized the close connection of research projects with the practical vital tasks of the Russian economy, and pointed out that at the very inception of the Center, the areas of its future research were determined after extensive consultations with oil and gas industry representatives, and priority was given to collaboration with the industry. Spasennykh remarked on Skoltech's advantage of having a wide partnership network with the world's leading schools, including the Calgary University, University of Lausanne, Stavanger University, Heriot-Watt University, Moscow and Baku state universities, and many others. As a result, Skoltech is able to attract experts and professors from all over the world to take part in its research and educational programs. Director of the Center for Hydrocarbon Recovery also delivered a presentation "Unconventional reservoirs (Bazhenov, Domanik, Khadum formations): the program of petrophysical and geochemical studies, establishment of technologies for exploration of recovery."

Dr. Alexei Cheremisin, Deputy Director of the Center for Experimental Studies, spoke about using Skoltech and its partnership program with the University of Calgary as the basis for lab research to develop tight hydrocarbon recovery technologies in the interests of LUKOIL. According to Cheremisin, the system of modelling the in situ combustion, developed at the University of Calgary and scheduled for installation at Skoltech, will permit the researchers to closely simulate in situ combustion and thermalstream effects. Cheremisin's report was received with great interest from the guests who noted that LUKOIL's recent acquisitions make the issue of highly viscous oil development essential, and appreciated the fact that Skoltech has trial infrastructure necessary for carrying out unique research.

Concluding the meeting, Nadezhda Lyadova, Deputy CEO of LUKOIL-Engineering, praised the discussion, which she called particularly relevant to the company: "Research vectors presented by Skoltech fit in with our priorities. We are strengthening our lab and research base – it's the foundation for the development of future processes. Today we are actively developing basin modelling and would like to improve our skills in this area. Opportunities for collaborative research and educational programs presented by Skoltech are of great interest to the company."

Nadezhda Lyadova, Deputy CEO of LUKOIL-Engineering

News@Skoltech

May 30 and 31, 2016

First BRICS Photonics Conference to take place at Skoltech

In line with the Moscow Declaration and Action Plan adopted at the III BRICS Science, Technology and Innovation Ministerial Meeting on the 28th of October 2015, the new initiative on co-operation on photonics was included with India and Russia as coordinating countries.

As part of the Action Plan in Photonics, the BRICS First Conference on Photonics will be held on May 30 and 31, 2016. The conference is organized by the Skolkovo Institute of Science and Technology. The aim of the conference is to identify the priority areas in the field of photonics, which are of common interest to the BRICS member countries, as well as to coordinate the actions in accordance with existing competences as well as the participants' financial, scientific and technological resources.

An important goal of the conference is to promote the establishment of partnerships between academic institutions, real economy players and other entities of BRICS member states that are interested in implementing joint industrially-oriented projects.

About 60 participants are expected at the inaugural conference – representatives of academic institutions, industry and coordinating organizations of the participating countries: Russia, Brazil, India, China, and South Africa. The Russian side will be represented by the Skolkovo Foundation, Russian Space Systems, Perm Instrument Manufacturing Company, Central Research Institute of Robotics and Engineering Cybernetics, ITMO University, and other partners.

The conference will be held at Skoltech. In addition to the plenary sessions, parallel discussion sections will also be organized.

ANTICIPATED TOPICS OF DISCUSSION AT THE CONFERENCE:

- OPTICAL COMPONENTS AND MATERIALS
- OPTICAL DATA COMMUNICATIONS
- OPTICAL DATA PROCESSING AND STORAGE
- OPTICAL INTERCONNECTS
- INTEGRATED OPTICS
- OPTICAL DETECTORS AND SENSORS
- OPTICAL NAVIGATION SYSTEMS
- NANOPHOTONICS
- BIOPHOTONICS

Skoltech&Skolkovo

Startup Tour in Krasnodar

On March 14 and 15, the Startup Tour came to its next stop, this time in the city of Krasnodar. The event drew over 500 people – entrepreneurs and scientists – from the southern regions of Russia.

The Skolkovo Institute of Science and Technology was represented by Igor Seleznev, Director of Research Programs and Technology Transfer at the Center for Entrepreneurship and Innovation, and Alexander Chuchalin, Associate Dean of Education.

On the first day of the Startup Tour, Chuchalin led a seminar titled "Using CDIO Academy programs in engineering curriculum." The goal of the CDIO Academy, implemented by the international CDIO consortium, is to provide the faculty and management of Russian universities with tools for modernization of engineering education. The best Russian and international universities, including MIT, Chalmers University of Technology, Moscow Institute of Physics and Technology, and Moscow Engineering Physics Institute, took part in the development of the program. The final educational program helps the universities to improve and modernize their engineering curricula. Chuchalin presented the audience with the online learning option of the program that will help Skoltech and CDIO Academy to expand the number of participating universities. Come September, many more Russian universities will be able to study and implement the concept of project-oriented education.

Sergei Ulyakhin, Licensing and Technology Transfer Manager of Skoltech Center for Entrepreneurship and Innovation, gave a presentation of the institute. The audience was especially excited to learn about Skoltech's educational programs and innovative environment, as well as the main principles of the Translational research program and the transfer and commercialization of technologies.

The second day of Startup Tour was dedicated to project pitches. There were especially many of them in the field of agrotech and robotics. The expert jury selected 15 winners who will travel to Moscow in the beginning of June to take part in Russia's largest startup conference Startup Village-2016.

Startup Tour 2016

February 1-2 – Irkutsk
February 4-5 – Vladivostok
February 9-10 – Novosibirsk
February 15-16 – Chelyabinsk
February 17 — Magnitogorsk

March 14-15 – Krasnodar
March 17-18 – Taganrog
March 24-25 – Tula
March 30-31 – Almaty

April 7-8 – Minsk
April 14-15 – Kaliningrad
April 18-19 – Togliatti
April 21-22 – Saratov

Alexander Chuchalin, Associate Dean of Education

Skoltech&Skolkovo

Startup Tour in Taganrog

On March 17 and 18, Taganrog hosted the next stop of the Startup Tour 2016, the most ambitious Russia and CIS search for the promising and innovative hi-tech projects. Taganrog event of the Tour attracted 1,148 participants with 231 projects.

Startup Tour calendar included lectures of the educational program "Future business and science trends for startups and entrepreneurs," master classes and training sessions, face-to-face meetings to discuss the projects, a mentorship program and pitching sessions, as well as the innovative project competition, business meetings with key market players, and face time with business angels and investors.

Skoltech delegation at Taganrog was headed by Alexei Sitnikov, Vice President for Development. He spoke highly of this stage of the Startup Tour and stressed the importance of ties between the regional universities and Skoltech: "This year's stage took place in the Southern Federal University, and there were many of its undergraduate and graduate students as well as faculty among the participants. Taganrog as a whole has a great reserve of human capital. Back in Soviet times, for example, Taganrog Radio Engineering Institute was among the best universities in its field. Today, the students of the Southern Federal University demonstrate great results.

And while we always suggest that the undergraduate and graduate students consider the issue of applying to Skoltech, we have no desire to "steal" all the best and promising people from the regional universities. For us, a more promising solution is to organize joint programs with different universities that allow the students to come into their own both at their alma maters, and at Skoltech. The ideal format would be to organize joint online programs of Skoltech and its partners. For example, the Southern Federal University has a very strong foundation in the agroindustrial complex. Biotech in agriculture is important both for Skoltech, which is joining the agricultural program now, and for Skolkovo, which has a special agro cluster. Therefore, agrotech projects seem to be the most obvious area for collaboration between Skoltech and the Southern Federal University. And, of course, we hope that our cooperation with the regional universities will encompass other areas of research as well."

Alexei Sitnikov

Participants of Startup Tour in Taganrog

Education@Skoltech

Anja Tekic, 28, Serbia
Education: University of Novi Sad, Serbia

Specialization at Skoltech: PhD student at the Center for Entrepreneurship and Innovation, with research focus on co-creation in product innovation projects and related intellectual property management issues

How I learned of Skoltech: When I moved to Moscow, a year and a half ago, I did not have a plan to study in Russia. Back then, I was a PhD student at University of Novi Sad in Serbia. However, after I had an opportunity to meet Professor Kelvin Willoughby and visit Skoltech, I knew instantly that I would like to work on my PhD with him, at this place. Once you experience Skoltech, its environment and people, it's easy to make your decision.

First impressions of Russia and Skoltech: Coming from Serbia, a country with population twice as small as that of Moscow, I can say that I am really glad that I don't feel lost or unable to adapt as I feared I would. Moscow is a city that instantly attracts you, showing off everything it has to offer. Skoltech follows this pattern. It makes you feel a part of its growing family of ambitious and motivated people, supporting you to progress constantly.

Advice for future students: Dream big. Improve yourself continuously. Work hard, as it will pay off, much sooner than you expect. Grow your local and international network. Build your team and co-create to achieve great results. If you are an international, learn Russian – it will make your stay here more fun. Enjoy Moscow.

Plans for the next 3 years: During my PhD studies I hope to have an opportunity to help Skoltech grow and contribute in establishing its recognition in the academic world in the field of innovation and intellectual property management. Along with writing my PhD thesis, I am going to focus on publishing my work and building strong connections to the world of practice. Additional point on my to-do list is to explore the lovely city of Moscow as much as I can in the years that come.

Education@Skoltech

Divya Shankar, 25, India

Education: BE in Electronics and Communication Engineering at Nitte Meenakshi Institute of Technology in Bangalore, India

Specialization at Skoltech: MSc. Student in Space Science and Technology

How I learned of Skoltech: I got to know about Skoltech from one of the emails sent out to the International Astronautical Congress participants, as I was one of them. As I was looking for a fully funded opportunity to do my masters degree in space technology, Skoltech – which was offering education without fees and an opportunity to study both in Russia and USA, the two space superpowers, – was something I could not pass up.

First impressions of Russia and Skoltech: Being a space enthusiast, I have always been a huge fan of Russia for its space history. Living here for a while now has furthermore increased my love for this beautiful country. Getting an opportunity to study at Skoltech, a place where you grow with the university, is the best thing to experience. I am so impressed with the innovation culture that is followed here.

Advice for future students: What you give matters more than what you get. It's our responsibility to bring recognition to the university or to make it famous with our work. Skoltech gives us this opportunity to contribute and learn by providing flexibility in the education system and supporting us in all the possible ways. Making use of it for the fullest potential is our responsibility.

Plans for the next 3 years: I want to work in a space tech company for a few months and then become an aerospace entrepreneur in the next few years.

Education@Skoltech

Adeniyi Adebayo, 24, Nigeria
Education: Kazan National Research Technological University

Specialization at Skoltech: Hydrocarbon Recovery

First impression of Russia: Cold! My very first time in Russia was during a winter. It looked like a scene from Frozen. Beautiful in a very cold way. I enjoyed the snow. There is also the obvious fact that people are very welcoming once they get to know you. I love architecture in general, and Moscow architecture is something unique. I spent the days circling the city center and enjoying the architectural landscape.

First impression of Skoltech: I was skeptical of coming to Skoltech at first. But once I got here and met the other students and faculty, I felt at home. Everyone here is fascinating and doing remarkable work. The environment stimulates you to be a better version of yourself. I feel that this is one of the most important ingredients of success: an environment where you are expected to do well and people believe in you to do well.

Advice for future students: Skoltech will be what you make it be for you. So, come here with a plan. Ask yourself, what you want to get out of the experience. Entrepreneurship? Research? Network? You can make almost anything work out here in Skoltech, but you need to have the resolve to do that.

Plans for the next 3 years: To work on improving the state of the world using my experiences and knowledge in the fields of energy science and education.

Education@Skoltech

Daniel Kekere, 27, Nigeria
Education: Samara State Aerospace University, Samara.

Specialization at Skoltech: Energy Track: Advanced materials and design

How I learned of Skoltech: I got to know about Skoltech through a friend of mine. I decided to apply, because what Skoltech offered was totally different from every other opportunity I had. It was an opportunity to try something new, something totally different, and something out of my comfort zone. I also saw an opportunity to put innovational, entrepreneurial and research skills to good use.

First impressions of Russia and Skoltech: My first impression of Russia wasn't a very positive one, but with time, after I understood more about its people and culture, it changed for the better. My first impression of Skoltech, on the other hand, was very positive. The impression that I got, was that Skoltech cannot fail because there are more people who want it to succeed than those who do not.

Advice for future students: Skoltech is the right place to be, if you know exactly what you want. At Skoltech, you can rest assured that you will get all the support you need at every stage of your program.

Plans for the next 3 years: My plan for the next 3 years depends on which career direction I finally pursue: research track or industry track. I'm really excited about what lies ahead.

Education@Skoltech

Future Biotech winter science school

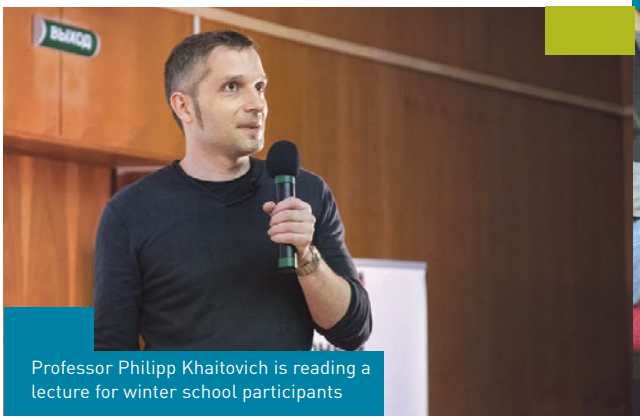
On February 22-28, the 4th Future Biotech winter science school took place not far from Moscow. Eighty participants – undergraduate and graduate students and young researchers – were selected from half a thousand applications that came from all over Russia. Skoltech was one of the School's co-sponsors. Each day, the students attended no less than three lectures by major scholars, and there were also master classes, roundtable discussions, academic combat, and poster sessions.

Skoltech's MSc students Artem Isaev and Anastasia Naumova joined the School's student body, while Vita Stepanova, PhD student at the Center for Data-Intensive Biomedicine and Biotechnology, was on the School's Organizing Committee. Skoltech professors Evgeny Nikolaev, Philipp Khaitovich, and Konstantin Severinov gave lectures.

According to Vita Stepanova, "the winter school brings together Russia's best undergraduate and graduate students and young researchers, giving them and opportunity to meet each other and to learn about what is happening in the related industries. The week-long shot of inspiration and drive usually leads to new ideas and projects. As organizers, after each School we receive thank-you notes and stories about how the participants' lives had changed. This motivates us to continue making the future schools even more interesting and intensive."

Artem Isaev, MSc from Skoltech, said that this year all of the School's events were broadcasted live, expanding the number of participants by almost a thousand. He believes that "Future Biotech school is one of the best platforms, giving an opportunity to both learn of all the recent biotech developments, and to collaborate with students and young researchers from different scientific fields adjacent to biology." In addition to the lectures, the School's participants could try their hand at presenting their own findings, or take part in discussions on the ethical aspects of genetic engineering and popularization of science. Isaev added that he'd already participated in the winter school in 2013, and it was then that he learned about Skoltech and decided to apply. This year, he was the one sharing information about the institute, student life, and research with other participants.

Anastasia Naumova, another MSc from Skoltech, who also took part, believes that the "Future Biotech winter school is one of the most exciting biology events available to young Russian scientists. The sense of synergy that permeates the halls encourages the appearance of new and unexpected ideas. Something like this is also happening at Skoltech, where anyone can try his hand at any field of science, creating a profession at the junction of several specializations. Such abundance of information is very productive for the establishment and development of scientists."



Professor Philipp Khaitovich is reading a lecture for winter school participants

Skoltech MSc student Anastasia Naumova at one of the lectures

Education@Skoltech

The main talk was delivered by Sergei Ulyakhin, Licencing and Technology Transfer Manager

Intellectual Property Day at Skoltech

The management of intellectual property created by Skoltech students and professors in the course of their scientific research was the main topic of discussion at the Intellectual Property Day that was organized at the institute.

The first-of-its-kind event took place on March 1, and participants talked about analysis and legal protection of intellectual property. Among other things, a lot of time was spent on such topics as the correct distribution of intellectual property rights, reduction of business risks tied to commercialization of technologies, and the effect of publications on patenting technologies and vice versa.

Participants were welcomed by Ilia Dubinsky, Director of the Center for Entrepreneurship and Innovation, who pointed out the importance of the IP Day, noting that not enough people at Skoltech know about existence of the Knowledge Transfer Office (KTO) and its IP management services available to the researchers. The main talk was delivered by Sergei Ulyakhin, Licencing and Technology Transfer Manager, who spoke of the importance of IP management for the future development of Skoltech as an organization intent on creating and circulating innovations for the benefit of society. Ulyakhin said that the "ecosystem of IP management allows us to create portfolios of technologies, and to correlate the interests of research sponsors and startup companies with the interests of researchers and Skoltech, while guaranteeing transparency and adherence to the best global practices. As a result, commercial companies gain access to Skoltech technologies made up of one or several intellectual property assets through the purchase of licenses. Retention of IP rights at Skoltech and provision of licenses to the interested companies allows Skoltech technologies to have the most beneficial effect on society."

Answering a question from the audience on the purpose of the event, Ulyakhin explained: "Here, at Skoltech, the students attend a special IP management course, but there's no such course for the faculty and researchers. It's a very important knowledge because the more people learn about IP and technology management, the more successful commercialization efforts there will be. The main objective of today's event is to increase the IP awareness of people who didn't have a chance to get this knowledge before. Our office is limited in resources, and we can't convey the message of our services to everyone face to face. That's why we decided to organize an event and to convey this information to a bigger audience in a relatively short period of time."

In the second part of the event, there was a Q&A session, as well as the examination of several typical IP management cases. Participants also discussed the influence of patenting on the timeliness of scientific publications and vice versa, spoke about the ways to evaluate the commercial potential of technology, and shared experiences of working on a project with researchers from several organizations.

Student life@Skoltech

Parliamentary debate tournament at Skoltech

On February 27 and 28, Skolkovo Institute of Science and Technology hosted a student parliamentary debate tournament. Altogether there were 36 teams from a number of Russian universities, including two teams that represented Skoltech's recently created Parliamentary Debate Club.

In accordance with the debate rules, participants had to defend a draft law in front of the judges and the audience, or to speak for its rejection. Each of the speakers was given a maximum of seven minutes. Experienced judges included Andrei Averyanov, semi-finalist of the World Universities Debating Championship-2015 in Malaysia, and Sofia Vengerova, semi-finalist of the Oxford Intervarsity Debate Competition.

Altogether, there were seven rounds dedicated to various problems of the modern society. In particular, the contestants discussed the ethics of research publications that point out superiority of some group over a certain minority, and the ban on government service for multiple members of one family. In the final round, the best of the tournament's speakers argued on the situation of men and women in contemporary Russia. The victory was awarded to the Moscow State University team, which consisted of the Law School graduate Ilya Lapatin and fourth-year student Aitalina Nikitina, who gave a convincing presentation on the hardships faced by women in the Russian provinces.

The tournament was conducted in Russian, as English-language debates in Russia are still only gaining momentum. English-language training debates are organized only at the Moscow State Institute of Foreign Relations, at the Higher School of Economics, and – as of recently – at Skoltech. The institute at Skolkovo is all set to become one of the springboards to launch the Russian debaters to international competitions.

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Student life @ Skoltech

Discussion Club gives Skoltech students and faculty opportunity to share perspectives

In mid-November 2015, six Skoltech students (4 international and 2 Russian), headed by Yunjeong Lee from South Korea, organized the Discussion Club. The club currently has 30 members, both students and faculty. Out of these, one third is Russian, while the other two thirds represent 17 different countries from Europe, North and South Americas, Africa, South Asia, and Northeast Asia. The usual attendance of the bi-weekly 90-minute club meetings is 15 people. Yunjeong Lee explains her inspiration behind the club: "While talking to colleagues from different countries, I realized that quite a few students and faculty members at Skoltech are genuinely interested in talking about various issues that are not just scientific, but also political, economic, and social... When I lived in New York, I had a number of opportunities to attend various panel discussions and events on global affairs at NYU, Columbia University, and the Harvard Club of NYC. I've decided to create something similar with the help of my colleagues and the Student Affairs Office." At the meetings, the participants listen to one or two speakers who cover one topic or one region/country, and then engage in discussion.

The club consists of 30 people – and includes both students and faculty

In the months of its existence, members of the Discussion Club covered such topics as "Human Migration: From Refugee Crisis to Brain Drain," "Neo-Colonialism and Hegemony," "ISIS: Journey of the Self-Proclaimed Caliphate," "Understanding Russia Through Its Holidays and Beyond," "Dissecting the Rise of Contemporary China," "Two Koreas and Their Ambiguous Path to Reunification," and "Global Threats of Infectious Diseases." The choice of topics depends solely on the speakers and demonstrates the the interests of Skoltech students and faculty are far from being limited by science and technology.

"Every time I attend the club meetings, I learn something new about the problems people face worldwide. When you stay in one country, it's hard to obtain alternative sources of information. Meeting people from different countries with diverse backgrounds has broadened my views and changed my attitude about global problems." **Aleksandra Sveshnikova, PhD student, Russia.**

"The experience I've had at each meeting has liberated my mind and helped me to look at the global issues from multiple angles. As a student/researcher spending most of the time within academia, you can become rather insensitive to the current events, but the Discussion Club has opened my eyes to what's happening in the real world, outside of the academia." **Carolina Moreno, MSc student, Colombia**

"It has been a great experience because people from different countries can share their ideas with respect and without prejudgment. Here, I realize that people from different parts of the world have distinct points of view and solutions of the same problem. We discuss questions and refine our answers to find the right ones, and the experience has upgraded my mind." **Roohallah (Masih) Hafizi, Visiting PhD student, Iran**.

"Information you find online is often skewed and not really true. Instead of relying on such information, it's cool to learn about what's happening in other countries by directly talking to people from those countries." **Anastasia Fursova, MSc student, Russia.**

Research@Skoltech

Five Skoltech scientists win grants for their research

Four of the grants were received by the researchers of Skoltech Center for Computational Data-Intensive Science and Engineering.


Igor Ostanin

Igor Ostanin and **Maxim Rakuba** were awarded grants from the Russian Science Foundation. Igor is doing research on multiscale mechanical modelling of carbon nanotube-based materials using generalized discrete element method. As part of his previous research, the scientist has already developed a working model that can be used for analysis of various mesoscopic structures and materials, and in the future Ostanin plans to expand the applicability of his model and introduce new elements that will improve its accuracy and efficiency.


Maxima Rakuba

Maxima Rakuba was awarded a grant to research fast tensor approaches to electronic structure calculation. As part of his previous research, Maxim had developed an algorithm whose total complexity has a linear dependency on one-dimensional grid size. This method has already been tested on closed-shell atoms up to argon, as well as on several molecules and clusters of hydrogen atoms. The results confirm the method's efficiency, and now Maxim will continue his studies of the model's potential.


Mikhail Litsarev

Two grants from the Russian Foundation for Basic Research were awarded to **Mikhail Litsarev** and **Alexander Mikhalev**, who also work at the Center. All four researchers collaborate with professor Ivan Oseledets.


Alexander Mikhalev

Mikhail was awarded his grant to work on fast algebraic methods for solving partial differential equations and computation of multidimensional integrals. His current research is devoted to application of low-rank approximations to the multidimensional integration. It appears that for certain classes of functions, this method enables researchers to decrease the dimensionality/complexity of the problem down to (an almost) linear dependence, making it possible to design new, fast, and efficient algorithms in scientific computing.

Alexander Mikhalev is the principal research engineer of the software package for black-box approximation by sample of large dense matrices. He is also the author of a new algorithm for the rectangular maximum-volume submatrices. His grant will allow Alexander to continue his research on the latter topic.


Artem Abakumov

The last but not least is the grant from the Civilian Research and Development Foundation awarded to professor **Artem Abakumov**. Abakumov was awarded by the Foundation for his work on production of safer Li-ion batteries, specifically, the creation of new cathode materials. The key factor, currently limiting the capacity of Li-ion batteries, is the material used for cathode production. Abakumov's research group is actively working on new cathode materials that will help the batteries recharge within minutes, operate under high current densities, and store greater reserves of energy.

Research@Skoltech

RASA Conference «Skoltech: Point of Access»

At the end of February, Skoltech hosted the conference of the Russian-speaking Academic Science Association (RASA) entitled ***Skoltech: Point of Access***. Before the conference, representatives of RASA met with Alexander Kuleshov, Skoltech President, to discuss opportunities for collaboration.

The welcoming remarks were made by Vladimir Shiltsev, Association's President and Director of Accelerator Physics Center at Fermi National Accelerator Laboratory, who spoke of organization's activities, partners, and participants, as well as of RASA's goals and objectives.

"We knew about Skoltech, and from the very beginning many of Association's representatives took part in the expert evaluation of Skoltech CREIs. A lot of experts in all the priority fields of research were required at that point, and RASA members pitched in, - said Vladimir Shiltsev. - Now Skoltech is entering a new stage of its development, it has a new management, and we came here in order to get acquainted and to discuss points of mutual interest. The scientific diaspora is a valuable resource for Skoltech. For example, professor Artem Oganov was the President of RASA USA, while he worked there, and now he is a Skoltech professor."

Elena Atochina-Vasserman, director of RASA center at Tomsk Polytechnic University and Adjunct Assistant Professor of Medicine at the University of Pennsylvania School of Medicine, shared her advice with Skoltech students: "The Association is open to scientists who work abroad. If Skoltech students want to study or work abroad, I would recommend working with our Association within the framework of the Young Researchers Program. This will help them to establish useful connections. Thanks to constant collaboration within the academic networks, we know a lot of people, and we can provide students with information and assistance. Knowledge is power, and we are ready to share this knowledge with students."

Association brings together researchers, educators, undergraduate and graduate students, as well as other scientific and technical professionals from universities and companies, and hi-tech innovators and entrepreneurs from the countries of the former Soviet Union, who are currently working or studying outside of the Russian Federation, regardless of their nationality, religious and political views, and economic interests.

The Skoltech: Point of Access conference was organized at the Skolkovo Institute of Science and Technology in order to introduce the school's students, faculty and experts to the Association, the opportunities it provides, and the projects for future mutually beneficial cooperation.

Alexei Sitnikov, Skoltech's Vice President for Development, Executive Secretary of the Board of Trustees, and Nikolay Vasilyev, MD, President of RASA-USA, Staff Scientist at the Department of Cardiac Surgery at Boston Children's Hospital

Research@Skoltech

IRINA DEZHINA ON MOBILITY OF RUSSIAN SCIENTISTS

The Institute of World Economy and International Relations has published research book "Cross-sectoral mobility of academic staff" under the editorship of Irina Dezhina who heads Skoltech's scientific and industrial policy group. Researchers looked into the patterns of academic staff behaviour in transition from universities or research institutes to businesses as well as at the arrival of real economy specialists to research and educational institutions. They also wanted to know how such moves influence the quality of research and profitability of businesses.

In the interview with sk.ru magazine, Irina Dezhina shared some of the researchers' conclusions.

- The research conclusively proves that cross-sectoral mobility has a healthy influence on such indicators of individual scientific success as the number of publications, h-index, etc, as well as on the innovativeness of businesses, measured by the number of patents. Is it possible to say how academic staff mobility influences science itself?

– I would like to give a somewhat broader answer. Speaking of the formal indicators that are used to measure whether something is good or bad. Actually, research on this topic differs. The majority claim that all of these indicators are growing, which is good both for the scientists, and the companies. But there is also some research that shows that if a scientist goes to work for a company, the number of his publications drops, because there usually are a lot of classified subject matters that the company would prefer to convert into patents, not publications. So, for the scientist's personal career, if he ever decides to get back to the academic fold, it may be a problem.

As for the way mobility influences science... In my view, this is good for science, because such transfer of knowledge creates the demand for it. Research done by the scientists is transferred to the companies faster, and is transformed into certain products, and the society can see that the scientists didn't labour in vain, that science is necessary, that science should be given support. Thanks to the science, new drugs appear, other things too — as opposed to the perception of science as a thing in itself, in which the researchers compete with each other for the greatest number of publications. And, anyway, who — apart from the scientists — needs this thing called "advanced science"? Of course, one day, advanced science will be transformed into basic one...

Research@Skoltech

– In your work, you say that despite all the positive connotations of scholarly traditions, they have a certain negative effect: a scientific school fortifies itself with scientists, reluctant to let them go, on the one hand, and repulsing any new people on the other.

- I even published a small book on this subject. Scientific school phenomenon in Russia at some point becomes an ill, not a blessing. I do have to admit that very few people share my point of view — I am not completely alone, but I have very few supporters. There are certain notions in our country, which are constantly put forward as ideal, and the scientific schools and great teachers are among them.

After the break-up of the Soviet Union, scientific schools were given a special status. A scientific school competition was organized, and the money was distributed on the basis of this competition. This meant that certain research topics were assigned to certain well-respected scientists or scientist administrators. But the most important thing is that these research groups cling to certain concepts in their assigned topics, which means that the scientific schools basically restrain any new ideas or directions of research that may arise in this field.

– And this is just one of the constraints that you mention in the book. You say that the principal mobility constraint is the scientists' mentality.

– Mentality is a very serious problem in Russia. Mentality hampers even the good measures developed by the government. The scientific community often says: "The government is doing everything wrong." In reality, there are some rather good mechanisms, created, in particular, to promote cooperation of science and industry. But it turns out that not all the scientists can tackle the tasks faced by the industry.

– One of the motives for mobility is the personal financial interest: not just in Russia, but everywhere in the world, compensation of researchers and professors is below salary levels in comparable business areas. In the book, you introduce a definition of a scientist as an "individual entrepreneur of the knowledge economy." But in Russia, such entrepreneurship is generally limited to holding two jobs at two different universities or research institutes.

- In Russia, we at least have the ability to move to some other academic institution, but when it comes to hi-tech companies with R&D units, there are very few. Of course, a scientist can establish his own company. There are examples of people who head their own companies and teach at universities. But in general, when people leave science for industry, they become managers, not researchers.

– One of the surprising conclusions of your research is that in Russia, research institutes provide many more cadres for the industry than universities do.

– This is a relic of Soviet times, and little has changed in this regard. The research institutes always had a better connection with the the real economy. The Academy of Sciences had some departments that did a lot for the industry. There were sectoral research institutes, which also provided a flow of cadres. But people rarely leave universities for the industry. The ideas of entrepreneurship, innovation, and technology transfer didn't appear at the universities until the early 2000s. Energetic and entrepreneurial people who work at universities usually create their own businesses: this allows them to combine teaching with work in small innovative companies.

– Your book reminds me of Milton somehow: the description of paradise lost is much more convincing than the attempts to regain it. Recommendations at the very end seem to be very cautious.

- I think that in the current situation, it would be foolish to try and convince people to leave their positions and go try something new full-time, even for a limited period. Everything is so unstable. In France, for example, they have a system that allows you to leave the research lab to go work for a company, but your position at the lab, your social guarantees, your method of pension accounting are reserved for you for several years, and you can return to the world of academia with no problems. We are unlikely to have such a system any time soon. Which is why I wouldn't suggest "tough mobility" measures. Instead, I speak in favour of various forms of job combination and cooperation between universities and companies – anything that can be loosely defined as cross-sectoral mobility.

Interview taken by Mikhail Baklanov

Research@Skoltech

Alexander Safonov is Skoltech's new Vice President for Academic Relations

Alexander Safonov joined Skoltech at the end of February as Vice President for Academic Relations. Alexander will be responsible for the development of Skoltech's relations with other research and educational institutions. He will focus on creation of joint R&D projects, specifically, the research and school labs of the Institute and its partner organizations.

Before joining Skoltech, Alexander had worked at the Kharkevich Institute for Information Transmission Problems. He is the author and co-author of more than 40 academic papers and international patents. Moreover, Alexander has made a significant contribution to the development of IEEE 802.11 standard, commonly known as Wi-Fi, by presenting the results to the IEEE 802 LAN/MAN Standardization Committee.

Before his move to Skoltech, Alexander served as the Kharkevich Institute's Deputy Director for Research and Work with Youth. His responsibilities included communication with the Federal Agency for Scientific Organizations, oversight of the Institute's development program under the grant of the Russian Science Foundation and educational program in the field of telecommunication, joint project with MIPT and one of the Institute's spin-off companies.

– At the Kharkevich Institute, you were responsible for working with the youth, and in particular you organized the annual School and Conference "Informational technologies and systems." Could you speak in some detail about this initiative, do you plan to promote it among the students here, at Skoltech?

– The School of Young Researchers is a signature event for the Kharkevich Institute. I would definitely recommend participation in this initiative to Skoltech's MSc and PhD students. The School was organized soon after the establishment of the institute, and was held for the first time exactly 50 years ago, in 1966. In the 1990s the tradition was broken for a while, but we were able to revive the School in 2007. It is now called Informational Technologies and Systems school, and applications are open to all of Russia's young scientists. It's a very intense and useful experience. Last year, in the course of four days, we had lectures by 33 world-famous academics.

– The scope of your new duties includes the establishment and development of joint scientific and education projects — do you already have some specific plans in this regard?

Alexander Safonov, Vice President for Academic Relations

– Skoltech professors are already collaborating with a number of academic institutions and universities. At the Institute of Gene Biology there's a study and practical lab for MSc and PhD students who are studying biotechnologies at Skoltech. The lab is doing research in the field of genome editing, they are working at the forefront of science. We are hoping to expand this lab, and for its part Skoltech is ready to provide the necessary additional equipment that could be used both by our students, and by the Institute's staff. We anticipate that in the coming year the number of such joint projects, aimed at advanced research and development of talent, will increase significantly.

– It's been a month since you joined Skoltech's team — can you say a couple of words about your new colleagues, the faculty and students?

- Skoltech has brought together a great number of outstanding people, and I'm convinced that the institute has great potential!

Innovation@Skoltech

Student project receives a grant from the Skolkovo Foundation

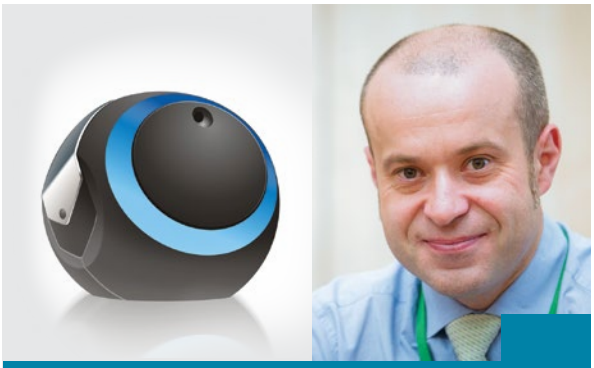
A project by Skoltech students – **Lexy** robotic company – has received an approval from the grant committee of the Skolkovo Foundation and will be awarded a mini grant of 5 million rubles. The money will be used to develop a solution for human speech recognition in noisy environments.

The **Lexy** robot is promoted as a home assistant: it can tell you the time, share a weather report or find information on the web. It can also be integrated into the "smart home" grid and entrusted with management of home appliances. When the owner comes home, the robot is programmed to initiate a dialogue. The student project has already received recognition from a number of prestigious hi-tech competitions. The team was designated as the best in the robotics competition of Startup Village 2015, won the first place in the Innovation category of Microsoft's Imagine Cup 2015, topped the special nomination in the "Startup of the Year" competition, and made it to the semi-finalist list of Innorobo 2016.

A group of Skoltech students has been working on **Lexy** "intellectual human companion" since 2014, headed by the PhD student of the Space Robotics lab Dmitry Suvorov. Today, **Lexy** is a medium-sized device equipped with a camera and all kinds of sensors including motion ones. Designers are currently improving the prototype and its intellect.

Dmitry Suvorov explains that the grant from the Skolkovo Foundation will help the team to teach the robot to better understand human requests: "We applied for the grant to develop a solution based on array of microphones that would allow us to localize the sources of sound and formulate the directional response. This solution will allow us to identify human speech at a distance of up to five meters and in noisy conditions. Similar technologies are used in Amazon Echo, but they cannot be employed by outside home appliance manufacturers and system integrators. We will incorporate our solution in the **Lexy** home assistant as well as launch several outside projects with system integrators that already expressed a lot of interest in our product."

According to Suvorov, **Lexy's** speech-recognition solution will significantly surpass the existing market analogues in terms of several technical parameters. **Lexy's** creators believe that its prospects go far beyond the entertainment gadget format. In the near future, the team plans to test the robot in assisting people with impaired sight and hearing.



"In general, existing robots have a great vision and rather poor hearing. Artificial intelligence is capable of distinguishing cats from dogs and recognizing familiar faces better than a person can do himself," – notes Albert Yefimov, the head of the Robotics Center of Skolkovo IT cluster.

Dmitry Suvorov (left) and Roman Zhukov

Innovation@Skoltech

"Hearing remains the trouble spot of the natural interaction between human and robot – e-assistants are good at identifying drivers' commands inside the cars, but a free-flowing continuous human speech is still too difficult for error-free recognition, - continues Yefimov. - If the **Lexy** team is able to do what they claim they will do, their product will be in very high demand."

But the possible uses of technologies incorporated in **Lexy** go beyond this framework.

Dzmitry Tsetserukou, Skoltech professor who heads the Robotics Lab, believes that this technology has an even brighter future: "The system of microphone array for the "smart assistant" is actually a separate product that can be marketed alongside **Lexy**. This product has a wealth of potential uses. Initially it was created as a system for high-quality audio recording during court sessions or other proceedings, when the conversation involves several people at once, and for future isolation of the requisite voice from the whole "swarm," with its subsequent transcription. But along with this, we were looking at other ways to use this feature. Using array of microphones, such as the one incorporated into **Lexy**, we can solve the problem of voice commands in systems characterized by high level of ambient noise and a large distance from the source of command. Existing designs, based on single-microphone use, fail to do a good voice recognition under such circumstances.

This is why, in the course of the project, we decided to concentrate our efforts on creating a microphone array and sound processing system in such a way that the device could determine the source of voice commands, adapt to the voice's individual characteristics, learn to sift out all the ambient noise, and determine where the source of the sound is coming from. The most ostensible example of such environment is a "smart home," which can be full of people and working appliances, and the commands may be given by several people at once – working under such conditions requires clear voice identification.

Right now our aim is to develop a scalable system containing microphone array and the audio processing board. We expect that results of our work will have a wide range of applications.

An important area of application may be found in the car manufacturing industry. Installed on the car exterior, the microphone array could supplement the automobile's safety system. Right now, the systems of adaptive cruise control use millimeter-range radars and costly laser-based optical sensors called lidars. A microphone array is much cheaper, and even if it couldn't fully replace a system of such sensors, it could certainly supplement it. Our sound sensors could be used to determine the distance to the nearest car (using the noise from the grip of the wheels and the sound of the engine) or location of the closest pedestrians or groups of children (picking up their conversations); they can inform about bypassing bikers, warn of street lights for the blind, or determine the approach of an ambulance. Similar to Google Street View, we could use this project to build an interactive sound map of any city, called TrafficVoice. Any user could submerge himself into the world of sounds from any city in the world.

Another thing to keep in mind is that pretty soon the world will begin large-scale implementation of communication systems between both the driverless and driver-managed cars and infrastructure objects (Car2Car), when the cars will transmit information about road events to the road users around the area of concern. The use of a system based on microphone array, which could warn the drivers of the car accidents, appearance of pedestrians and children, or movement of the ambulance, should improve the effectiveness of the Car-2Car system. Our device could supplement the cameras in cases when visual information is unavailable."

The team plans to spend the first year after receiving the grant on research and development, and to make a "public appearance" by the end of 2016 or beginning of 2017. The appearance will include a marketing promotion and a crowdfunding campaign with a goal of $50,000 that will allow the developers to manufacture and ship the first devices in 6 to 12 months.

Innovation@Skoltech

Student projects to represent Russia in the final round of the Global Happiness Technology Challenge

Webot and **Lexy**, two projects spearheaded by Skoltech PhD students, have made it to the final round of the Global Happiness Technology Challenge competition. The competition, which takes place in China and is organized by the Tsinghua University and business incubator TusStar on the premises of the world's largest Tsinghua University Science Park, seeks to find and promote startups and technological companies that can change people's lives for the better.

Webot and **Lexy** projects were co-founded by Skoltech's PhD students Stas Ashmanov, Dmitry Suvorov (Space Robotics lab), and Roman Zhukov (Advanced Manufacturing lab). At the end of 2015, they submitted applications with the projects' presentations, business plans and video demonstrations of the current stage.

Webot is a telepresence robot, which allows the operating person to perform actions at the robot's location, using a computer with internet access. It allows the operator to observe the events from a distance and to speak with people, to see the outside world and to move through it at the speed of a walking person.

Lexy is a smart home assistant, a tabletop device with artificial intelligence and voice interface. **Lexy** can look up information online, manage the household appliances, and read the social media.

Both projects were selected first for the semi-final, and then for the final round of the competition that will take place in China on April 12-16. ***"To make it to the final, we had to submit a forward-looking technological concept that envisions possible commercialization on the Chinese market. Another important factor was that we already have commercial relations with Chinese manufacturers of electronics and plastic goods,"*** Dmitry Suvorov says.

Ten best projects will be awarded cash prizes. The participants can also turn their appearance of the list of competition's prize winners into an "entrance permit" to the Asian market.

It's worth noting that both projects are residents of the Skolkovo Foundation's IT cluster and members of the Skolkovo Robotics Center. The Center is very excited for its mentees, and says that getting into the final round of the Global Happiness Technology Challenge competition shows the high value that can be attached to the Russian startups on the international level.

WEBOT AND LEXY, TWO PROJECTS SPEARHEADED BY SKOLTECH PHD STUDENTS, HAVE MADE IT TO THE FINAL ROUND OF THE GLOBAL HAPPINESS TECHNOLOGY CHALLENGE COMPETITION.

Innovation@Skoltech

Skoltech innovation program at St. Petersburg Industrial Exhibition

On March 17, delegation of Skoltech specialists traveled to St. Petersburg to take part in the conference "Innovation Ecosystem of Universities: Towards Effective Solutions," which was organized by the Russian Venture Capital Association in partnership with Skoltech.

The conference was organized as part of the Smart Place Industrial exhibition in the form of a panel discussion. It was moderated by Evgeny Kuznetsov, Deputy General Director of the Russian Venture Company, and the discussion was joined by Igor Seleznev, Director for Research Programs and Technology Transfer of Skoltech's Center for Entrepreneurship and Innovation, and Dmitry Pebalk, Manager of Skoltech Innovation Program.

The panel discussion covered a number of issues such as cooperation of universities among themselves and with private and/or government companies, transfer of staff and competences from the industry to the academia and vice versa. Other panelists included representatives from the leading Russian universities as well as the top managers of the institutes of development and innovation businesses, who described the existing barriers that prevent effective interaction between the sides.

In addition to this, Igor Seleznev and Dmitry Pebalk made a separate presentation to introduce the participants to the Proof of Concept methodology and the Translational Research and Innovation Program, which is implemented at Skoltech.

The conference concluded with a meeting of the initiative group of the International Proof of Concept Centers Association (IPOCA). Rustam Kagirov, Specialist of Skoltech Innovation Program and coordinator of IPOCA, gave a talk detailing the organization's plans for 2016. New members of IPOCA were introduced, and the participants agreed to hold a review of university IT and robotics projects on April 22-23, at Kazan's Innopolis University. The projects will be presented to industrial companies and institutes of development that will provide them with feedback on further development, share contacts and, possibly, discuss potential collaboration.

On April 22-23, Kazan's Innopolis University will host the review of projects in the fields of IT and robotics that had been developed by the teams from the Russian universities that form the International Proof of Concept Centers Association. The meeting will bring together innovators and industry experts who will give their feedback on project presentations, exchange contacts and discuss potential for collaboration.

Faculty@Skoltech

Commenting on his decision to join the prize jury, professor Severinov said: "I'm interested in discovering the exact boundary between enlightenment and education, and I hope that the study of this year's submissions will help me in this. Educational books are fascinating. On the other hand, it's important to make sure that accuracy is not sacrificed in favour of engagement. To tell a falsehood is outside of science. Science is a very honest, perhaps the most honest form of human activity."

Skoltech professor Konstantin Severinov joins the jury of ENLIGHTENER-2016 award

March 3 marked the date of the press conference that announced this year's Enlightener award, which is given for the best Russian-language popular science book, and the start of the submissions period. This year's expert jury that will select the winners was joined by biologist Konstantin Severinov, professor of the Skolkovo Institute of Science and Technology.

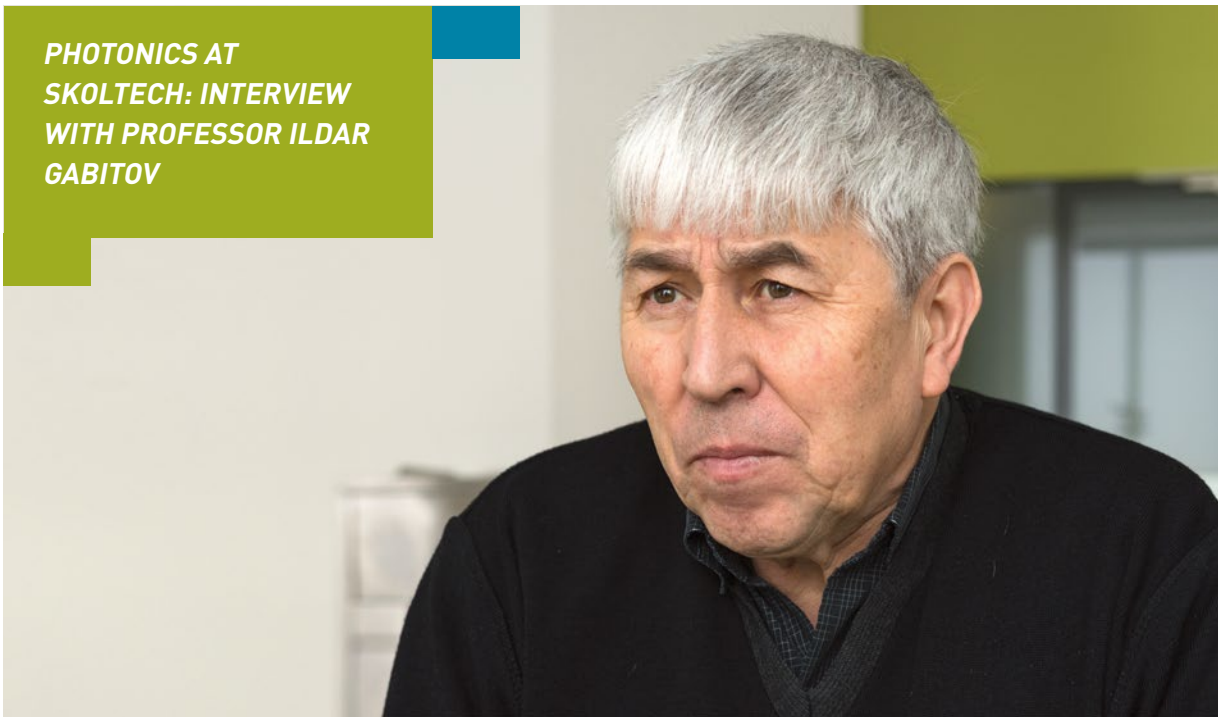
The Enlightener prize, established by businessman Dmitry Zimin in 2008, is awarded for the best popular science book written in Russian. The award seeks to draw the readers' attention to the educational genre, to encourage the authors, and to create prerequisites for the expansion of the educational literature market in Russia.

This year's updated competition will be sponsored by the Zimin Foundation. The competition is open to popular science books, written in Russian and seeking to educate an untrained reader in some area of humanities, hard science or technology. The year of book's publication is irrelevant for the purposes of the competition.

Konstantin Severinov, specialist in molecular biology (transcription mechanisms and regulation in bacteria), professor of the Rutgers University (New Jersey, USA), head of research laboratories at the Institute of Molecular Genetics and the Institute of Gene Biology of the Russian Academy of Sciences.

Faculty@Skoltech

PHOTONICS AT SKOLTECH: INTERVIEW WITH PROFESSOR ILDAR GABITOV



If it's true that the best technology is the one that fully dissolves in our everyday lives, improving them discreetly, then photonics is, no doubt, one such technology. The majority of people have no idea about photonic technologies, but they gladly use their derivatives. As of today, a third of the world's products are manufactured using photonics.

"I once calculated that every day we are surrounded by no less than 50 LEDs, not counting everything else that's directly related to photonics, - says Ildar Gabitov, Director of the Skoltech Center for Photonics and Quantum Materials. ***- Mobile phones, computers, lighting fixtures, kitchen appliances, and other things all have LEDs. About 35% of all the world's products are manufactured using photonic technologies, where the flow of photons (light) is used like the electrons in electronics. Without light, no life would've appeared on Earth, and the modern society, with its complex information, financial and economic structures, couldn't exist either."***

The new century has brought us a breakneck progress in the development and implementation of technologies based on photonics. This is happening, in part, because the moving force of the recent decades, electronics, is approaching the limits of its capabilities.

Many countries (China, South Korea, EU and the United States) treat photonics as a priority area of development. These countries already have national strategic development programs for the next 10 to 20 years. The global photonics market is valued at $500 bln. Europe accounts for 20% of this market, and in some of its more important sectors, such as lighting, the share of European production reaches 40%. Photonics is directly responsible for 20-30% of the whole European economy and 10% of the total labour force (about 30 mln jobs). Photonics is exceptionally important in solving many social tasks: production and efficient use of energy, provision of healthy life for the ageing population, safety guarantees, adequate response to climate changes, and much more. In Europe, production volumes of photonic products are growing at the annual rate of 8%. The British government report entitled "PHOTONICS: a UK strategy for success" reads: "There is good reason to believe that the impact of photonics in the 21st century will be as significant as electronics was in the 20th, or steam in the 19th."

The rapid development of photonic technology is limited by several restraining factors. ***"The electron is charged, and so you can control it with the help of an electric or magnetic field. But photons are neutral, and controlling them is a big problem. Why don't we have photic (optical) computers, and***

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data processing is still done by electrical means? One of the main reasons is the lack of good mechanisms to control the light streams, - explains Ildar Gabitov. ***- Moreover, it's very difficult to "pack" the photons into a volume that is smaller than the length of a light wave, which is about 1,000 nanometers. Electronics industry is operating on another technological scale – there is some research into operations on a scale of 7 nanometers, while Samsung and some other companies are currently working on the scale of 15 nanometers. In other words, many more electronic devices can fit into the unit volume than photonic ones."***

Skoltech Center for Photonics and Quantum Materials, which has recently created the Hybrid Photonics lab headed by the Greek researcher Pavlos Lagoudakis, is trying to circumvent these limitations. The idea is to replace the "pure" photons with complexes or coupled states (such as a photon and agitated-state electron, which is called exciton) in non-organic, organic, or hybrid semiconductor structures. Such coupled quantum states are slower than photons, but they are also much smaller. Skoltech researchers believe that the process of creating photonic devices with high level of integration will undoubtedly lead to the dramatic expansion of their functionality. It's rather difficult to forecast the full spectrum of such functionality, and in this regard the situation resembles a period of twenty years ago, when it was also rather impossible to forecast the full functionality of electronic devices.

Another promising area of Center's research are the low-dimensional systems (single-walled carbon nanotubes and graphene). Ildar Gabitov explains that ***"research in this field is led by Vasily Perebeinos who has joined us after a very successful career at IBM, and by Albert Nasibulin, a great expert in the field of flexible electronics."***

While in Finland, professor Nasibulin and Nokia engineers created mobile phone displays on the basis of thin film made of carbon nanotubes. At Skoltech, Nasibulin's team is synthesizing and studying characteristics of new nanomaterials, particularly carbon nanotubes that can be used in flexible and elastic electronic devices in manufacturing of sensors, displays, and solar batteries, all of which require conductive and transparent film.

The third area of the Center's research are the metamaterials and plasmonics. Professor Gabitov explains: ***"This is a relatively new area of study, which appeared in the United States about 10 years ago and has spread all over the world rather quickly. It envisions creation of and work with materials that possess unique record properties; materials with properties that do not exist in nature, such as the left-handed materials; and materials that possess new functionalities or a combination of such functionalities."*** Research in this area is led by a well-known academic Vladimir Drachev. When he was working in the United States, Drachev was responsible for experimental optical research in the team of another Russia expatriate Vladimir Shalaev, professor of Purdue University and member of the Skolkovo Foundation Scientific Advisory Council. Shalaev's group was the first in the world to create an optical negative index meta-material. While in the US, Vladimir Drachev also collaborated with the pharmaceutical companies, developing the technology of highly-sensitive detectors to monitor the purity of medical drugs. The scientist will continue to work on this technology at Skoltech.

Right now, a technical advisory group, which includes professor Gabitov, is working on the draft of the photonics development program that will most likely receive consideration this coming summer.

According to Gabitov, **"we have lost a lot of time, and photonics in other countries has made a huge leap over the last quarter century. If we procrastinate, we'll miss the technological breakthroughs associated with photonics, just like it happened with electronics. We still have a chance to catch up, but we have to start immediately. It would be naive to believe that we'll be able to achieve quick and noticeable success in all areas of photonics. We have to coordinate our efforts and choose the areas of concentration. The multitasking photonics development program will be successful, if we manage to find the right place for ourselves, to use the resources and the global know-how correctly. Photonics development program has to encompass both education and industry, faculty training, finances and scientific instrument-making. It's a very difficult and complex problem, but without it nothing can be done. Miracles don't come out of thin air."**

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Firsthand space experience with Professor of Practice Sergei Krikalev

The future of space programs, missions to Mars and the Moon, space tourism and scientific research in space were the main topics of the lecture delivered to Skoltech students by the record-breaking veteran of six space expeditions and Professor of Practice at Skoltech Space Center Sergei Krikalev.

"Living and working in space" was the title of the lecture delivered by the Russian cosmonaut who for ten years (from 2005 to 2015) held the world record for the total amount of time spent in space (803 days).

Following a short summary of the history of space and lunar explorations, Krikalev spoke in detail about such things as the most promising avenues of space research, special aspects of preparation for manned flights, and the planning of such flights.

The professor spoke in particular detail about lunar exploration and contended that humanity cannot consider the Moon a closed chapter in space exploration, concentrating all of its efforts of Mars missions. Sergei Krikalev believes that additional exploration of the Earth's satellite and establishment of a lunar base will create the conditions for a successful manned mission to Mars. In the course of construction of a lunar base, the scientists and engineers will have a chance to put various technologies into practice. Among such technologies the professor named new types of robots or construction technologies that utilize lunar soil and 3D printers.

The Q&A session held after the lecture expanded the list of topics. Skoltech students wanted to know all about the future of the International Space Station, international cooperation in space exploration, and inclusion of private companies in the process, whether robots can replace humans in the exploration of Mars and the Moon, and — the obligatory question of the day — how to become a cosmonaut. Krikalev hastened to assure his audience that Skoltech students have excellent chances of making it to the cosmonaut training since the engineering education is one of the topmost advantages for the candidates.

Following the lecture, Sergei Krikalev answered a number of questions from the sk.ru magazine.

- Why did you decide to join the staff of the Skolkovo Institute of Science and Technology?

I liked that this place is full of students with an engineering background. Having an engineering background myself, as well as a certain practical experience of working in space, I wanted to understand what interests these students, what makes them tick, what are their goals. I will try my best to help them, if space is one of those things.

- In January of 2015, after you just joined Skoltech, you said "interaction with the students and professors may lead to the appearance of new ideas that will be implemented on Skoltech's platform. I'd like to practically implement a number of ideas that have been discussed for a while in the industry and scientific circles. These are the issues of spacecraft manipulation, interaction between humans and complex engineering systems, design and creation of man-machine interfaces." Has anything been realized?

As usual, we always want and plan on doing more than we finally achieve. That's OK, one should always have ambitious goals. Right now we are in the process of establishing communication and collaboration with the students and Skoltech as a whole. I

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hope that in the future we'll have practical projects in the areas of engineering infrastructure and such.

- Getting back to your students. Skoltech has gathered the most talented graduates of the best technical universities. Would you agree with such evaluation?


Sergei Krikalev

One thing that I did notice is that these young people don't just have a good engineering background, they have the aspirations to put these skills into practice. Here, they are taught project management, creation of new projects, possible commercialization. But the space industry is inert. On the one hand, that's an advantage, as the outside factors don't have a great influence on this system, and it continues to develop in the right direction. But at the same time, it hampers quick implementation of startup inventions into the inert system. I do have some thoughts on how we can use the students and their mobility, but, unfortunately, they haven't been realized yet.

- Skoltech is an international project, and its Space Center is also very international: it's headed by a German, and among your colleagues are some Italians, an American and a Spaniard. Did the recent political woes have any impact on space cooperation between Russia and other countries?

As I already said, it's a very large and inert system, so there haven't been any serious changes over the last two years.

Getting back to the thesis about Skoltech as an international project. Space exploration is also an international project. It began at first as a competition, where everyone took his own path, moving in the same direction. But even during the early stages we began to cooperate in space exploration. Despite the high and low tides of politics, this cooperation continues.

- There is a popular opinion that the American space industry is much more open to the private companies, while the Russian space industry is a very closed system with rare exceptions. Is this true?

This is some sort of illusion, that there was nothing of this sort [in the American space industry], but there is now. In reality, it's a very long, very gradual, very quiet process. It's true, that from the very beginning, everything, down to the smallest screw, in cosmonautics was state-made and state-controlled. That's understandable — space exploration was something new, there were lots of questions and the state took the risks upon itself. As the project develops and the number of risks goes down, commercial companies enter the fold, but it's a slow process.

When we were at Houston in 1993-94, there was a big discussion about the plans to hire a commercial organization to service the shuttles. There were many people who believed that only the state should be engaged in such important activities. But with time everyone saw that everything's working fine, and that it's more profitable for the state to pay commercial organizations money to perform non-high-risk and not-too-critical operations. It's just that here, in Russia, the process is much slower than in the US.


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