

# Skoltech

Skolkovo Institute of Science and Technology



NEWSLETTER  
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**Edward Crawley,**  
Skoltech President

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## Dear friends!

We have reached this long-awaited and exciting moment when the first Skoltech students are graduating – bright young people, passionate, ambitious, real innovators, and start-up entrepreneurs. Almost all of you have already launched your own projects and have received unique experience of working with the leading practitioners and researchers both in Russia and abroad.

You completed internships at the world-renowned tech companies and spent several months at the MIT in Cambridge, Massachusetts. There is a stellar career, exciting jobs and, quite likely, major discoveries, ahead of you. We firmly believe that professors and staff at Skoltech helped you identify your goals, unlock your potential and learn practical skills in entrepreneurship in the field of cutting-edge technology. This is another step to making your dream come true!

Remember that you are always welcome in Skoltech, especially if you make it to the top 30 of leading innovators list of one reputable magazine or another!

On June 17 we officially bid you farewell at the Graduation ceremony (and it was a very moving occasion). We all had a wonderful time enjoying the summer BBQ on the fields of Skolkovo, in Technopark. And it was great to greet you all at the grand stage of the Startup Village, on June 3. This ambitious festival of innovations and startups attracted hundreds of visitors and Skoltech students put their best foot forward. You brilliantly presented your projects and innovations, and told our guests what it feels like to be an innovator!

**I wish you all the best this summer!**

Edward Crawley,  
Skoltech President

## Mega event@Skoltech

### **Viva Skoltech!” Russian PM Medvedev Celebrates with First Graduating Students**

**The first group of Skoltech students celebrated the end of their studies in a ceremony with Russian Prime Minister Dmitry Medvedev at Startup Village.**

Accompanied by cheers of “Viva Skoltech” and thunderous applause from the 2,000 the 53 master’s students threw their Graduation Caps – and posed for a selfie with the top politician.

Earlier, Medvedev congratulated the graduating students and awarded the first diplomas to students Dmitry Smirnov and Anna Dubovik. “I remember flying above this area west of Moscow a few years ago”, said the Russian PM, “I was being told that things will be built and happen here. Now the promises have turned into reality.”

The graduates, completed the innovation university’s programs in Information Technology, Energy, Space and Advanced Manufacturing after enrolling in 2012-13, the institute’s first year of operations in collaboration with MIT (the Massachusetts Institute of technology).

“You took a huge risk by joining us”, said the university’s president, Prof Ed Crawley, “at the time we barely had more than a website. Now we are a thriving community of researchers, innovators and entrepreneurs, working with Russian and international universities. And almost half of you have established your own startup companies or projects. I’m proud of you.”



Russian Prime Minister Dmitry Medvedev poses for a ‘selfie’ photo with graduating Skoltech students at a ceremony held at the Startup Village conference. The innovation based university graduates 53 master’s students in IT, Energy, Space and Advanced Manufacturing.

All graduates are scheduled to attend a ceremony in the Russian traditional “last bell” style on June 17 at the Skolkovo Innovation Center.

“We are proud to show off our graduates to the Skolkovo community, to participants and guests of the Startup Village, and to investors,” said the innovation university’s vice president Alexei Sitnikov.

Every year, Skoltech takes an active part at Startup Village, the biggest conference of its kind in Eastern Europe. This year’s presentations by leading researchers, included Prof Dzmityry Tsetserukou (head of the Space Robotics Lab), and Prof Alessandro Golkar, Director of the Strategic Innovation Research Group (SIRG). The event also featured a working session of IPOCA – International Proof of Concept Centers Association.

Skoltech is a core ingredient of the Skolkovo ecosystem, supplying the brain power to create innovations that will be commercialized further down the road. More than half of the university’s current intake already have innovations that are either on the market or soon to be available.

“The most important thing for us as producers of talent inside the innovation center, is that many of the guys already have their own companies and startups, and intend to develop them further after graduating from Skoltech,” Sitnikov said.

**The official “last bell” graduation ceremony took place on June 17 at Skoltech.**





# Startup Village@Skoltech



## Mega event@Skoltech

**A group of technology transfer experts sporting blazers and light-blue button down shirts is probably not the first image that comes to mind when discussing one-on-one athletic activities.**

Yet when Skoltech professor Ilia Dubinsky moderated a panel on the journey from lab to market at Startup Village, a conference connecting investors with researchers and entrepreneurs, he was greeted with unanimous agreement when declaring that “innovation is a full contact sport”.

“It is true”, said Prof James Callaghan of Newcastle University, the UK, “in my experience there is no substitute to personal connections. Inventors need to go out there and meet those potential investors and build a network.”

This focus on effective social skills was echoed by Igor Seleznev, of Skoltech’s Center for Entrepreneurship and

Innovation. “As a startup university we introduce an element of competition to our programs. We know that it helps people learn from one another.”

And so a consensus was achieved. With all due respect to ingenious technologies, when it comes to the race to commercialization nothing beats networking and personal connections. That, in a nutshell, is the underlying premise of Startup Village, the biggest event of its kind in Eastern Europe.

The pictures curated here feature Skoltech researchers pitching to investors, building bridges with fellow academics and celebrating – along with Russia’s Prime Minister Dmitry Medvedev – the graduation of the university’s first group of 53 master’s students (in IT, Space, Energy and Advanced Manufacturing). The photos, aptly enough, seem to reiterate the same point: it is all about the people.





# Kazan@Skoltech



**The Memorandum on mutual understanding on the establishment of International Association of Technology Implementation Centres was officially signed by Skoltech and a number of Russian universities at the 15th Russian and 10th Kazan Venture Fair on 23 April 2015\*.**

Among the signatories were Kazan Federal University (Kazan), Ural Federal University (Ekaterinburg), North-Eastern Federal University (Yakutsk), Innopolis University (Kazan), Samara State Aerospace University (Samara) and Russian Venture Capital Association. The Association will unite university-based technology implementation centres, as well as manufacturers, investors, entrepreneurs, development institutes and other organisations, whose mission is to accelerate the introduction of innovations through international cooperation and network building. The Association's objective is to help with translating lab-based projects into finished products and services as part of the global innovative ecosystem. Alexei Sitnikov, Vice President for Institutional and Resource Development, signed the Memorandum on behalf of Skoltech.

Next day, on 24 April, Kazan Federal University hosted an extended meeting of an action group, where Skoltech's experience of implementing the Programme for translating research and innovation was analysed and a number of issues regarding the establishment of the Association and its further development were looked at. Ilia Dubinsky, Director of the Center for Entrepreneurship and Innovation, Igor Seleznyov, Director of Research Programs and Technologies Transfer, Dmitry Pebalk, Skoltech Innovation Program Manager and Rustam Kagirov, Skoltech Innovation Program Specialist, took part in the meeting on behalf of Skoltech. Russia's leading universities - those that have already joined the Association and those that are looking to become its members - were represented by the vice-principals for science and innovation. The participants agreed on launching effective cooperation and supporting innovation in the form of the International Association.

The next meeting of the action group is scheduled as part of the Startup Village on 2-3 June 2015 and it is going to be attended by foreign experts on technology transfer and representatives of foreign universities that are potential partners of the new Association.



Signers of the Memorandum



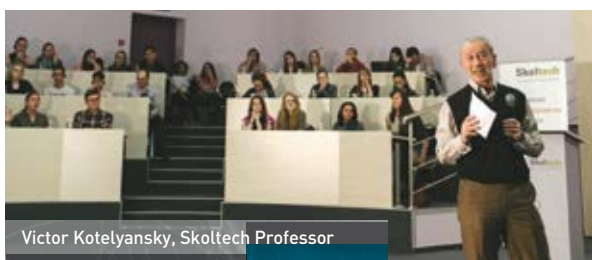
A triumphant handshake after the signing of the Memorandum

\* In 2013 Skoltech initiated the establishment of International Association of Technology Implementation Centers. The first memorandum of understanding on the establishment of the Association was signed with Deshpande Center for Technological Innovation, Masdar Institute of Science and Technology (UAE) and Saint Petersburg State University of Information Technologies, Mechanics and Optics. Later on, Nizhny Novgorod State University named after N.I. Lobachevsky (Nizhny Novgorod), Tomsk Polytechnical University (Tomsak) and Perm National Research Polytechnic University (Perm) also signed the Memorandum.

## Sci Talks 2.1@Skoltech



On 17 March, 2015 top biomedical researchers and thought leaders, all Skoltech professors, delivered a series of presentations – short talks focusing on cutting edge science and trends in biomedical technology. Dozens of people attended the event to learn about the global challenges that world class biomedical experts are tackling here, at Skoltech.



Victor Kotelyansky, Skoltech Professor

### Speakers and their lecture topics:

- Prof. Raul Gainetdinov, “**Transgenic model of brain disorders**”
- Prof. Victor Kotelianski, “**Biomedical research and pharmaceutical business. International experience**”
- Prof. Raj Rajagopalan, Provost, “**Tension between physics and biology: mechanobiology**”
- Prof. Konstantin Severinov, Director, Skoltech Center for Data Intensive Biotechnology and Biomedicine, “**Bacterial Immunity**”
- Prof. Philipp Khaitovich, “**Molecular structures in the brain**”



Skoltech professors and the leading science journalists at Skoltech Sci Talks



# Achievement@Skoltech

## Professor Konstantin Severinov receives international Scopus Award



**Konstantin Severinov received Scopus Award 2015 for his invaluable contribution to the development of molecular biology at both national and international levels. The award is run by publishing company Elsevier – the leading provider of scientific information that actively contributes to the development of science all over the world.**

Konstantin Severinov, doctor of biological sciences, manages the Laboratory of Molecular Genetics of Microorganisms at the Institute of Gene Biology of the Russian Academy of Sciences and the laboratory at the Institute of Molecular Genetics of the Russian Academy of Sciences. He holds the position of professor at Skoltech and Rutgers University (US), and manages the Molecular, Environmental and Applied Microbiology Laboratory at St. Petersburg State Polytechnic University.

Professor Severinov, whose research is focused on the study of bacteria's DNA transcription, analysis of interaction between bacteria and bacteriophage, as well as the analysis of peptide-derived antibiotics, said, 'Of course, it is very nice to receive an award – it's like a candy for a child. Today this award symbolises scientometrics, which, unfortunately, is often overused in Russia's scientific and especially administrative circles. However, stimulating Russian scientists to publish the results of their research in highly rated academic journals is the only way to integrate Russian science into the global scientific community and to overcome the resistance of back numbers'.



'The fact that such scientists as Khokhlov and Archakov also received this award, makes me feel like I am standing on the shoulders of giants', added Severinov.



Scopus Award Russia was awarded in 2014 jointly by the Ministry of Education of Science, Russian Fundamental Research Fund and Russian Venture Company.

## Research@Skoltech



Professor Albert Nasibulin examines a carbon nanotube reactor at the lab he had helped set up at Helsinki University of Technology (nowadays Aalto University) in the early 2000s. Recently, he has moved to Moscow where he leads nanomaterial research and teaches at Skoltech.

**Smartphones with curved screens, super stretchable speakers, and keyboards that can be folded and rolled to a tiny film.**

**These might all seem futuristic, but such innovative products might soon be available on the market, thanks to nano materials research performed at Skoltech in Moscow and Aalto University in Finland by joint teams of scientists.**

For that purpose, Skoltech Energy and Advanced Manufacturing graduate students spent a weekend at Aalto University for a hands-on carbon nanotubes lab, led by professors Albert Nasibulin (Skoltech) and Esko Kauppinen (Aalto U), and TA Evgenia Gilshtein.

The visitors worked along with Finnish colleagues and local instructors to gain hands-on experience of the technologies and methods used to operate a unique gas-phase reactor, synthesize highly conductive nano-carbon tubes utilizing graphene, and test the materials' characteristics, for example its ability to stretch and fold much more than materials currently used by electronics companies.

The teams then analyzed the results using tools such as electron microscopes and spectrometers. The lab experience is a first step in a long process, as researchers intend to conduct numerous experiments over the next year or two – until they can produce stretchable and flexible electronics that can be commercialized.

The state of the art facility in Finland had been established by Prof Albert Nasibulin in 2000, who later moved to Moscow and now teaches and conducts research at Skoltech. Nasibulin said: "What is being done here is potentially revolutionary. The next big phase is to enhance the process of carbon nanotube synthesis so that the end result is more conductive and flexible than anything available now. We are aiming at combining carbon nanotubes and graphene", he pauses, "like husband and wife".

This match made in a reactor is the end goal of teams from both universities. The masters and PhD students also visited the production plant of Canatu, a spin off company established by Nasibulin and three other partners from Aalto a decade ago.



## Research@Skoltech

The start-up, which raised 22 million \$USD in three rounds of funding, focuses on transparent conductive and programmable films for new applications from car dashboards to tablet screens. Dr David Brown, a shareholder and Canatu's CTO, presented the company's development plans and commercialization prospects.

Researchers from Skoltech and Aalto plan to continue the collaboration in the near future and on a long term basis.



## GEFF@Skoltech

**On April 1-3, 2015 in California has happened the first meeting of the GEFF - Global Educational Futures Forum - an international design platform, which unites the leading international experts and creators of the educational systems of the XXI century.**

GEFF project has been launched by the Skolkovo Institute of Science and Technology and a group of Re-Engineering Futures, and has been supported by Tomsk State University and the Russian Venture Company.

The advisory board of the project consists of the world's leading experts on education from Russia, USA, Europe and Asia. Among them: Dirk van Damme (Head of the Innovation and Measuring Progress Division (IMEP) in the Directorate for Education at the OECD), Toru Iiyoshi (Professor at Center for the Promotion of Excellence in Higher Education, Kyoto University), Alexander Laszlo (57th President of the International Society for the Systems Sciences (ISSS), Director of Doctoral Program at ITBA), Henry Etzkowitz (President of the Triple Helix Association), Tom Vander Ark (Founder at Getting Smart and Partner at Learn Capital), Simon Bartley (President of World Skills International), Claudio Naranjo (Gestalt-psychotherapist, founder of SAT Institute). Leader of the project is Pavel Luksha, Professor of Moscow School of Management SKOLKOVO and member of Russian Agency for Strategic Initiatives).

We have to mention that the need for design contours of the global education system is marked by all developed countries. Nowadays the traditional education makes extensive use of international standards in order to standardize the implementation of the educational degrees and ratings. Also - new global online educational platforms (such as Coursera or Duolingo) already begin to compete with the national education system. Finally, throughout the world there is a transition to education throughout life - and this requires a fundamentally new approaches and solutions. So GEFF focuses on the arrangement of

the educational system of the future, where are combined global players, respect for national interests and the needs of local users.

**There has been defined three main areas of GEFF:**

- a) educational models and technologies that support lifelong learning;
- b) «Future skills» due to changes in technology and management methods, which support the preparation of these educational systems;
- c) public policy and public initiatives in order to implement the new educational system (primarily in developing countries, including Russia and BRICS).

The first GEFF session in California was devoted to the first disclosure of the above-mentioned topics. It has become a key focus on the prospect of creating educational systems that respond to the lifelong needs. It is already clear that the future education will occur not only in schools and universities, but within mobile devices and urban spaces. Such education can take place at any time, anywhere, with the adjustment under the personal rate of employment and personal problems of any man.

Advanced technologies such as artificial intelligence, augmented reality, and neurointerfaces will play a greater role in solving educational problems. But at the same time, technology can not replace people. There will be additional educational space, where people learn from each other's different skills to explore, create and solve social problems. That was the main closure of the meeting in Silicon Valley. The session was attended by around 100 leading experts in the field of the future of education from 15 countries, including leaders of organizations involved in systemic changes in education (Innovation Unit, ISSS, and others), foresight education experts from the OECD and UNESCO, and about 40 representatives platforms and innovative educational projects. The outcome of the Forum was to build four «maps of the future» and to create several





# Education@Skoltech



systemic initiatives in order to develop a global educational system of the future, including proposals of a number of international standards that will be finalized during this year and next. Among the proposed initiatives: creating a «Declaration of the student» for the global education platform, the establishment of the international metric development of regional and municipal educational systems, establishment of global maps on major institutions supporting educational innovations.

The participants have been working with Russian technique Rapid Foresight. This technique is widely used in Russia in order to predict and to design the future of the educational system, regions and sectors, including in the projects «Foresight Fleet» by Agency for Strategic Initiatives, in the design of the National Technology Initiative, in creation of «Atlas of new professions», a joint project of Russia and the International Labour Organization, and in other areas.

The Californian session has been held in partnership with GTS (Global Technology Symposium) - the leading event in Silicon Valley with the participation of Russian and American start-ups and venture capitalists. This year



the main topic of discussion was the GTS opportunities offered by the market of educational technologies and new education. So the participants of GEF session are actively involved in the discussion of GTS, and the representatives of start-ups and venture capital funds have contributed significantly to the content of foresight.

The next session of GEF will be held in May 2015 in Kazan and in August 2015 in Sao Paulo. At the session in Kazan, carried out under the national finals of World Skills Championship, there would be brought together the experts on new industry and on vocational education from more than 40 countries. The result of this work should be the forecasts and projects of the development of the international system of vocational training.

**GEFF will be completed at the November session in Singapore, which will create a road map on political and civil initiatives to support the new education in developing countries and BRICS. The results of that cycle of sessions will be presented in a unique Report on the future of global education. The results of the Report to be presented in January 2016 at the World Economic Forum in Davos.**



Participants of the Global Education Futures Forum at the California session



# First Students Graduation@Skoltech



Mats Hanson, Dean of Education, Skoltech

*I am thrilled when I see our students take a big step into the future.*

*It is amazing to see that they our students already can bridge research into innovation*

*In the very beginning it was unbelievable to see one hundred of thesueh brightest students from all over Russia and abroadn working together in teams, at the same time, in one big room, making prototypes (selection weekend 2015).*

*It's a great pleasure to spend more time with the students in our rapid prototyping lab when they turn crazy ideas into real and smart products. It's just amazing!.*

*Our Skoltech students are ready to change to a better world. I wonder what they are doing twenty years from now?*

*I am so proud, to see the students actively create and build the creative culture at Skoltech. They are the leaders of the future.*



## Students@Skoltech



**Lissa Natkin, MIT.**

The first selection weekend – Skoltech devised a series of team challenges for students who had never met each other previously and came from a variety of educational backgrounds. The stress of learning quickly how to work together, to have to communicate in English, and to trust each other’s various levels of expertise quickly showed the evaluators who would fit into Skoltech.

This was a Skoltech that launched its student body across the world—to MIT, HKUST, ICL, and KTHZ. Students not only studied at these various institutions, they absorbed the culture of each university - with the goal of bringing the best of each back to Skoltech. Skoltech student government incorporated the strengths and character of these international institutions as well as the students’ previous Russian institutions. Clubs and athletic teams were quickly formed, creating even stronger ties between cohorts from different years.

In three short years, Skoltech has grown from 20 Master’s students to over 220 MS and PhD students.

I can’t believe that almost three years have gone by already, and that the first two cohorts are graduating with MS degrees this June. The Year 0 and Year 1 cohorts have accomplished so much—they helped create an institute unlike any other in Russia, where entrepreneurship and innovation are an integral part of the curriculum, active learning is the norm and the ability to work both alone and in teams to complete projects is the everyday expectation.



## ART project@Skoltech

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Two Russian designers Eugene and Mark depicted Startup Village 2015 in colors: tech bazaar, Skoltech students graduation, robots and the tasty durum-durum. Here are the results.





# ART project@Skoltech

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## Visual angle@Skoltech

### 7 questions for Dmitry Teteryukov, professor at Skoltech. How humans can coexist with robots.

**The global robot market is booming, with record-high sales that reached tens of billion dollars last year. Russian Reporter (RR) magazine talked to Dmitry Teteryukov, professor at Skoltech and director of Intelligent Space Robotics Laboratory, about what we can expect from robots**  
By Andrey Konstantinov

**1. It is a fact that the number of robots is rising dramatically. But the question remains: where are they hiding, except for those used in manufacturing?**

In addition to industrial robots, service robots are becoming increasingly popular too – I am sure everyone has heard about robot vacuum cleaners and quadcopter robots delivering parcels. Robots are widely used in healthcare and they've been fighting in the US army for a while now. For instance, crawler robots with grippers are used for demining. In fact, these robots proved extremely useful in dealing with emergencies and they were used at the site of Fukushima disaster.

**2. What kind of robots are you developing at Skoltech?**

I continue the work that I started in Japan. One of the projects focuses on managing a group of robots, when they all have a common plan and they operate as a team, exchanging information and taking into account each other's actions. We purchased three mobile robots and we are teaching them to process visual information together, for instance, to create a 3D map. We are going to test it here on Earth first, but since we are working at the Intelligent Space Robotics Laboratory, we are planning to send them to space in due course.

**3. Science fiction writers have always portrayed robots as individualists. However, it looks like they are more likely to be working in groups, guided by some kind of common intelligence.**

It makes much more sense to distribute the work between several robots than entrust everything to just one. An autonomous robot can process all the information about road surface, but if they are placed everywhere, it will be much easier for them to work based on a common programme. At our lab we are also developing a classic humanoid robot, a very advanced model, and we are doing it from scratch, while studying human-robot interaction at the same time.



**4. When robots become too similar to humans – both in terms of their appearance and intelligence – it gets a little bit scary, no?**

Japanese professor Hiroshi Ishiguro creates androids that look so similar to humans that I recently mistook one of his geminoids for a real person. However, this only works as long as the robot is sitting. At the moment there's no robot that would walk like we do – so the way they walk instantly gives them away. Ishiguro even made a robotic copy of himself and his daughter. However, when his daughter saw her doppelgänger, she was frightened, started crying and ran away. This proves that once robots become too similar to humans, it provokes a very strong negative reaction. However, past this threshold, once a robot's appearance and movements become indistinguishable from those of a human, it is perceived as a human being. That said, in order to reach this threshold, robots need to have not only human-like appearance, but also intellectual capabilities and an ability to hold a normal conversation.

**5. Do you think the famous Turing test – if we cannot distinguish a robot from a real person during a conversation then the robot must be considered a human being – is still relevant or does it need to be rephrased perhaps?**

These days the Turing test is used as a way to test the programmes simulating people's interaction in live chats. However, it's not just about the intelligence – we won't mistake an anthropomorphic robot for a human being unless it demonstrates emotions, moves and behaves like a human being. I tend to think that there'll be an extended version of Turing test for androids.



## Interview@Skoltech

### 6. Are you not afraid of – to put it crudely – robot uprising?

I am much more concerned by the increasing integration of people and computers. I think we will be slowly turning into cyborgs, constantly increasing our capabilities, installing all kinds of microchips into our bodies to improve our memory and other skills. Evolution is unstoppable, but it's difficult to say where the line between humans and machines is going to be.

### 7. Maybe the difference lies in the fact that robots are pre-programmed, while we, humans, are unpredictable?

In fact, it's not a problem to introduce certain irrationality and irregularity into a robot's programme. For instance, there is software that can demonstrate irony and sarcasm quite convincingly.

### FIGURES

**80%** of jobs currently performed by humans, according to OECD, will be replaced by robots in the next few decades.

**178** thousand industrial robots were sold in 2014.

**52%** – Japan's share in industrial robot market. According to 2013 data, Japan is the world leader in robot manufacturing.

**0.17%** – Russia's share in industrial robot market (according to 2013 data).

**5%** a year – growth rate of global industrial robot market.



Dmitry Teteryukov, Skoltech Professor

## 3D-printer@Skoltech

### Skoltech researchers: "We produced the strongest 3D printed composite material in the world"

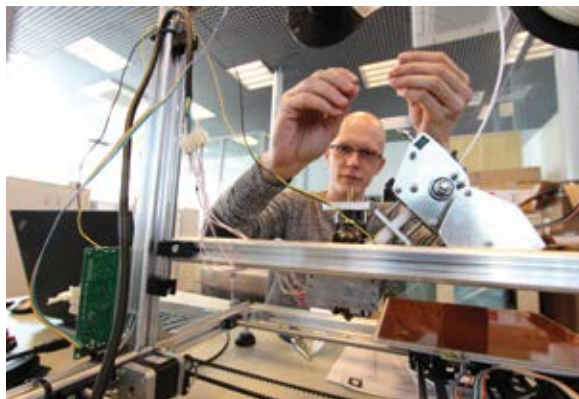
At midday the Skoltech composite materials laboratory is a busy yet quiet hive of activity. Researchers and assistants are typing away at their laptops, their faces wearing an impression of unflinching studiousness. There is no discernible office chit chat. In the midst of the hushed space, under the watchful eyes of the lab's senior research scientist Fedor Antonov and Mikhail Golubev, a design engineer, a 3D printer is patiently mixing carbon fiber and thermoplastic resin. The two scientists fiddle with the machine's extruder. Then the printer spews out a thin line of material. "Take a look", Antonov presents the elongated rectangle. "It is an incredibly resilient and very strong composite material."

His voice is laced with contentment like that of a proud father.

"This humble piece is possibly the strongest 3D printed fiber-plastic in the world. And we know how to make more of this stuff."

For the last twenty years, the quest for the design and production of stronger and more flexible composite materials has attracted the imagination of business and research leaders. Composites' wide range of applications, from medicine through aerospace to toys, made these unique materials increasingly important.

Researchers at The Skoltech Center for Advanced Structures, Processes and Engineered Materials (ASPEM) began their journey towards producing what is arguably a revolutionary material – with a challenge from their chief. Prof Zafer Gurdal, the center's director, who moved to Moscow after working with the University of South Carolina, encouraged his students at USC and Skoltech to produce 3D printed materials. The team envisioned a groundbreaking method to impregnate carbon fibers with thermoplastic resins and to achieve exceptional fiber-plastic bonds and high adhesion levels. A Russian government grant bought the scientists time, but not success.



"At first we failed. Then we failed again and again and again", Antonov reminisces, "the main problem with this technology is to achieve good quality of material: less porosity, better bonding between components, better fiber alignment. But eventually we got it right and came up with a completely new way to cover the fibers with a special chemical agent, which forms the durable interface between the components of the composite material. Our invention is special because of the way we treat carbon fiber tow (the packaged form of individual spools)."

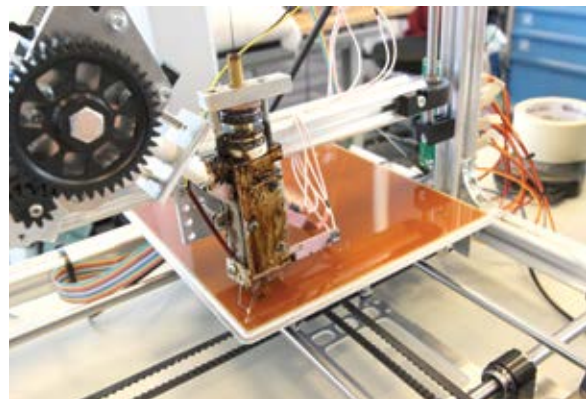
But that secret ingredient was not enough to create the final unique concoction. A new design for the printer's extruder – which mixes fiber and plastic prior to deposition – was also required. The results, researchers claim, might be twice stronger and stiffer than that produced by MarkForged, an American company which claims to be the world's first carbon fiber 3D printer. Now the ASPEM team is racing to register an international patent on the new material and its manufacturing process.

"We are very enthusiastic about the future of the project," says Antonov, "we have a patentable idea and a working prototype, which can print very strong and stiff parts."

And what is that good for? Which applications do you foresee?

"We might be able to extend the application of 3D printers from prototyping to real structural parts, having locally optimized geometries and material properties." So this is useful for manufacturing toys, car parts or plane components?

"You can print parts for UAV drones, quadro-copters and robots, impellers which are used at centrifugal pumps, or casing for drills. You can print orthopedic insoles for your shoes, or belt brackets. You can even print a non-bending cover for your iPhone 6 Plus. But these are all small parts. In the future we believe this will become a useful technology for the aerospace industry. And that is going to be a very significant development. We can hardly wait for the next phase."





# Prof. Ishiguro Lecture@Skoltech



**Hiroshi Ishiguro, a famous roboticist and director of the Intelligent Robotics Laboratory at Osaka University, Japan, delivered two lectures in Skoltech in May. He is famous for developing realistic androids – remotely operated humanoid robots. The extent to which they resemble humans is astounding, down to minute movements and blinking.**

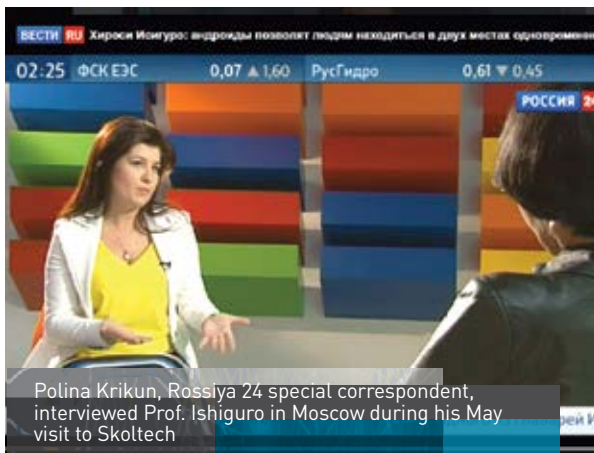
A human-like robot Geminoid is particularly famous. Ishiguro often jokes that he could use Geminoid to give lectures instead of himself.

The roboticist takes his creations on the road, as part of a traveling 'android theatre', where they act out scenes with humanlike expressions. Deep down, Ishiguro believes

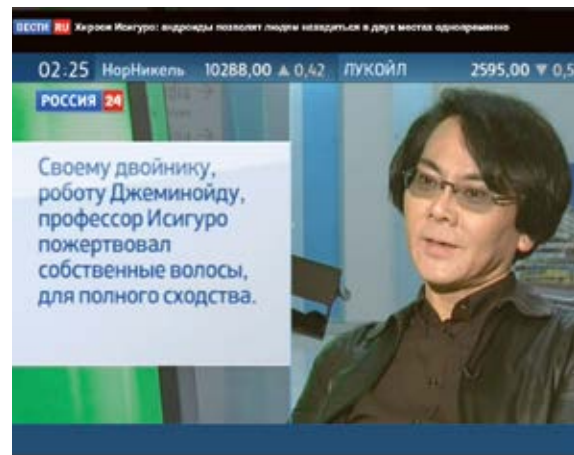
that his robots are flawless. As he puts it, 'they resemble humans more than humans themselves do'. This might be the reason why not so long ago he deliberately started introducing certain flaws into their design.

The talented roboticist has also created a Telenoid, which lacks any gender or age characteristics so that people could project any face onto his neutral appearance. Ishiguro tested Telenoid among elderly people in Denmark, and, according to him, the reaction was very positive.

Ishiguro also produced Elfoid, a smaller version of Telenoid, which functions as a mobile phone. He admitted that since everyone talks so much about smartphones these days, he wanted to personalise it and make it a little more humane.






Polina Krikun, Rossiya 24 special correspondent, interviewed Prof. Ishiguro in Moscow during his May visit to Skoltech





Herzog & de Meuron

Skoltech in social networks

-  [www.twitter.com/Skoltech](http://www.twitter.com/Skoltech)
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