सत्यमेव जयते

Bimonthly Newsletter
of the
Embassy of India
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Dear Readers,

Greetings from Science & Technology Wing, Embassy of India, Moscow!

The months of July and August have witnessed a very strong impression of Indian technological and manufacturing sector at INNOPROM 2016 as a partnering country during 11-14 Jul, 2016. The Indian exhibition spread over 3,700 m^2 presenting 115 industrial companies, including those widely known in Russia (Sun Group, Heavy Engineering Corp Ltd, Grover International) and the ones new to Russian consumers and the international market. The Indian delegation at INNOPROM exceeded 400 official and business representatives. Chief Ministers of three major Indian states (Andhra Pradesh, Maharashtra, and Rajasthan) represented their country for the first time in the history of Indian and Russian relation.

On 19 Aug 2016 Russian President Vladimir Putin appointed Dr Olga Vasilyeva to the post of Russian Minister of Education and Science and In addition, Alexey Lopatin, Former Deputy Head of Federal Agency for Scientific Organisations, was appointed Deputy Minister of Education and Science. Russian Federal Agency for Scientific Organizations (FASO) has adopted priority directions on development of research infrastructure On 09 Aug, 2016, the working group on the development of innovative activity of scientific organizations governed by FASO has started work.

Russia is now ranked 48th in the 2016 Global Innovation Index (GII), just ahead of Chile and Costa Rica and immediately after the United Arab Emirates and Turkey. Russia has risen from the 56th place it occupied in 2015.

Siberian engineer Maksim Lyashko has developed a robotized prosthetic arm which is ten-to-a hundred times less expensive than the imported competition. The 28-year-old inventor lost his own arm in 2013 working in a mine and took up the challenge to create a novel prosthesis all on his own. Researchers at the Tomsk State University of Control Systems and Radio Electronics (TUSUR) have developed an artificial intelligence system that is said to be able to use its own "brain" to pinpoint malware without relying on third-party antiviral products. Scientists from MIPT together with colleagues from Institute of Applied Physics of the RAS and company IRE-Polus have developed a novel compact and powerful ceramic-based laser. Researchers at the Moscow Lomonosov State University (MSU) have developed an innovative air cleaning technology to combat carbon oxide and many toxic substances in the atmosphere. For this, they have harnessed the untapped properties of nanomaterials and the sunlight. Physicists from the Moscow Institute of Physics and Technology (MIPT) have discovered that the two-dimensional form of graphene might be the ideal material for manufacturing plasmonic devices capable of detecting even single molecules of explosive materials, toxic chemicals, and other organic compounds.

Looking forward to take Indian-Russian Relations in Science and Technology to new heights and this is possible by continued support from you and your valued team.

We hope our Newsletter facilitates identification of potential Russian partners by Indian organisations. Your queries on Russian S&T developments and suggestions for improving the impact of the Newsletter are welcome.

Dr. Abhishek Vaish

I. Bilateral / Multilateral Cooperation

1) India becomes Partner Country for Innoprom 2016

Indian Exposition Opening at INNPROM 2016 in Yekaterinburg.

International Industrial Trade Fair "INNOPROM" is annually held in Yekaterinburg since 2010. The main principles of INNOPROM are to organize a trade fair rooted in the priorities driving world industry and technology at present – and on the priorities that underpin Russia's program of industrial and manufacturing development, and to set out a platform for international cooperation.

On 11-14 Jul, 2016 the delegation from Republic of India participated as the Partner country of INNOPROM 2016led by Nirmala Sitharaman, Minister of State for Ministry of Commerce and Industry of India. Within the program of the main industrial exhibition in Russia, Indian participants managed to successfully represent both commercial and industrial resources of the state, and cultural parity among the Indian states. As the partner country India participated in three main formats: national exposition; business events and cultural program. The key event was the Russia-India Business Forum on Russia-India: New Industrialization and Industrial Cooperation.

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Bilateral meeting between Indian and Russian representatives at Innoprom 2016

The Indian exhibition spread over 3,700 m2 presenting 115 industrial companies, including those widely known in Russia (Sun Group, Heavy Engineering Corp Ltd, Grover International) and the ones new to Russian consumers and the international market. India booths demonstrated major products exported globally, such as IT, processing technologies and equipment, pharmaceuticals, chemical products, energy, machine building, machine building components, and industrial design. The national exhibition of the Republic of India attracted over 48,000 visitors during four INNOPROM days, including delegations from 95 countries, such as Japan, Germany,

Belgium, Finland, and other INNOPROM participants. India's exhibition was visited by Dmitry Medvedev, Prime Minister of the Russian Federation, Denis Manturov, Minister of Industry and Trade of the Russian Federation, and other distinguished guests.

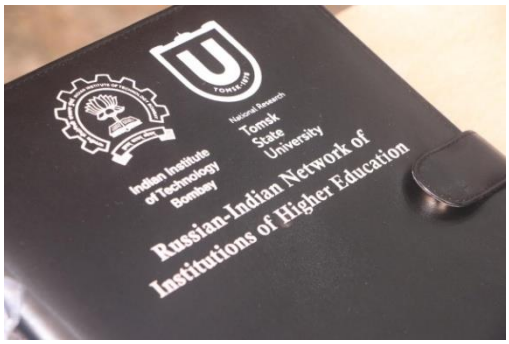
The Indian delegation at INNOPROM exceeded 400 official and business representatives. Chief Ministers of three major Indian states (Andhra Pradesh, Maharashtra, and Rajasthan) represented their country for the first time in the history of Indian and Russian relations.

On 12 Jul, 2016, within the framework of the event the meeting was held between AV Abramov, Head of Federal Agency on Technical Regulation and Metrology, and Alka Panda, Director General of Bureau of Indian Standards. The agenda of the meeting covered general issues regarding bilateral cooperation, in particular possibility of signing a Joint Work Program in the framework of implementation of the MoU on cooperation in the fields of standardization and conformity assessment between the Federal Agency for Technical Regulation and Metrology and the Bureau of Indian Standards.

One of the outcomes of India's participation in INNOPROM was the signing of mutually beneficial cooperation agreements between Russian regions and Indian states, including the bilateral Russian-Indian cooperation agreement between the Indian Business Alliance and Kaliningrad Region Development Corporation and the cooperation agreement between Sverdlovsk Region and Maharashtra state.

The large-scale participation of the Republic of India in INNOPROM-2016 as its Partner Country helped new small and medium Indian businesses to find their way to the Russian market and for the Indian companies working in Russia to strengthen their positions. More than 40 Indian companies expressed the desire to attend INNOPROM-2017.

b) Indian-Russian Network of Universities Expanded



A Network of Higher Education Institutions of the Republic of India and the Russian Federation (RIN) was launched on 8th May 2015 as a non-profit network that unites Indian and Russian Academic Institutes on a voluntary basis. The main objective of the Network is to deepen and strengthen mutually beneficial cooperation by combining efforts of the leading Academic Institutes of India and Russia towards training highly qualified staff for the innovative economy and strengthen scientific, technical and technological cooperation between the two countries.

Followed by a productive meeting of RIN members in February 2016, the number of Indian participants has increased by 10, and the number of Russian participants has increased by 3. As of now, RIN unites 20 Indian, 25 Russian participants. The list is as follows:

1. The Indian Institutes of Technology in Mumbai, Madras (Chennai), Delhi, Kanpur, Kharagpur, Roorkee, Guwahati, Hyderabad, Patna, Gandhinagar, Bhubaneswar, Ropar, Indore, Mandi, Jodpurand Varanasi.
2. Indian Statistical Institute
3. National Center for Biological Sciences

4. University of Delhi
5. Jawaharlal Nehru University
6. Lomonosov Moscow State University (Russian Coordinator)
7. Moscow Institute of Physics and Technology (MIPT)
8. National Research Technological University "Moscow Institute for Steel and Alloys" (MISiS)
9. National Research University "Higher School of Economics" (HSE)
10. National Research Nuclear University "Moscow Engineering Physics Institute"
11. Skolkovo Institute of Science and Technology
12. Bauman Moscow State Technical University
13. Saint-Petersburg State University
14. Saint-Petersburg National Research University ITMO
15. Peter the Great Saint-Petersburg Polytechnic University
16. Far Eastern Federal University
17. Kazan (Volga region) Federal University
18. Magnitogorsk State Technical University
19. National Research Tomsk State University
20. National Research Tomsk Polytechnic University
21. Lobachevsky State University of Nizhni Novgorod
22. Novosibirsk National Research State University
23. Novosibirsk State Technical University
24. Samara State Aerospace University
25. Ural Federal University
26. Pacific National University.
27. People's Friendship University of Russia
28. Russian Union of the Scientific and Engineering Organizations
29. Moscow Automobile and Road Construction University
30. Tyumen State Oil and Gas University

Strengthening of ties and continuous expansion of RIN reflect an overall growth in bilateral scientific relations between both the countries. RIN is open to newmembers who wish participate in the actively developing cooperation network.

c) New Russian Minister of Education and Science appointed.

Dr Olga Vasilyeva, new Minister of Education and Science.

On 19 Aug 2016 Russian President Vladimir Putin appointed Dr Olga Vasilyeva to the post of Russian Minister of Education and Science.

According to Russian Prime Minister Dmitry Medvedev, he has proposed to appoint Olga Vasilyeva to the post of minister on the basis of her proven track record and ability to implement new tasks. According to Medvedev, in order to bring the formulated ideas to life, new approaches and new powers are needed, and in a number of cases, new people.

From 1991 until 2002 Olga Vasilyeva worked at the Russian Academy of Sciences and began her professional activity as a teacher. In 2012 - 2013 she was Deputy Director of the Department of culture of the Russian government. In 2013 - 2016 she was Deputy Head of the Department of public projects in Russian Presidential Administration and oversaw issues related to the implementation of social projects in education.

Mr Alexey Lopanin, new Deputy Minister

In addition, Alexey Lopatin, Former Deputy Head of Federal Agency for Scientific Organisations, was appointed Deputy Minister of Education and Science. As the Ministry has seven deputy heads in charge of various fields of work, Alexey Lopatin is expected to use his broad experience to coordinate and control work of the Ministry with regard to innovative activities in the science-technological field; priority directions of science and technology; international integration and international cooperation in education and science.

d) FASO to Boost Innovation and Modernization of Scientific Institutions

Meeting of FASO-RAS Working Group. Left to right: Strelkov Oleg, Advisor to Head of FASO, Academician Aldoshin Sergey, Vice-President of the RAS, Aleksey Medvedev, Deputy Head of FASO.

Russian Federal Agency for Scientific Organizations (FASO) has adopted priority directions on development of research infrastructure. The pilot program for the modernization of centers for collective use and unique scientific installations includes the following areas: astrophysics and space research, nuclear physics and accelerators, supercomputing centers, as well as bioresource collections. The total program budget for 2016 is about 1.5 billion rubles, about half of which would be spent on repair of costly equipment. Modernization of instrumentation parks in directions" Astrophysics and Space Research" and "nuclear physics and accelerators" would also take place.

On 09 Aug, 2016, the working group on the development of innovative activity of scientific organizations governed by FASO has started work. In the first meeting a draft work plan was made and proposals on the concept of development of innovation were presented. The working group is chaired by the Alexey Medvedev, Deputy Head, and Academician Sergei Aldoshin, Vice-president of the Russian Academy of Sciences. Members of the group include directors of leading research institutes in the field of natural sciences, agriculture and medicine, as well as heads of structural divisions of FASO.

e) Russia Rises in Global Innovations Ranking

Russia ranked 48th in the 2016 Global Innovation Index (GII), just ahead of Chile and Costa Rica and immediately after the United Arab Emirates and Turkey. Russia has risen from the 56th place it occupied in 2015.

The Global Innovation Index (GII), published annually by the Cornell University, the INSEAD Business School and the World Intellectual Property Organization in partnership with other institutions, ranks 128 nations by their capacity for, and success in, innovation.

According to Moscow's Higher School of Economics experts, Russia's position reflects its high level of human capital and the accumulated capabilities for scientific research along with functional high technology sectors. Russia's gross domestic expenditure on R&D increased twofold in constant prices from 2000 to 2014 and now accounts for 847.5 billion roubles in current prices (roughly US$39.9 m). That brings Russia into the group of top 10 leaders in total government expenditure on R&D, a group in which USA is 1st (US$456.9 m), China is 2nd (US$368.7 m), the UK is 6th (US$44.1 mi), and Brazil is 8th (US$35.5 m).

f) Exchange Visits

Indian Scientists to Russia

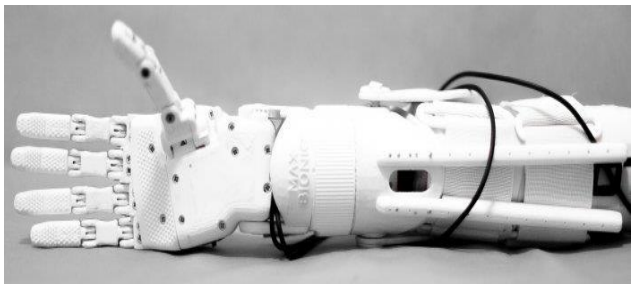
- Over 400 Indian official and business representatives visited Ekaterinburg during 11 – 14 Jul, 2016 to participate in INNOPROM 2016.

Russian Scientists to India

- Prof Dmitry Sokoloff, MSU, visited Shivaji University during 18 – 25 Aug, 2016 under GIAN Programme.

II. Science, Technology & Innovation in Russia.

1. Affordable Hi-Tech Prosthesis Created for Serial Production.



Cost-effective high-tech prosthetic arm, developed by Maksim Lyashko.

Siberian engineer Maksim Lyashko has developed a robotized prosthetic arm which is ten-to-a hundred times less expensive than the imported competition. The28-year-old inventor lost his own arm in 2013 working in a mine and took up the challenge to create a novel prosthesis all on his own.

His MaxBionic prosthesis is built around an open source idea. Unlike two plastic pioneering versions, his new one, a third, will be metal-based and is expected to become a serial product weighing 400 gm. The prosthetic arm consists of a control board, a number of electromyographic sensors, know-how finger drive system with self-blocking capability, and springy holding system. To keep an object elevated the finger does not require permanent motor operation, and if the object tends to slide off the arm, it clenches the thing even tighter. It takes a user about 10 min to customize settings.

Prosthesis parts can be printed out on a 3D printer, and the entire product will cost around $1,000 with electronics all included. Industrial imports typically cost anything between $25,000 and $250,000. According to Mr Lyashko, he had prepared all engineering drawings and technical requirements all on his own—that's why contracting component manufacturers saved him a lot of money.

Mr Lyashko has since gained an ambitious team of supporting staff. He is using a Russian crowdfunding platform to support his current product and a version for children aged 7-12, while simultaneously looking for foreign investors.

2. Siberian Scientists create "Immune System" for Computers

Researchers at the Tomsk State University of Control Systems and Radio Electronics (TUSUR) have developed an artificial intelligence system that is said to be able to use its own "brain" to pinpoint malware without relying on third-party antiviral products. The system, called "Adaptive Immunity for OS (AIOS)," is also reported to be smart enough to identify the maker of a virus by looking into its programming code. Scientists want to prove that sometimes it is the very IT security companies we expect to buy virus protection from that create viruses.

According to analysts, in Russia most users spend up to a hundred dollars a year on their computer protection. New viruses that threaten our computers' "health" pop up basically every month—evolving, self-learning, and changing their "behavior."

According to Mr Evgeny Garin, Head of TUSUR's intellectual property department, university polls have shown that 65% of users polled do not trust the existing antiviral solutions because of a reported lack of transparency in their operation. The security software can access all areas in the computer and external data carriers, which means accessing people's personal data.

Most of the popular antiviral solutions we use cannot recognize malware except the viruses that are already in their libraries, and therefore require regular updates. Until certain malware is found and registered in databases, it remains unnoticed.

The AIOS is built around the concept of identifying artificial intelligence elements in software products.

As per Mr Gagarin, the algorithms developed at TUSUR enable the specialists to analyze programming codes to see if the body of a virus can copy itself and manifest other signs of a self-regulating system similar to a living organism. The software can be likened to a real immune system. A conventional antiviral solution resorts to its maker's database to get "medicine" for a computer, and if the database has no remedy for this particular "contagion", the computer breaks down, as it has no immunity of its own. On the contrary, the AIOS can check programming codes for signs of malware, thus operating as an immune protection system.

The developers believe that in the future their artificial "immunity" will be able to recognize 100% of viruses. The new system is expected to help the scientists put together a library containing individual semantic "traces" programmers leave when creating malware. This will enable "virus busters" to not only follow the viruses in action and isolate them but also track down the makers of such programs for the law enforcement to take care of them.

The Siberian researchers are seeking agreements with the developers of Russian operating systems to build computers with their pre-installed "immunity." This is expected to protect end users against not only viruses but also unscrupulous IT security players, and spare the users the burden of spending on system updates on an annual basis.

The developers believe with the adaptive "immunity" domestic operating systems will be able to compete with the market flagships like Windows, Linux, Android, and iOS. The AIOS project has already been brought to the attention of several potential investors.

3. A Minimally Traumatic and Cheap Laser Scalpel developed.

Scientists from MIPT together with colleagues from Institute of Applied Physics of the RAS and company IRE-Polus have developed a novel compact and powerful ceramic-based laser. It is expected to be used as a minimally traumatic and inexpensive laser scalpel for surgical operations, and also for cutting and engraving composite materials.

The research team used a ceramic obtained from compounds of rare-earth elements – lutetium oxide with added thulium ions (Tm3+:Lu2O3). It was the thulium ions that enabled the ceramic to generate laser radiation. Researcher Dr Obronov explained that ceramics were chosen as a promising type of medium for lasers because they are produced by sintering powders into a polycrystalline mass. They are cheaper and easier to manufacture than single crystals, which is extremely important for serial production. In addition, it is easy to alter the chemical composition of ceramics, which in turn alters the laser properties.

The laser they have developed converts energy into radiation with an efficiency of more than 50%, while other types of solid state lasers have an average efficiency of approximately 20%, and it generates infrared radiation with a wavelength of about 2 microns (1966 and 2064 nm). The wavelength is what makes this laser so useful for medical purposes.

As per Dr Obronov, radiation from the most common infrared lasers, with a wavelength of about 1 micron, has very little absorption and penetrates deep into biological tissue, which causes coagulation and large areas of "dead" tissue. A surgical scalpel needs to "operate" at a very specific depth, which is why 2-micron lasers are used, as they do not damage underlying tissue.

According to him, doctors usually use 2-micron flashlamp-pumped holmium lasers, but these devices are very expensive, relatively bulky, and are not very reliable. Ceramic lasers have a significant competitive advantage; they are cheaper to manufacture, simpler and more reliable, and approximately four times more compact than holmium lasers.

Another potential application of ceramic lasers is the composite industry. Widely used 1-micron lasers are good at cutting metal, but polymers are practically transparent to them. A 2-micron ceramic laser, on the other hand, can effectively cut and engrave plastics, such as composite materials.

Dr Obronov concluded, that composites are increasingly being used to produce technological equipment such as aircraft. The wing of the new Russian MS-21 airplane is almost entirely made of composites. A ceramic laser could also be a useful tool for production industries.

4. New Air Purification Technology developed.

Researchers at the Moscow Lomonosov State University (MSU) have developed an innovative air cleaning technology to combat carbon oxide and many toxic substances in the atmosphere. For this, they have harnessed the untapped properties of nanomaterials and the sunlight.

Prof Elizaveta Konstantinova, the project leader and head of MSU's radiospectroscopy lab, has stated that the new technology may find wide air cleaning applications in public health and education facilities, at homes, and in industry. Brand new technology can reportedly accumulate no toxic substances. Impacted by titanium dioxide nanoparticles and the sunlight in the process of photocatalysis, the toxins are reported to be

fully decomposed down to innocuous elements like water and carbon dioxide.

According to the researchers, one of the goals they were pursuing was to retire the traditional UV lamp used for disinfection/decontamination. UV radiation is harmful to the human body, and to make these lamps inert gas and mercury vapor are used, which is expensive and also detrimental to the environment.

The new tech has got a Russian patent. Prof Konstantinova reckons that industrial filters using this innovative combination of titanium dioxide nanoparticles and the sunlight could be effective on 80% of the surface of the Earth, from the equator to Central Russia latitudes.

5. Scientists count Microscopic Particles Without Microscope.

A Russian-Australian research team put forward a simple new way of counting microscopic particles in optical materials by means of a laser. A light beam passing through such a material splits and forms a characteristic pattern consisting of numerous bright spots on a projection screen. The researchers found that the number of these spots corresponds exactly to the number of scattering microscopic particles in the optical material. Therefore, the structure and shape of any optical material can be determined without resorting to the use of expensive electron or atomic-force microscopy. According to the researchers, the new method would help design optical devices much faster.

A research team from ITMO University, Ioffe Institute, and Australian National University for the first time suggested analyzing the structure of photonic crystals using optical diffraction method, that is, by looking at the light pattern generated while the sample is exposed to a laser beam. The study showed that the number of these spots is equal to the number of scattering microscopic particles in the sample structure. Previously, such small particles could only be seen and counted with powerful and expensive electron or atomic-force microscopes.

According to Mikhail Rybin, Senior researcher at the Department of Nanophotonics and Metamaterials at ITMO University and first author of the paper, the light senses heterogeneity and, depending on the shape and relative position of the scatterers, the light wave continues to propagate differently behind the sample. In other words, the structure of the sample affects the diffraction pattern, which will be projected on the screen. As per Rybin, the researchers found out that looking at the pattern, it is possible to determine the precise number of scatterers in the material. This helps understand not only the type of the sample lattice (square, triangular), but also to establish its structure (20 to 20 particles, or 30 to 15) just by counting light spots on the screen.

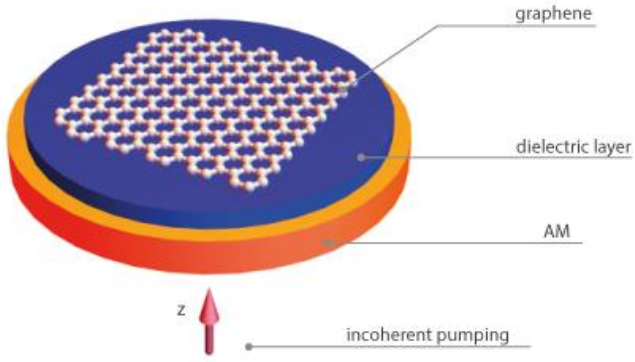
The new method is a much more affordable alternative to expensive electron or atomic-force microscopy and in this case, does not spoil the sample. According to Rybin, even an ordinary person can buy a laser pointer, adapt a small lens to focus the light better, fix the sample and shine a laser beam on it. In addition, their method makes it possible to study optical materials without changing their structure in contrast to electron microscopy, where the sample surface has to be covered with conductive metal layer, which impairs optical properties of the sample.

6. 'Sniffer plasmons' to Detect Explosives.

Physicists from the Moscow Institute of Physics and Technology (MIPT) have discovered that the two-dimensional form of

graphene might be the ideal material for manufacturing plasmonic devices capable of detecting even single molecules of explosive materials, toxic chemicals, and other organic compounds.

The development of active and passive plasmonic devices is challenging due to the high level of dissipation in normal metals. One possible solution to this problem is using alternative materials, such as graphene. In order to find out whether a detection technology behind plasmonic devices was feasible, scientists had to find a numerical solution to the relevant quantum-mechanical equations. This was accomplished by a team of researchers at the Laboratory of Nanostructure Spectroscopy headed by Prof Yurii Lozovik. Their research has led to development of a quantum model that predicts plasmonic behaviour in graphene. As a result, the scientists described the operation of a surface-plasmon-emitting diode (SPED) and the nanoplasmonic counterpart of the laser—known as the spaser—whose construction involves a graphene layer.



Design of the spaser with the graphene layer shown as a honeycomb lattice above the dielectric layer (blue). The spaser is optically pumped through the active (gain) medium shown in orange.

A spaser could be described as a device similar to a laser and operating on the same basic principle. However, to produce radiation, it relies on optical transitions in the gain medium, and the particles emitted are surface plasmons, as opposed to photons produced by a laser. An SPED is different from a spaser in that it is an incoherent source of surface plasmons. It also requires considerably lower pump power. Both devices would operate within the infrared region of the spectrum, which is useful for studying biological molecules.

According to Alexander Dorofeenko, one of the authors of the study, the graphene spaser could be used to design compact spectral measurement devices capable of detecting even a single molecule of a substance, which is essential for many potential applications. Such sensors could detect organic molecules based on their characteristic vibrational transitions ('fingerprints'), as the light emitted/absorbed falls into the medium infrared region, which is exactly where the graphene-based spaseroperates.

7. Advanced Underwater Robots for Estimating Bioresources developed.

Advanced underwater hardware systems to estimate marine biological resources have been developed by scientists of the Far Eastern Federal University (FEFU) and the Institute of Marine Biology FEB RAS. The project is aimed at monitoring, conservation and sustainable use of ocean resources.

According to Academician Andrey Andrianov, Head of Institute of Marine Biology FEB RAS, traditional estimation of biomass is conducted with the use of bottom trawls andbottom-grabs, which leads to death of a large number of marine organisms that fall under the study. To offer a better solution, the scientists have worked out a new technology. Their novel underwater robotic unit is able to analyze the biomass at any depth and any radius, at any temperature and for any demersal landscape. This enables the specialists to conduct realistic assessment of

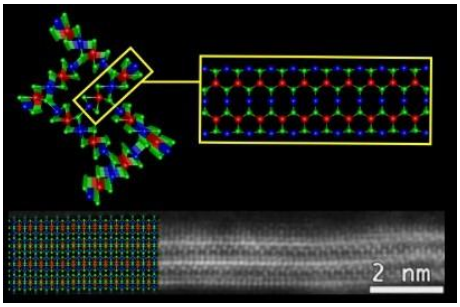
stocks of marine resources and to understand how much can be extracted without adverse effect for nature.

The robot moves over the sea bottom in the required direction and makes two video snapshots per second with the help of a video system. Then it automatically produces an overall image of the location of sea-urchins, starfish, mollusks and other objects. With the help of built-in scanning devices it can reportedly estimate the capacity, size and number of sea animals.

As per Adrianov, the use of their technology proved more advantageous and safer in comparison to existing analogues. The equipment has already been tested in several expeditions in the seas of the Russian Far East. The next expedition would be held in the deepest part of the northwestern Pacific, in the area of the Kuril-Kamchatka Trench, which reaches a depth of 10.5 km.

The research is supported by megagrant of the Russian Scientific Fund and additionally involves specialists from the School of Natural Sciences of the FEFU, the School of Biomedicine of the FEFU and several academic institutions.

8. New Single-Crystal Material for Electronics developed.



An experimental image and a theoretical model of nanowire Ta-Pd-Se with a diameter 2.1 nm. The foundation of the structure a separate nanowire Ta2Pd3Se8 as highlighted in a frame.

Scientists from National University of Science and Technology "MISiS", jointly with colleagues from the Tulane University of Louisiana, have created the world's first single-crystal semiconductor material with huge potential for use in microelectronics. The discovery was made possible through the use of micromechanical exfoliation, the method once used to discover graphene. The experimenters utilized a combination of tantalum, palladium/platinum and selenium, a synthetic material which was put together more than 30 years ago but had hardly ever been used until now.

It's not the first time scientists faced the task of developing a single-crystal semiconductor. Putting together such a material for use primarily in optoelectronics and microelectronics is expected to help boost capacity and lower the energy consumption of a great range of devices. According to researchers, reducing a material to nanodimensions gives it extraordinary electronic, optical, mechanical, chemical and biological properties.

Researchers from the Nonorganic Nanomaterials laboratory at MISiS were responsible for the theoretical part of the project, while experiments were mostly conducted at the Tulane University of Louisiana. The results of this unique research have been published in English in Nano Letters.

III. Profile of R&D Institutes and Industry in Russia.

1. Irkutsk State Transport University (IrGUPS)

Rector: Dr Andrey P. Khomenko
Address: Russia, Irkutsk, Chernyshevskiyst 15
Contacts: Tel: (3952)638-310; Fax: (3952) 387-746; Email: homenko@irgups.ru; mail@irgups.ru
Homepage: https://www.irgups.ru/en/nauka

Established in 1932, Irkutsk State Transport University is a Regional and Sectoral University Complex with branches in five subjects of the Russian Federation and one foreign branch in Ulan Bator (Mongolia). The main tasks of the scientific activities of the university is the development of existing and creation of new research directions based on modern methods of research through active innovation, training of scientific and pedagogical personnel.

University organizes and carries out fundamental and applied research, conducts experimental design, design and survey, research and consulting, expert analysis on a wide range of areas, including on rail transport and the problems of engineering education. The main direction of research - development and improvement of transport services and facilities of the transportation process in the East Siberian region.

- Dynamics of controlled technical systems;
- Technology simulation of complex technical and socio-economic systems;
- Analysis and synthesis of information and control real-time systems;
- Railway engineering and engineering systems in complex engineering-geological conditions;
- The transformation of the economic mechanism in terms of structural changes in the economy;
- Marketing and Logistics in managing the development of the region;
- Metallurgy and heat treatment of metals. Problems of increasing operational stability of steel;
- The electricity sector of transport systems: energy saving, modeling, control;
- Chemistry of compounds. Directed synthesis and structure determination of organic and organometallic compounds;
- Ecology (Environmental Engineering).

Irkutsk State Transport University supports and develops international partnerships with universities, research institutes and companies in China, Mongolia, Republic Of Korea and Switzerland to increase research at a high level as well as its position as a competitive technical research institution.U niversity welcomes research universities and institutions from India for joint research and development.

2. Irkutsk State Medical University

Rector: Dr Igor V Malov
Address: Russia, Irkutsk, Krasnogo Vosstaniya st 1
Contacts: Tel: (3952)638-310;
Fax: (3952)387-746; Email: malov@irmail.ru
Homepage:
http://www.ismu.baikal.ru/ismu/news.php

Irkutsk State Medical University is one of the elite medical universities in Russia, located in the Eastern Siberia and the Far East. The University is located in Irkutsk city, it is the administrative center of Irkutsk Region. Since 1994 the University has been accepting international students from all over the world. From the date of establishment in 1919 until the present day, the University has trained more than 70000 highly qualified specialists and famous scientists. Irkutsk State Medical University is recognized by World Health Organization (WHO).At present the list of specialties is as follows:

1. General Medicine
2. Pediatrics
3. Medico-prevention Management
4. Dentistry
5. Pharmacy
6. Nursing and Care Management
7. Medical Biochemistry

The structure of Irkutsk State Medical University consists of 7 institutes, 54 departments, 14 laboratories. In the 54 departments of Irkutsk State Medical University works 300 Professors, 270 Doctors and 215 Candidate of Science. There are 18

city hospitals comes under the Irkutsk State Medical University which means student can gain good practical skills along with theoretical knowledge as well. Irkutsk State Medical University provides accommodation in 4 hostels which are fully, equipped with internet and basic necessities.

Irkutsk State Medical University is one the best University in Russia (Russian Federation), holds 4th position in Russia and 34th rank in among world's 100 top Universities. Degrees of Irkutsk State Medical University is acceptable World Wide including MEDICAL COUNCIL of INDIA (MCI), USMLE and UK PLAB as well, which means graduate of Irkutsk State Medical University can work anywhere in the World without any hindrance.

Irkutsk State Medical University is an ideal place for those students who wants to pursue their career in MEDICINE or MEDICINE related fields. Irkutsk State Medical University is consider to be one of economical university in terms of studying and living cost. In Irkutsk State Medical University yearly fees and living charges are affordable which is good for those desirable and promising students who are looking for MEDICAL UNIVESITIES in Russia within their budget. Fees is mentioned below according to the courses:

The University has been cooperating with India since 1980s. In the period from 1993 to 2012 98 Indian citizens have received education. At present 12 undergraduate students and 3 PhD students study at the university. The University cooperates with Kerala Institute of Medical Sciences(KIMS) in the field of medical education and research. Priority directions of cooperation are academic mobility of students and professors, exchange of medical specialists, conducting joint research projects, preparation of joint research thesis under joint guidance, conducting joint conferences and symposia, short-term undergraduate and practical trainings in KIMS.

3. Irkutsk National Research Technical University (INRTU)

Rector: Dr Aleksandr Diomidovich Afanasev
Address: Russia, Irkutsk, Lermontov str.83
Contacts: Tel: (3952)405-100;
Fax: (3952)405-009;
Email: oms@istu.edu; rector@istu.edu
Homepage: http://www.istu.edu/structure/53/

Irkutsk National Research Technical University is one of Russia's largest and best technical universities; it was founded in 1930. The university comprises ten institutes, seven faculties, two technical schools and one college. Over 17,000 students study at INRTU for a degree in 98 areas of specialization (78 Bachelor's degree programs, 15 specialist degree programs, 57 Master's degree programs, 67 postgraduate degree programs and 15 secondary vocational education programs). In 2010 the University was awarded the category "National Research University" and receives additional considerable federal funding for its R&D activities what will help the University to ensure its positions as one of leaders of Russian higher education.

Priority areas of research at INRTU include:

- High-performance technologies for subsoil management;
- High-tech, high-performance technologies for production of machines and equipment;
- High-tech life support systems for urbanized and sparcely populated areas;
- Nanosystems and nanomaterials industry.
- The University today is a dynamically developing higher educational establishment; it represents the brightest sample of a high-level university complex with well-developed infrastructure, management system,

scientific and productive environment as well as with multi-level educational system.

4. Tyumen Industrial University (IUT)

Rector: Dr Oleg Aleksandrovich Novoselov
Address: Russia, Tyumen, Volodarskogo St 38
Contacts: Tel: +7(3452)28-36-69; E-mail: gordiev@tsogu.ru

Industrial University of Tyumen (IUT) joins Russian-Indian Network of Institutions of Higher Education (RIN) to establish cooperation with Indian universities in the areas of academic mobility and scientific research.

IUT is one of the biggest engineering universities in Russia; it provides a wide range of opportunities for education. In the University, you can study 34 Bachelor's Degree courses and 21 Master's Degree courses in the fields of petroleum engineering, geology, mechanical engineering, chemical technology, technosphere safety, transportation processes, informatics, architecture and construction, civil engineering, etc.

IUT has the modern research infrastructure with more than 20 various laboratories with cutting-edge equipment, subarctic scientific training ground, experimental drilling equipment plant, "Neftegazproekt" research and design Institute (that provides full design and exploration works cycle in the field of arrangement of oil and gas fields),small innovative enterprises (that operate in the field of oil and gas production, electronics, mechanicalengineering, tool engineering, laser technologies), "Geo-navigation in drilling oil and gas wells" engineering center, etc.

The University has strong cooperation ties with the large companies, such as Rosneft, Gazprom, Gazpromneft, Transneft, LUKOIL, Weatherford, Halliburton International, Schlumberger, Baker Hughes, CUPET, NIS, SIBUR, etc. The cooperation covers the areas of students and personnel training, scientific cooperation in the sphere of scientific research, and industrial implementation of advanced technologies developed by the University.

5. Pacific National University

President: Dr Sergei N Ivanchenko
Address: 680035, Russia, Khabarovsk, Tihookeanskayast136
Contacts: Tel: (4212)72-07-12; (4212)73-40-03; Fax: (4212) 72-07-12;
Email: SBurkov@mail.khstu.ru

Pacific National University (PNU) is one of the largest universities in the Russian Far East. Established in 1958, the university today trains over 21000 students in 54 majors and employs more than 900 people of the teaching staff, including about 540 doctors. The University pursues all-round development of fundamental and applied R&D in priority areas of science and technology. The University is also a member of Indian-Russian Network of Universities (RIN).

The main areas of research include:

- Research in mathematical analysis, differential equations and the theory of functions;
- Numeric modeling of problems in the field of continuum mechanics and geophysics;
- Study of the interaction of electromagnetic radiation and matter;
- Standardization and quality control of products;
- Measuring and computing and management tools and systems for information processing, information systems and technology, design of automated information systems for various applications;
- Research in the field of nuclear physics;

- Technology innovation and entrepreneurship;
- Research and development of computer-aided design facilities of new technology and process engineering, construction, chemical and forestry sector;
- New materials and technologies for their production and use;
- Improving the design and manufacturing processes to improve quality, reliability and durability of machines and mechanisms;
- More efficient use of vehicles and improvement of their performance;
- Design of industrial and civil buildings and structures;
- Problems of management and organization of production;
- Research and development of technologies for harvesting, deep processing of wood and biomass and restoration of forest reserves;
- Research, design and development of technologies for the construction and operation of transportation facilities;
- Environmental problems of nature and the environment.

More than 20 internationally recognized scientific schools were established at PNU. The University has made and continues to make a significant contribution to the development of science in the Far East. In recent years scientists of PNU have produced world-class results in the fields of theoretical physics, magneto-optics, laser technologies, microprocessor technologies, non-destructive testing of new materials, law and many others. There were also created Mathematical Models, Algorithms, Software Tools of Submerged Images Processing, and there investigated the Effect of a Nanosecond Electromagnetic Pulse Irradiation on Physical Properties of Alloys. Many applicative developments of the university are being actively introduced into production. The results of research projects are actively implemented in the industry of the region. Technologies of using the Far Eastern raw mineral materials for the production of new materials are developed and are actively used. Beneficial effects on the economy take place thanks to the applied research in the field of information technology, the development of modern methods of construction and operation of transportation facilities, machinery and metallurgy. Three employees of the university have been awarded with Prize of the Government of the Russian Federation in the field of science and technology.

Annually more than 600 scientific papers which cover the results of PNU scientific research are published in leading Russian and foreign journals and paper collections of international conferences. Continuous development of material and technical basis of the university and use of modern scientific equipment contributes to the increase of research effectiveness. There are more than 20 laboratories, more than 20 Scientific-Educational and Engineering Centres and two students' Design Engineering Bureau at PNU. The University teams of researchers actively participate in various competitions for conducting researches within the framework of the Federal Target Programs, Scientific and Technical Programs, Grants in different scientific fields (grants and programmes of Federal Agency for Education and Federal Agency for Science and Innovation, The Russian Foundation for Basic Research).

PNU maintains fruitful relations with more than 120 foreign partners from 21 countries. The most contracts were signed with countries of the Asia-Pacific region and especially the bordering countries: China, Japan, Republic of Korea, Korean Democratic People's Republic. Other countries include Germany, Italy, France and USA. PNU cooperates with universities, research centres, production companies and administrative bodies. The University is engaged in active

international cooperation in scientific and educational programmes, exchanging of faculty members and students, joint research projects, carries out scientific and technical conferences. The university scientists take part in international conferences and symposiums in China, USA, Japan, Portugal and other countries. In May 2015 PNU became a participant of the Network of Higher Education Institutions of the Republic of India and the Russian Federation.

6. Bach Institute of Biochemistry of the Russian Academy of Sciences

Director: Dr Popov Vladimir Olegovich
Address: 119071, Moscow, Leninsky prospekt 33/2
Contacts: Tel: +7(495)952-34-41; +7(495)954-52-83, Fax: +7(495)954-27-32; E-mail: vpopov@inbi.ras.ru ; dzantiev@inbi.ras.ru ; inbi@inbi.ras.ru;
Website: http://www.inbi.ras.ru/index-e.html

The Bach Institute of Biochemistry, the first biochemical institution affiliated with the Academy of Sciences, was organized in 1934. Its founders were the outstanding scientists – Academicians Alexey Nikolaevich Bach and Alexandr Ivanovich Oparin. The main objectives of the Institute are related to research into the biochemical foundations of vital processes and application of the basic results obtained to production. The history of the Institute is tightly associated with the formation and development of scientific foundations of food, medical, microbiological, vitamin, enzymatic, and other branches of industry in Russia and abroad. AN Bach Institute of Biochemistry has become well-known for the theory of life origin, the discovery of ATP activity of myosin, decoding of molecular mechanisms of solar energy transformation under photosynthesis, the development of the theory foundations of globular protein structure, the development of biochemical genetics foundation, the prediction of information RNA existence and the discovery of informosomes, the creation of sub-cell structure biochemistry, the studies in the field of plant biochemistry and nitrogen fixation, the discovery of actin and myosin in all eukaryotic cells that resulted in the discovery of cytoskeletal structures, the creation and implementation of new biotechnology.

Biotechnological developments of the Institute have found wide application in the national economy, yielding considerable benefits. These works brought highest governmental and scientific awards to their authors - the Lenin Prize, State Prizes of the USSR and the Russian Federation, the Prize of the Government of the Russian Federation, the Lomonosov Golden Medal, and other prizes, decorations, and medals of the Russian Academy of Sciences, named after prominent scientists, as well as scientific prizes of foreign countries.

The Institute plays an vital part in organizing and developing of Russian biochemistry. The institute regularly holds home and international conferences and symposiums. It has taken part in organizing the All-Union Biochemistry Society and the International Scientific Society researching the life origin. At present, the Institute is actively involved in training scientific personnel, including students, postgraduates, and researchers working for the doctorate degree. The Institute specialists were given the honorary titles of foreign universities and rewarded with the governmental and academic premiums. Together with Moscow State University, institutions such as the People's Friendship University of Russia, Moscow State University of the Food Industry, and other institutions of higher education and scientific educational centres have been organized; over 100 students and postgraduates are involved in their work.

The Institute pays much attention to innovative activities. Among the latest developments of the Institute, a highly efficient microbiological technology for

purification of ventilation discharges from toxic volatile compounds is worth noting. The gas-cleaning systems designed using this technology are successfully exploited in Russia, the UK, and South Korea. Immunosensor systems for ecological monitoring and medical diagnostics have been developed. Diagnostic kits for the detection of drugs and early diagnostics of phenylketonuria have been designed and introduced into practice.

The Institute comprises 22 research laboratories with the expertise in the fields of

- Enzymology;
- Structural biology;
- Biochemistry of phytoimmunity;
- Immunobiochemistry;
- Photosynthesis;
- Molecular mechanisms of motility;
- Environmental biochemistry and biotechnology;
- Analytical biochemistry, biosensors/diagnostic kits;
- Biotransformations;
- Proteomics of human muscles tissues.

Major industry oriented projects include:

- Bioreactor - a novel type of biotrickbing filters, a specially designed hardware containing a consortium of immobilised natural micro-organisms that removes from air emissions an impressive number of VOCs;
- A novel jne-step synthetic route of photochemical synthesis of Ca-folinate used for cancer and anemia treatment;
- Development of synthetic vaccine against latent tuberculosis caused by Mycobacterium tuberculosis;
- Development of DNA diagnostic kits for inherited myopathias;
- Development of immunosensors and immunodiagnostic kits for ecological monitoring and healthcare;
- The technology to substitute synthetic formaldehyde containing toxic resins in the process of manufacturing of wood chipboard by natural binders produced by partial destruction of wood polymers by strains of basidiomycetes;
- The microbial technology for obtaining of biodegradable polymer beta-oxybutyrate with production over 90% of the polymer.

The research performed at the Institute is supported by domestic and international grants and foundations, namely, programmes of the Presidium of the Russian Academy of Sciences and grants of the Russian Foundation for Basic Research, Russian Ministry of Education and Science, Government of Moscow, INTAS, INCO-Copernicus, CRDF, NATO, Welcome Trust, ISTC, and others. A lot of attention is paid to the usage of the obtained fundamental results in applied work: for example, in agriculture, medicine, food industry and various biotechnology and ecology directions.

The Institute collaborates with many foreign institutions through implementation of joint projects, including European Laboratory for Molecular Biology, German National Research Center for Environmental and Health Research, and University of Bochum, and Technical University of Berlin (Germany); University of Stockholm and Lund University (Sweden); Institute of Biological Sciences of the University of Wales and the University of Kent (UK); Institute for Food and Nutrition Research, University of Bologna, and Center for Magnetic Resonance (Italy); Institute of Environmental Chemistry (Spain); Swiss Institute of Technology; University of Jerusalem (Israel); Agricultural University of Athens; and University of California in Davis and Carnegie Mellon University (USA).

Nowadays the Institute represents a blend of expertise and youth, a unanimous team of like-minded people, and a tremendous intellectual potential. Combining the research into most topical problems in biochemistry with innovative activities, the Bach Institute creates a new impetus for

further development. As to the future, the Institute is optimistic and ready to respond to all challenges of science of this century.

IV. Forthcoming Workshops and Conferences in Russia

1. International Conference "MDMR 2016 — Modern Development of Magnetic Resonance 2016"

Date: 31 Oct - 04 Nov, 2016
Place: Kazan, Russian Federation
Coordinator: Prof Alexey A. Kalachev, Chairman
Contacts: Tel: + 7(843)2319096; Fax: +7(843)2725075; Email: mdmr@kfti.knc.ru; a.a.kalachev@mail.ru;
Website: http://kfti.knc.ru/mdmr/2016/

Topics would cover: perspectives of magnetic resonance in science and spin technology; theory of magnetic resonance; low-dimensional systems and nano-systems; electron spin based methods for electronic and spatial structure determination in physics, chemistry and biology; molecular magnets and liquid crystals; spin-based information processing; strongly correlated electron systems; chemical and biological systems; medical physics; magnetic resonance imaging; other applications of magnetic resonance; modern methods of magnetic resonance; magnetic resonance instrumentation; related phenomena.

2. V International Conference for Young Scientists "High Technology: Research and Applications-2016" (HTRA-2016)

Dates: 05-07 Dec, 2016
Place: Tomsk, Russian Federation
Coordinator: Ms Ekaterina Kulinich, Organiser
Contacts: Phone: +7(3822)606-175;Email: hightech@tpu.ru;
Website:
http://portal.tpu.ru/science/konf/hightech/eng

Tomsk Polytechnic University cordially invites students, PHD students and young scientists to take part in the conference. Six Conference sections include: Technology of new-generation materials and nanomaterials; Optical technologies; Organic chemistry and biotechnology; Rational use of mineral and water resources; Problems of reliability in mechanical engineering and machine engineering technologies; Simulation of physicochemical processes in modern technologies.

3. International conference "Anosov Systems and Modern Dynamics"

Dates: 19-23 Dec, 2016
Place: Moscow, Russian Federation
Coordinator: SM Aseev, Chairman of the Organising Committee
Contacts: Email:anosov80@mi.ras.ru ;
Website: http://www.mathnet.ru/eng/conf812

The conference is dedicated to 80th anniversary of Dmitry Anosov (1936-2014). It is focused on areas where D.V. Anosov worked — and first of all, on hyperbolic dynamics, for which he was one of the founding fathers.The conference program will include invited plenary talks and a poster session (open call).

4. International Conference Geometric Analysis and Control Theory

Dates: 08-12 Dec, 2016
Place : Novosibirsk, Russian Federation
Coordinator: Dr. D. Isangulova, Chairman
Contacts: Email: geomcontrol@math.nsc.ru; geomcontrol@gmail.com ;
Website:http://gct.math.nsc.ru/?event=geometric-analysis-and-control-theory-rus&lang=en

Arising complicated applied problems in physics, technology and economics require creation of new fundamental concepts of (sub)riemannian geometry and geometric analysis, and inventing new methods to solve them. The aim of the conference is to provide an opportunity for both experts and young researchers to discuss their results and to start new collaboration. Topics of conference include: Analysis on metric structures;

Calculus of variations; Geometric control theory; Geometry of vector fields and hypoelliptic equations; Sobolev spaces and geometry of mappings; Riemannian geometry in the large.

5. X International IEEE Scientific And Technical Conference "Dynamics of Systems, Mechanisms and Machines" (Dynamics)

Dates: 15-17 Nov, 2016
Place : Omsk, Russian Federation
Coordinator: Dr Vladimir Liholobov, Member of Program Committee
Contacts: Tel/Fax: (3812)653536;
Email: dynamics2016@omgtu.ru;
Website: conf.ict.nsc.ru/Dynamics-2016/en

The conference will be held in Omsk State Technical University. The aim of the conference is to provide the platform for Students, Engineers, Researchers and Scientists to share the knowledge and ideas in the recent trends in the field of systems, mechanisms and machines dynamics. The Conference has five areas of research:

1) Research area 1: Mechanics and mechanical engineering; Dynamics Of Machines; Transportation, aircrafts and space systems; Production technology of machines, machinery production equipment;
2) Research area 2: Radio engineering systems and devices; Instrument making; Electronics; Information and Telecommunication Technologies and Information Security;
3) Research area 3: Energyand Electro Technical Complexes and Systems; Thermal and Low-Temperature Processes;
4) Research area 4: Nanotechnologies and Nanomaterials; Physical and Chemical Processes and Systems;
5) Research area 5: Mathematical and Computer-Aided Modeling.