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SAMARA POLYTECH
Flagship University

TECHNOPOLIS OF THE VOLGA REGION

popular science edition

TOP DIGEST 2017

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popular science edition

TOP DIGEST 2017

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Editorial director: Dmitry BYKOV

Editor-in-chief: Olga NAUMOVA

Associate editor-in-chief: Maxim EREMIN

Translation reviewer: Victoria DOBROVA

Designer: Victoria LISINA

Photography editor: Antonina STETSENKO

Advertising manager: Elena SHAFERMAN

TEXT AND PRODUCTION

Svetlana EREMENKO, Eugenia NOVIKOVA, Ksenia MOROZOVA, Nelly LEONOVA, Evgeniy NEKTARKIN

ADDRESS OF THE PUBLISHING HOUSE:

244, Molodogvardeyskaya Str., main building, Samara, Russia 443100
Telephone: +7(846) 278-43-57, 278-43-11
E-mail: tehnopolis.63@yandex.ru
Web page: www.samgtu.ru

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Dmitry Bykov, Rector of a flagship university, Honorary Figure of Russian Higher Education, chief editor of the journal Technopolis of the Volga region

Dear colleagues!

Samara Polytech is on a strong track as a Flagship university in 2017, and its profile has been significantly raised at the international level. In the world's top professional ranking of universities, RankPro® 2016/2017, which includes 600 world's best universities, Polytech has 27th position among 44 Russian higher educational establishments. In addition, our university was included into the prestigious rating of QS BRICS and has 147-th position. The top-rated list includes 300 leading educational establishments in Brazil, Russia, India, China and South Africa.

Strengthening of SSTU reputation attracted more foreign citizens. More than 560 foreign students are studying here now, and we expect there will be more in the near future.

Polytech's participation in the XIX World Festival of Youth and Students, held from October 14 to 22 in Sochi, had an absolutely surprising effect. At the Robotics Pavilion our university introduced "Larifuga - Wanderer" of the original design. The Forum passed but the name of Samara Polytech continues to echo throughout the world. Russia and the entire world are interested in the history of "Larifuga". The invention of Polytech's designers Anton Rakov and Julia Ratieva became extremely popular not only among visitors of the Exhibition but all over Russia. TV Channel RussiaToday (RT), TASS News Agency broadcasted it all over the world. British newspaper DailyMail compared this model of walking architecture with the "hut" of Baba Yaga.

There are obvious breakthroughs in the field of research and development. For example, our scientists under the supervision of Yakov Klebanov, Professor, head of the Department of Mechanics, created a new way to control the mirror surface in space telescopes for correction of distortions and improvement of the image clarity. The invention has been already patented in Russia and the USA.

Also this year, Polytech's researchers have developed an innovative control scheme for the lock check gate. Specialists of the Department of Electronic Systems and Information Security invented a method for cargo delivery to the international space station using multi-agent technologies.

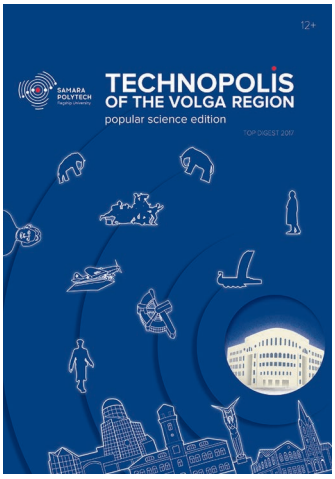
By the way, the use of such technologies is a new approach to resource control in real-time. It is fundamental in the creation of water-air fleet of robots designed to monitor the marine area. This project is carried out in cooperation with the research and production company Network-centric Platforms and has good prospects in view of the technological challenges of the modern era.

So, Technopolis of the Volga Region provides information about our achievements, remarkable people, innovations, discoveries and prospects. It has been published since 2014 for friends and partners of the university. We invite everyone to benefit from publications as an open media platform for strengthening friendly ties and mutually beneficial cooperation.

editorial text

advertising

new section



ALL TOGETHER

SCIENTISTS DISCUSSED ENVIRONMENTAL CONDITIONS

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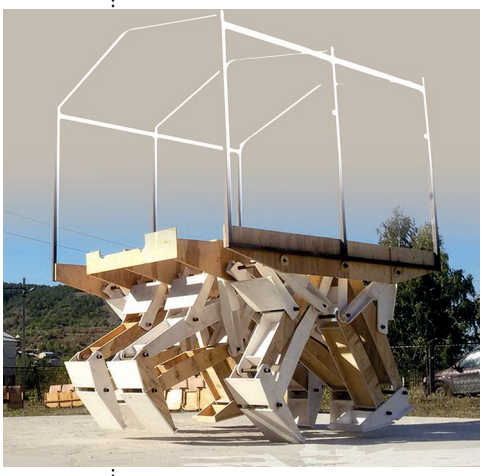
GREAT PROJECT REVOLUTION – 2017

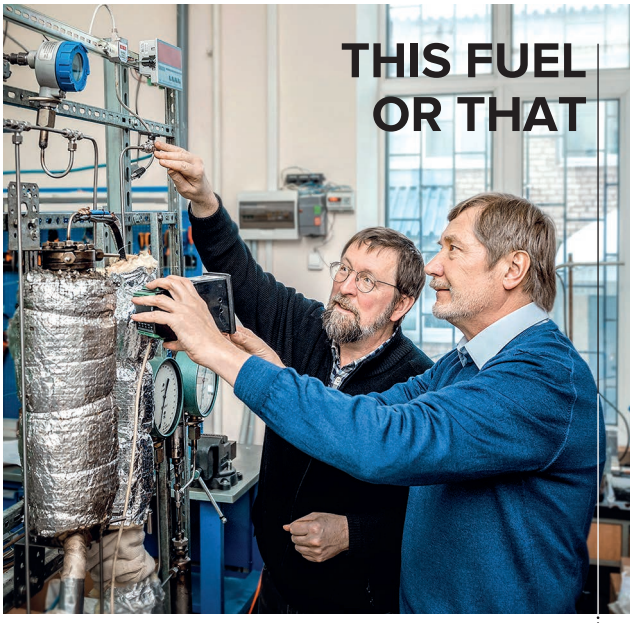
THE IMPLEMENTATION OF STRATEGIC PROJECTS IN A FLAGSHIP UNIVERSITY IS IN PROGRESS

BRIDGE BETWEEN SWITZERLAND AND RUSSIA

ALONG THE SILK ROAD

FORWARD, MARCH!





THIS FUEL OR THAT

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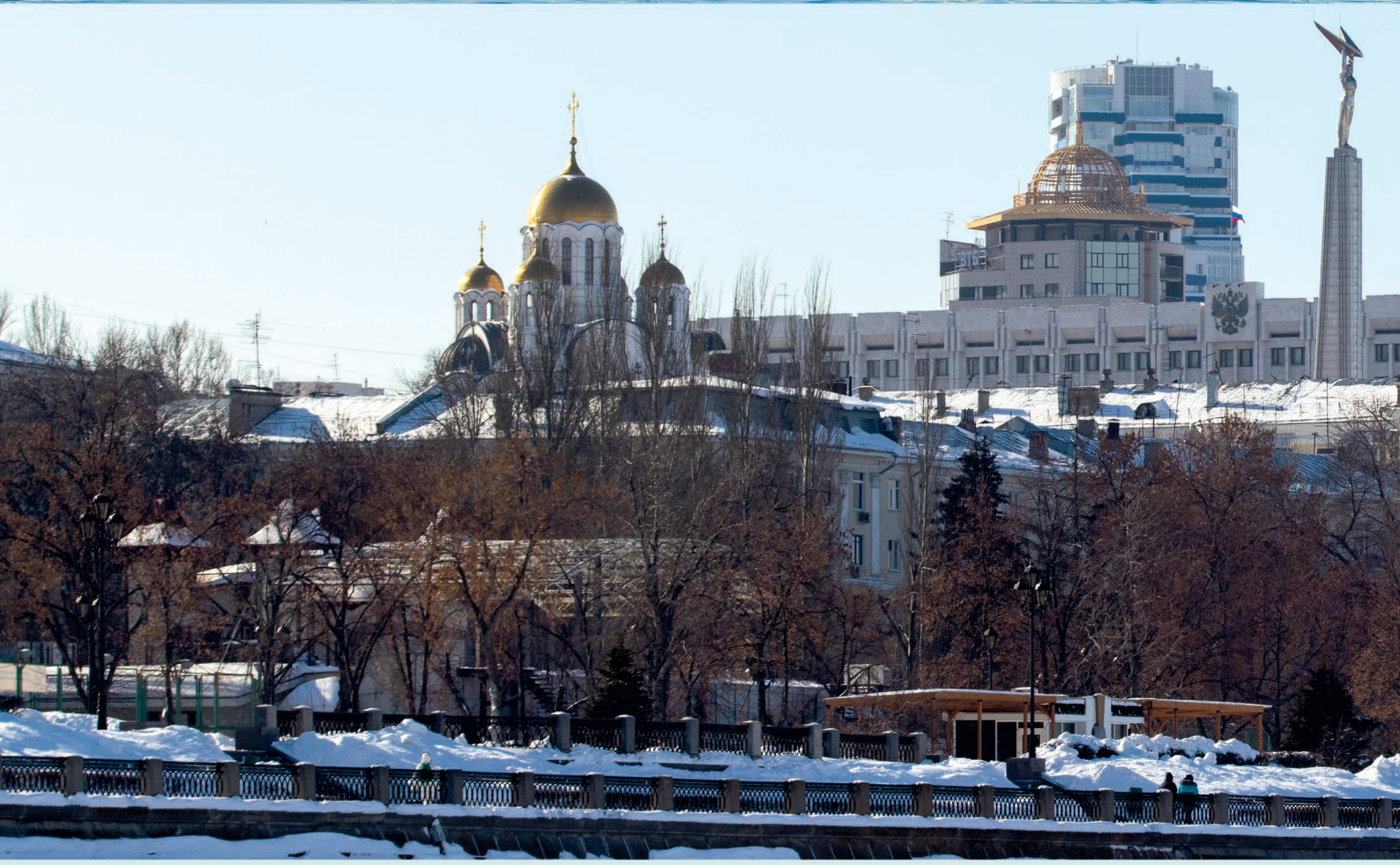
PROJECTS AND POST-PROJECTS

PAWS, RIBS AND SCALE

SAMARA



SAMARA

POLYTECH AND THE WORLD IN 2017

PERI SPECIALISTS HELD WORKSHOPS AT POLYTECH

PERI, one of the world's largest suppliers of formwork and scaffolding systems, and a flagship university agreed to hold a series of training workshops for Polytech's students in April 2017.

PERI specialists have been building huge constructions in the USA, Singapore, Australia and in more than 90 countries. In the Russian market PERI started with the construction of a Cancer Center in Samara in 1993. Successfully implemented projects of the company in Russia include a bridge across the Golden Horn Bay, skyscrapers in Moscow City, sports facilities for the Olympics in Sochi-2014. The Polytech's graduates of the Faculty of Industrial and Civil Engineering are among the employees of the PERI branch in the Volga Federal District.

NEW ACADEMIC PARTNERS

At the II Forum of Universities of Russia and Azerbaijan held in Ufa on May 18 and 19, bilateral agreements between Russian and Azerbaijan universities were signed. Samara Polytech signed cooperation agreements with Azerbaijan Technical University and Mingyachevir State University. "A flagship university should develop international contacts, especially with universities of the post-Soviet space,"- said Olga Yusupova, vice-rector for academic work at Polytech. "Our mentality and education systems are similar". The Republic of Azerbaijan has promising construction and architectural universities and schools, as well as universities specializing in Oil Engineering. We can share our experience and are ready to develop academic mobility programs.

The Association of Russian-Azerbaijan Universities was established in 2015 in Baku in order to create and implement joint educational programs and distance forms of training. The co-chairmen of the association are Ufa State Petroleum Technical University and Sumgait State University.

Photo by Tatiana Melichova

STUDENTS OF THE SPECIALTY CUSTOMS IN POLYTECH WERE RECOGNIZED AS BEST AT THE I-CUSTOM CONFERENCE

In March, SSTU hosted the selection stage of the International Youth Conference “i-CUSTOMS”. There were 20 presentations in English performed by students from several cities of the Volga region. The students from Polytech and Saratov Chernyshevsky State University were the best.

The next stage of the conference will take place in May 2018 in St. Petersburg. The best reports will be presented at the World Conference organized within the framework of the Partnership in Customs Academic Research and Development (PICARD) in Tunisia.

In 2016 the Volga Regional Directorate of the International Youth Conference “i-CUSTOMS” headed by the dean of the Faculty of Heat Engineering, Konstantin Trubitsyn, and the Volga Regional Group of the International Association of Students of Customs Specialties ICSA were established in Polytech. This was made possible by close cooperation between SSTU and St. Petersburg ITMO University.

FOREIGN COLLEAGUES VISITED POLYTECH

On May 26, a delegation from the Polytechnic Institute of Braganca (Portugal) visited our university. Joaquim Leite, Professor of the Department of Economics, and Hose Eduardo Fernandez, Professor of the Computer Science Department discussed development options for scientific, technical and academic cooperation with Andrey Pimenov, vice-rector for International Cooperation of Samara Polytech, and Nikolai Gubanov, dean of the Faculty of Automation and Information Technologies. Foreign colleagues were interested in interdisciplinary projects and innovative developments of our university.

On May 29, a delegation from Taipei-Moscow Coordination Representative Commission on Economic and Cultural Cooperation (Taiwan) visited Polytech. Members of the delegation spoke about universities and industrial enterprises in Taiwan and visited the Department of Foreign Languages, the Mineralogy and Geology Museum, laboratories at the Department of Chemical Technology of Oil and Gas Processing and at the Faculty of Food Production.

More news on our web-site samgtu.com

POLYTECH AND THE WORLD IN 2017

SAMARA POLYTECH
Flagship University

UNIVERSITY IMPROVED RATING INDICATORS

Samara State Technical University is included into top-600 universities according to Worldwide Professional University Rankings – RankPro 2016/2017. Our university has 27-th position among 44 Russian universities. Worldwide Professional University Rankings RankPro 2016/2017 is issued by the International Council of Scientists (ICD Group, Ltd.) within the worldwide program Global World Communicator – GWC. The rating is based upon three components: - Academic ranking (academic possibilities of a university) - Ranking by BC-Index (information availability on a university website (English version) - Public ranking (national and worldwide university reputation).

INCLUDED IN QS BRICS-2018 RATING

Samara Polytech was included in the prestigious international rating of QS BRICS universities for the first time and has 147-th position. The top-rated list includes 300 leading universities from Brazil, Russia, India, China and South Africa. QS BRICS-2018 rating took into account 8 different indicators including faculty/student ratio, proportion of staff with PhD and employer reputation from Global Survey.

OUR SCIENTIST MADE A PRESENTATION AT THE INTERNATIONAL CONGRESS IN BULGARIA

Dmitry Pashchenko, Associate Professor of the Department of Industrial Heat Power Engineering made a presentation at the 13th National Congress on Applied and Theoretical Mechanics. The Conference was held from 6 to 10 September at the Institute of Mechanics and Biomechanics of the Bulgarian Academy of Sciences in Sofia. The research of our scientist was about the numerical study of synthesis gas combustion in the ANSYS Fluent software environment and about some aspects of creating a computer model of the human cardiovascular system and its integration with telemedicine services. Researchers from 30 countries presented the results of their scientific work in the field of fluid mechanics and solids, biomechanics, CFD modeling.

SAMARA POLYTECH'S STUDENT BECAME A PRIZE WINNER OF THE UNIVERSIADE

A fourth-year student of the Faculty of Heat Engineering Alexander Kudashev, a world-class athlete, participated in the 2017 Summer Universiade in Taipei as a part of the Russian national swimming team. He won bronze in 4 × 200 meters freestyle relay, and silver in 4 × 100 m medley relay. According to Natalia Zavyalova, the coach of Politech's swimming team, Alexander covered his favourite distance - 200 m butterfly very steadily and only at the finish he lost to the Japanese athletes.

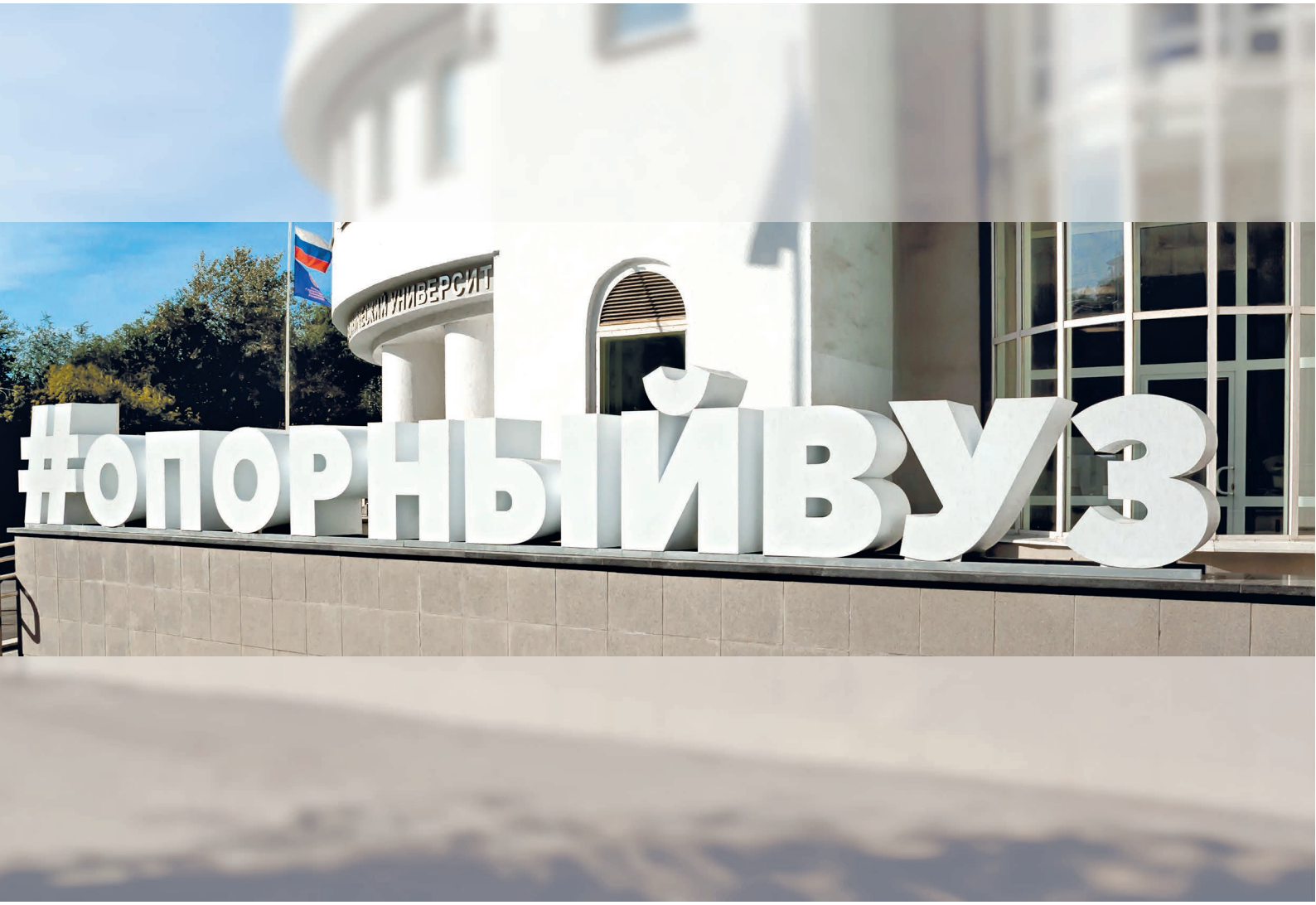
STARTUP VILLAGE WAS INTERESTED IN SAMARA POLYTECH'S STARTUP

From 6 to 7 June 2017, at the International Conference Startup Village held at the Skolkovo Innovation Center, a team from a Samara flagship university presented an agricultural project. It included an agro-portal and a mobile application for drones providing panoramic shooting to monitor the state of agricultural land and collect data on crops.

According to the project manager Denis Budayev, a large number of agricultural producers have showed their interest in the novelty.

TALK TO HISPANICS

In late November, an international videoconference with Latin American-Russian Association for Higher Education ALAR from Peru was held at Polytech. Jorge Cieza de Leon, director of ALAR, greeted the participants and had a talk to Polytech's students from Egypt, Nigeria, Bolivia, Turkmenistan, Iraq, Peru, South Korea, Jordan, Colombia, Venezuela, Mongolia, Ecuador, Indonesia, Lebanon and Yemen. All these students are listeners of the Center of additional training for foreign citizens. They talked about the training opportunities on programs available in the Samara flagship university and discussed the prospects for cooperation between Samara State Technical University and ALAR.


#ОПОРНЫЙВУЗ

GREAT PROJECT REVOLUTION – 2017

THE IMPLEMENTATION OF STRATEGIC PROJECTS IN THE FLAGSHIP UNIVERSITY IS IN PROGRESS

The idea of strategic projects is one of the main “springs” of the university development program until 2020. A unique navigation system appeared a year ago and was translated into seven strategic projects including “Constructor of competences. Interdisciplinary project teams”, ”Educational hub in the region”, “Technology design holding”, “Communication platform – 2020”, “Development and approbation of system-wide transformational events”, “Technology polygon” and “Territory of life”.

Realization of each of them will bring the university closer to the main goal - to start technological elite training. Their qualification and engineering advances will contribute to the growth of industries and quality of life in the Samara region. “Technology polygon” and “Territory of Life” received financial support from the federal budget in the amount of 80 million (within the framework of the program for the development of a flagship university), as well as co-financing from the regional budget and the university funds.

- DEVELOPMENT AND IMPLEMENTATION OF NEW METHODS FOR THE RECOVERY OF CONTAMINATED AREAS

- CREATION AND IMPROVEMENT OF THE TECHNOLOGY OF EDIBLE FOOD FILM MAKING WITH GIVEN PROPERTIES

- IDENTIFYING BIOACTIVE SUBSTANCES TO DEVELOP NEW MEDICINES

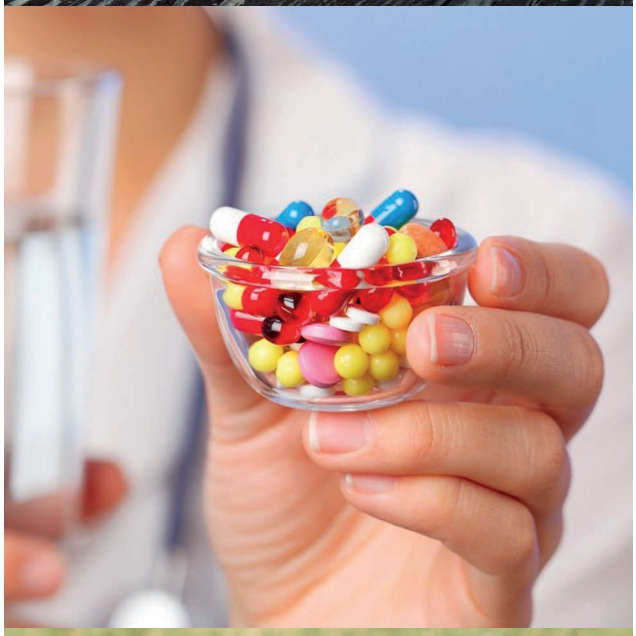
TERRITORY OF LIFE

OBJECTIVE: To create a system of lasting improvement of people's quality of life on the basis of science-intensive environmental, pharmacological and food technologies.

PROJECT MANAGER: Olga TUPITSYNA, Doctor of Technical Sciences, Professor at the Department of Chemical Technology and Industrial Ecology

The university is developing a system of lasting improvement of people's quality of life. Scientists from Polytech are researching antioxidant, antimicrobial and anti-inflammatory activity of plant raw materials in the Samara region. The project also involves creation of new technologies for production of medicines for treatment of socially significant diseases, development of methodology for producing composite edible films and creation of an operational monitoring system of the environment.

Top 3 events



Top 3 events

- **IMPROVING THE TECHNOLOGY OF DETONATION SPUTTERING OF NANOPOWDERS TO CREATE WEAR-RESISTANT COATINGS**

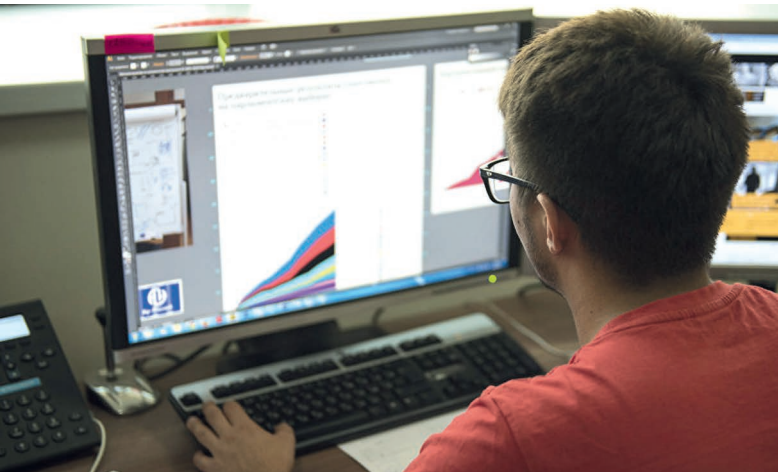
- **TRAINING SPECIALISTS IN THE FIELD OF COMPUTER ENGINEERING AND DESIGN INCLUDING ADDITIVE TECHNOLOGIES AND REVERSE ENGINEERING**

- **POPULARIZING SCIENCE**

TECHNOLOGY POLYGON

OBJECTIVE: to develop a flagship university as a resource center to ensure the creation of innovations.

PROJECT MANAGER: Dmitry DEMORETSKY, Doctor of Technical Sciences, Professor, head of the Department of Technology of Solid Chemicals



By 2020, Polytech should become a resource center for innovations. It is the platform for creation, approbation and implementation of future technologies where the competences of scientific, industrial and engineering companies of the region are united. Schoolchildren, students, representatives of different professions and social groups are involved in science. The results of basic and applied research in the field of materials science, mechanics, machine building, power engineering, electrical engineering, information technology, environmental protection, construction and architecture have been going global.

TOWARDS BREAKTHROUGH SOLUTIONS

NEW INTERDISCIPLINARY RESEARCH TEAMS HAVE BEEN FORMED IN POLYTECH

Text: Evgeniya NOVIKOVA

SIX TEAMS HAVE BEEN FORMED FOLLOWING THE RESULTS OF THE SECOND CONTEST OF INTERDISCIPLINARY PROJECTS THAT HAS TAKEN PLACE IN POLYTECH THIS SUMMER AS PART OF THE PROGRAM FOR THE FLAGSHIP UNIVERSITY DEVELOPMENT. GROUPS OF CROSS-SECTIONAL SPECIALISTS GOT FINANCING FOR MAKING INNOVATIONS IN PRIORITY BRANCHES OF SCIENCE AND TECHNOLOGY. ANOTHER TEAM HAS BEEN FORMED IN SEPTEMBER OUT OF COMPETITION - ITS MEMBERS WILL BE ENGAGED IN SERIOUS ENVIRONMENTAL PROBLEMS AND THEIR SOLUTIONS.

MAKING A DIGITAL MODEL OF THE CARDIOVASCULAR SYSTEM

AMONG THEM – 9 STUDENTS

LIFE OF THE PROJECT: 2 YEARS

13 MEMBERS

BRANCHES OF SCIENCE: POWER ENGINEERING, MATHEMATICAL MODELING, COMPUTER ENGINEERING, MEDICINE

An interdisciplinary project team led by the Associate Professor of "Industrial Heat Engineering" department **Dmitry Pashchenko** will create a competence center for computer engineering and digital production. The pilot project of the team will be the construction of a digital model of the cardiovascular system. In the context of computer engineering and computational fluid dynamics, the heart is a membrane pump, the vessels are flexible pipelines, and the blood is an incompressible fluid. Ideally, the model should turn out to be simple and accessible, so that everyone could run an application on a smartphone and after measuring the pulse, see a digital analogue of their cardiovascular system. Both consultants and experts on medical issues and the staff-members of the Center for Cardiovascular Surgery named after A.N. Bakulev will take part in the work of the team. Scientists from the Samara State Medical University will be invited to take part in the project implementation.

Dmitry PASHCHENKO, Candidate of Technical Sciences, Associate Professor of "Industrial Heat Power Engineering" department:

- Figure is the thing of the future. The implementation of the project will, in particular, improve the diagnosis of cardiovascular diseases. People will be able to get a visual digital copy of their cardiovascular system, and doctors will have an accurate history of its condition. Also, specialists will have a large amount of data that can be integrated with other services. Of course, we will not leave it only at medicine. Computer engineering can be applied in all sectors of the economy. The slogan of our team is: "Everywhere you can imagine"

Dmitrii Pashchenko hopes that with the successful implementation of the idea the model will be able to integrate with one of the telemedicine services, for example "Yandex. Health".

By the way, while a new center is in the process of getting started, the interdisciplinary team is not sitting on its hands. Now Dmitry and his students are working on several tasks from sidelines of science and technology. For example, the members of the interdisciplinary project team (IPT) develop a digital model for the dispersion of combustion products from the chimneys and the methodology for assessing the impact of these emissions on nearby residential buildings. This problem is now relevant for the microdistrict Yuzhniy Gorod, where next to the new school there is a boiler house, the pipes of which are at the same height with the upper floors of the educational institution.

INSTALL THE COMPLEX FOR DETERMINING THE QUALITY OF THE ALLOY

Head of “Information and Measuring Technology” department **Ekaterina Yaroslavkina** leads a team of specialists developing the information and measuring system in the field of nondestructive testing. The members of the interdisciplinary team will start with a complex for improving the quality of aluminum alloys in the casting process. Then in plans - “to run the system” in the iron and steel enterprises and adapt it to alloys from other metals.

The process development unit will allow predicting the size of grains, cracks, slag nodules and voids in aluminum by acoustic emission (measurements of acoustic waves that spread in an elastic medium-alloy).

Ekaterina YAROSLAVKINA, Candidate of Technical Sciences, Head of “Information and measuring equipment” department:

- Currently available complexes determine grain size on cut ingots physically. Our system will allow us to make alternations and achieve a more reliable design, significantly saving resources. The prototype installation has been developed on our department and has already been tested at the metallurgical plant. We have agreements on the implementation of the system at the enterprise and on co-financing the works.

With the help of the complex, an analytical database with the characteristics of alloys in the liquid state will be created. This will allow comparing them with the results of metallographic analysis of solid cast products. On the basis of the dependence “liquid - solid” it will be possible to predict the quality of the alloy, which will allow, if necessary, correcting the technology of preparation of liquid-alloys for casting.

The team is expecting to receive part of the test data on the basis of the Samara Metallurgical College - two of its students are part of the interdisciplinary project team. Two students also included in the number of participants are from the Samara University and one is from the Samara State University of Economics.

WE USE NEURAL NETWORKS IN COMPUTER VISION SYSTEMS

LIFE OF THE PROJECT: 2 YEARS

6 MEMBERS

BRANCHES OF SCIENCE: AUTOMATION, PROGRAMMING, COMPUTER-AIDED LEARNING

Vyacheslav KUZNETSOV, Master of Science in Mechanization, Automation and Power Supply of Construction:

- Our goal is to create a flexible and powerful machine vision system with the use of neural network algorithms. They can be used, for example, in warehouses of finished products. The system could identify the objects and automatically transport them. We will make a warehouse layout on a 3D printer to demonstrate the principle of the technology on it. In general, the scope of its application is very extensive. Our technology will scale the system if necessary. In addition, it can be controlled from mobile devices.

Vyacheslav Kuznetsov, master's degree student of Polytech, believes that enterprises incur unreasonably high expenses when introducing computer vision systems into production. It's about computer technology that can detect, track and classify objects in different ways. Vast sums of money are spent for purchasing, maintenance and service of equipment for these systems. The human factor complicates the matter: people with different experience, opinions and competencies work at enterprises, and technology companies are not tending to develop common industrial standards in the market. As a result, well-designed systems are often introduced into production through self-made "crutches". And if large companies are still able to cope with this, for the medium and small-sized business it is impossible to afford work process automation due to the labor and funding shortage.

Master's Degree student Kuznetsov is confident that his interdisciplinary team will be able to design a universal and easy-to-maintain machine vision system that could work on undemanding equipment. Vyacheslav suggests using neural network algorithms to create a technology that allows making effective calculations due to self-learning.

WE CONSTRUCT A FLAT GAS CYLINDER

AMONG THEM – 4 STUDENTS

LIFE OF THE PROJECT: 3 YEARS

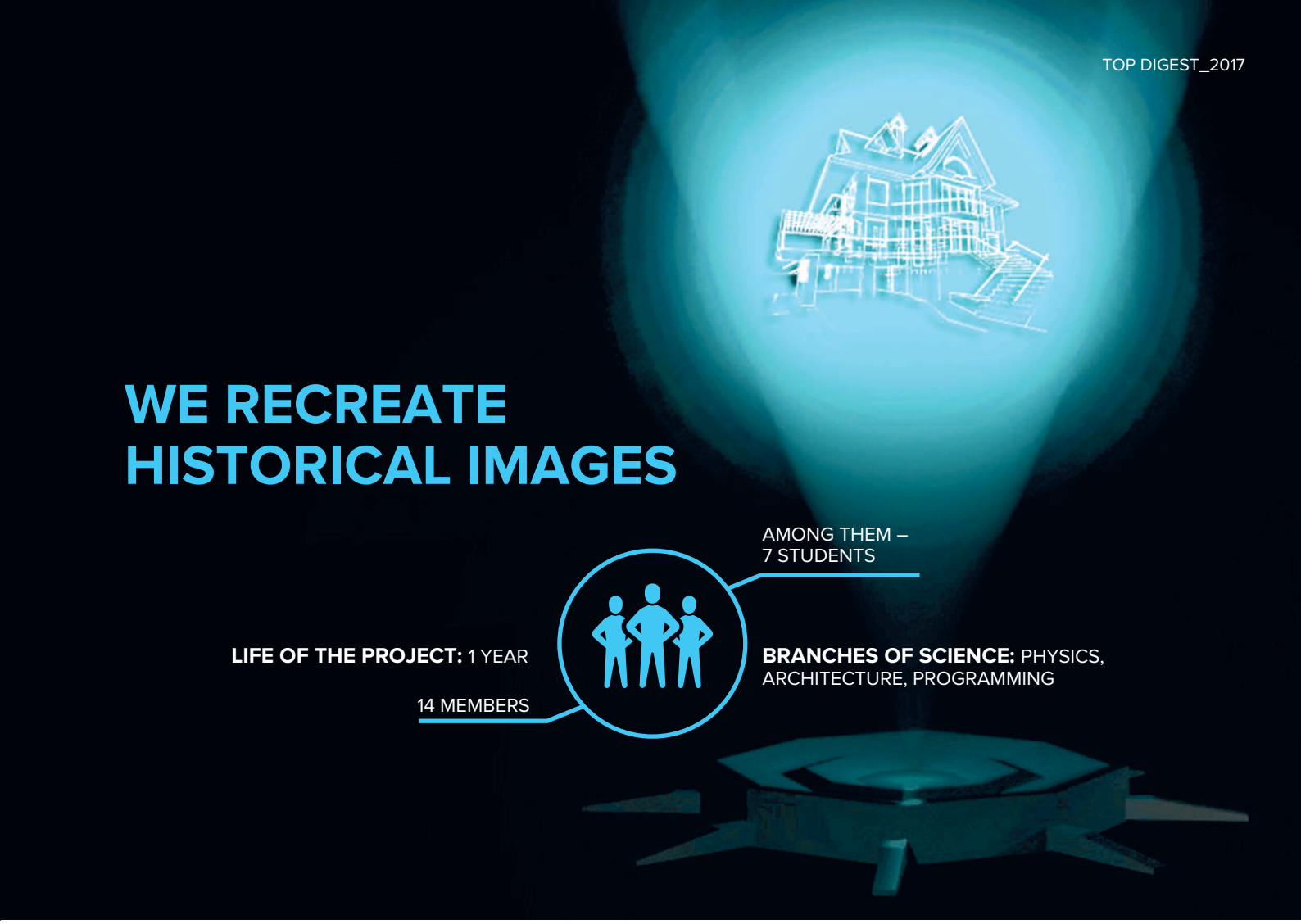
BRANCHES OF SCIENCE: METALWORKING, 3D-MODELING, COMPUTER ENGINEERING

6 MEMBERS

The implementation of the project under the supervision of an engineer of the center of prototyping and reverse engineering **Sergey Yemelianov** will make life easier for motorists first of all. An interdisciplinary team is working on the technology of creating flat gas cylinders that will save up to 60 percent of space in the luggage compartment of the car. As a material for the cylinder, aramid, resin and aluminum will be used. The prototype will be created by experts of the center of prototyping and reverse engineering. The product may be of interest to owners of air drones, boats, military equipment, as well as tourists.

Sergey YEMELIANOV, an engineer of the center of prototyping and reverse engineering:

The number of consumers of gas fuel is increasing by 13-15% per year. But the existing cylinders are uncomfortable, unaesthetic and unsafe. Our cylinder will exactly repeat the shape of the luggage compartment, it will be half the weight and four times stronger. Note that the idea has an analogue of Australian production, but the cost of this product is high, and it is not certified in the market of Europe and CIS countries.



WE RECREATE HISTORICAL IMAGES

AMONG THEM – 7 STUDENTS

LIFE OF THE PROJECT: 1 YEAR

14 MEMBERS

BRANCHES OF SCIENCE: PHYSICS, ARCHITECTURE, PROGRAMMING

Mikhail SYARDIN, Director of OOO" Novaia Stroitelnaia Kompania" (New Construction Company):

- Holography is used in engineering, medicine, art and other fields. But there is no holographic construction of objects in the urban environment in world practice. This method will convey the meaning and significance of any architectural idea to general public.

According to **Mikhail Syardin**, full-size holography of objects in the urban environment will be a powerful tool in working with the population in the process of urban design.

Students from the department of Architecture and the department of Automation and Information Technology take part in his project. According to the dean of "Automation and Information Technology" department Nikolay Gubanov, for implementing such an ambitious idea, technologies that are commonly used for laser shows, 3D projections on facades of buildings (the so-called 3D-mapping) and other visual effects will be tested.

The main difficulty an interdisciplinary team is going to face is the size of objects for holography.

At the first stage, it is planned to include in the curricula of students and graduate students special courses related to the development of various elements of these technologies: analysis of fragments of urban planning environment of Samara, 3D modeling of urban environment development facilities, 3D printing of these objects. Then the team will create a layout - a fragment of the urban environment on a scale of 1: 500 and will look for cases of embodiment of the invention.

The result of the work will be the technique of holographic modeling of a structure in a real environment with the maximum approximation to reality. It will also give an opportunity to revive, at least partially, the lost architectural heritage of the city.

WE DESIGN THE URBAN ENVIRONMENT

AMONG THEM – 15 STUDENTS

LIFE OF THE PROJECT: 2 YEARS

18 MEMBERS

BRANCHES OF SCIENCE: ARCHITECTURE, ANTHROPOLOGY, ECONOMICS, SOCIOLOGY

Professor of “Innovative design” department **Evgeniya Repina** and head of the department of the General layout of the Samara city department of construction **Alexander Gnilomedov** conduct the process of creating a laboratory for urban environment design “City code”. The laboratory staff will develop a typology and concept of urban environment objects, as well as new educational programs in the corresponding field.

The team will begin its work with pilot replicable projects for different yards. The results of this work will form the basis for a catalogue of solutions or standards for the environment formation, a document that residents, activists, designers and officials can use as a guidance manual. The team also plans to develop an effective concept of Polytech campus integrated into the urban environment, as well as engineering and construction projects for prefabricated construction. In future, the laboratory can become an open urban architectural center on the basis of the flagship university.

Evgeniya REPINA, Professor of “Innovative Design” department:

- The main idea is to create such a space that will respond to the demands of the middle class, local active population, cultural, scientific and business elite, students and professionals in various fields of activity. In other way, Samara will lose real opportunities to become a national leading city.

ENVIRONMENTAL REMEDIATION

LIFE OF THE PROJECT: 3 YEARS

8 MEMBERS

BRANCHES OF SCIENCE: GEOLOGY, GEOPHYSICS, ECOLOGY, CHEMISTRY, OIL AND GAS BUSINESS, PETROCHEMISTRY

Dmitry BYKOV, Doctor of Technical Sciences, Professor, Honored Worker of the Higher School of Russia, Member of the Russian Eco-Audit Chamber:

- This is a clear task for both the enterprise and the university with scientific and practical results and funding. On top of all of that it is a creative project; decisions are to be made under harsh conditions.

According to the agreement reached between the Rector of Politech **Dmitry Bykov** and the Director of Novokuibyshevsk oil refinery **Vitaly Zuber**, the seventh interdisciplinary team under the leadership of **Olga Tupitsyna**, the professor of "Chemical technology and industrial ecology" department, is being formed in the flagship university. Specialists of the university will work on the development of technology for the elimination of environmental damage caused to the territory of the enterprise, with the simultaneous extraction of hydrocarbons from the polluted geologic environment. It is planned to do this without excavating the soil on the surface, using the methods of reagent treatment and washing. The composition of the washing liquor will be developed taking into account the geological, physical and hydrodynamic features of the oil shows. The efficiency of their action and the forecast of the change in the location of the lens (build-up of waste in the soil) will be evaluated by a special facility purchased by the university as part of the program for the development of a flagship university.

SIX DIMENTIONS OF SCIENCE AND PRACTICE

ON AUGUST 23 - 25, II INTERNATIONAL SCIENTIFIC AND PRACTICAL CONFERENCE “INTEGRATED ENGINEERING IN OIL AND GAS PRODUCTION: EXPERIENCE, INNOVATION, DEVELOPMENT” WAS HELD

Text: Alexandra ISHIMOVA

THE FORUM WAS ORGANIZED BY ONE OF THE LARGEST DESIGN INSTITUTES OF THE COUNTRY “GIPROVOSTOKNEFT” JSC. THIS YEAR, OIL AND GAS PRODUCING COMPANIES, SCIENTIFIC AND TRAINING CENTERS, EQUIPMENT SUPPLIERS, AND SOFTWARE DEVELOPERS WERE INVOLVED IN ITS WORK - SEVENTY ORGANIZATIONS FROM SIX COUNTRIES ALL OVER THE WORLD. DURING THE CONFERENCE, FOR THE FIRST TIME AN ONLINE BROADCAST OF REPORTS WAS CONDUCTED, WHICH WAS WATCHED BY ALMOST NINE THOUSAND PEOPLE. SCIENTISTS AND GRADUATES OF SAMARA POLYTECH TOOK AN ACTIVE PART IN THE EVENT.

SCIENCE

Leon Grigoryan, Professor, Doctor of Engineering, held a presentation of a resource-saving oil treatment unit. The development reduces the material and energy losses during oil purification from corrosive impurities, and also eliminates the loss of useful components in the production of fuels. Two such upgraded facilities operate on deposits in the Orenburg region. Currently, the project is being implemented in Otradnoye.

Alexey Podyachev, Candidate of Technical Sciences, Associate Professor of “Drilling of Oil and Gas Wells” department, spoke about the method of improving the quality of information for constructing one-, three-, four-dimensional geomechanical models of the wellbore in order to reduce costs in their construction and development:

- With the help of our model, it is possible to obtain more accurate information about the deposit and give a forecast about its operation. The data obtained are analyzed by programs developed at the university. The model was tested in the Samara region in Samaraneftegaz JSC and in western Siberia at RN-Purneftegaz LLC. A number of experiments and comparisons have been carried out at one of the most complex territories in terms of geology. Today we are organizing a specialized center that will conduct a full range of similar studies.

Polytech graduate **Irina Dolzhikova** presented the development of the “General physics and physics of oil and gas production” department. The project offers optimization of well operation technologies with the help of mathematical modeling to remove laydowns and prevent their formation. The developed module makes it possible to calculate the parameters of heating the well with various types of cables and the options for their placement.

Leading researcher - the main expert of field development in Giprovostokneft JSC, Candidate of Technical Sciences, Associate Professor of Polytech **Galina Kovaleva** spoke about horizontal wells in terrigenous highly-permeability formations saturated with high-viscosity oils.

The Candidate of Technical Sciences, Associate Professor of the “Drilling” department **Victor Gnibidin** examined ways to improve tools for managing the efficiency of well construction. To do this, the scientist has developed methods for assessing and distributing unavoidable risks.

PRACTICE

The head of the department of PJSC Gazprom Neft Rinat Ismagilov stated that experts consider the decline in world oil prices to be a natural process and do not predict their new growth. So, profits in the industry will depend only on efficiency. This, in turn, is impossible without new technologies and engineering approaches to the development of marginal deposits with tight and heavy oil. Mining companies need mobile modular solutions for technical tasks, including complex oil and gas production. For efficiency, high speed of designing and implementing projects, digital transformation of databases between customers, designers, suppliers and within companies are also significant.

and freezing can be predicted at the design stage, which will prevent additional operating costs. The effectiveness of the developments was confirmed by the experience of their implementation in the projects for the company "Vietsovpetro" in the fields of the Central Khoreyver Uplift.

Leading engineer of JSC "Giprovostokneft" **Pavel Bryukhanov** reported on the project of arrangement of the Kuyumbinskoye field, where the specialists of the design institute together with the equipment suppliers found new ways to improve the quality of the pipe

Chief Project Engineer of JSC "Giprovostokneft" **Vladimir Yatsenko** spoke about the new experience of using polymer-reinforced flexible pipelines in one of the largest modern deposits in the Krasnoyarsk Territory. He noted the validity of using a material that is more expensive than metal to shorten the terms of commissioning:

"You can quickly build a pipeline system with it." The volume of material on one drum allows running to two and a half kilometers of the highway. The corrosion resistance of the polymer is also advantageous.

Alexander Nikolaev, head of the laboratory for the study of oil emulsions of Giprovostokneft JSC, presented options for solving problems in pumping paraffin-containing and rheologically complex oil. The risk of its self-suspension covering due to the constant need for their heating.

Vitaly Smyslov, the head of Zarubezhneft JSC direction, the Candidate of Physical and Mathematical Sciences, told about the competitive advantages of Russian developments in the oil and gas industry for entering the Iranian projects. He identified the exchange of technologies as one of the most important areas of cooperation between Russia and Iran in the field of oil and gas business. Among the topical issues were the problems of using electric centrifugal pumps in oil production, dumping

Vladimir NOZHIN, General Director of Giprovostokneft JSC:

- Formation of competent technical tasks is an important problem that customers and project organizations have to solve within the framework of equal partner relations. It is necessary to work out new technologies of interaction at all stages of implementation of capital construction projects.

(level 6D). In 3D, energy projects are already being ordered, in 4D - the company Gazprom and the state corporation Rosatom. To effectively manage assets, more complex models will be required.

These and other reports of specialists from Giprovostokneft demonstrated the current state of the Institute's developments, the relevance of which was confirmed by customers and colleagues from the design and scientific centers of Samara, Moscow, Kazakhstan, Tyumen, and Vietnam. At present, Giprovostokneft JSC is working on new projects commissioned by Gazprom and Novatek. In the long term, the experience of Samara designers can be in

and disposal of bottom water, organization of autonomous energy supply systems, as well as re-engineering and cluster approach to development, that is, combining the deposits into groups to obtain a synergistic effect.

FUTURE

In the conditions of the fourth industrial revolution, special attention is paid to the development of IT-technologies.

"In the next three to four years," says **Ekaterina Puzhanova**, director of engineering at the Russian Project Management Center for the PMSOFT Group of Companies, "all projects except for real-time changes will need to include a description of the deadlines (this is a 5D level characteristic), as well as a list of necessary equipment

demand in Iran's fields. The head company Giprovostokneft JSC Zarubezhneft signed a memorandum of understanding with the National Iranian Oil Company (N.I.O.C.).

GIPROVOSTOKNEFT

ALL TOGETHER

SCIENTISTS DISCUSSED ENVIRONMENTAL CONDITIONS

Text: Kseniya MOROZOVA, Evgenia NOVIKOVA

FROM SEPTEMBER 20 TO 24, THE INTERNATIONAL ENVIRONMENTAL CONGRESS ELPIT-2017 WAS HELD AT SAMARA POLYTECH. OVER 1,000 SCIENTISTS AND PRACTITIONERS FROM RUSSIA, ITALY, PORTUGAL, FRANCE, THE CZECH REPUBLIC, GREECE, LATVIA, UKRAINE AND KAZAKHSTAN TOOK PART IN IT. THE CONGRESS PUT A PREMIUM ON THE FACT THAT IT WAS HELD IN THE YEAR OF ECOLOGY AND PROTECTED AREAS.

Highly-topical programme of the congress included symposiums, international roundtable discussions, an exhibition of technologies and equipment in the field of ecology and life safety and other thematic events.

The leaders of top companies, well-known Russian and foreign scientists started off the congress and the first plenary assembly. Thus, **Bernard Sonilak**, Vice-President of AvtoVAZ PJSC for industrial services, noted that the company is a long-standing partner of the congress, because supporting environmental conferences is an important point in the work of the Renault-Nissan and AvtoVAZ alliance on environmental protection.

Gennady Rosenberg, a famous Russian scientist, corresponding member of the Russian Academy of Sciences, made a landmark report at the first plenary session. He talked about ways to improve the Volga. A permanent member in the ELPIT congresses is a professor at the University of Florence, president and technical director of Vie En.Ro.Se. Ingegneria **Dr. Sergio Luzzi**, in turn, shared ways to create comfortable landscapes and sound scales in urban areas.

Ksenia TUTUKOVA, Master of Science in Chemical Technology and Industrial Ecology:

- I am engaged in research of biosorption mixtures for effective oil utilization in places of oil spills. They not only neutralize the soil, but also activate it, have an organic origin, so do not require recycling.

He explained the essence of the European approach, whose main task is to improve and ensure the comfort of the territory as a whole, and not to reduce the negative impact of certain environmental factors. **Fabien Gaultier**, an engineer of the company “Renault”, presented modern methods of energy saving in industrial buildings.

V Innovative Forum of Young Scientists YOUNG ELPIT closed the Congress. Young scientists from nine regions of Russia and from Italy took part in it. Among the winners are our undergraduate **Kseniya Tutukova** and postgraduate student **Dmitry Peregudov**.

- It is great that the Congress is a real holiday for young researchers. Perhaps, it will become a start in a big scientific life for future scientists, said **Andrey Vasiliev**, Doctor of Technical sciences, Professor, Head of “Chemical Technology and Industrial Ecology” department.

Dmitry PEREGUDOV, postgraduate student of “Chemical technology and industrial ecology” department:

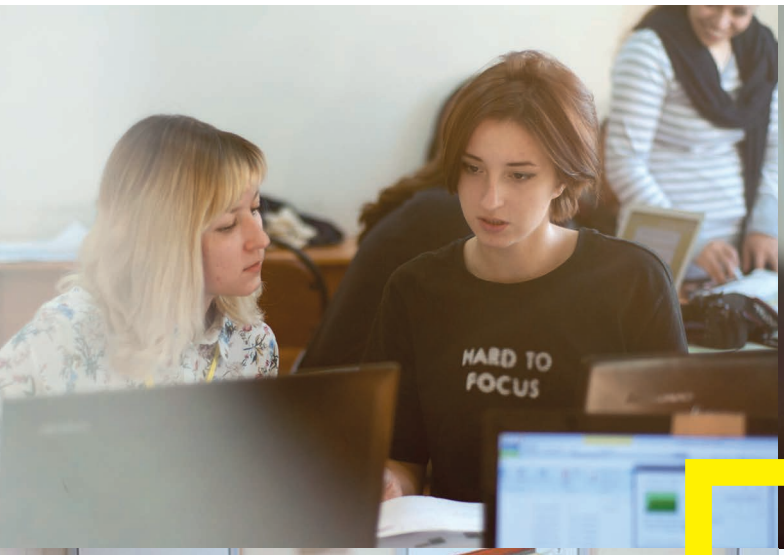
- Due to the further development of the technogenic infrastructure in the Samara region, ecological state monitoring is becoming increasingly important. The purpose of my work is to determine the influence of oil contained in the aqueous medium, on the morphology of the planktonic crustacean organisms Daphnia magna Straus. I’ve chosen the parameters of body length. Despite the fact that such plankton parameters are rarely used as bioindicative signs, they can detect the presence of low concentrations of toxins in the waters without the use of complicated and expensive chemical analysis.

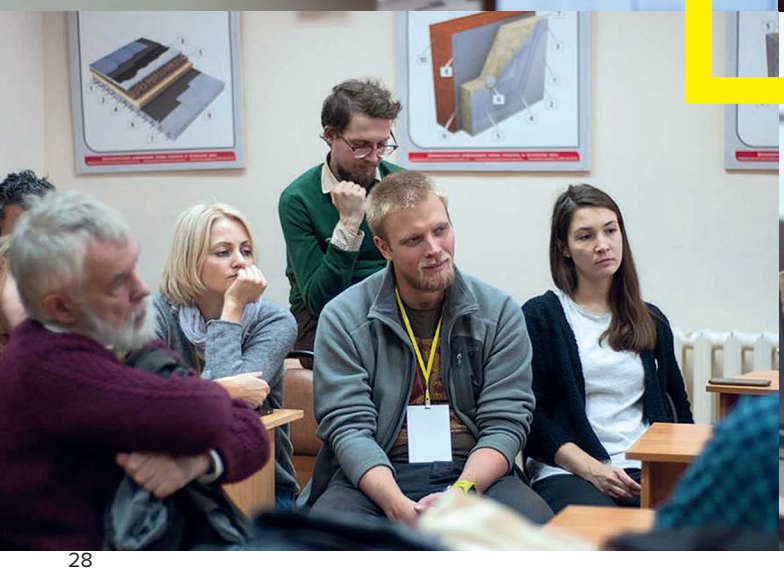
ALONG THE SILK ROAD

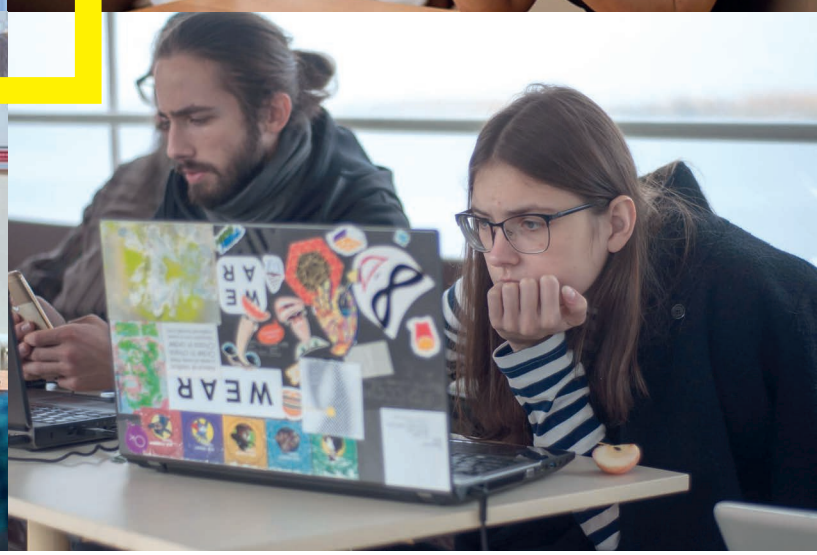
STRATEGIC FORUM IN POLYTECH

Text: Evgeny Nektarkin

ON OCTOBER 14, THE IX INTERNATIONAL STRATEGIC FORUM "GROWTH OF CITIES AND PRESERVATION OF HERITAGE ALONG THE EURASIAN CORRIDOR (SILK ROAD)" WAS COMPLETED AT THE FLAGSHIP UNIVERSITY. 60 STUDENTS AND SUPERVISORS FROM 20 UNIVERSITIES OF RUSSIA, JAPAN, CHINA, KAZAKHSTAN AND IRAN TOOK PART IN IT. WITHIN TWO WEEKS, PARTICIPANTS DEVELOPED PROJECTS, THE IMPLEMENTATION OF WHICH WILL MAKE OLD SAMARA A PLACE THAT IS COMFORTABLE FOR RESIDENTS AND ATTRACTIVE FOR TOURISTS.







Sergey MALAKHOV, Candidate of Architecture, Head of “Innovative Design” department:

- The materials of the forum are a huge layer of ideas. Today, pedagogy is not much concerned with system design of the environment, even less attention is paid to culture as part of architecture. In this respect, the forum has proved to be very useful to us.

In general the discussion has taken place in two cities – in Samara and Moscow (Polytech and Higher School of Economics). Forum included three stages: the first one was the workshop for international teams from foreign and Russian universities, followed by the conference with presentations of projects developed on workshops, and the final session took place on the 14th October.

Workshop in Polytech included lectures, discussions, urban explorations, and project sessions. During the workshop six teams under the guidance of foreign and Russian supervisors have created conceptual designs of valuable fragments of the old Samara.

For example, the team of the architect, urbanist, chief of the General Planning Department of the City Planning Department of the Samara Administration **Alexander Gnilomedov** came up with how to accumulate the already established successful practices of “soft” regeneration of the historical centers of cities and adapt them to our reality and norms.

Experts marked three areas of development of the historical environment of the city: the core, the periphery and the middle zone.

According to the strategy developers, the core needs to maintain functionality - for example, to provide preferential leasing in order to actively use the yard space and the territories adjacent to the facades. And for the development of the periphery it is necessary to subsidize and offer credits for the building renovation. In the middle zone, all the above listed tools can be applied depending on the community’s requests.

The Forum was initiated by the Architectural Institute of Japan (AIJ), supported by the Government of the Samara Region, authorized representative of the President in the Volga Federal District, All-Russian National Trust and Culture, ARCHI-DEPOT Corporation, the Union of Architects of Russia.

During the forum in the gallery Formogramma an exhibition of Japanese architects' projects "Sense of place" was held. Architectural models of Kengo Kuma, Akira Sakamoto, Masahiro Harada and Kajima Corporation were exhibited here, provided by the world's only ARCHI-DEPOT museum, in which architectural models are exhibited.

“AVTOVAZ” STUDENT CLASS

POLYTECH HELD TRAINING COURSES FOR EMPLOYEES OF THE AUTOMOTIVE COMPANY

Text: Evgeniya Novikova

INSTITUTE OF ADVANCED TRAINING OF POLYTECH HAS WON A COMPETITION FOR TRAINING EMPLOYEES OF AVTOVAZ PJSC BY ORDER OF THE MINISTRY OF LABOR AND SOCIAL PROTECTION OF RUSSIA.

“The assignment included a large amount of work, and only in our university there were professionals who can train specialists in all the necessary programs for professional development,” said the institute director **Vera Zhivaeva**.

Lecturers and professors of the “Institute of Automation and Information Technologies”, “Mechanical Engineering, Metallurgy and Transport”, “Engineering and Economics” and other Polytech departments taught the company’s employees lean and eco-friendly manufacturing, modern data processing, CAD / CAM software applications, competent personnel management, projects and finance, analysis structures and other competencies. From 1st November to

20th December, more than 5,000 people completed 100 programs.

“We worked all day,” says **Alexander Sustin**, a leading process engineer, “we watched interesting educational films, solved logical problems, and performed the final tests. Everything was organized at the highest level. Very quickly I managed to find a common language with the professor, who was of great help in my studies. As a result, we were given a certificate of professional development. I show it to my relatives and say that I was a Polytech student.“

Every day at the sites of AVTOVAZ, 9 to 11 groups of 50 to 150 people each were engaged. The duration of the programs ranged from 16 to 40 hours.

- The directions of training programs were determined based on the analysis of the needs of the enterprise, - explained Olga Kalmykova, associate professor of “Economics and management of the organization” department. - The staff of our department conducted classes on leadership, talked about improving the personnel policy, the prevention of professional stress and destructive conflicts.

Programs of advanced training began and ended with intake testing. The teaching work quality was estimated by the commission of the Ministry of Labor of the Russian Federation.

- It was nice to hear the positive feedback from the AVTOVAZ staff members about our work, - said **Olga Kalmykova**. - The overwhelming majority of evaluation lists included a recommendation to continue cooperation with the Polytech. This is also useful for us: in the course of classes, professors can identify the specifics of work in production and use the acquired knowledge in the educational process.

SCIENTISTS, STUDENTS AND PARTNERS OF THE UNIVERSITY PARTICIPATE IN THE PROJECTS OF ALPINE-ZHIGULI CENTER

BRIDGE BETWEEN SWITZERLAND AND RUSSIA

SAMARA STATE TECHNICAL UNIVERSITY ESTABLISHED LINKS WITH COUNTRIES BY OPENING THE ALPINE-ZHIGULI CENTER FOR INTERNATIONAL COOPERATION

THE CENTER WAS ESTABLISHED IN 2016 AS PART OF THE PROJECT INTERNATIONAL COOPERATION: RUSSIAN-SWISS BRIDGE FOR THE DEVELOPMENT OF PARTNERSHIP RELATIONS BETWEEN SWITZERLAND AND RUSSIA. THE ACTIVITIES OF THE CENTER ARE AIMED AT IMPLEMENTATION OF THE PROGRAMS OF THE SECOND INTERNATIONAL RUSSIAN-SWISS FORUM INNOVATION DAY HELD IN SAMARA STATE TECHNICAL UNIVERSITY IN JUNE 2016.

PLATFORM FOR BUSINESS COMMUNICATION DEVELOPMENT

Polytech is a suitable platform for business community interaction of Russia, Samara and the Swiss canton of Neuchâtel.

- We establish business contacts, help improve the exchange of information on investments and implementation of educational, scientific, trade and economic programs, - says Sergey Ganin, a project partner. – The potential of Samara Polytech, a flagship university, is aimed at developing all sectors of the regional economy. The university has been successfully cooperating with leading enterprises in the field of scientific development and personnel training, as well as in various innovative projects.

DMITRY BYKOV, rector of SSTU opened the presentation of new projects at the Alpine-Zhiguli Center

MULTIFUNCTIONAL SITES OF THE CENTER COULD BE OFFICES FOR BUSINESS MEETINGS AND PRESENTATIONS

BUSINESS PROGRAM: TOURISM, COURSES FOR WINEMAKERS, CHEESE MAKERS AND CHOCOLATIERS

In 2018, several new projects have been introduced at the Alpine-Zhiguli Center. Courses for winemakers, cheese makers, chocolatiers and a school of healthy nutrition are among them. They are intended both for professionals and a wide audience. The courses are based on latest internationally recognized results of the Faculty of Food Production of SSTU. Winegrowers, farmers, food industry experts from Samara region and Switzerland have been invited to attend the courses.

“TASTY” TOURIST ROUTES FOR CHILDREN AND ADULTS WITH MASTER CLASSES AND TASTINGS HAVE BEEN DEVELOPED IN SAMARA POLYTECH.

The Alpine-Zhiguli Center offers fascinating and informative thematic business programs with the participation of potential business partners to the guests of the region. Another promising direction that is being implemented in the center today is the development of routes for business, family, pilgrimage and event-driven tourism, as well as the activities of the language school. Our center is open for presentations of tourist routes of different countries and regions.

Participants were interested in the program of **MASTER COURSES, EXCURSIONS AND BUSINESS SERVICES**

SOMMELIER ANNA MALAFEEVA is at a Polytech's wine tasting

VISITORS HIGHLY VALUED THE QUALITY OF WINES, CHEESES, CHOCOLATE AND ICE CREAM made on the basis of original recipes of the Faculty of Food Production

VLADIMIR BAKHAREV, dean of the Faculty of Food Production spoke about the author's courses on brewing and winemaking

Galina BYKOVA, director of the Alpine-Zhiguli Center for International Cooperation:

- We are aimed at the result, so we have been working with competent, honest and reliable partners. Priorities for us are search for cost-effective solutions, efficient preparation of effective commercial agreements and implementation of profitable projects. We are sure that such an approach will provide the highest standards of quality and market access. It would also remove all cultural and language barriers.

The idea to create the Alpine-Zhiguli Center belongs to **GALINA BYKOVA,** the director of the Center

OUR KNOW-HOWS:

- advising on business and management matters;
- seeking new partners (distributors, suppliers, investors, specialists, etc.), starting joint ventures, provision of legal assistance;
- organizing assistance in international cooperation of universities with foreign specialists and entrepreneurs for scientific and technical work such as transfer of technologies and innovations;
- organizing/holding international forums, public lectures, master classes, exhibitions, conferences, seminars, etc.;
- organizing programs, training courses, internships, cultural and educational programs, exchange of delegations at various levels;
- seeking and developing investment projects, undertaking the designing for the import / export of goods, services, works and innovations, production, etc.
- promoting of new competitive products and innovations on the market.

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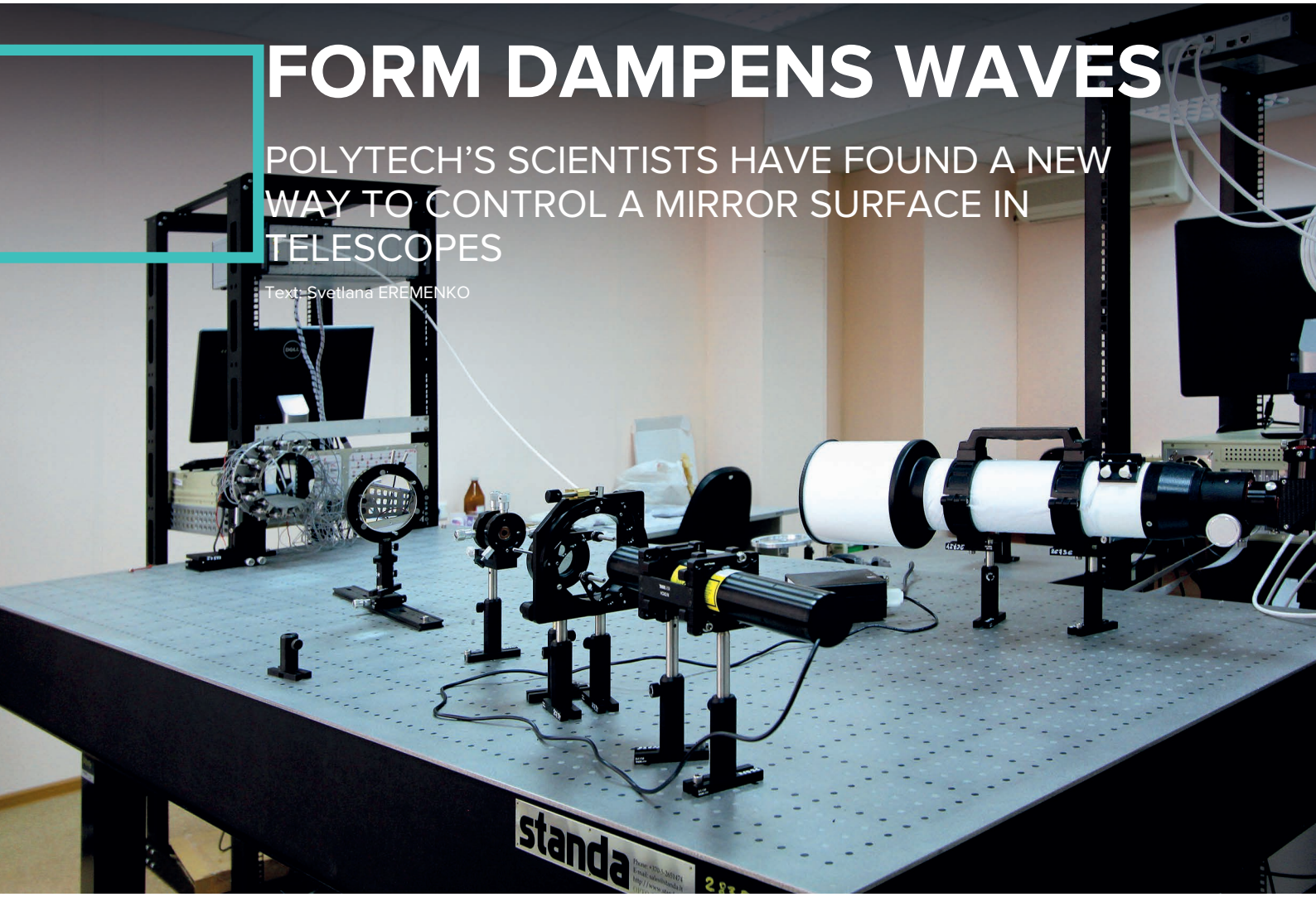


FORM DAMPENS WAVES

POLYTECH'S SCIENTISTS HAVE FOUND A NEW WAY TO CONTROL A MIRROR SURFACE IN TELESCOPES

Text: Svetlana EREMENKO

MORE THAN 400 YEARS HAVE PASSED SINCE GALILEO GALILEI FROM THE UNIVERSITY OF PADUA FOUND OUT SPOTS ON THE SUN AND MOUNTAINS ON THE MOON'S SURFACE WITH THE HELP OF THE TELESCOPE (HIS OWN INVENTION). BUT THE WORKING PRINCIPLE OF THIS OPTICAL DEVICE HAS NOT CHANGED. ITS BASIC PURPOSE IS NOT TO INCREASE THE OBJECT OF OBSERVATION, AS MOST PEOPLE BELIEVE BUT ONLY TO COLLECT LIGHT.
COLLECTING LIGHT FROM OTHER GALAXIES WILL BECOME EASIER THANKS TO THE INVENTION OF THE SCIENTISTS FROM POLYTECH.

BIGGER DOESN'T MEAN BETTER

In a classical Galilei's refracting telescope two types of lenses are used. A convex spherical lens (an objective) collects light from stars but decomposes it into color components and makes the picture fuzzy. But the following concave lens (an eyepiece) gives accuracy and clarity to the observed image. The larger the size of the first lens is, the more light will be collected that makes it possible to see more distant objects. It is the total amount of light collected that determines the level of visible details, whether it is a remote Martian landscape or the contents of the white-tailed eagle's nest in the Zhiguli mountains.

In reflecting telescopes a concave mirror is used as an objective lens. Thus, it is possible to avoid chromatic aberrations (reducing the image definition, colored contours, spots or stripes). However, the application of large mirrors has shown that the reflectors are also not without weaknesses. So, astronomers have noticed that large mirrors still increase the number of distortions. When using telescopes in orbit,

there are deviations caused by the lack of gravity and due to the temperature difference. In an airless space, some unexpected defects were detected in the optical instruments designed on the Earth. Engineers had to ensure image quality by changing the very design of the telescope and inventing new thermoregulation systems. Basic parameters of a good space telescope including a large field of view, high angular resolution, a wide spectral range that directly depend on the optical characteristics of the main mirror are to be taken into account as well.

Eventually, specialists began to apply active mirrors in large telescopes. Such types of mirrors can be driven and deformed by a variety of mechanisms mainly piezoelectric devices. These mirrors that come into motion and change the form of the reflecting surface can compensate at a certain moment the aberrations of the telescope caused both by its design features and, for example, by the turbulence of the atmosphere. The development of active optical systems was a breakthrough in telescoping.

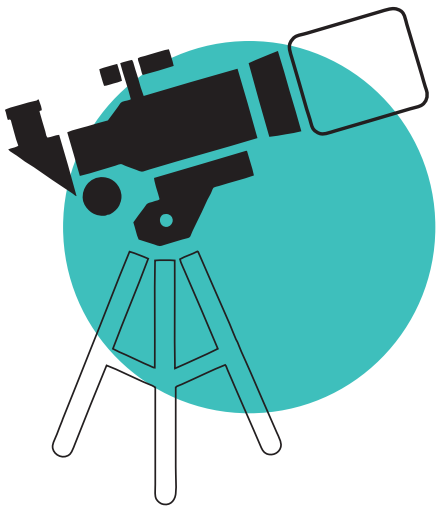
MOVEMENT WITHOUT DISTORTION

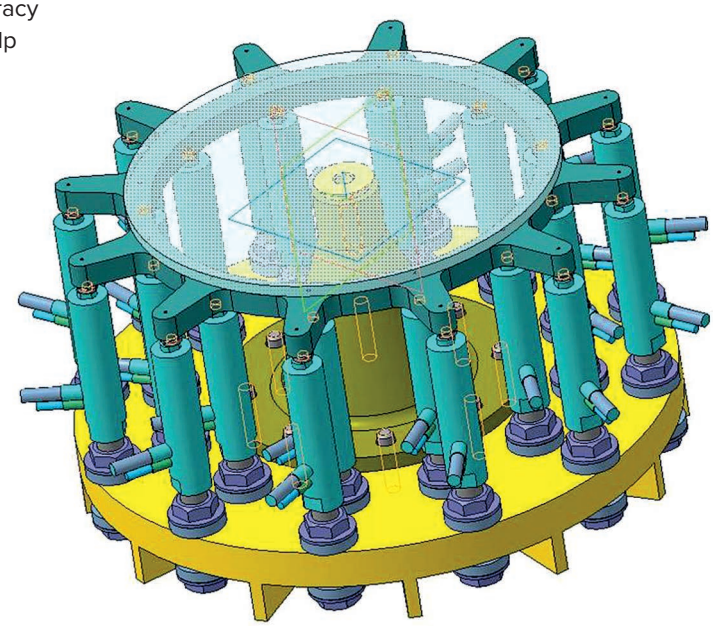
- The technology of active optics is effective for optical instruments with various schemes where an active mirror at the right moment provides correcting the image. The disadvantage of many currently used active mirrors is the limited accuracy of compensation for wave front aberrations, says **Yakov Klebanov**, head of the Department of Mechanics at the Faculty of Mechanical Engineering, Metallurgy and Transport. Under his guidance the scientists created the original form of the cosmic mirror. They have developed a device that loads it at given points at a given time and have calculated how to assess the possibility of using a mirror.

Scientists proved the possibility to regulate the accuracy of controlling the shape of a mirror surface with the help of a new modal decomposition method. Advantages of the method are related to the fact that the active mirror control relies on a physically correct description of the process of its deformation. Due to the introduction of active elements that will correct the wave aberrations, the image quality will be guaranteed. Now, based on the research of our scientists, it is possible to design a mirror. It will have a smaller mass and size, which is especially important for space-based systems.

MIRRORS FOR SPACE TELESCOPES ARE MADE FROM ASTROSITALL. THIS IS A SPECIAL HIGH-STRENGTH, THERMALLY STABLE GLASS-CRYSTALLINE MATERIAL OBTAINED AS A RESULT OF DIRECTIONAL CRYSTALLIZATION OF THE GLASS.

To date, the sample collected at the Center for computer simulation and integrated analysis of tools for thermomechanical stability and image quality for advanced electrooptic telescopic spacecraft systems has already been tested. Our scientists have also applied for a patent in Rospatent for a new method for compensating aberrations using a deformable mirror.





III INTERNATIONAL RESEARCH AND PRACTICE CONFERENCE

INTEGRATED ENGINEERING IN OIL AND GAS PRODUCTION: EXPERIENCE, INNOVATIONS, DEVELOPMENT

The Volga platform for sharing experience between all partners of oil and gas field engineering and construction

HOSTED BY

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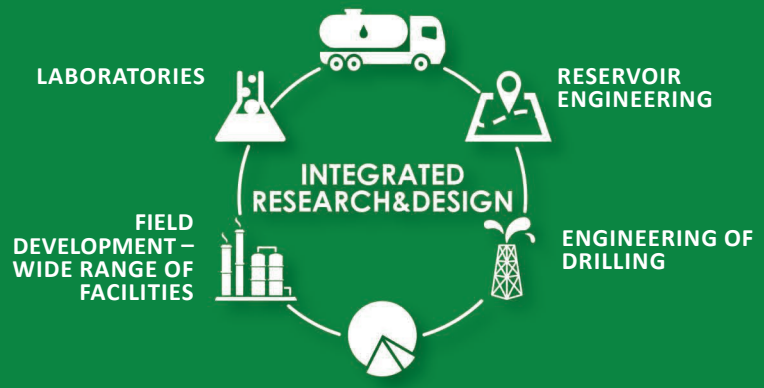
70 YEARS
OF WORK EXPERIENCE
IN 25 COUNTRIES

EXPLORATION PLANNING AND SUPERVISION



CONCEPTUAL DESIGN. DEVELOPMENT PROGRAMS AND CONFIGURATION SCHEMES OF OIL AND GAS PRODUCTION COMPLEXES

PARTICIPANTS:
Engineering, research and design, operating and service companies of oil and gas sector, vendors of oil and gas equipment and materials

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MINISTRY OF INDUSTRY AND TECHNOLOGY OF SAMARA REGION

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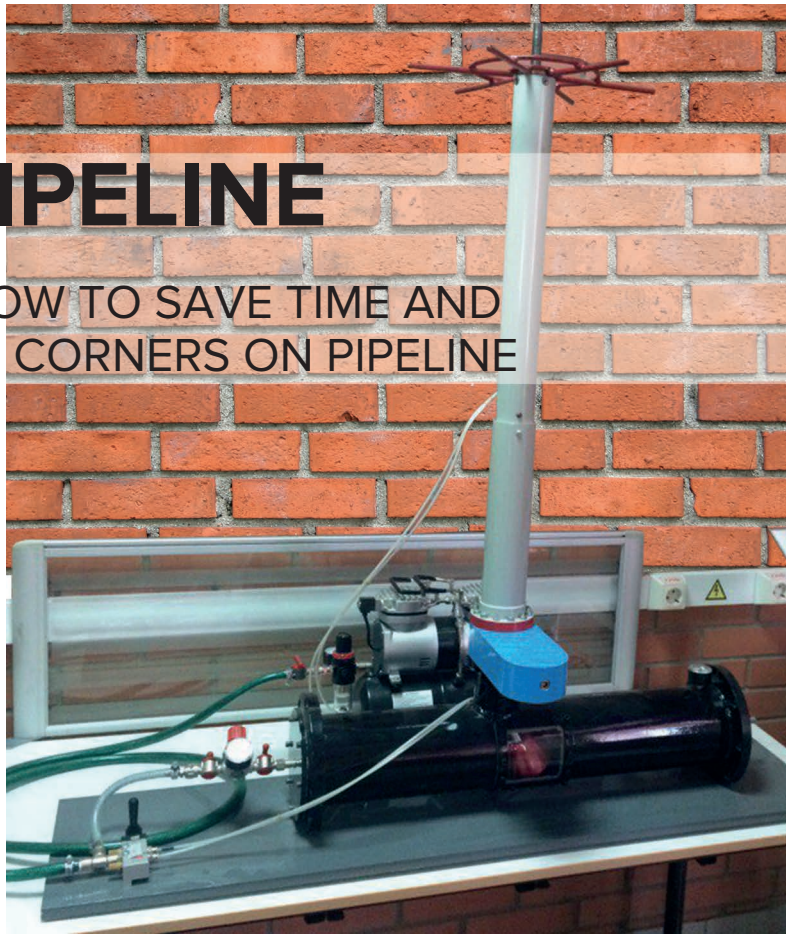
Telephone: + 7 (846) 333-46-96.
Fax: +7 (846) 279-20-58.
E-mail: gipvn@gipvn.ru
www.gipvn.ru

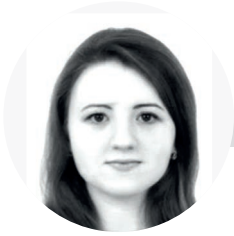


BLOCK A PIPELINE

POLYTECH KNOWS HOW TO SAVE TIME AND MONEY FOR CUTTING CORNERS ON PIPELINE REPAIR

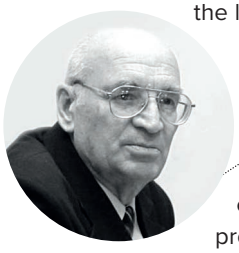
Text: Evgeniya NOVIKOVA

AT THE END OF 2016 POLYTECH PROJECT JOINED THE RANKS OF FINALISTS OF THE INTERNATIONAL INNOVATION COMPETITION FOR THE DEVELOPMENT AND IMPLEMENTATION OF NEW TECHNOLOGIES FOR THE OIL AND GAS INDUSTRY SKOLKOVO PETROLEUM CHALLENGE. EXPERTS HIGHLY APPRECIATED THE PITLESS TECHNOLOGY FOR MAIN PIPELINE REPAIRING WITH THE USE OF AN INNOVATIVE OVERLAP DEVICE CREATED BY THE STAFF OF "PIPELINE TRANSPORT" DEPARTMENT.



According to the head of the hydraulics subdivision of the project, the teaching assistant **Nataliya Ivanova**, operational and safe repair of pipelines is a priority for the industry companies.

"The technology has an American analog," Nataliya explains. "But in our development, the holes for introducing the overlapping device are much smaller in diameter, which reduces the negative impact on the strength of the pipeline. The developed technology will significantly reduce the time of production and increase the level of environmental safety.



In addition, the technology of colleagues across the sea is designed for a small diameter of the pipe - up to 500 millimeters. Polytech research and development engineers offer a solution to the problem for pipes with a diameter of up to 1000 - 1200 mm.

The main point of the development is as follows. A pipe branch is welded to the pipeline, a gate valve is assembled and a tap-in machine is installed. After cutting the hole into the pipe, a device with moving parts is installed, using a hydraulic system as a drive component. It blocks the flow of oil or oil products in the damaged area, while the transportation of liquid through the pipeline does not stop due to the connected bypass line. Unlike the traditional method of repair, in this case only the defective part of the pipe is released from the oil, which saves considerable time and cost of work.

Vladimir Tian, the head of "Pipeline Transport" department, conducts the work of the project. Apart from Nataliya Ivanova, the team of technology developers includes Professor **Nikolay Dedov** - he is the head of the strength subdivision, as well as the analyst **Irina Fedotova**.

Now the project team is preparing a patent for the invention.

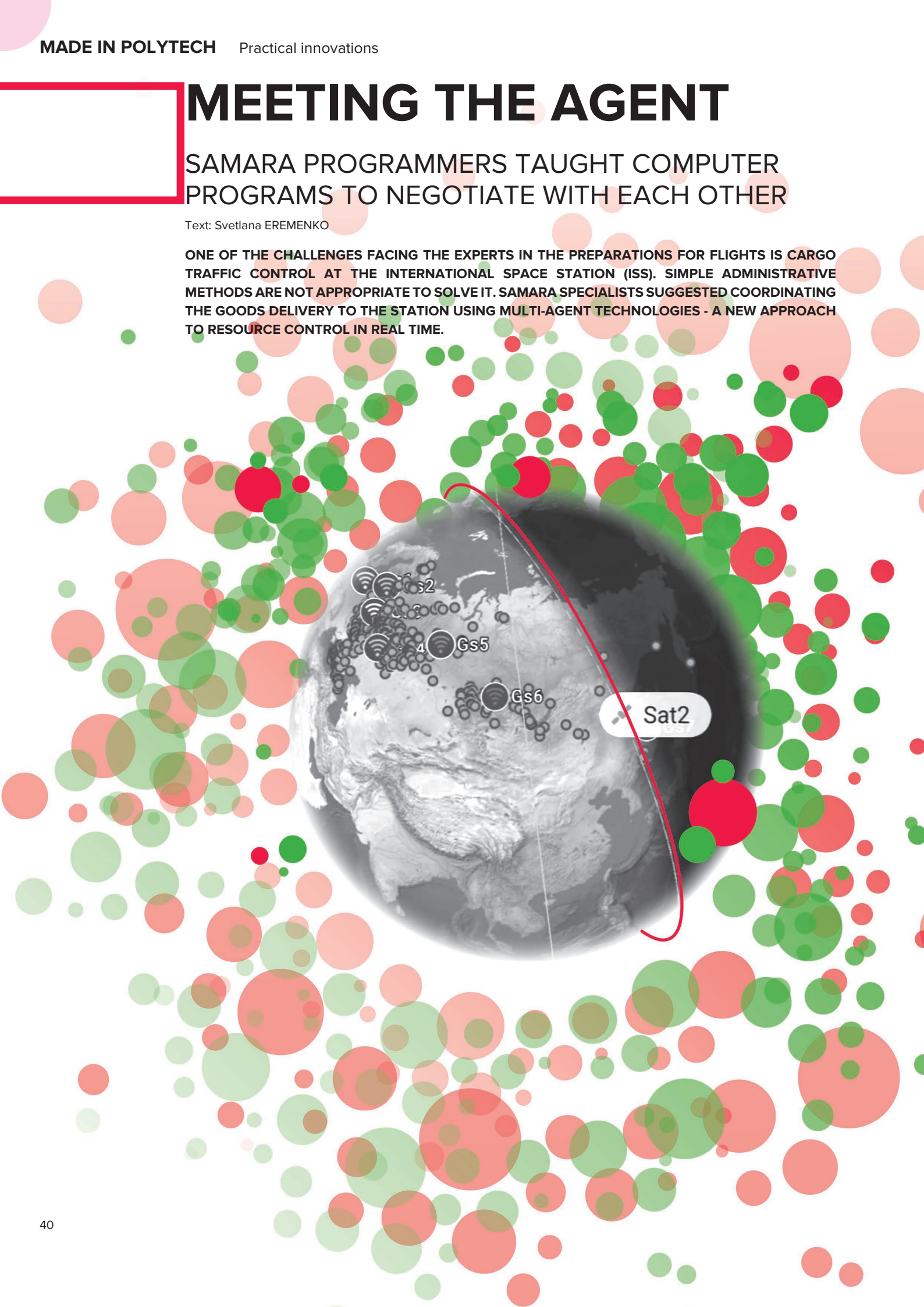
- In the Skolkovo competition we participated in hopes that we will receive funds for carrying out certain engineering design that is necessary for our further research, - explained Nataliya Ivanova.

MEETING THE AGENT

SAMARA PROGRAMMERS TAUGHT COMPUTER PROGRAMS TO NEGOTIATE WITH EACH OTHER

Text: Svetlana EREMENKO

ONE OF THE CHALLENGES FACING THE EXPERTS IN THE PREPARATIONS FOR FLIGHTS IS CARGO TRAFFIC CONTROL AT THE INTERNATIONAL SPACE STATION (ISS). SIMPLE ADMINISTRATIVE METHODS ARE NOT APPROPRIATE TO SOLVE IT. SAMARA SPECIALISTS SUGGESTED COORDINATING THE GOODS DELIVERY TO THE STATION USING MULTI-AGENT TECHNOLOGIES - A NEW APPROACH TO RESOURCE CONTROL IN REAL TIME.



Peter SKOBELEV,
Doctor of Technical Sciences,
head of the Department of
Electronic Systems and Information
Security of Polytech:

ABOUT INSECTS

Annually, about eight tons of various cargoes are delivered from Earth to the ISS. To control these cargo traffic Roskosmos specialists have resorted to Artificial Intelligence. And now even the inhabitants of Norton's spaceship "Queen of the Sun" would envy the crew at the station as there are no problems with the order of goods delivery into orbit, timely waste control and sending the results of space experiments to Earth.

Peter Skobelev, Doctor of Technical Sciences, head of the Department of Electronic Systems and Information Security told us about multi-agent technology, artificial intelligence applications and how Samara specialists compete with the world's largest software producers.

-At first, scientists attempted to solve the task of timely cargo delivery using classical approaches, methods, software tools, - said Skobelev. - But it failed because any given cargo and any given transport ship have their own characteristics and they need to be taken into account. Moreover, we are talking about essential cargoes necessary for life support of the ISS Russian segment (ISS RS) including fuel, air, water, food, scientific equipment for space experiments.

Special software agents (avatars) were developed for each cargo. It's a kind of "brain" for the cargo that monitors the terms and other delivery parameters. Agents interact with each other and "agree", "solve" together problematic issues and "eliminate" conflicts. It is very similar to natural phenomena such as a swarm of bees or an ant colony where each individual is very small and does not have an outstanding intelligence. But when small colonists work in a coordinated and organized manner without any oversight from above, it is a powerful organism with a high IQ. So, scientists borrowed an idea of self-organizing control systems from social insects.

BARGAINING IS APPROPRIATE

Multi-agent technologies are a real revolution in programming. It was a significant step from traditional centralized hierarchical programs to a community of small stand-alone software objects that can perceive information, make decisions and interact with each other. The majority of tasks on computers used to be solved by the standard method of enumeration of options, now the solution can be achieved by eliminating conflicts between software agents. In fact, it's the way people solve complicated tasks. All agents are also goal-driven and have goal-directed

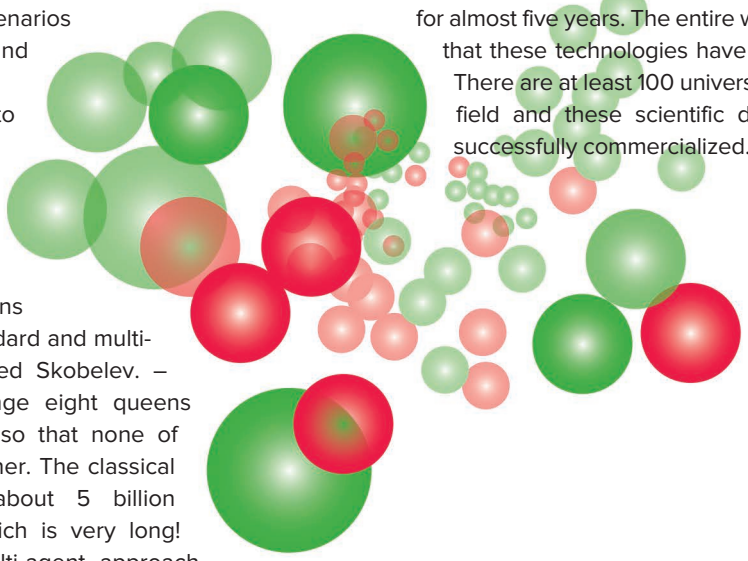
- As the whole world started to create small satellites with a weight of 1 kg or less, there was a need to control this swarm of miniature spacecrafts on orbit. Let's say I'm going to study some area, so I send a request from my cell phone. The first receiving satellite quickly decides whether it is able to fulfill my request, say, examine a fire place more carefully or find a pipeline rupture.

If it can't fulfill a request or can cope with only part of the task, it refers to other "members of the swarm." So it looks like a wave running through the system. In the end, they get the overall result and deliver the data to Earth. If you "destroy" satellites one by one, the system will still try to survive, regroup and fulfill the task. That's the communities of programs that are based on the principle of self-organization. I'd venture to say about the evolution of programs - they will soon evolve themselves in the course of work. In the future such systems will work on the basis of knowledge bases which are the most important component part of intellectual decision support systems.

I think this is important for understanding the development process of artificial intelligence (AI). Scientists used to think that AI would be assembled as a machine on a conveyor (a block of induction, deduction, a huge memory of a supercomputer, hardware), and in some way, like a miracle, the artificial intelligence would appear. In our view, AI will result as a self-organizing system from the interaction of very small agents (operating in the "smart" Internet) and people forming an "intellectual resonator" by strengthening each other's decisions and working together for the results they can't achieve individually. Some scientists have been already talking about "emerging team intelligence". This direction of a new class of intelligent systems is still in its early stages. There is a big future in that.

behavior. They cannot be “called” just as we “call” a regular program, but only “ask” for something to do because they could have already taken “obligations” to other agents. And whether it agrees or refuses to fulfill the request depends on the degree of its progress towards the main goal by taking existing “arrangements” into account.

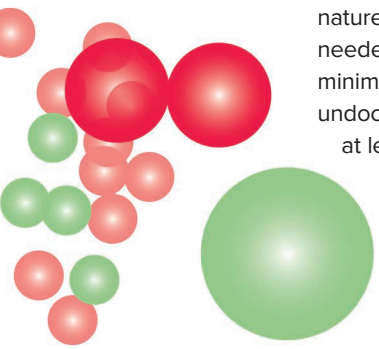
It’s clear that the agent should be able to respond to events, solve various goals and communicate with its team to achieve the result. Also, agents should be able to give way to each other to achieve a common goal. So, it is not a simple algorithm but a certain set of scenarios of behavior and interaction.



- In order to provide a clear understanding let’s try to solve the classical chess puzzle about eight queens in two ways: standard and multi-agent, - suggested Skobelev. – We should arrange eight queens in a chess field so that none of them beat the other. The classical approach has about 5 billion combinations which is very long! But with the multi-agent approach this problem has only 36 solutions. Each queen possesses a software agent and has the option to make requests to other chess pieces and control the situation and stay alive. The queens usually solve the problem in five moves per second. By the way, mankind had been trying to solve this puzzle for almost a century and a half.

PLANNING IN SPACE

When solving the task of flight program designing and cargo traffic planning of ISS RS, Samara programmers had to take into account a lot of rules and limitations. They include some special aspects of dockings to the stations of various types of spacecrafts, nature of fuel consumption and other critical needed resources, solar activity, ballistics, the minimum time interval between docking and undocking operations, constant presence of, at least, one manned transport ship Soyuz (docked to the ISS), priorities for cargo placement, load capacity of transport ships, weight, cargo volume, etc. It is quite logical that changing only one of the parameters affects the others.



The main feature of the system created in Samara is that it provides planning cargo traffic of ISS RS in real time as soon as new needs are identified including emergency situations. It was the case in 2015, when the Progress M-27M truck was lost, and ground services had to reconsider all the ISS supply plans, without exception. The multi-agent planner successfully met this target including management of redistribution of all necessary cargoes for the onward flights of transport ships. So, the astronauts were not on short rations or without work (there were materials for space experiments on the truck).

New cargoes with “low” priorities were postponed until later flights. And 2000 kg of waste accumulated at the station for exportation by Progress were spread in ISS for further utilization with the help of skillful agents.

Roskosmos has been using the Samara multi-agent system for almost five years. The entire world understands that these technologies have a huge potential. There are at least 100 university projects in this field and these scientific developments are successfully commercialized.

CAN DO EVERYTHING

Our scientists won a tender in Airbus group for the development of an experimental scheduler for shift tasks in Airbus A-350 production. The created multi-agent resource control system provides planning, optimizing and controlling integrated and multiply connected manufacturing processes at the ramp-up stage which is the initial stage of creating new technical products that have not put into mass production yet. The new medium-haul aircraft A-350 of the Airbus group, the hit of the world aviation market, is the very type of product. It is equipped with a new engine and consists of 70 % composite materials. The release of a radically new liner model is a serious challenge even for such a giant as Airbus. The main task of the intelligent system proposed by Samara engineers is to track unforeseen events and to restructure the production plan so that the management and staff are always to be aware of what to do.

The assembly line for A-350 fuselage in Hamburg was the first experimental site for testing the multi-agent intelligent system. The system was tested, and now the company has started its industrial version for PJSC Irkut producing a new MC-21 aircraft.

To date, a Family of Multi-agent Systems has been created. The sphere of their applicability is unlimited, for instance, operational distribution of tasks between the mobile teams of Samara gas and Vodokanal or control of satellites. Right now, Samara programmers are developing a multi-agent system for a group of satellites that can collectively solve a complex problem which can’t be done individually.

MULTI-AGENT SYSTEM “FLIGHT AND CARGO TRAFFIC PROGRAM”:

FLIGHT PROGRAM DATA (FUEL, WATER AND FOOD BALANCE) ANALYZED BY THE SYSTEM CREATES

15 % TIME SAVINGS FOR EACH MODULE.

ABILITY OF AUTOMATIC CARGO TRAFFIC RE-PLANNING IN CASE OF ABNORMAL SITUATIONS RELATED TO THE LOSS OF A TRANSPORT CARGO VEHICLE COULD SAVE APPROXIMATELY

4 HOURS.

THE TIME OF FLIGHT RESERVE PROGRAM CREATION FOR ABNORMAL SITUATIONS TAKING INTO ACCOUNT THE RESOURCES COULD SAVE APPROXIMATELY

32 HOURS.

THE TOTAL TIME SAVINGS RESULTING FROM THE SYSTEM IMPLEMENTATION IS APPROXIMATELY **2094** HOURS PER YEAR,

OR **262** WORKING DAYS.

THE RIGHT SHIFT

POLYTECH'S SCIENTISTS HAVE PATENTED A NEW WAY TO CONTROL THE DOORS OF THE NAVIGATION LOCKS

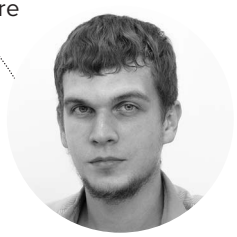
Text: Svetlana EREMENKO

IT IS WELL KNOWN THAT ANY SCIENTIFIC DEVELOPMENT TAKES TIME TO BE IMPLEMENTED. THIS PROCESS IS ESPECIALLY DIFFICULT IN RUSSIA WHERE INVENTORS HAVE TO WAIT FOR DECADES TO MATERIALIZE THEIR OWN IDEAS.

In this regard, Polytech's engineers of the Faculty of Automation and Information Technologies are fortunate as they could see the results of their work three years after the research started. **Evgeny Melnikov,** Associate Professor of the Department of Information and Measurement Technology, and **Andrey Bochkarev,** Master's degree student, created an innovative gate control system for the navigation lock.

FOLLOWING LEONARDO'S FOOTSTEPS

It is not known precisely when locks on waterways appeared in Europe. According to recent data, the locks appeared in 1373 in the Netherlands in the province of Utrecht. And the first hydraulic engineer who began to use floodgates widely was Bertol da Novate, an Italian engineer of the XV century. He developed almost all basic elements of a modern waterway which were later improved by his brilliant follower Leonardo da Vinci. In particular, it was Leonardo who focused on one of the main technical devices of such a system - the mechanism of opening and closing the lock gates. This problem had been occupying the minds of hydrotechnical engineers at all times. Now it has become particularly relevant as all large and medium-sized rivers in Russia were blocked by powerful artificial dams which were built mainly in the 50-60 years of the last century. Any small failure of this already obsolete, worn-out equipment can cause a disaster.



-The navigation lock is a complicated construction equipped with a minimum of two pairs of gates, - says Evgeny Melnikov. - The gates can vary in design. On the Volga, lifting-overpour and swinging gates are mainly used. Swinging gates move with variable speed by a complex algorithm. If the doors open unevenly, it can result in door jam and structural damage. Such incidents are known in the world practice. Over time, worn-out equipment will need more tightened inspection.

SECURITY IS ABOVE ALL

Polytech's project was aimed at developing an innovative method of controlling the process of miter gate shutting.

ANDREY BOCHKAREV PRESENTED THE POLYTECH'S INVENTION AT THE YOUTH FORUM " IVOLGA AND RECEIVED A GRANT TO CONTINUE THE RESEARCH. BY THE WAY, THE WATER LEVEL IN THE ZHIGULI RESERVOIR IS NOW CONTROLLED BY A DEVICE MADE BY THE STAFF OF THE DEPARTMENT OF INFORMATION AND MEASURING TECHNOLOGY AS WELL.

- Earlier the operators with the help of sensors monitored the turning angle of the door of the gate, - explains Andrey Bochkarev. - They did not take into account the fact that in case of wear of the galsbant (holding device for gates) the door of the gate started to swing. We proposed a method that not only determine the speed but also monitors the position of the gate in the same plane. To monitor equipment there are only three sensors: the first one is to monitor the turning angle and other two sensors are for measuring linear movements. But even if one of the sensors for some reason fails, the system will continue to work. Hence, severe accident will be avoided.

Thus, without complicating the design of the gate we have increased the reliability of the synchronization system and have simplified its maintenance. Our invention makes it possible to shut the doors of the gate more accurately and to reduce the risk of impact opening when mechanisms are destroyed most often.

In addition, this method provides the ability not only to control the movement of the gate but also to simulate the entire process on the computer, that is, to see the angular displacement of the door before an accident. The reliability of the modernized experimental gate control system of the navigation lock developed by Polytech's scientists was tested at Balakovo Hydroelectric Plant. In the summer of 2017, the authors received the patent for the invention.

The new way to control the gate shutting will be introduced at the navigation lock in Nizhny Novgorod. Design and construction company Techtransstroy focusing on hydraulic facilities construction is currently working on the implementation of this project.

INSIDE THE SWEETS

"TECHNOLOGY AND ORGANIZATION OF PUBLIC CATERING" DEPARTMENT SURPRISES US WITH A NEW INNOVATION

Text: Nelya LEONOVA

THIS TIME SSTU IS IN MOOD FOR SOMETHING SWEET. CREATIVELY DIFFERENT SWEET FILLINGS HAVE BEEN MADE AT "FOOD PRODUCTION" DEPARTMENT. IN A SHORT TIME THE UNIVERSITY WILL TAKE OUT A PATENT ON THE PRODUCTION TECHNOLOGY OF THESE FILLINGS.

NUT PRALINE AND GANACHE

Head of the department, PhD of Chemistry, Professor **Nadezhda Makarova** is holding a small box with 10 sweets. The main thing about them is the filling, different for every sweet. It has taken many months to develop their production technology. Experiments resulted in the invention of new exclusive favors that are absolutely innovative at the market of confectionary products.

We have a new praline filling, that has been made only by our University, - Makarova said. – We want to patent it. Sweets from the shop are the trend of 80s, but Polytech moves on. Now we are ready to offer the hand-made production technology of sweets with unique taste qualities.

Though they have first success, experiments continue. One of the latest, most successful experiments led to the filling based on ganache. This is the development of the candidate of technical sciences **Irina Kustova**.

SOONER OR LATER

To make “handmade” sweets in a hurry will not work. One batch takes up to four working days. But it is possible to produce sweets of another kind simultaneously.

In each batch, the ingredients are carefully selected and then mixed in a special way, forming a praline mass. This operation requires the exact observance of the timeframe for complete mixing of the components. Nut weight is assimilated in a fruit filling, which is added to praline. Their composition must come to an equilibrium state.

An important stage of production is chocolate tempering. This is a fairly long process, during which you have to periodically change the temperature, and then raise it, and then lower it.

Cooked sweets should also “ripen”.

It turns out that sweet dessert is the result of a long, laborious creative work. Many trial materials are rejected. Therefore, handmade candies are expensive.

By the way, the employees of the department have already received certificates of conformity on them in the Samara Center for Standardization and Certification.

PRALINE (FR. PRALINE) IS A DESSERT INGREDIENT MADE FROM GROUND ALMONDS OR OTHER NUTS FRIED IN SUGAR. PRALINE IS USED FOR MAKING FILLINGS, CREAMS AND FOR DECORATING CAKES AND MUFFINS.

HONEST CHOCOLATIER

Today, not only polytechnic scientists are engaged in the manual manufacture of sweets. However, according to Nadezhda Makarova, many sellers of “man-made” chocolate products sin of using ready-made chocolate. It is usually not of a very high quality, contains not cocoa butter, but a large amount of vegetable fats and thickeners. Producers prefer cheaper fruit and berry fillings: jam and confitures to walnut praline, which is extremely rare to eat in such sweets. This product cannot be ranged to the premium class.

In Polytech for the production of chocolate, in which neither sugar nor sweeteners are principally added, only natural cocoa powder and cocoa butter are used. Therefore, the main product - chocolate - remains bitter. But the filling in it is sweet, thanks to the high-maltose syrup. It is useful because people with diabetes, as well as those who scrupulously count calories, can eat such sweets and do not worry about increasing blood sugar levels.

In the view of organoleptics a sense of unobtrusive bitter taste creates the right perception,- the expert explains.

GANACHE (FRENCH GANACHE) IS A FLAVOURED CREAM OF CHOCOLATE, CREAM, USED AS A FILLING FOR SWEETS AND CAKES AND FOR DECORATING DESSERTS.

- One or two sweets a day are enough to get not only taste pleasure, but also the necessary number of vitamins contained in the components obtained from berry juices, as well as the charge of protein microelements and fatty acids from natural nuts.

LABORATORY FOR NEW IDEAS

For the comfortable working environment on experimental samples a modern and multifunctional laboratory is equipped in Polytech. It is possible due to the program of the flagship university development. Everything is made cleverly here: hoods, cookers, and workplaces for cutting food. There is a special fridge for sweets and chocolate because they absorb all kinds of flavors and smells. New equipment contributes not only to optimizing the learning process, but also to new scientific ideas and developments.

Now we have a working kitchen area for organizing research in the field of food production, computer places with access to the Internet. Thus students and post-graduate students have the opportunity to carry out theoretical and practical scientific research and development. But it is important to bear in mind that this field requires not only keen interest but also hard work.

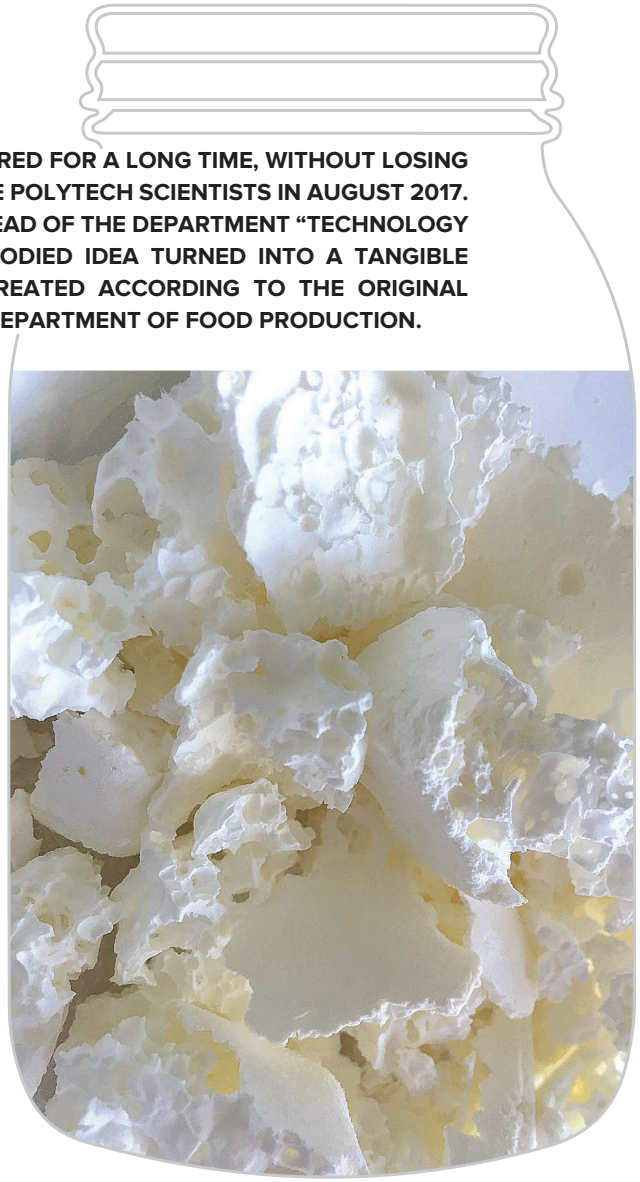
It is necessary to conduct many experiments in order to succeed. Soon a year, as we are engaged in the production of fillings for sweets and the development of appropriate technologies. We are far advanced, but I'm sure there are still a lot of discoveries ahead.

REDUCING TO DUST

POLYTECH SCIENTISTS DEVELOPED A SUBLIMATED YOGURT

Text: Nelya LEONOVA

THE IDEA OF CREATING A YOGURT THAT WOULD BE STORED FOR A LONG TIME, WITHOUT LOSING ITS USEFUL PROPERTIES, OCCURED TO THE HEAD OF THE POLYTECH SCIENTISTS IN AUGUST 2017. UNDER THE SUPERVISION OF NADEZHDA MAKAROVA, HEAD OF THE DEPARTMENT "TECHNOLOGY AND ORGANIZATION OF PUBLIC CATERING", THE UMBODIED IDEA TURNED INTO A TANGIBLE PROJECT, AND IN THE LATE AUTUMN A PRODUCT CREATED ACCORDING TO THE ORIGINAL TECHNOLOGY APPEARED IN THE LABORATORY OF THE DEPARTMENT OF FOOD PRODUCTION.



MINUS WATER

The production of a dried yogurt is based on the process of sublimation. It is a dehydration of the product, which is made by vacuum at low temperatures. Liquid yogurt is first frozen to minus 50 degrees, gradually bringing the temperature to minus 70 - 72 degrees Celsius. Along the way, pressure begins to drop to zero atmospheres. In this state, the ice in yogurt evaporates, bypassing the liquid phase, and the output is a dehydrated, dried mix. To get 20 grams of powdered freeze-dried product, you need to take 100 grams of liquid yogurt.

Generally, in the process of sublimation, a solid body turns directly into a gas. But it happens more slowly than evaporation of liquids. Frozen yogurt is dried for 24 hours, as it is homogeneous in consistency. Sublimation of other products, such as fruits or vegetables, lasts at least three days.

Starting the experiment, the scientists were going to check the date of expiry of the drink after sublimation. Yogurt without supplements and fillers was taken from the counter for analyzing its microflora. Then they froze the yoghurt, dried it and watched what would happen next.

"After sublimation, we stored the powder for a month at room temperature," said **Alyona Dancheva**, who is studying at the first year of a master's program in biotechnology. - We needed to find out how the microflora behaves in provocative conditions. The results showed that all microorganisms during the test period were preserved in the same volume as originally in the liquid product. We are going to continue tests and get to know how they behave in three, six, nine months and a year.

PLUS USEFUL PROPERTIES

When researching prototypes of freeze-dried yogurt, Polytech cooperates with the clinics of the medical university. The volume required for study - 1 milliliter of product - is dried directly in test tubes in order to observe the conditions of sterility. Then specialists determine the amount of dry matter, acidity and other parameters.

In the course of the experiments, one more advantage of the dehydrated milk product over the usual one was confirmed. Above-zero temperature, humidity and a sufficient number of nutrients create a favorable environment for the development of pathogenic microorganisms, with uncontrolled reproduction of which in the milky environment a sour taste and smell occur. If you remove all moisture from there, the conditions for the growth of bacteria also disappear, their quantity remains the same, and the product is protected from souring. Thus, the problem of summer storage of milk, kefir, yogurt is solved. At this time of the year they are produced in maximum volumes, but because of the high temperature and the duration of transportation, a significant part of the product may be spoiled.

Using the technology of sublimation, you can safely produce yogurts in summer and in the powder state you can realize them within a year without losing the original quality.

- This technology can be used for burgers, baked yogurt, sour, ayran and even for mother's milk, - explains Nadezhda Makarova. - The principle of work is the same. The most important thing is that the quality and quantity of useful properties is preserved.

Sublimation does not really affect the taste of the product, although the expiration date naturally increases. Storage and preparation of freeze-dried yogurt does not cause trouble for consumers: it is quite simple to add water to the powder and stir to the desired consistency. Such a product can be included in the diet of people who spend a lot of time away from civilization: drillers on offshore oil platforms, polar explorers, military and even cosmonauts.

THE VOLUME REQUIRED FOR THE STUDY - 1 MILLILITER OF PRODUCT – **IS DRIED DIRECTLY IN TEST TUBES**. SO THE CONDITIONS OF STERILITY ARE OBSERVED.

SUBLIMATION - EVAPORATION OF SOLIDS

Wet laundry at a temperature below zero dries as a result of sublimation

Naphthalene sublimates at room temperature and normal pressure

Sublimated coffee better preserves the substances of the coffee extract than the powdered coffee

Frost on branches is an example of desublimation, the transition of a substance from a gas state to a solid state, bypassing the liquid phase

FORWARD, MARCH!

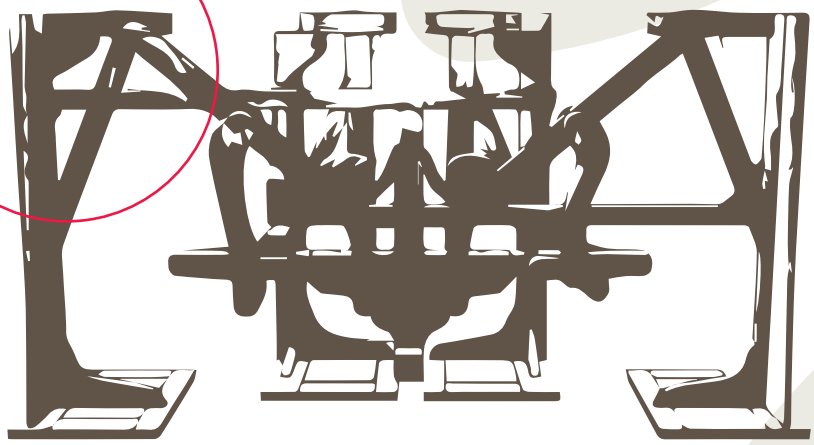
POLYTECH SCIENTISTS INVENTED A MECHANISM THAT CAN MOVE FROM PLACE TO PLACE ON ITS OWN FEET

ARCHITECTS ANTON RAKOV AND JULIA RATIEVA CALCULATED AN INNOVATIVE SCHEME FOR CONVERTING ROTARY MOTION INTO STEPS. THE MECHANISM, MADE ON ITS BASIS, IS A FREE PLATFORM, LOCATED ON WALKING FEET. THE STRUCTURE WAS CALLED KS-13, OR LARIFUGA.

Inventors got inspiration from the animal world. At the heart of Larifuga is natural design: the mechanism was created on the basis of the structure of mammals, reptiles and insects limbs. In some modifications, the object is set into motion only with the help of muscular strength of a man, in others - electric motors are installed. Now such mechanisms are made of plywood, in the future, the use of metal and concrete is planned.

- The project has grown out of a social problem, - explains the candidate of architecture, the senior lecturer of “Innovative design” department **Anton Rakov**. - Coming out of the university and starting their own business, young professionals face the need to rent a room. It is expensive, but there is no guarantee of a regular income. Hence the need for a special, charge-free object that does not create inconvenience to others, and if necessary, could move freely from place to place. Mobile facilities on wheels, the scientist believes, are not always suitable for such use, in addition, they need an engine and have difficulties with mobility and roadability. In this sense, walking designs look more promising.

Polytech developers and their invention came into the international spotlight after the XIX World Festival of Youth and Students, which was held from October 14 to 22 in Sochi. Mechs of the original design, controlled remotely with the help of a special glove (that is also an invention of Artem Brazhnikov, the student of the flagship university) were presented at the exhibition, section of robotic technology. After the Forum the world continued being interested in the Samara larifugas and its history of invention. Russia Today (RT), TASS news agency have made reports about it. And the British newspaper **Daily Mail** compared this model of walking architecture with the hut of Baba-Yaga.



Walking is one of the most common ways in the animal world to move from one place to another. Legs (paws, tentacles, etc.), created by nature, allow their owners to make movements that are inaccessible to the wheeled gear invented by man: step over the curbs, climb stairs, jump. The first world mechanical walker - **“footstanding machine”** - was created by the Russian mathematician, professor of St. Petersburg University, Paphnuti Chebyshev. Back in 1874, this mechanism was a sensation at the World Exhibition in Paris.

Daily Mail

The bot, called Larifuga, can move in different directions, run, dance and engage in a 'judo fight' with another bot. 'Larifuga' means vagabond, or wanderer, in Latin - alluding to the tech's movement capabilities. Eventually though, the researchers claim it could be adapted to investigate the surface of the moon.

The engineers behind the bot are already developing an interdisciplinary project for exploring the moon.

According to the engineers, the bot's design was inspired by the dream of owning a mobile home, a concept from the Russian fairy tale Baba Yaga.

TWO MILLION DRAWN WITH A “PENCIL”

SAMARA’S STARTUP IS IN BIG BUSINESS

Text: Svetlana EREMENKO

Experts on business innovation in one voice claim that Russia has great scientific and engineering potential. It often happens that interesting projects never enter the market because investors cannot agree on financing with their authors. **Albert Galliamov’s** project is a lucky exception to the rules. It went very well for him, and the director of the Reversing Engineering and Prototyping Center of Samara Polytech managed to agree on cooperation with big business in just a couple of months.

HAVE JOINED THE FLOW

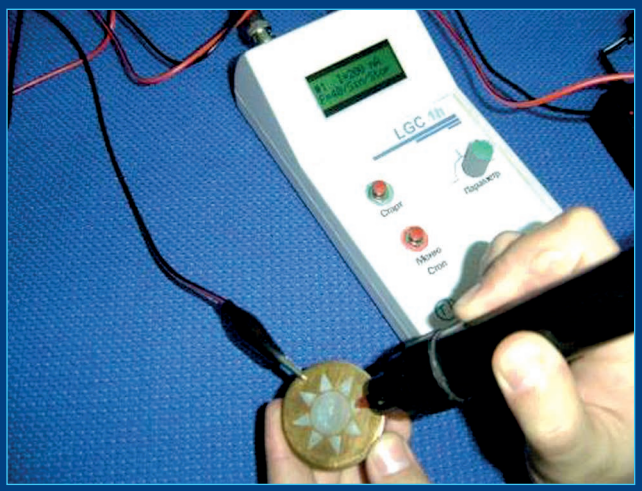
The project “Galvanic pencil for local functional coatings” was presented in the direction of MINING & METALS in one of the six tracks of Generation S, the largest platform for promoting business ideas in Russia, a kind of a project flow generator.

- We have met a lot of experts, mentors, investors. The work was almost non-stop, from early morning till late evening, - said Albert. - We have found an industrial partner, Krasnoyarsk Non-Ferrous Metals Plant, that is, a potential customer that is interested in the project. It is the largest company in Russia dealing with non-ferrous metals refining. We were not sure the joint work would continue. But when we were invited to present the project and demonstrate the product under factory conditions, we realized that they agreed to continue our cooperation, and, most importantly, to invest for a long period of time.

The accelerator format is really a perfect tool that helps the authors to assess their capacity, work on the project quality, find the customer and try to position themselves in a new niche. For investors it helps get access to the project database, expand the list of potential suppliers and reduce their risks. Start-ups that have passed the accelerated program are completely ready to attract investments, so they provide powerful messages for further development. Samara scientists are indeed fortunate as Krasnoyarsk Non-Ferrous Metals Plant is a rather closed company for the venture market. But such kind of enterprises could get new and promising technologies through partnerships with institutions and universities. One of the useful innovative findings for Krasnoyarsk Non-Ferrous Metals Plant was a galvanic pencil from Samara University.

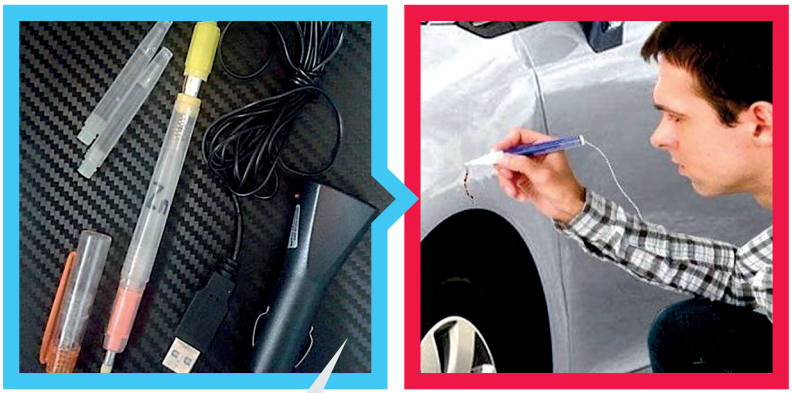
	TRADITIONAL METHODS OF GALVANIZING	GALVANIZATION IN POLYTECH'S WAY
COATING ON COMPLEX GEOMETRIC SHAPES	DIFFICULT	THE GALVANIC PENCIL PROVIDES LOCAL AREAS COATINGS OF PRODUCTS WITH A COMPLEX PROFILE BY "STYLUS GALVANICS" PRINCIPLE IN THE DEVICE.
COATING WITH SPECIFIED PROPERTIES	IMPOSSIBLE	THE PENCIL IS PROGRAMMED FOR THE NECESSARY CONDITIONS ON HARDNESS, THICKNESS AND SPECTRUM OF ELECTROLYTES.
ECOLOGICAL COMPATIBILITY	HARMFUL PRODUCTION REQUIRING WASTE DISPOSAL	ONLY ENVIRONMENTALLY SAFE ELECTROLYTES ARE USED.

The Reversing Engineering and Prototyping Center has already created a line of mobile pencils, both compact disposable and of industrial types. There are plans to develop, manufacture and test a production model of a galvanic pencil in 2017, and 2018 is the year of production site development and sales organization.



MINIATURIZATION AND MINIMIZATION

This small mobile complex is designed for applying electrochemical coatings. The key element of a device is a “pencil” for coating the surface being processed. The entire complex of the galvanic bath is miniaturized and is mounted inside an ergonomic casing. Inside the pencil there is a porous tampon filled with an electrolyte. One end of the tampon is connected to a felt tip (a feather), the other end is connected to an anode (a stainless rod). A power supply and a control unit are made as an independent device. The positive pole of the power supply unit is connected to the anode of the pencil via a detachable connection, and the negative pole is connected to the surface being processed. The electrolyte contains salts of such metals as gold, silver, zinc, copper, nickel, tin, iron and chromium.



In a traditional galvanizing process, large-sized baths equipped with a ventilation and communication system having high energy capacity are used. The sample designed by specialists from Polytech is less than 1 kg and has an autonomous power system whereas the power consumption is less than 15 W.

A coating of up to 30 microns and an area of 0.2 square millimeters can be applied with a pencil, which is very important when processing items of complex configuration such as electrical contacts, radio components, fastening elements, welds, body components subjected to corrosion, jewelry, design, defects of any galvanic coatings.

By the way, Politech’s scientists have already calculated the approximate cost of a “one-use” pencil. Automobilists will appreciate it as they often face the problem of removing small scratches or small areas of corrosion on the car body. The price is less than one thousand rubles. According to Galliyamov, auto services are also among potential consumers of the product as they can use it for anti-corrosion zinc processing of the body. Enterprises could use it for functional and decorative coatings in such industries as machine-building, instrument-making, electrical and jewelry.

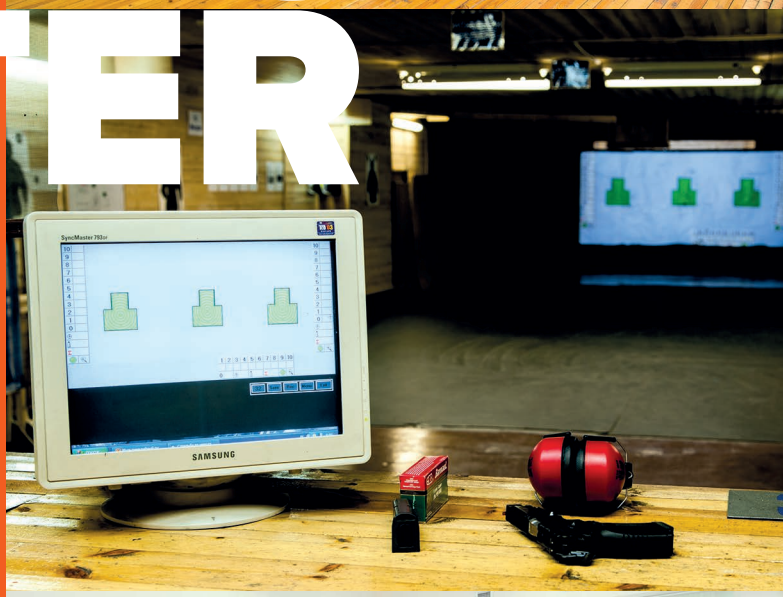
Polytech’s scientists are more than satisfied with the result of their participation in Generation S as a grant in the amount of two million rubles for the first prize in the accelerated program “Start” MINING & METALS will allow them to develop their invention to the production model.

Sport and entertainment center provides services to the students of Samara State Technical University and local residents: aerobics, martial arts, sports games, gym, and multimedia shooting gallery.

For children: swimming, karate, aikido, and dancing classes are available

SPORTS CENTER

Samara Technical University



27, Lukachev str., Samara, Russia
For more information: www.samgtu.ru
Tel.: +7 846 270 28 73, +7 846 270 28 74.

CHILDREN-SCIENTISTS

POLYTECH'S SCIENTISTS KNOW HOW TO WORK WITH GIFTED CHILDREN

A TALENTED CHILD FROM AN EARLY AGE PREFERS A BOOK OR EDUCATIONAL GAMES TO A TABLET. AS A RULE, THESE CHILDREN HAVE ENOUGH TIME NOT ONLY TO STUDY BUT ALSO TO ATTEND A DRAMA GROUP, A GYM, A WEEKEND SCHOOL AND TO PLAY THREE MUSICAL INSTRUMENTS. HOW TO APPLY THIS CREATIVE ENERGY OF TALENTED CHILDREN?

"VZLET" TEAM

In 2015, an inter-university Department of Information and Developing Educational Systems and Technologies of Samara State Technical University proposed to create a Coordinating Council for work with gifted children under the Governor of Samara. And that began the program "Vzlet". The content of this program is the research projects for schoolchildren under the scientific supervision of university scientists.

School teachers are involved in this process. Each of them can register on the website of the program and get acquainted with the list of topics. The teacher chooses the topic, offers it to a gifted child and the research starts. After the best projects are selected, university scientists consult the winners and continue their joint research in the university laboratories.

- It's surprising that projects from small towns win. It seems that science can find young talents in the places where all charms of civilization have not reached yet, - says Dmitry Bykov, rector of SSTU. According to the program developers, the main goal is to attract not only children with excellent marks at school. It's more important to take into account creativity, ingenuity persistence and enthusiasm of ordinary children.

In 2016, 800 participants were registered on the Vzletsamara.ru website. This year the number of applications is approaching 5000.

Dmitry BYKOV,
rector of Samara State Technical University, Honorary Figure of Russian Higher Education of Russia, chief editor of the journal Technopolis of the Volga region

- Samara region has been supporting a unique project for talented children for 2 years thanks to several lucky circumstances.

The first one is political will. In autumn 2013, the Governor of the Samara region established a coordinating council headed by Deputy Governor Dmitry Ovchinnikov for work with gifted youth in the field of science and technology. In early 2016, the "Concept of a single Samara regional system of measures to identify and develop creatively gifted youth in science, technology and innovative development of the Samara region" was approved. Its main idea is to provide talented children with a through channel of applying their creative skills "school - university - enterprise".

The next fortune is a well-functioning information system that provides evaluating the creative rating of students by the intensity of their research activities. This is a unique development of Semyon Piyavsky, head of the Department of Information Developing Educational Systems and Technologies. On the basis of this system the Samara regional information and communication system "Vzlet" was created.

And finally, within the reform of the Russian system of higher education, Samara State Technical University has got the status of a flagship university. One of its key tasks is to provide the regional labor market with qualified personnel, to take appropriate measures that address the loss of intellectual potential.

Last year we managed to create a strong bond - "school-university". Within the framework of "Vzlet" program, the university lecturers of the Samara region offered schoolchildren about 500 themes for research. As a result, groups - "triangles" started to form: a high school student (8-11th grade), a teacher (coordinator) and a university scientist (scientific consultant of the research). Most importantly in this process is that the boundary between the university and the school has been erased. The scientists not only tell the students about their scientific work but interact with them in a joint research project.

Our goal is to educate an all-round man. The students will get professional qualifications at universities but we need creative people possessing vast multidisciplinary knowledge.

Since September 2016, we began to form the second bond - "university-enterprise." The semantic content of this level is to create mixed-age research teams. Firstly, we identified the collaboration centers between the real economy and the university sector and, secondly, completed the vertical structure for students. This program was called "Flight".

It is important that major activities in the work with gifted youth are financially low-cost.

"VZLET" WINNERS AND THEIR PROJECTS

WHO: **David Gukasyan,** Grade 10

LOCATION: Chapayevsky settlement

DETAILS: David invented the program with elements of artificial intelligence to solve physical problems. The program analyzes the text, recognizes the data, units of measurement, selects the desired formula and gives a solution. "I'm sure that a similar idea came to the minds of many students - to invent a robot that will do homework instead of you. I guess such programs have already existed but this is my own Author's program,"- says David.

WHO: **Bogdan Gulyaev,** Grade 10

LOCATION: Togliatti

DETAILS: At the age of 16 Bogdan created and implemented a programming system for finite state machines on NET platform. "In fact, I aimed at creating a new programming language," said Bogdan. "Of course, that was only an ambition but after finishing grade 9, I was able to define the task and write the language. Then I had to get an understanding of its relation to the hardware platforms."

WHO: **Daniil Batyrshin,** Grade 11

LOCATION: Roshchinsky settlement

DETAILS: Daniil has been working on problems of creating websites, effective design and increasing attendance rate of Internet platforms. A high school student is trying to solve the problems for University graduates. "First I had an idea to experience an internship in the marketing department of a large company immediately after school but later I decided to follow the traditional scheme and go to University," said Daniil.

ANTIVIRUS PROGRAM

HOW POLYTECH CHEMISTS INVENT NEW SUBSTANCES TO CREATE DRUGS AGAINST THE INFLUENZA VIRUS

Text: Kseniya MOROZOVA

Marat BAIMURATOV – 2010 Polytech graduate
In 2016 he defended the dissertation ""Synthesis and chemical properties of allyl derivatives of the adamantane series." His scientific interests include the chemistry of unsaturated compounds of the framework structure, the synthesis of biologically active compounds, and the physico-chemical methods for studying organic compounds.
Developed more than 100 new compounds containing a frame fragment.

SCIENTISTS OF "ORGANIC CHEMISTRY" DEPARTMENT HAVE BEEN SEARCHING FOR BIOLOGICALLY ACTIVE SUBSTANCES ON THE BASIS OF WHICH AN EFFECTIVE ANTIVIRAL DRUG CAN BE MADE. MOST EXPERIMENTS ARE CARRIED OUT WITH THE SO-CALLED FRAMED COMPOUNDS – POLYCYCLIC CHEMICAL COMPOUNDS OF A SPACE STRUCTURE. FRAMED STRUCTURE ALLOWS MOLECULES EASILY PENETRATE WITH CELL MEMBRANES, THUS INCREASING BIOAVAILABILITY, ACCESSIBILITY OF THE COMPOUNDS. IN ADDITION, CHEMISTS TRY TO SPEED UP THE PROCESS OF CREATING A MEDICINE AS MUCH AS THEY CAN. SENIOR RESEARCH SCIENTIST OF THE DEPARTMENT MARAT BAIMURATOV ALLOWED "TECHNOPOLIS OF THE VOLGA REGION" TO LOOK INTO THE LABORATORY AND SEE HOW THEY DO IT.

1

First biologic targets are selected for a new drug. Then virtual screening is carried out - selection of the most promising chemical compounds from the database, which will give the future medicine a certain set of medicinal properties. Then molecular docking of selected compounds is carried out, that is, molecular modeling, which allows to predict the most favorable orientation and position of one molecule relative to the other.

2

In order to synthesize one compound, it is necessary to carry out several consecutive reactions. The choice is made in favor of the approach, which contains fewer steps, gives a greater yield of the target substance and requires a minimum of financial investments for the purchase of reagents and equipment. The target compounds are then synthesized for further studies of their biological activity. It should be noted that the most important building blocks in the synthesis of many biologically active compounds are alkenes - unsaturated acyclic hydrocarbons with one double bond - and their derivatives. Interest in the unsaturated substrates of the adamantane series is primarily due to the fact that these are reactive and accessible compounds. The introduction of the adamantane fragment into the molecule of the biologically active compound makes it possible to enhance the pharmacological action.

3

Synthesized samples are sent to the virology centers. After obtaining the data on activity in in vitro experiments (in vitro), scientists compare them with the activity of the compounds that make up the known drugs, and from this they conclude about prospects for further research.

PIXEL TO PIXEL

DEVELOPMENTS OF POLYTECH'S SCIENTISTS IN THE FIELD OF HYPERSPECTRAL MONITORING WILL HELP RUSSIA BECOME THE LEADER IN REMOTE SENSING OF EARTH

Text: Svetlana EREMENKO

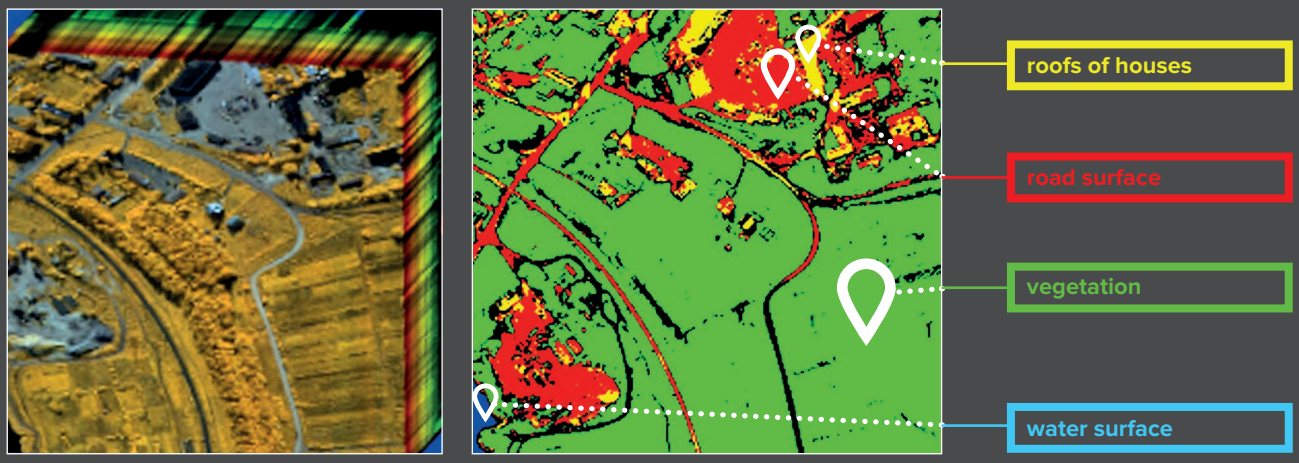
USUALLY WE COME INTO THE INTERNET SERVICE GOOGLEEARTH TO FIND THE RIGHT BUILDING OR A CLEARING IN THE WOODS FOR A PICNIC. IT HAS A DEFINITE SCIENTIFIC NAME - REMOTE SENSING OF EARTH.

DETAILS ARE MORE IMPORTANT

Today, the results of remote sensing (RS) are used in various fields, from weather reports to the prediction of natural disasters and climate changes. Geologists, rescuers, foresters, environmentalists, road workers need accurate data on the "state of health" of Earth and facility conditions on its surface. Ways of obtaining such data have been constantly improved. The fastest developing industry is the spectral monitoring one. By 2020 the volume of hyperspectral information for solving various problems can increase by 20 percent compared to 2010.

Today, hyperspectral images contain a huge amount of data but it is not so easy to interpret them. To do this, we need to know exactly, for example, what characteristics of materials are specified and how they correlate with the results of other measurements. We need atlases of the images themselves, databases, libraries of spectra (their signatures). In addition, remote sensing requires the consolidation of knowledge in the field of physics, chemistry, geology and mathematics.

The next step in the development of the spectral monitoring industry in SSTU was made last year. A unique interdisciplinary project team started its work and the results in the coming years are expected to become a breakthrough.



TO EARTH FROM ABOVE

Pavel Kuznetsov, Doctor of Technical Sciences, Director of the Research Institute of Problems of Mechanical Systems Reliability in SSTU, Professor of the Department of Electric Drive and Industrial Automation describes specific objects of interest for specialists involved in spectral monitoring of oil wells, sowing areas, forest areas, water objects, road nets, etc.

Vasily YERMAKOV, PhD of Technical Sciences, associate professor of the Department of Chemical Technology and Industrial Ecology:

- We started with the selection of algorithms for mathematical processing of satellite images. We were able to detect the soil contaminated by oil and oil products but it was impossible to identify small objects. To do imagery at least two more levels was required for clearer pictures.

- A certain area of the Earth surface is being shot with the help of a spacecraft. Then the flying laboratory installed on a light motor aircraft or on a drone is used. From a height of 3 km you can get pictures with a resolution of up to 1 meter or more. On the ground, measurements are possible when the test material is in contact with submersible and contact probes, portable spectroradiometers and narrowband discrete analyzers.

This multistage system of data extraction and analysis provides measuring a lot of parameters such as detecting in time the site of fire in the forest, analyzing the composition of hazardous waste of oil flares, measuring the depth of the artificial dam and preventing ruin of the roadway. The whole system of large and small devices containing space-based monitoring facilities, air laboratories and in-situ mobile analyzers must take up these challenges faced by scientists, rescuers, oil workers, foresters, farmers.

Present methods of remote monitoring will also be useful for geologists, archaeologists, biologists, and astrophysicists. Thus, it is the hyperspectral data that makes it possible to determine the rock composition of other planets and asteroids. And this is important for finding fossils on the Moon or other planets of the solar system, and for understanding the extent of the asteroid hazard the whole world is now talking about.

MOST ACCURATE UP-TO DATE DATA

The hyperspectral equipment fixes electromagnetic radiation in hundreds of very narrow spectral ranges. During the hyperspectral survey, a multidimensional image is formed where two measurements show the spatial location of the terrain points, and the third one shows their spectral properties. Each smallest addressable element of the image (pixel) is accompanied by a spectral characteristic of the radiation.

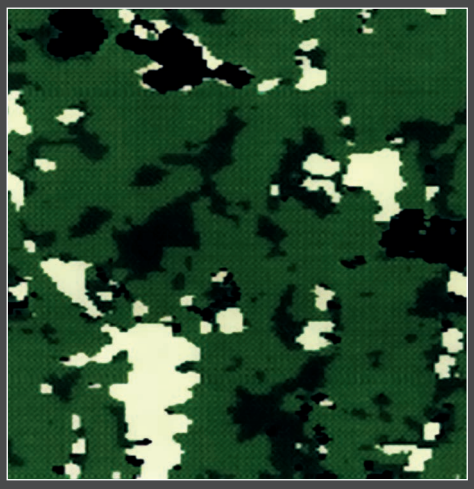
Prior to the hyperspectral imaging technology, to obtain information about a particular area of the terrain the scientists used multispectral images, i.e. a series of images of the same object made in a small quantity in different spectral ranges. However, modern methods of remote monitoring provide examining details that could not be detected on a multispectral picture.

In the field of the development of spectral monitoring technologies, Samara region has a leading position in Russia. Multi- and hyperspectral data are obtained here with the help of sensors placed onboard the spacecrafts Resurs-P and Aist-2 made at Samara JSC SRC Progress. Samara scientists have extensive experience in processing of remote sensing data. Over the past three years, the staff of SSTU jointly with the Progress specialists have developed a unique for Russia methodology for thematic analysis of data and have created signature databases for the spectral and chemical composition of soils and waters in the Samara region.

At present, Polytech's scientists have been cooperating closely with farmers from Samara and Krasnodar regions who are very interested in implementing "satellite farming". Using the methods of spectral monitoring, it is possible to control the moisture level in the field, the amount of fertilizers needed and the density of the Anisoplia austriaca beetle population. It has been calculated that "satellite farming" increases grain yield by 20-30 %. The economic effect from the use of remote sensing will be shown not only through the reduction of all agricultural expenses but through saving money for carrying out Government Accounting of Land Resources as well.

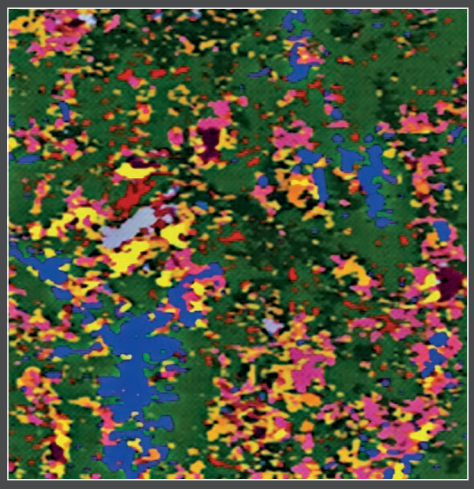
Scientists assure that further development of remote sensing systems will allow the relevant services of Conservation of Nature to prevent unauthorized intrusions into soil and water. Emergency wastewater discharges, oil spills, spontaneous landfills and signs of aggressive anthropogenic impact on the environment are detected as a multicolor picture of spectra. The high efficiency of observations will make it possible to identify areas of harmful emissions into the atmosphere.

MULTISPECTRAL IMAGE

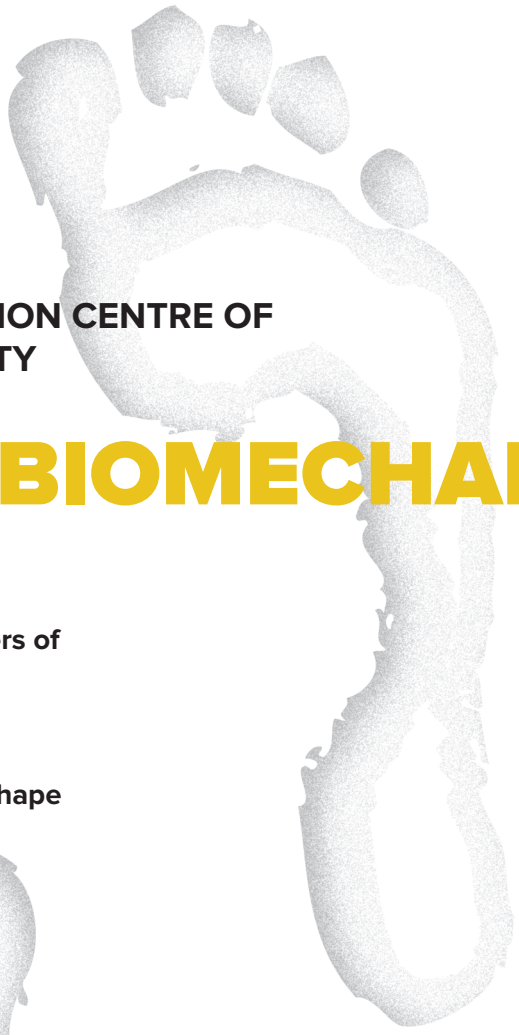


no data
hardwood
softwood
grass

HYPERSPECTRAL IMAGE



grass
red maple
red oak
mixed deciduous forest
coniferous forest
white pine
deciduous forest
mixed coniferous forest
norwegian spruce
douglas fir
spruce + swamp
deciduous forest + swamp



THE SCIENTIFIC AND PRODUCTION CENTRE OF SAMARA TECHNICAL UNIVERSITY

COMPUTER BIOMECHANICS

OFFERS **individualized orthopedic insoles using the biomechanical parameters of the patient.**

The unique technique uses a three-dimensional model of the human foot to shape each insole.

- Computer diagnostics of foot deformations (flat, flat-valgus foot, cross flat , Halluxvalgus etc.) without the use of X-rays ;
- Computerized video gait analysis by using a treadmill and a set of video cameras;
- Photo analysis of postural disorder (scoliosis, kyphosis, lordosis, etc.);
- Three-dimensional optical scanning of both feet with a scanner IQube.

Software package Ortho Model is focused on creating of orthosis for 5-7 minutes. Virtual design is completed by software product OrthoMill.

SPC Computer biomechanics
29, Lukachev str., Samara, Russia
Tel. : +7 937 649 54 44
E-mail: zinnat.ildar@gmail.com

THERE ARE SOME CONTRADICTIONS, YOU SHOULD CONSULT A SPECIALIST.

TECHNOLOGIES OF HOPE

ECOLOGICAL DEVELOPMENTS OF OUR SCIENTISTS GIVE INTOXICATED SOILS A SECOND LIFE

Text: Svetlana EREMENKO

ONCE, INDUSTRIAL AND HOUSEHOLD WASTE HAS BEEN VIEWED ONLY AS GARBAGE. NOW ANY DUMP IS A REAL SOURCE OF SECONDARY RESOURCES. ALL BY-PRODUCTS OF HUMAN ACTIVITY WILL SOON BE TRANSFORMED INTO FUEL, FERTILIZERS OR CONSTRUCTION MATERIALS.

GROUND FROM WASTE

One of the modern “green technologies” is the processing of contaminated soil using strains of microorganisms. In regions with developed oil production and oil refining industry it can be compared with a life-saving circle, for example, for agricultural lands that have been affected by unavoidable accidents on pipelines, spills of toxic hydrocarbons and therefore taken out of use. Specialists of the Scientific &Analytical Center for Industrial Ecology (NCPE) at SSTU are making progress in the development and implementation of new methods for the rehabilitation of disturbed lands.

- Humus-rich soils are used for urban landscaping or rehabilitation of soils containing landfills and mines. It is necessary in order to restore the grass cover on disturbed lands. Meanwhile, the Middle Volga region, in contrast to Kazakhstan with virgin lands, does not have enough black earth, - says **Konstantin Chertes**, Professor, Doctor of Technical Sciences. – During a shortage of natural soils, artificial materials can become their substitutes.

THE IDEA OF CREATING A RECYCLING CLUSTER FOR A RESOURCE-SAVING INDUSTRY WAS BASED ON THE RESEARCH OF SAMARA CHEMISTS. SSTU NOW HAS A SCIENTIFIC SCHOOL HEADED BY DMITRY BYKOV, PROFESSOR, DOCTOR OF TECHNICAL SCIENCES, RECTOR OF A FLAGSHIP UNIVERSITY. IT WAS CREATED IN 2001 AT THE DEPARTMENT OF CHEMICAL TECHNOLOGY AND INDUSTRIAL ECOLOGY OF OUR UNIVERSITY. TODAY, FIVE DOCTORS OF SCIENCE AND MORE THAN THIRTY PHDS WORK HERE.

are aimed at customers. After the author's technologies are created, specialists of the Center begin to develop project documentation.

- Our University differs efficiently from other technical universities of Russia as we do not seek the assistance of large design institutes, - explains **Olga Tupitsyna**, a leading expert of the Project Group at the Scientific & Analytical Center for Industrial Ecology.

Our Center designed complexes for neutralizing and recycling of municipal and construction waste for Togliatti, Otradnoye and Novokuibyshevsk. More recently, a unique

Artificial soils are created literally from recycled mud and garbage including drill cuttings and oil contaminated soils, active sludge of city treatment facilities, sewage sludge, sludge from thermal power plants, dropouts at sorting and processing of solid household waste and some types of construction debris. It turns out that according to the agrochemical composition these wastes are similar to weak humic soils. Polytech's scientists learned how to neutralize them. Now patented methods for producing soil-like recultivation materials from various wastes are in the tool kit of our scientists.

TO DISCOVER AND NEUTRALIZE

Our scientists are not limited to theoretical scientific developments, they

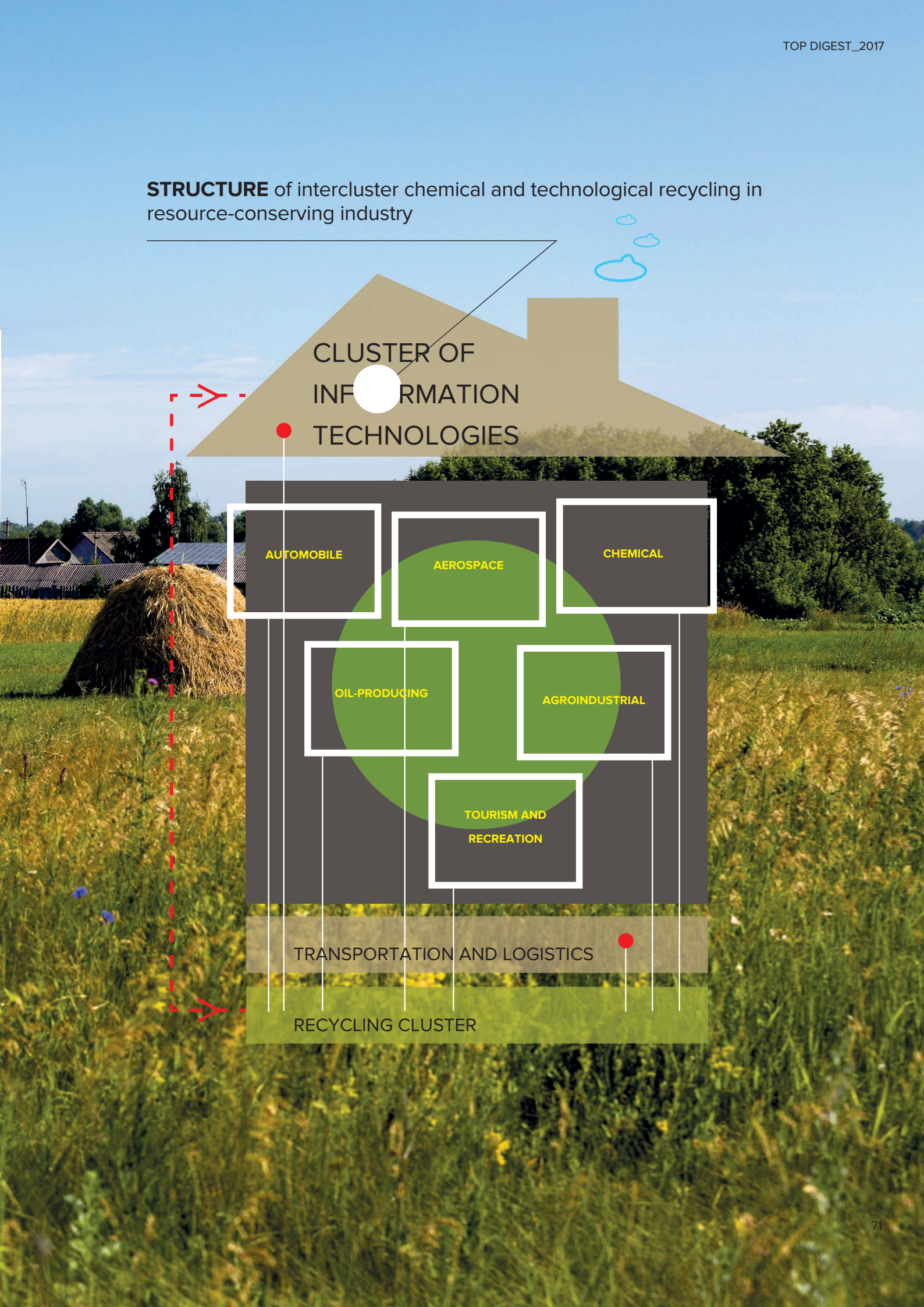
complex for the processing of drilling sludge has been put into operation in the Krasnoyarsk region.

- Oil drilling causes penetration into the subsoil of several kilometers deep, - explains Professor Chertes. - Hundreds of cubic meters of drilling chips mixed with various additives containing almost the entire Mendeleev's table are brought to the surface. That is drilled cuttings, i.e. pasty waste containing both very toxic organic compounds and mobile forms of heavy metals. Until recently, drilled cuttings were stored in barns. Herewith, compounds that are toxic to nature and human health have inevitably polluted the soil, groundwater and surface water sources.

To use drill cuttings as raw materials for production of construction materials, all toxicants must be fixed in some way and transferred to an environmentally friendly form. Polytech's scientists have developed technologies for cementation of drilled cuttings and have patented methods for the production of special cementitious additives that provide using these wastes in construction.

At present, more than 10 million tons of sludge have been found on the territory of the Samara region.

STRUCTURE of intercluster chemical and technological recycling in resource-conserving industry



Olga TUPITSYNA, Doctor of Engineering, a leading expert of the Project Group at the Scientific & Analytical Center for Industrial Ecology:
While recycling waste we not only reduce Hazard Class but obtain finished products (topsoil, crushed stone, fertilizer, construction substrates) corresponding to all GOSTs. We are not aimed at producing commercial products, we just solve the problem of minimization of accumulated waste, rehabilitation of contaminated lands due to the production activity and restoration of them into economical use.

Technologies developed by specialists of the Scientific & Analytical Center of Industrial Ecology at SSTU, made it possible to rehabilitate more than a thousand hectares of disturbed lands. About two hundred thousand tons of hazardous wastes were recycled into materials used in recultivation and construction. With the participation of the Polytech's scientists a unique complex of biothermal treatment of oil-polluted soils was created. The soils contaminated with hydrocarbons are mixed with special additives and subjected to pump aeration. Due to heat, air and microorganisms, the inert material is obtained after one or two warm seasons. It is used as technological substrates in the construction of roads and in recultivation of disturbed areas.

SCIENTIFIC AND ANALYTICAL CENTER INDUSTRIAL ECOLOGY OF SSTU

CONDUCTING CHEMICAL ANALYSES OF SOILS, WASTE, SEWAGE AND SURFACE WATERS

ENVIRONMENTAL AUDIT OF ENTERPRISES

MONITORING OF THE ENVIRONMENT STATE IN THE ZONE OF MAN-MADE OBJECTS IMPACT

DEVELOPMENT OF ENVIRONMENTAL JUSTIFICATIONS FOR THE ACTIVITIES OF ENTERPRISES OF HAZARDOUS WASTE MANAGEMENT

CERTIFICATION OF HAZARDOUS WASTE, CALCULATION OF HAZARD CLASS

DESIGNING OF LANDFILLS FOR INDUSTRIAL AND DOMESTIC WASTE DISPOSAL

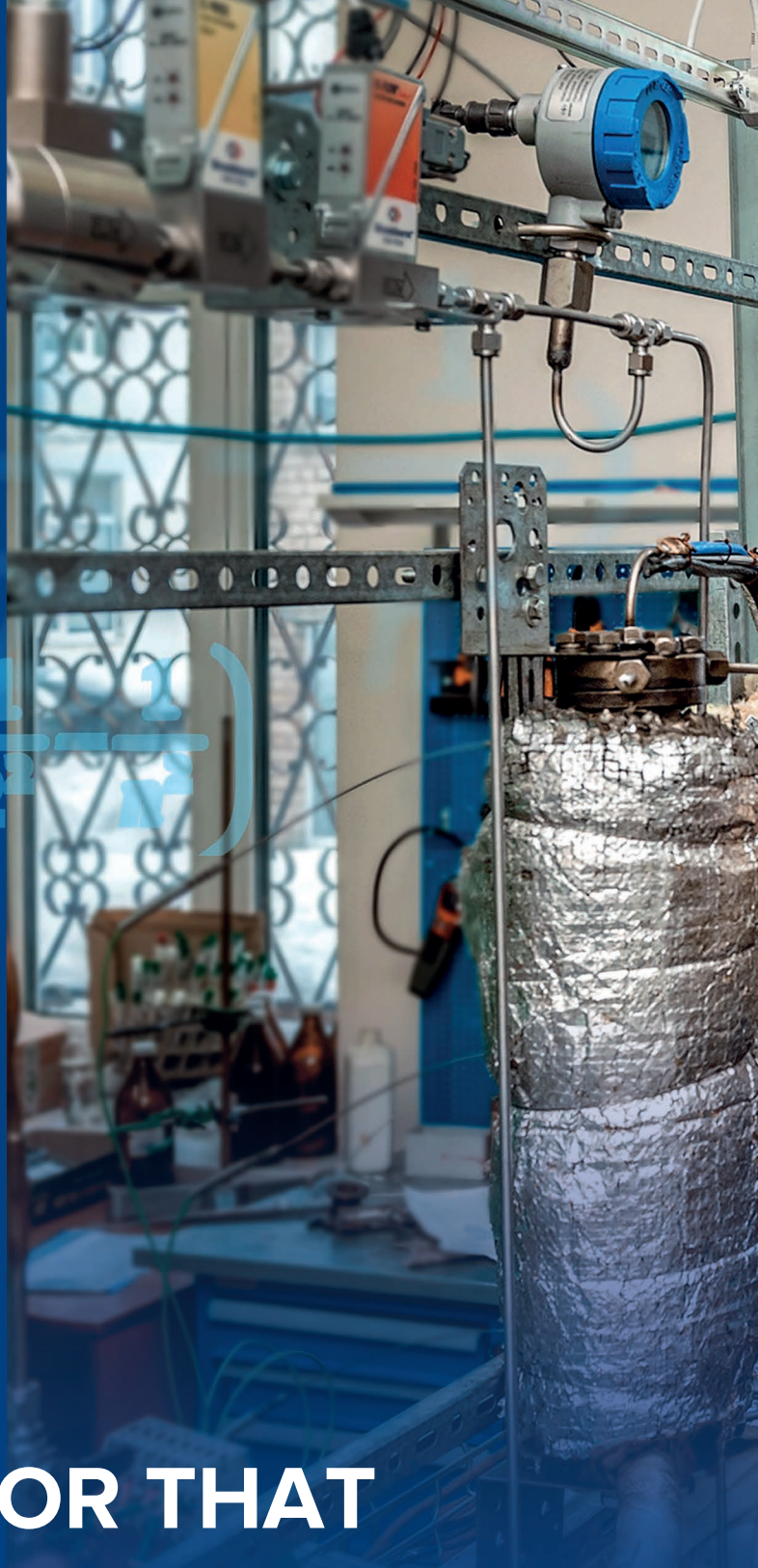
SCIENTIFIC DEVELOPMENTS IN THE FIELD OF WASTE MANAGEMENT IMPROVING

ECOLOGICAL SUPPORT OF DESIGN DOCUMENTATION OF CONSTRUCTION OBJECTS

Accreditation and licenses for the relevant types of work. Maintenance of the coordination of the developed documentation in controlling bodies (Federal Service for Supervision of Natural Resource Usage , Federal Service for Surveillance on Consumer Rights Protection and Human Wellbeing , Russian Federal Service for Ecological, Technical and Atomic Supervision, Ministry of Emergency Situations, patent support)

1 PERVOMAYSKAYA STR., OFFICE 723, CITY OF SAMARA, RUSSIA
TEL.: +7 (846) 337-15-97.
E-MAIL:NCPE@MAIL.RU,
WWW. NCPE.SAMGTU.RU

$$\frac{1}{\lambda} = R'\left(\frac{1}{2^2} - \frac{1}{n^2}\right)$$



THIS FUEL OR THAT

RESEARCHERS OF THE FLAGSHIP UNIVERSITY ARE WORKING ON THE PROCESSES OF HYDROGEN ACCUMULATION IN AROMATIC MOLECULES

Text: Maxim EREMIN

THE SIMPLEST THING THAT NATURE CREATED IS A HYDROGEN ATOM. A PROTON AND AN ELECTRON. PLUS AND MINUS. THAT'S AN AMAZINGLY MINIATURE PHENOMENON. TO MAKE AN IMAGINARY CHAIN COMPARABLE IN SIZE TO THE CIRCUMFERENCE OF A 1 RUBLE COIN, YOU NEED AT LEAST 785 MILLION PRESSED CLOSE TOGETHER ATOMS. THE RESULTS OF FUNDAMENTAL RESEARCHES CONDUCTED BY ANDREY PIMERZIN, PROFESSOR OF SAMARA STATE TECHNICAL UNIVERSITY, HEAD OF THE DEPARTMENT OF CHEMICAL TECHNOLOGY OF OIL AND GAS PROCESSING AND SERGEY VEREVKIN, PROFESSOR OF THE UNIVERSITY OF ROSTOCK (GERMANY) PROMISE TO OPEN ACCESS TO THE GRANDIOSE ENERGY POTENTIAL OF THIS SUBSTANCE.

THE BEST PROJECT

Sergey Verevkin is a specialist in physical chemistry and thermodynamics. Pimerzin's sphere of interests is chemical technologies and catalysis. The idea to join efforts came up long ago, and at the crossroads of scientific interests the project "Thermodynamics and catalysis as the basis of the strategy for creating promising processes for obtaining fuels from renewable raw materials and technologies for hydrogen accumulation using unsaturated organic compounds" appeared. This innovative idea won a grant last year at the RF Government grant competition. Experts selected only 40 projects from 542 applications. Polytech received 90 million rubles to implement a three-year project.

The man managed to reach a near-earth orbit, to understand the complexity of nucleotides in the DNA of living organisms but so far could not find an effective way of accumulation and storage of large energy reserves. Our ancestors discovered electricity. It's an almost perfect form of receiving and transmitting energy. But to save its surpluses for a "black day" is still a difficult and extremely costly task. We don't consider batteries, small devices as they will not solve the problems of the global energy shortage. So the main "storage tanks" are still oil, coal and gas. To transform electricity into these known to us substances is meaningless.

And what if we try to "preserve" it in ... hydrogen?

Sergey VEREVKIN, Professor of the Department of Physical Chemistry, University of Rostock (Germany):

- Let's say I bought such a battery. I put this device in the car and drive. After 100 kilometers I exchange it at the "gas station" and go on driving. Another option: in a country house equipped with solar panels I "collect" hydrogen by electrolysis during the day, and in the evening I combust it and get electricity. I also can use a hydrogen engine on the yacht. Similar experimental installations already exist. I was delighted with the thoroughness of the technological design of chemical processes at the University of Erlangen – Nuremberg. We tried to understand the energy of molecules that "take" and "give" hydrogen. Our task is to find free or cheap raw materials that could be technologically hydrogenated and dehydrogenated while using available catalysts.

PRESERVED HYDROGEN

The idea of energy storage in the form of hydrogen has been in the air for a long time. There are lots of attempts to make it happen in different ways. The most obvious option is to produce hydrogen, pump it into cylinders and transfer it into a liquid state under high pressure. Then we can transport, store and use it when necessary. However, this way is very dangerous because of the constant threat of an explosion.

The second option involves the use of various substances with absorbed molecular hydrogen on the surface or inside.

Polytech's chemists believe that hydrogen storage and release as a result of chemical transformations is the most promising way. A simple and effective way to convert electrical energy into a hydrogen "form" is as

follows: we obtain hydrogen from the electrolysis of water and store it in aromatic compounds.

-We all pay for electricity but use it extremely unevenly,- says Sergey Verevkin. – For instance, on Monday morning we don't need it. Then, during the day lights, computers and other electrical appliances are turned on. By evening, the need for electricity decreases again, and at night it is not consumed again. Ordinary people do not think that the producers of electric energy bear huge expenses as electricity is produced 24 hours a day, even when it is not in demand. In this case, it is reasonable to use a backup option, a backup installation.

Once some extra energy is created, we use the electrolysis, and two molecules of water are split into two molecules of hydrogen and oxygen. In cases of energy shortage, we release hydrogen by catalytic reaction and burn this almost free hydrogen, turning it into water again. In terms of ecology it's a perfect technology.

Chemists have proposed a very elegant way of preserving hydrogen in molecules containing double bonds, for example, in naphthalene ($C_{10}H_8$). In its structure there are two benzene rings. It means that during the catalytic hydrogenation, 10 additional hydrogen atoms can be attached to them, and, if necessary, we can "take them back".

It is important that energy storage in such molecules is safe and will not cause either an explosion or a fire. Another thing is that there will not be enough energy in naphthalene. In addition, the use of a "hydrogen battery" based on this substance will be limited by the high cost, sharp and unpleasant odor and high melting point (more than 80 ° C).

According to Grant Project, within three years Sergey Verevkin and Andrey Pimerzin should find new affordable and inexpensive chemical compounds with high content of hydrogen providing its accumulating and develop new effective catalysts that will ensure the hydrogen release reaction at low temperatures.

It is clear that the "hydrogen storage" should be liquid. Gas is difficult to hold-up, and catalysts do not work in the solid. And in terms of technical application, liquid as an energy carrier is the most familiar and convenient.

ENERGY FROM THE FIR TREE

The parallel direction of the fundamental work of chemists is the creation of technologies for obtaining fuel from natural renewable raw materials. Fossil sources of energy such as oil, gas and coal are finite. In countries with a small resource base, a search for alternatives has been under way for a long time.

No one today remembers who first came up with a brilliant idea of using plant biomass as a fuel. Another important thing is that during the combustion of plant raw materials, carbon dioxide is emitted. It returns to the atmosphere in the same volume that it was absorbed in the process of photosynthesis. This is how global ecological task is being solved, as the content of carbon dioxide in the air greatly increases when using a traditional hydrocarbon fuel.

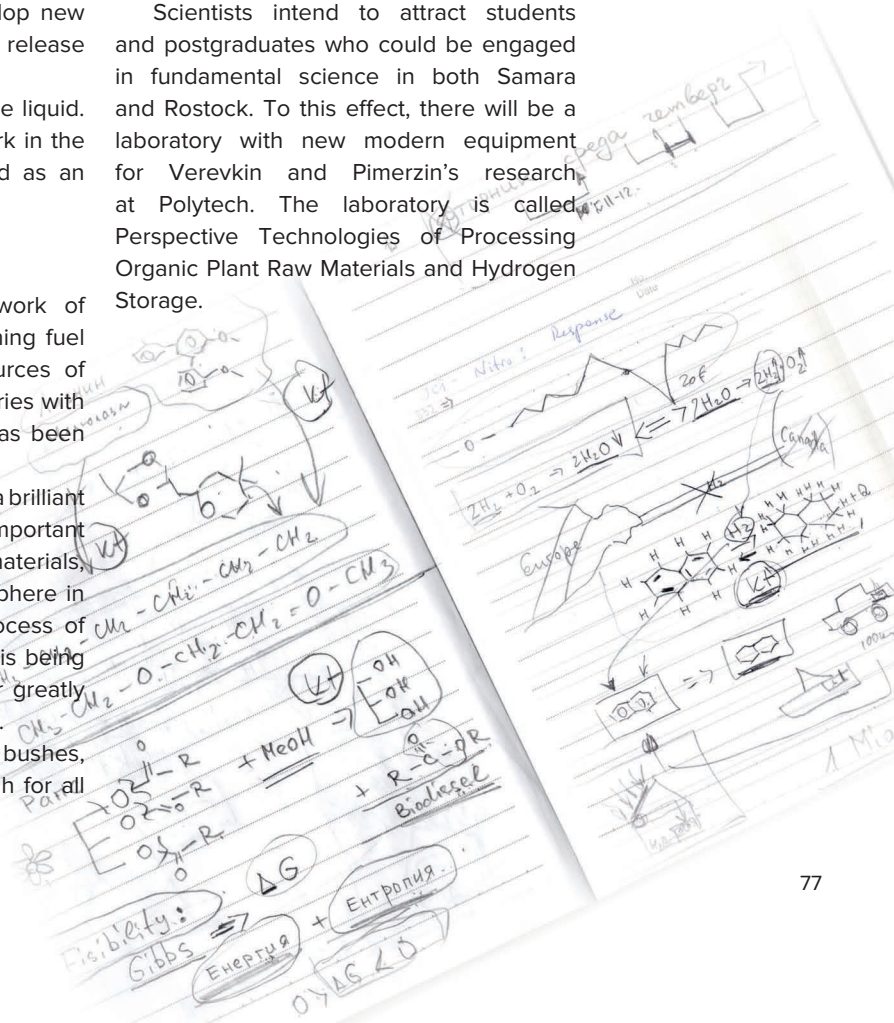
On Earth there is a lot of biomass such as trees, bushes, algae, and the energy contained in them is enough for all human needs.

However, there are great difficulties in using it at the moment. The composition of bioorganic compounds differs from the composition of fuels. In addition, they contain elements that deactivate and "kill" catalysts, which could produce fuels similar to the traditional ones.

-We need to find catalysts that cope with this problem, - says Andrey Pimerzin. We could move in small steps, use compromises, for example, suggest a joint processing of oil products and a small amount of plant raw materials (15-20 percent of the total mass). At this stage it will simplify the task because it is now unreasonable to rebuild the existing infrastructure for oil and gas processing into production units for plant raw processing. But we are focused on the creation of catalytic systems that could process pure renewable plant raw materials. We have three years and we are aimed at success in solving this problem.

In addition to applied research in the field of catalysis and inorganic chemistry, scientists intend to study the fundamental properties of key organic substances that are the basis of plant materials. The researchers promise to get new data on their thermodynamic and physicochemical parameters. Scientific work of such a scale involves the use of extremely accurate experimental devices and methods of quantum chemistry, and participation of research capacities of Russia and Germany.

Scientists intend to attract students and postgraduates who could be engaged in fundamental science in both Samara and Rostock. To this effect, there will be a laboratory with new modern equipment for Verevkin and Pimerzin's research at Polytech. The laboratory is called Perspective Technologies of Processing Organic Plant Raw Materials and Hydrogen Storage.



PRETTY MUCH THE SAME

POLYTECH SPECIALISTS OF FOUNDRY TECHNOLOGY CENTER RENOVATE CULTURAL HERITAGE SITES OF OUR CITY

Text: Kseniya MOROZOVA

Konstantin NIKITIN, Doctor of Technical Sciences, Dean of "Mechanical Engineering, Metallurgy and Transport" department:

- Recently, the work of our team was marked with a letter of gratitude from OOO NPU SamaraRestavratsiya. We were also invited to restore some parts of the Il-2 airplane monument, which was dismantled for the time of repair of the Moscow highway in the regional capital. It means that we have achieved high professionalism.

For five years engineers of "Mechanical Engineering, Metallurgy and Transport" department have been participating in major restoration projects. For the first time Polytech scientists played the role of restorers, renovating letters and decorations cut by vandals from the pedestal of the bronze bust of our fellow countryman, political and military figure, USSR Defense Minister Dmitry Ustinov in Glory Square. And last year, by only one door handle found in the basement of the mansion Subbotin-Shikhobalov (Governor's House) on A. Tolstoy Street, 3, the technology was developed for producing a whole series of this element of the architectural hardware.

"The most difficult part for us was to participate in the project for making a star for the Eternal Flame in Glory Square," recalls **Anton Barinov**, the leading engineer at the Foundry Technology Center of Polytech. - The main problem was that I had to work with a burning torch, because you can't "turn off" the Eternal Flame".

Engineers have lofty agenda in store. In the near future, our specialists will help to restore the block near the museum named after P.V.Alabin.

At present the technology of casting security plates for buildings that are monuments of architecture is being developed.


ОБЪЕКТ КУЛЬТУРНОГО НАСЛЕДИЯ
ПАМЯТНИК АРХИТЕКТУРЫ
РЕГИОНАЛЬНОГО ЗНАЧЕНИЯ
ЗДАНИЕ ПОЧТОВОЙ КОНТОРЫ, ГДЕ В 1889-1893 ГГ. БЫВАЛ В. И. ЛЕНИН. В ДЕКАБРЕ 1889 Г. ИМ ОТПРАВЛЕНО ОТСЮДА ПИСЬМО В КНИГОТОРГОВУЮ ФИРМУ БРОКГАУЗ
1866 Г., 1889-1893 ГГ.
ПОДЛЕЖИТ ГОСУДАРСТВЕННОЙ ОХРАНЕ
ЛИЦА, ПРИЧИНИВШИЕ ВРЕД ОБЪЕКТУ КУЛЬТУРНОГО НАСЛЕДИЯ, НЕСУТ В СООТВЕТСТВИИ С ЗАКОНОДАТЕЛЬСТВОМ РОССИЙСКОЙ ФЕДЕРАЦИИ
ОБЪЕКТ КУЛЬТУРНОГО НАСЛЕДИЯ
ПАМЯТНИК АРХИТЕКТУРЫ
РЕГИОНАЛЬНОГО ЗНАЧЕНИЯ
“ГОСБАНК”
1897 - 1902 Г.
ПОДЛЕЖИТ ГОСУДАРСТВЕННОЙ ОХРАНЕ
ЛИЦА, ПРИЧИНИВШИЕ ВРЕД ОБЪЕКТУ КУЛЬТУРНОГО НАСЛЕДИЯ, НЕСУТ В СООТВЕТСТВИИ С ЗАКОНОДАТЕЛЬСТВОМ РОССИЙСКОЙ ФЕДЕРАЦИИ УГОЛОВНУЮ, АДМИНИСТРАТИВНУЮ И ИНУЮ ОТВЕТСТВЕННОСТЬ
УСТИНОВ
ДМИТРИЙ ФЕДОРОВИЧ
ДВАЖДЫ ГЕРОЙ СОЦИАЛИСТИЧЕСКОГО ТРУДА

PROJECTS AND POST-PROJECTS

YOU CAN GET TO KNOW THE IDEAS OF SAMARA ARCHITECTS NOT ONLY IN SAMARA

Text: Kseniya MOROZOVA, Egor GORIGLYADOV

AT THE END OF LAST YEAR, PROFESSORS OF "INNOVATIVE DESIGN" OF SSTU DEPARTMENT EVGENIYA REPINA AND SERGEY MALAKHOV TOOK PART IN THE EXHIBITION OF MODERN ARCHITECTURE "POST-PROJECT - NARRATIVE WITH THE REALITY" IN TOKYO. THE EXHIBITION WAS HELD IN THE MUSEUM OF ARCHITECTURAL MODELS ARCHI-DEPOT, WHICH WAS OPENED IN JULY LAST YEAR IN THE PICTURESQUE COASTAL ZONE OF TENNOZU ISL. THIS IS THE ONLY MUSEUM IN THE WORLD THAT, IN ADDITION TO COLLECTING UNIQUE EXHIBITS, IS ENGAGED IN THE RESTORATION AND CONSERVATION OF SOME SAMPLES. NOW THE EXHIBITION MODELS OF SAMARA ARCHITECTS WILL ALWAYS REMAIN IN THE COLLECTION OF THE JAPANESE MUSEUM.

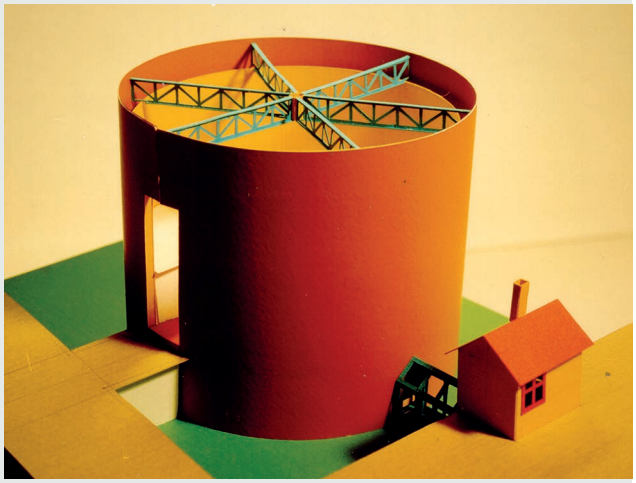
MEANINGFUL STORIES

The name of the Japanese exhibition points to a methodology that the Samara professors discovered about 20 years ago. Post-projection is the process of turning to the past, a culturological game. It is work with those objects that have already been built. The aim of the artist is to reconceptualize what has been done, to return the lost meanings to the objects.

Usually the architectural idea moves from the project to its actual embodiment. Post-project creates the opposite situation: the reason, the starting point of the work is already established objects and the cultural environment around them. This makes it possible to reveal the true values of anonymous, abandoned buildings and spontaneous houses, to give them a new meaning.

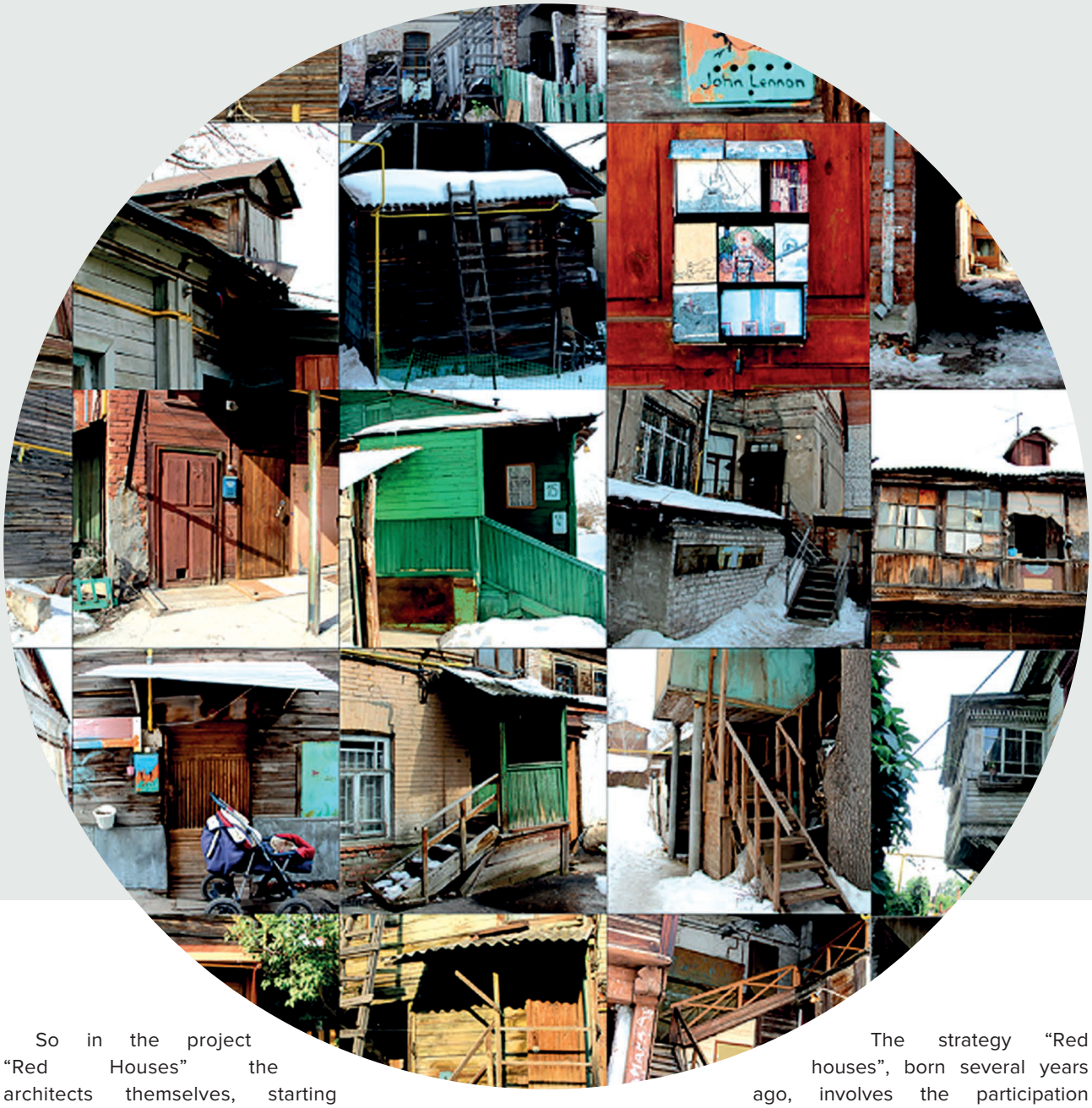
An important place in post-projecting is given to the stories. Experts make up “legends” for the built objects, telling about how, by whom and for whom they were designed. This creates a parallel cultural space where real people and real structures are embedded in a new context of existence. Post-projection, therefore, becomes a point of contact between architecture and philosophy, cultural studies and history. In this case, it is not so important what was the first: construction or project.

The long-term development of the concept of Samara architects resulted in creation of such post-projects as, for example, Palazzo Massimo Iori, the house of Flea Barket, the house of actor Borisov. In particular, the prototype of the post-project “House of Actor Borisov” was a huge rusty reservoir on the outskirts of the village Pribrezhnyi and country house, typical for the Soviet period. These two objects have united in a common plot. So there appeared a legend about actor Borisov, an alternative scenario of his creative life: in his huge tank he has his own theater for the actor’s essence expression, and in a small hut there is a bedroom with a fireplace, suitable for private life.



RED HOUSES AND KVARTAL 13

The concept of Sergey Malakhov and Evgeniya Repina's post-projects found their translation into the idea of "profiles of Samara yards", being brought to life by the public organization "Institute of Samara city" (leaders - **Sergey Malakhov**, **Evgeniya Repina**, **Alexander Gnilomedov**). The backbone of the idea is developing evolutionarily; any yard at a certain moment becomes a unique system that combines spatial and cultural values. The history and activity of its inhabitants, combined with the birth of the world, the cosmos with its own rules and rituals, overlay with the features of development and the valuable qualities of the environment. Each such world deserves to be immortalized in the memory of not only its inhabitants. Architects offer people keep a story, a blog, a profile about their yard, talk about problems, success, share news and ask for advice.



So in the project “Red Houses” the architects themselves, starting out from the profile of the block, bounded by Cheremshanskaya, Voronezhskaya, Nagornaya Streets and Rotorny Lane, developed a strategy for the development of this territory.

According to some old-timers, this block was once called “Rasheika”. Others say that it is not so. When asked the question “Where do you live?” local residents answered “In the Frunze houses” or “In Red Houses”. In the early 1940s, this area was mainly covered with green area, and there was the Proletarskiy poselok and Tomashev Kolok poselok next to it, as well as a psychiatric hospital and a brick factory. In 1958, two-story apartment houses made of red brick started being built for employees of the plant number 24 (named after Frunze).

The strategy “Red houses”, born several years ago, involves the participation of residents in the fate of “their” block. An alternative to such ways of territory modernization, as the demolition of old or new infill development, is a program that simultaneously takes into account the interests of citizens, authorities, investors and experts. Polytech architects in cooperation with the public organization “Novoe Zemstvo” came up with a scheme for surveying the block, where each house receives a private garden space that passes into the ownership of residents. The rest of the territory becomes a place for common use.

Experts believe that people will treat their land with respect.

КАФЕДРА ИП ИННОВАЦИОННОГО ПРОЕКТИРОВАНИЯ СГАСУ

институт города

НОВОЕ ЗЕМСТВО
самара и самарская область

A CLEAN JOB

POLYTECH ECOLOGISTS GENERATE ADVANCED IDEAS FOR SAFE EXECUTION OF WORK

Text: Evgeniya NOVIKOVA

AN INDUSTRIAL CIVILIZATION HAS SEVERAL "TRIBAL CURSES." ONE OF THEM IS ECOLOGICAL. INDUSTRIAL DEVELOPMENT OFTEN COMES INTO CONFLICT WITH THE NATURAL BALANCE, AND THE PROBLEMS OF ECOLOGY THAT ARISE IN THIS CASE DO NOT ALWAYS HAVE SIMPLE SOLUTIONS. HOW TO ISOLATE HAZARDOUS WASTE PRODUCTS? WHAT TO DO WITH THEIR PONDS? HOW TO RECONSTRUCT OLD TREATMENT FACILITIES? OUR SCIENTISTS KNOW THE ANSWERS TO THESE QUESTIONS.

COVER TRACKS

Employees of the scientific and analytical center of industrial ecology of Polytech are developing all kinds of technologies for restoring the territories poisoned by human economic activity. (For processing contaminated soil using microorganisms strains, see No. 12 of Technopolis).

"We have numerous developments related to isolation of hazardous wastes and their long-term conservation," said **Konstantin Chertes**, Doctor of Technical Sciences, professor. - We use special barriers - geomembranes, combined

ground and polymer sheets, so that the old burial that arose in the Soviet times and continues to be flooded with rain, snow, melted waste water, did not turn into a source of secondary environmental pollution.

In addition to that, Polytech scientists study old environmental footprints – holding ponds for petrochemical wastes with phenol, dangerous compound organic and mineral matters, heavy metals. Because of the holding ponds, significant land areas are torn away, air, soil, groundwater are being polluted. For many years a change in the structure and chemical composition of the waste, possibly with the formation of new, more dangerous compounds may take place.

The matter of the ecological heart comes from the Soviet five-year plan. At that time, few people cared about the observance of environmental standards, the treatment facilities began to be built only in the 60s and 70s of the 20th century, and the plants for the disposal of wastewater and liquid waste were selected based on the principle of convenience. As a rule, these were the depressed areas of the terrain - floodplains. It was in the floodplains that dozens of industrial waste ponds appeared. They represented giant disposal pits separated from reservoirs by dams. Over time, the dams got out of order and liquid removals wept into the reservoir.

In the 21st century holding ponds is a thing of the past and an environmental threat. But it is not so easy to get rid of them. Before putting them out of existence holding ponds, dike dams and waste landfill body should be examined carefully. For this purpose our specialists are conducting engineering activities. After determining the composition, properties, structure, depth of the location of hazardous waste, the nature of groundwater under the foundation of the reservoir, scientists offer copyright licensing technologies for their neutralization and control the subsequent recultivation of lands.

CLEAN RENOVATION

The creation of technologies for the restoration of contaminated areas nearly always ends with a patent, which indicates the priority of Samara scientists in solving environmental problems. Thus, our environmentalists take an active part in the work to strengthen the hydraulic components of existing waste ponds, as well as the creation of new sectionalized dams and wing dikes, entrance assemblies, distribution and disposal units for liquid waste.

“We use metal-reinforced frames, work pieces of various shapes from wire netting or gabions to create elements for strengthening and reconstructing the banks of waste ponds,” explains Konstantin Chertes. “We are developing technologies and structures for dehydration of bottom sludge, as well as sanitization of the geologic environment, and in its perimeter line.

The attention of ecologists is attracted not only by morally old-fashioned ponds of industrial wastes, but also by treatment facilities that have been in operation since Soviet times. According to the researchers, in the Samara region, there are hundreds of such objects - from small settlements to the aeration stations of large cities. Due to the reduction of water disposal in the 90s of the last century, some of the tanks were removed from service or lost their functional properties. Many of them - aerotanks, sinkers, sludge banks - need reconstruction and modernization.

Our environmental specialists are also engaged in the construction of new plants at the refinery for the production of gasolines and diesel fuels Euro-5 class. Scientists create projects for the preparation of sites for construction with the complete extraction of foundations, inactive communications, soils, develop technologies for processing building structures by grinding, sorting, turning them into secondary construction gravel.

BEAVER'S WAY

A YOUNG SCIENTIST KNOWS WHERE IN THE SAMARA REGION YOU CAN MEET A LARGE AND CAREFUL RIVER RODENT

Text: Kseniya MOROZOVA

Vitaly Antipov has been studying the river beavers (Castor fiber) for about 10 years. Three times a year - in spring, summer and autumn - the junior research assistant of the SSTU department "Chemical technology and industrial ecology" is sent to an expedition along the coastal zones of the major rivers of the Samara region. A young researcher looks for traces of these amazing animals, marks the places where they get their own food, and sizes up the impact of beavers on the environment.

In 17th-19th centuries beavers were totally killed off on the bigger part of Russia. In 30s-80s of the last century, reintroduction – recruitment of the species – was carried out. Zoologists call this a grand experiment, carried out on the scale of a huge and diverse in terms of natural conditions territory. In particular, to the Middle Volga region beavers were brought from Belarus and Kalinin city. In the floodplain of the river Samara Khoper (black) beavers were taken from Lipetsk. Gradually, the rodents settled and took not only protected natural areas, but also areas with high anthropogenic load.

"Now deforestation of the coastal forest, littering and construction along the shore line threaten the habitats of these animals. It was interesting to analyze how life in the neighborhood with a human affects the population of beavers," Vitaly says.

As it turned out, at present the population characteristics (the density of individuals and settlements per kilometer of the river bed, the average number of beavers in the

FACTS

HEAD OF THE ZOOLOGICAL MUSEUM NAMED AFTER D.N. FLOROV OF THE SAMARA STATE SOCIAL PEDAGOGICAL UNIVERSITY, CANDIDATE OF PEDAGOGICAL SCIENCES VALERY SHVEDOV SHARED WITH THE "TECHNOPOLIS OF THE VOLGA REGION" SOME INTERESTING FACTS ABOUT BEAVERS.

1. In the Middle Ages, monks during fasting were allowed to eat beaver meat, since the water fowl rodent was considered a fish class because of a pattern on the skin of a tail resembling scales. They say that the monks knew very well that the beaver was not a fish, they just wanted meat for fasting.

2. The beaver is an animal not used to give up. If it gets into the trap, it puts maximum effort to break free. Sometimes an animal can even leave a limb there.

3. Beavers are not badly tamed. They don't perform complex tricks, but the trained beaver is a real miracle. The only beaver trainers in the world are the **Silchenko** family from Belarus.

settlement, the proportion of singles from the total number of families and the length of settlements) are not so bad in the studied territories. Beavers cope with difficult living conditions due to high ecological plasticity, i.e. the ability of the body to adapt to changing environmental conditions. In addition, the river beaver is a species-edificator, that is, an animal that adjusts the habitat to itself: builds dams when it becomes necessary to deepen the reservoir, or burrows to bring the pool mirror closer to the trees on the shore.

Antipov studies the life activity of beaver populations in the Samara and Orenburg regions in the basins of the rivers Samara, Bolshoy and Maly Kinel, Borovka and Chagan. Politech's scientist regularly makes rounds of habitats of beavers, fixes openings, trails and bark strippings and shrubs. It turns out a very optimistic picture. Contrary to popular belief about the "harmfulness" of this rodent, at the current time in the research areas, beavers do not threaten the riparian forest at all. These animals contribute to biological and ecological diversity: reptiles and small mammals live in their burrows, and gnawed trees and bushes begin to grow and cluster.

BEAVER NIKOLAI

– European beaver settles down next to a man, but tries to avoid meetings with him, says **Alexander Kuzovenko**, deputy director of the Zoo Foundation for the Samara Zoo. - During one expedition in the Samara region, I happened to see the beaver very close. The case was in May near the village of Enduraykino in Sergievsky district. This beaver lived in a small pond (8 by 15 meters) near the spring of Nicholas the Wonderworker. It is not that difficult to detect a beaver floating in a spring, but it's almost impossible to take a picture of it. Beavers become less timid at night or early in the morning. I calculated that we should arrive at the shooting location by 4 am. As soon as the sky began to be painted with the first rays of the sun, the beaver appeared in the reservoir. At first it treated uninvited photographers with caution. And then it even allowed me to take a picture of itself taking sun baths and cleaning thick coat. It was not possible to determine the sex of the beaver visually, but we began to call it beaver Nikolai.

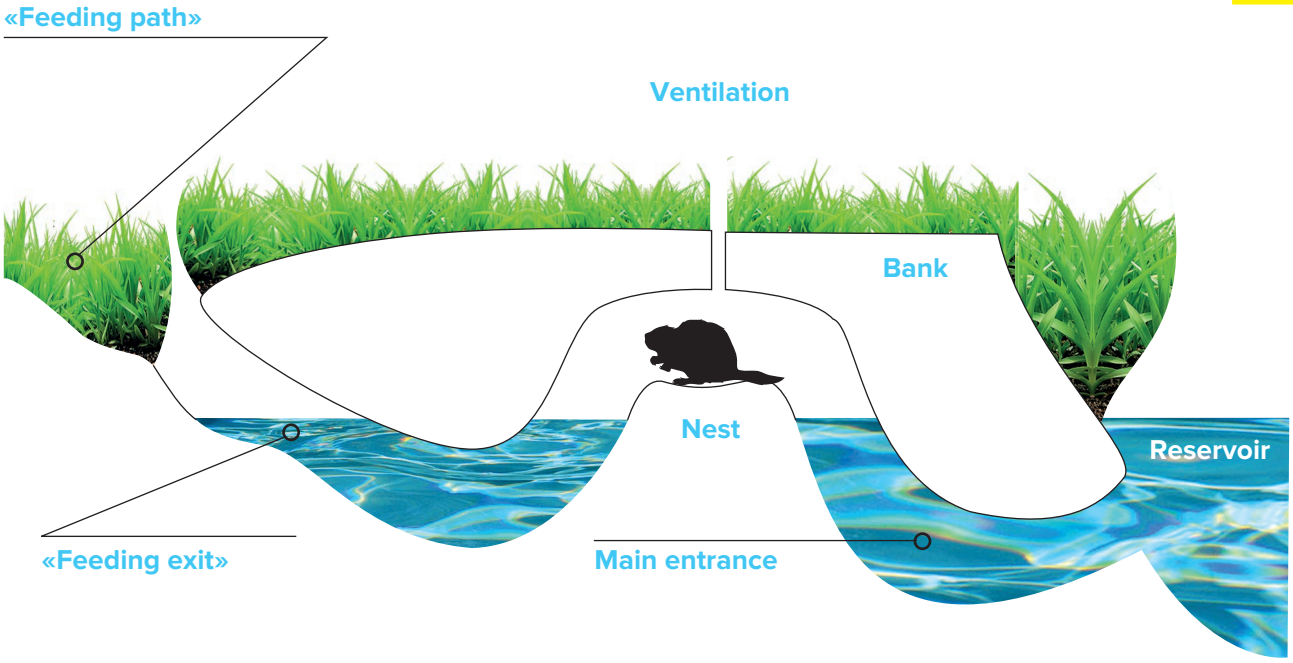
Vladimir BROZDNYAKOV, Candidate of Biological Sciences:
- The topic chosen by Vitaly Antipov is relevant, because many today blame the beaver for the global destruction of trees. The basis of nutrition of this rodent is herbaceous vegetation (water, semi-aquatic, terrestrial), and forest cover is only an additional food. Vitaly and I have been observing for six years the settling of beavers in a steppe area, where only 10 branches of willow with a diameter of less than 2.5 centimeters grow.

NOTES IN THE MARGIN OF THE BIOLOGIST'S DIARY

BEAVERS ARE FAVORITE ANIMALS OF THE CANDIDATE OF BIOLOGICAL SCIENCES VLADIMIR BROZDNYAKOV. MORE THAN A QUARTER OF A CENTURY HE HAS DEVOTED TO THE STUDY OF THEIR LIFE. IT SEEMS THAT HE KNOWS ALL THE BEAVERS NOT ONLY IN OUR COUNTRY, BUT ALSO IN THE COUNTRIES OF THE NEAR ABROAD. FOR EXAMPLE, HIS RESEARCH ON THE INTERACTION OF INDIGENOUS AND ARTIFICIALLY RETURNED (RE-ACCLIMATIZED) BEAVER POPULATIONS WITH AQUATIC AND NEAR-WATER ECOSYSTEMS IS BASED ON MATERIAL COLLECTED IN DIFFERENT NATURAL AREAS - FROM THE DRY STEPPE AND TO THE NORTHERN TAIGA.

BEAVER (CASTOR FIBER), MAMMAL OF THE ORDER OF RODENTS. BEAVER IS WELL ADAPTED TO SEMI-AQUATIC LIFE. BODY LENGTH UP TO **100** CM, TAIL - UP TO **30** CM; WEIGHS UP TO **30** KG. THE TAIL IS FLATTENED FROM THE TOP DOWN, WIDTH UP TO **15** CM, ALMOST NO HAIR, COVERED WITH OSTEOSCUTE. THE TOES OF THE HIND LIMBS ARE CONNECTED BY WIDE WEBBING. BEAVERS HAVE A HIGH-VALUE FUR, WHICH CONSISTS OF BRIGHT BEARD HAIR AND VERY THICK SILKY FLUFF. COLORATION IS FROM LIGHT CHESTNUT TO DARK BROWN, SOMETIMES BLACK. AGE OF LIFE OF THE BEAVER REACHES 35 YEARS.

LODGE IS A FORCED CONSTRUCTION, WHICH THE BEAVER BUILDS IN CASE OF THREAT OF FLOODING OF THE NESTING PLACE. AS IN THE SAMARA REGION THE MAJORITY OF RIVERS ARE WITH HIGH BANKS, THEN ALMOST ALL BEAVERS LIVE IN BURROWS, LESS THAN 1 PERCENT OF RODENTS ACQUIRE LODGES. OUTWARDLY, THESE LODGES ARE A CONICAL HEAP OF BRUSHWOOD. BUT IN REALITY IT IS A CAREFULLY DESIGNED AND STRONG RESIDENTIAL BUILDING. THE FRAME OF THE LODGE CONSISTS OF LARGE BRANCHES; THE INTERVALS BETWEEN THEM ARE FILLED WITH SMALLER BRANCHES AND GRASS. THEN THE WALLS ARE COATED WITH CLAY OR MUD. THE “HOUSES” ARE SO STRONG THAT EVEN BEAR WEIGHT CAN WITHSTAND. IN ADDITION, BEAVERS CAREFULLY THINK ABOUT THE SECURITY SYSTEM. THE ENTRANCE TO THE LODGE IS LOCATED UNDER THE WATER SO THAT UNINVITED GUESTS CANNOT GET INSIDE. THERE ARE ALSO SEVERAL EMERGENCY EXITS AND A VENT. AS A RULE, YOUNG FAMILIES FIRST ACQUIRE ONE-ROOM LODGES AND GRADUALLY COMPLETE IT TO A LARGE “COTTAGE”. REQUIRED ROOMS ARE A DINING ROOM AND A BEDROOM.



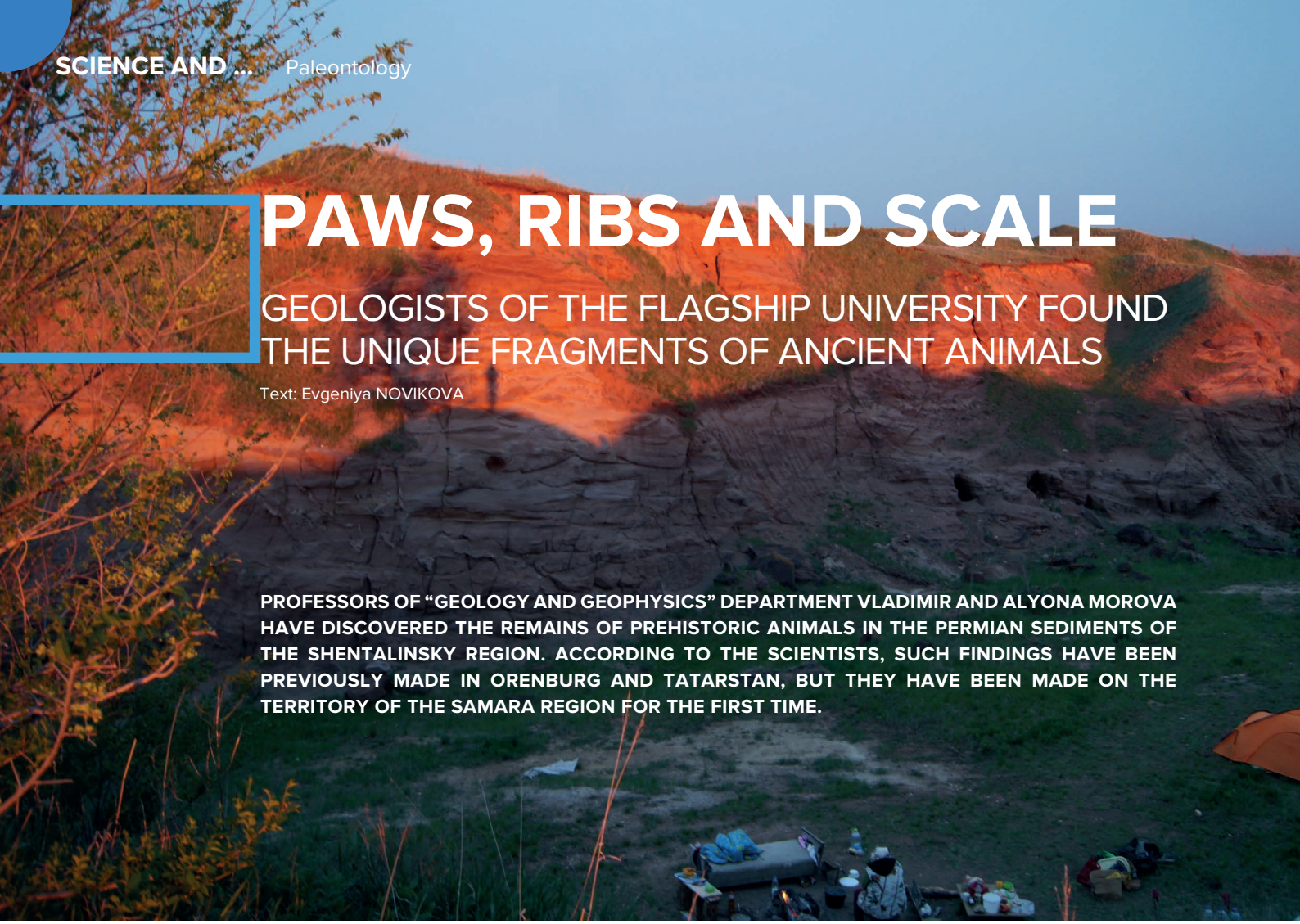
DAMS in the territory of our region are built by less than 5 percent of beaver families. These buildings are necessary to them in order to raise the water level in the streams near which they live. If the reservoir is deep, then a dam is not required.

In general, this strategic object solves important problems. First, the dam increases the mirror of the reservoir, respectively, the amount of water vegetation (the main beaver feed) increases. Secondly, the dam reduces the risk of deep freezing of the reservoir, which helps to protect the beaver family from death. Thirdly, the water mirror becomes closer to the stands, which greatly facilitates the extraction of woody forage.

IN WINTER beavers do not hibernate, but spend most of their time in burrows. They feed mainly on aquatic plants or make a small stock at the exit of the burrow for the winter - a stack of branches. In a thaw, animals can get ashore to treat themselves of a shrubby willow.

IN CASE OF DANGER, the beaver dives into the water, making a slap with his tail as a rifle shot. This way a brave beaver can drive out even a very large beast, such as an elk, from its territory. In addition, a tail slap on the water serves as an alarm for all beavers in the district.

IN 1998, the majority (more than 90 percent) of beaver families in the Samara region consume less than three percent of the total stock of trees and shrubs on the territory of the orchard. If we consider that the rate of restoration of trees and shrubs in the forest-steppe zone is 6 percent per year in average, it turns out that the activity of the beaver does not do any harm to the plant world.



PAWS, RIBS AND SCALE

GEOLOGISTS OF THE FLAGSHIP UNIVERSITY FOUND THE UNIQUE FRAGMENTS OF ANCIENT ANIMALS

Text: Evgeniya NOVIKOVA

PROFESSORS OF "GEOLOGY AND GEOPHYSICS" DEPARTMENT VLADIMIR AND ALYONA MOROVA HAVE DISCOVERED THE REMAINS OF PREHISTORIC ANIMALS IN THE PERMIAN SEDIMENTS OF THE SHENTALINSKY REGION. ACCORDING TO THE SCIENTISTS, SUCH FINDINGS HAVE BEEN PREVIOUSLY MADE IN ORENBURG AND TATARSTAN, BUT THEY HAVE BEEN MADE ON THE TERRITORY OF THE SAMARA REGION FOR THE FIRST TIME.

Meanwhile, initial studies of the fragments have shown that the material discovered by Polytech scientists is significantly different from that found in near-by regions. The bones lay in the bed of the ancient river, among the lagoonal deposits of Kazanian age of the permian period: limestones, dolomites, clays, marls, sandstones, hydrous sulphate of lime. They are 270 million years old.

- Rivers flew down the Urals, at that time high as the Himalayas, to the saline lagoons of dry subtropics, - describes the picture **Alyona Morova**. - On the banks of the rivers forests, including coniferous forests grew. Remains of tree trunks from these forests are still found throughout the northeast of the Samara region.

The fauna of Permian age is represented by ancient bony fish - platysoma, with primitive scales in the form of rhombic plates. Scales have been really found a lot. In less quantity, the remains of tetrapods or quadruped have been found: fragments of bones of large amphibians and small reptiles.

"Both water and land reptiles lived in this area, **Vladimir Morov** explains. - But the skeletons of animals and even their fragments have not been found here: animal remains were torn to pieces by more successful animals, the bones were grinded with pebbles, and small fragments were carried by a heavy current.

The main material was collected by Vladimir and Alyona Morova and **Alexander Vasiliev**, the first category engineer of "Geology"department. The most valuable assistance in extracting the samples have been done by involved volunteers, primarily **Roman Gunchin** and **Julia Zenina**, as well as a student **Evgeny Nikolaev**.

- Extraction and especially preparation of bone remains is a long and time consuming process that requires the use of special drugs and techniques, - said Alyona Morova. The slightest carelessness will lead to dust from the bone remains. Therefore, all collected material has been given to the Paleontological Institute. The process of its full study will take up a lot of time for specialists.

The scientific value of the discovery has already been confirmed by leading Russian experts from the Moscow Paleontological Institute of the Russian Academy of Sciences **Valery Golubev**, **Valery Bulanov**, **Anton Ulyahin** and a journalist and historian of Permian deposits studies of Russia **Anton Nelihov**. The delegation visited the excavation site in early May. By the way, now it is carefully guarded at the direction of **Vladimir Ivanov**, the head of the rural settlement of Tuarma in the Shentalinsky region.

LIFE IN THE PERMIAN PERIOD

GEOLOGICAL PERIOD:
290 – 250 million years ago.

CLIMATE:
global rise of temperature, sandstorms, subtropics with frequent rainfalls up to Nether-Polar Urals

ANIMALS:
archegosaurids, bolosaurus, captorinidus, dimetrodons, moschops, platysoma, helicoprion, titanoptera.

PLANTS:
articulates, lycopsids, conifers, pteridosperms, gingko

Scale of platysomus
(Alyona Morova's photo).

Bone of amphibian limb – archosaurus
(Roman Gunchin's photo).

Jaw of reptile - bolosauria
(Roman Gunchin's photo).

“Fashionable sentence”

FROM 11 TO 15 OCTOBER, XVII FESTIVAL OF FASHION AND THEATRICAL COSTUME "ALEXANDER VASILIEV'S VOLGA REGION SEASONS " WAS HELD IN SAMARA. THIS YEAR IT WAS DEDICATED TO THE THEME "FASHION AND REVOLUTION".

Polytech's designers were among the key participants of this fashion event. Lada Ahmedova, a second-year student of the Faculty of Design won the nomination Best sketch collection. Polina Gusarova, a fourth-year student, presented her works in the nominations Theatrical costume and Costume is an artistic idea and was awarded a special prize (Certificate for learning French) from the company Alliance Française Samara.

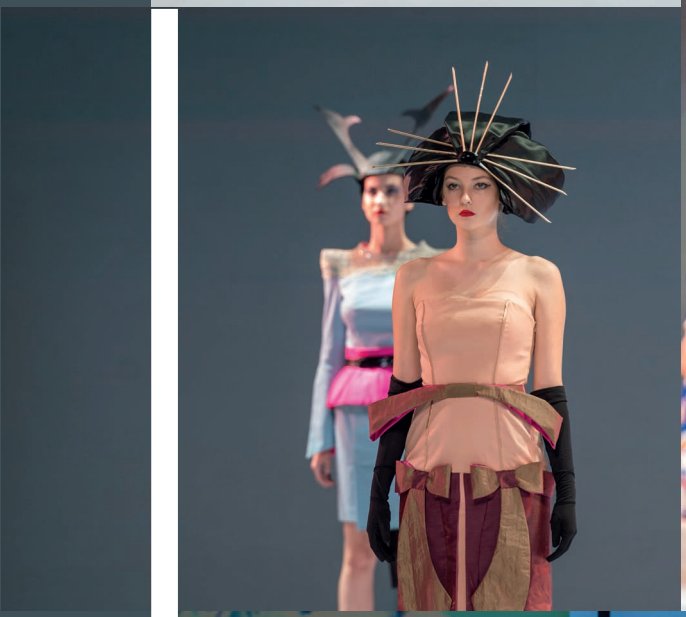

ПОВОЛЖСКИЕ


ПОВОЛЖСКИЕ


ПОВОЛЖСКИЕ
СЕЗОНЫ
Александра Васильева


СЕЗОНЫ
Александра Васильева


ОЛЖСКИЕ
ЕЗОНЫ

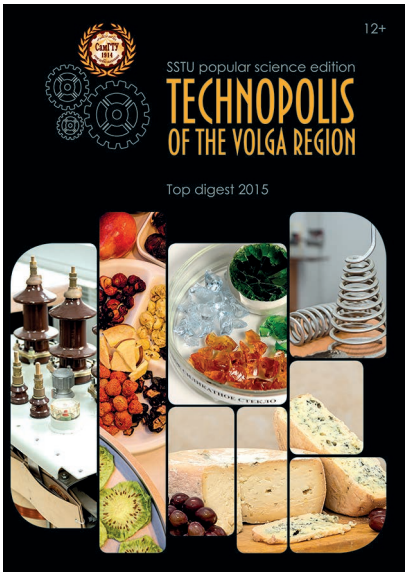



СЕЗОНЫ


ПОВОЛЖСКИЕ

TECHNOPOLIS OF THE VOLGA REGION

https://samgtu.ru/university/technopolis-volga-region/



■ SHOW ME A MOON STONE

The Moonsettlers' dwellings will be 3D-printed

■ DEODORANT FOR ODORANT

The reason why the SSTU scientists ozonize production tanks

■ RECYCLING INSTEAD OF WASTE DESTRUCTION

Samara chemists have created an industry of natural resource conservation

■ COLOURING THE SKY

Staff of the Chair of Chemistry and Technology of Organic Nitrogen Compounds in SSTU invented metal vapor generators to study the upper layers of the atmosphere

■ RENDEZ-VOUS WITH LABYRINTHODONT

SSTU employees participating in geological expedition found the unique pieces of ancient fauna

■ EXPLOSION WITH NO REGRETS

Scientists of Samara State Technical University developed a universal rolling method which allows the production of linear-shaped charges of any length and yield

■ SSTU SPECIALISTS KNOW HO TO DRAW FIBER

One of the few semiautomatic optic fiber production experts in the world works in Samara State Technical University

■ LIFE AND INCREDIBLE TRANSFORMATIONS OF SULPHIDE LEACH

Things that specialists at Samara State Technical University can make out of toxic explosive production waste

■ LOST IN STEPPES

A story about amazing things sometimes found under the feet of SSTU students and lecturers

■ TASTE EXPLOSION

In Samara State Technical University the production of freeze dried food is set up

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12 Novo-Sadovaya Str., Samara, Russia, 443100
Tel: +7 (927) 717-77-58,
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GREAT PROJECT

REVOLUTION – 2017

TERRITORY OF LIFE TECHNOLOGY POLYGON

TOWARDS BREAKTHROUGH SOLUTIONS

SIX DIMENTIONS OF SCIENCE AND PRACTICE **ALL TOGETHER** ALONG THE SILK ROAD **"AVTOVAZ" STUDENT CLASS**

BRIDGE BETWEEN SWITZERLAND AND RUSSIA

FORM DAMPENS WAVES BLOCK A PIPELINE **MEETING THE AGENT** THE RIGHT SHIFT **INSIDE THE SWEETS REDUCING TO DUST**

FORWARD, MARCH! **TWO MILLION DRAWN WITH A "PENCIL" CHILDREN-SCIENTISTS**

ANTIVIRUS PROGRAM **PIXEL TO PIXEL TECHNOLOGIES OF HOPE** THIS FUEL OR THAT PRETTY MUCH

THE SAME PROJECTS AND POST-PROJECTS

A CLEAN JOB BEAVER'S WAY

PAWS, RIBS AND SCALE

"FASHIONABLE SENTENCE"