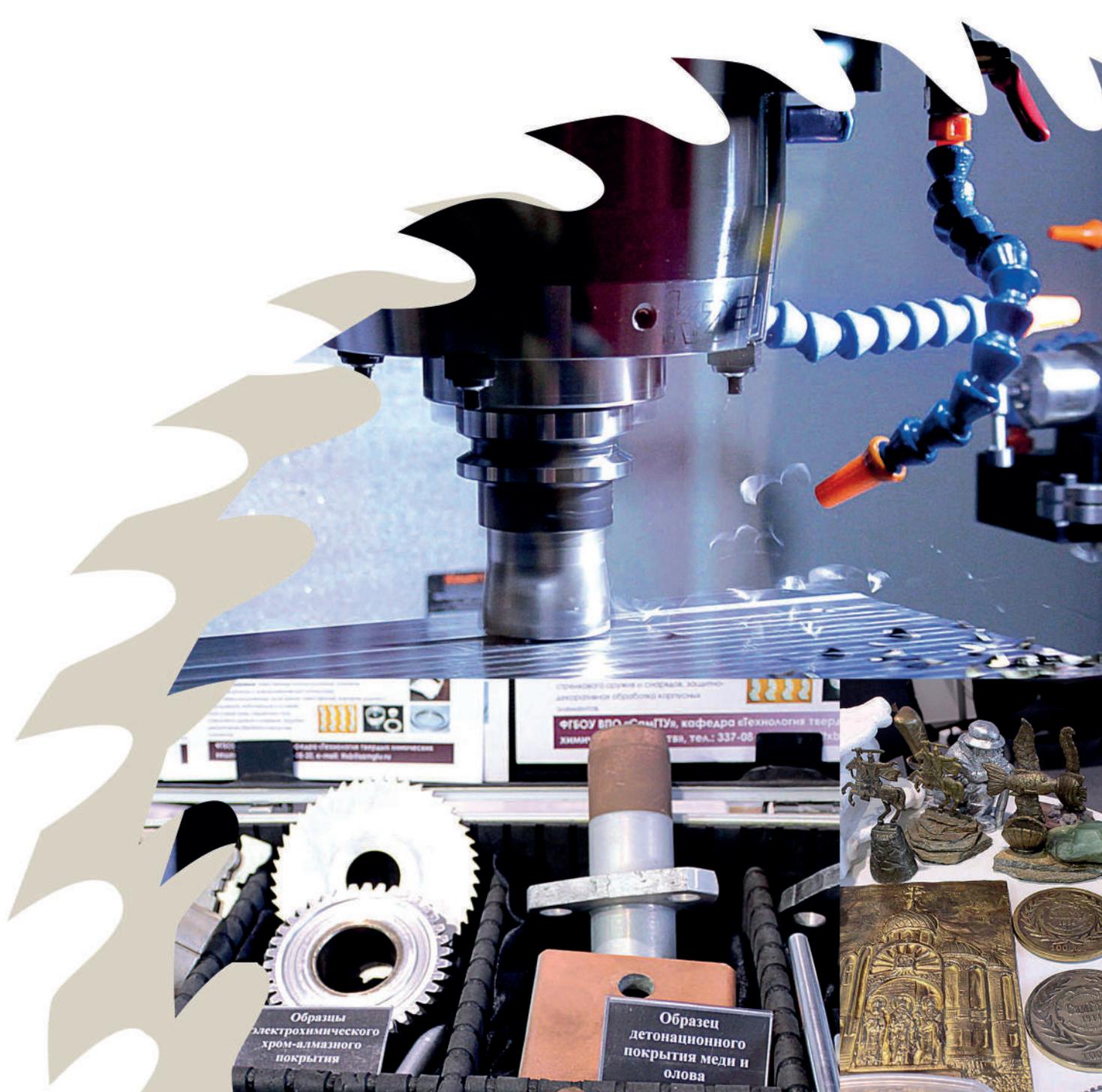




SSTU popular science edition

TECHNOPOLIS OF THE VOLGA REGION

Top digest 2014



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TECHNOPOLIS OF THE VOLGA REGION

Top digest 2014

Founder

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Dmitri BYKOV, SSTU Rector,
Honorary Figure of Russian Higher Education,
and Editor-in-Chief of "Technopolis of the Volga region" magazine.

Dear Colleagues,

In 2014 Samara State Technical University celebrated its 100th anniversary. In the past year, the research conducted at our university had an impact far beyond our region. Some of our students and professors won Russian and international recognition.

Recently, an agreement between SSTU and the Swiss company "Micron" was achieved for supplying the branded metal-working equipment for the SSTU training centers of Samara State Technical University. The University also received a patent for developing a way to produce apple brandy that was highly praised by the brand owner Christian Drouin – one of the leading European trendsetters in the alcoholic beverage industry. Our first-year student Alexander Lifanov captured gold at the Olympiad in Nanjing, and our postgraduate Andrei Bogomolov (a specialist at the German Company J&M Analytik AG, who is getting a Doctor's Degree at SSTU) developed an innovative method of milk analysis.

Our "Technopolis of the Volga region" magazine gives us the chance to highlight all the innovative research at our university. This is SSTU's first popular science magazine. Three issues of the magazine have already been published and have received recognition by industry experts. The magazine received the local public relations prize "Serebryanniy Luchnik – Samara" and a nomination for "The best corporate mass media organization".

Our magazine contains exclusive publications about well-known scientific schools, famous Samara scientists, and unique developments in oil production, petrol chemistry, machine building, environmental protection, robotics, and food manufacturing.

We have discussed these technical subjects not only with technical vocabulary, but also with simple and understandable language for layperson.

We invite everyone to take advantage of using this magazine as a media-platform to strengthen the friendly ties and mutually beneficial cooperation.

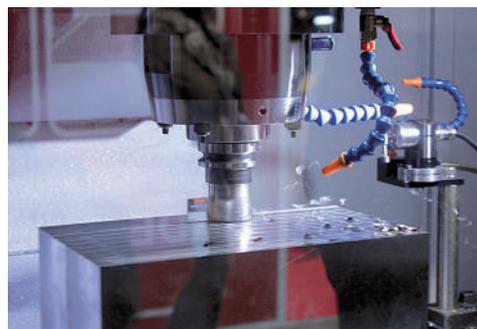
A handwritten signature in blue ink, appearing to be 'Dmitri Bykov'. The signature is fluid and cursive, with a large initial 'D' and 'B'.

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SAMARA STATE TECHNICAL UNIVERSITY IS TREATED AS "TECHICAL OF BRILLIANCE"

In 2014 Cambridge University Press published the book "The Guide to Excellence 2014 Edition. Celebrating 50 Years of CUSU". The authors called Samara State Technical University "Technical of brilliance": "The Samara State Technical University is a dynamic research and educational centre with modern scientific and social infrastructure, and significant human and scientific potential to influence the development of high-tech industries in the region and in Russia as a whole. An example of this is the university's most important environmental protection research, which focuses on the creation of new and effective systems for the processing of waste. Since 1984, it has developed more than 30 waste-processing technologies. Many of these have been put into practice, such as the technology of bioremediation, which uses an organism's metabolism to remove waste, and has been used to clear more than 2 million sq m of oil-polluted farmland. The university has also developed a new method for the sterilisation of oil slurries, leading to a positive evaluation in the Federal Environmental Impact Assessment. The creation of new medication is also a priority for the university, which performs research in the field in conjunction with leading global pharmaceutical companies Novartis, Bayer AG and Gedeon Richter. So far, five antiviral drugs designed to

treat poxviruses have been commercially produced as a direct result of SamSTU's research.

Improving the quality of motor fuels and increasing the depth of oil processing are also important areas of research. These are priority tasks for the whole of the Russian Federation, which is keen to reduce the emissions from road transport that lead to poor air quality and public health problems. In the field of petrochemicals, SSTU has also developed a new catalyst that processes hydrocarbon raw materials in cars, ensuring they meet the new minimum standards set by the EU with regard to pollutant emissions from diesel and petrol cars. The university's chemical engineering research faculty, meanwhile, has developed and produced nano-structured coatings for industrial equipment that are now supplied to over 35 countries and widely used in areas such as drilling and construction".

TRIBOLOGY CONFERENCE ENDED IN SSTU

The Forum was devoted to the problems of machine friction and took place from December 2-3. The participants, which included university professors, members of scientific centers and industrial enterprises, discussed new effective developments in tribology.

According to Dmitri Gromakovsky, the director of the scientific center at SSTU, there are a great number of problems relating to the durability and reliability of mechanisms today. "According to the leading tribologists from around the world, between 75% and 90% of machine breakdowns are connected to the friction units. Until now, there has been no computational design theory and methods for determining high-resource settings and no ways to improve the wear properties. This conference was meant to address these issues", said Gromakovsky.

All the materials discussed at the conference will be published in a collection at the Samara Scientific Center of the Russian Academy of Sciences and will be sent to the Russian industrial enterprises and scientific organizations.



SSTU STUDENTS ARE INVITED TO STUDY IN FRANCE

On November 10, 2014 representatives from the French state agency for the promotion of French higher education abroad, met with students from the Engineering and Economic Department of SSTU. The guests talked about the features of financial support for international students. The questions centered around scholarships, and an agreement which is about to be signed by the French Embassy and the Ministry of Education and Science of the Samara region.

“Scholarships will give our students an opportunity to study abroad in France. They will be given to graduate students, Ph.D. candidates and Doctors of Science to continue their studies in chosen subjects”, reported the coordinator of the “Campus France” network of the French Embassy in Russia, Charlotte Vozhel.

Natalia Kolesova, the head of the Samara office of “Campus France”, explained in detail how to use the agency site in order to find the appropriate French university, prepare the application, enter the university successfully, and apply for possible scholarships.

Twenty institutions of higher education in France are listed in the TOP 500 of the Shanghai Academic Ranking of World Universities. In order to enter the university in France, it's not necessary to travel to France to take exams or send applications. “Everything is done electronically,” Natalia Kolesova explained. “We help students create an application profile, choose the educational program, and interview before all the data are sent to the chosen institution”.

Kolesova assured that the political tension would have no impact on the academic cooperation: French institutions have always welcomed students from Russia.



SAMARA STATE TECHNICAL UNIVERSITY ATTRACTS THE ATTENTION OF EUROPEAN MANUFACTURERS

On October 9, the Swiss-Russian Industrial Business Club delegation arrived at SSTU. The delegation included more than a dozen people, including representatives of the Swiss canton of Neuchatel, and manufacturing companies Tschudin, Omera, Mikron and Millutensil. Unsurprisingly, the members of the delegation were mostly interested in the scientific-training center of SSTU.

The chairman of the Foundry and high-performance technology department, Vladimir Nikitin, showed the guests the foundry technologies center of SSTU. The visitors examined in detail different foam models made by students.

Nikolai Nosov, the dean of the Machine Building and Automobile Transport department showed the guests the various tools of the engineering training centers SSTU – DMG Mori and SSTU-VOLGABURMASH. Members of the delegation were very interested in the showcase products, which were also made by the students with the equipment from these centers. Gradually, the talk turned from production to training. The delegation asked the dean about the differences of the educational process on the manufacturing areas of SSTU.

Willi Nef, director of Mikron, gave a one-hour lecture to students about the prospects of the development of machine building. From his report, students of the Machine Building department believed that this is an emerging field, with more and more high-tech machine tool products appearing on the world market today.

The industrial business club delegation ended a tour with their visit of Politechpark and a tour of the training-engineering center EMAG-SSTU.



REPRESENTATIVES OF THE NATIONAL SCHOOL OF ENGINEERS AT SAINT-ETIENNE (ENISE) VISIT SSTU

The visit, which took place in early October, was to discuss the joint task programme to train technical personnel for “AvtoVAZ”.

In late August, two graduates of Machine Building department, Vasili Luibaha and Konstantin Churikov, were sent to ENISR, Saint-Etienne, France for training. A month later, the French side expressed a wish to hold a meeting with the administration of SSTU. According to Andrei Pimenov, the vice rector for international cooperation, the knowledge that our students studied abroad made the French professors take a closer look at Samara State Technical University.

On October 1, Philip Bertman, the program director of ENISE, and Igor Movchan, a leading research scientist, arrived at SSTU. Over the course of two days, they explored the production and scientific possibilities of the metalwork and automobile technologies at the university.

“Having studied the production capacity of the machine-building department and after visiting the training-engineering center DMG Mori Seiki and EMAG, our French colleagues came up with a proposal to exchange students on a “10 for 10” basis. They consider our university a useful place for exchange of graduate students and Ph.D.candidates,” Andrei Pimenov said. “In other words, they saw our powerful scientific-production base and understood that this is the right place where their students can get these skills which can’t be obtained at Saint-Etienne.”

The French guests, together with the administration of SSTU, discussed the details of developing a master’s program in metalwork. During the meeting, course details were defined, and academic hours were divided.

ENISE and SSTU are currently in discussion regarding the education of AvtoVAZ engineers. The reason for this is the new requirements of the French owners of the enterprise. The

mandatory condition of target staff preparation for the enterprise in Togliatti is that young specialists who are leaving for training in Saint Etienne must have a French diploma. That is why SSTU is in the process of making a joint proposal. Most likely, it will be a target training program in which Saint Etienne will represent the French side, along with the Lyon Political school, while the Russian side will be represented by SSTU and Togliatti State University.

INNOVATIVE TECHNOLOGIES OF SSTU CATCH THE INTEREST OF NORWEGIAN OIL COMPANIES

On September 17, representatives from the largest Norwegian Industry Energy trade union came to Samara to learn about the latest developments of SSTU in oil production.

Employees of several oil-technology departments presented a range of unique developments.

Victor Konovalov, the head of the Development and Exploitation of oil and gas production fields department at SSTU, presented the spectrometer, which is now installed on the launched satellite. With the help of the spectrometer it’s possible to fix the oil spills even in bad weather conditions.

“This is a very interesting idea, because such kind of technology will help to solve the problem of negative weather factors in the northern latitudes in oil extraction, including offshore drilling platforms”, Frode Alfheim, the vice president of Industry Energy, mentioned. “Today, the development of oil-bearing strata is moving farther to the North, so oil-industry workers in Russia and Norway have the same tasks. That is why it is so important to establish close collaboration in the field of innovative technologies of oil extraction with universities such as SSTU,” a member of Norwegian delegation added.

In the opinion of Andrei Pimenov, the vice rector for International Cooperation at SSTU, this visit of Scandinavian colleagues can lead to a long-term collaboration. “There are a lot of possibilities for collaboration. We have the technologies that allow us to develop from the ground up. Another possibility is to provide the academic mobility of students, professors and collaborate on common educational programs”.



SSTU CELEBRATED ITS 100TH ANNIVERSARY

On September 13th, faculty, alumni and students of Samara State Technical University marched along the streets of Samara city and celebrated the 100th birthday of the university.

Various floats dotted the procession, including The Planet of SSTU, vintage cars, bikers from the “VeloSamara” sport club, and members from the local orchestra.

“200,000 students have graduated from SSTU over the past century. It is equal to the size of a town, consisting of young, talented, smart, qualified engineers and scientists,” Dmitri Ovchinnikov, the vice governor of Samara Region announced to everyone at Kuibyshev square.

The president of SSTU, Vladimir Kalashnikov, reflected on the history of the university, as well as its merits. “You [the students] are such a force! We are not afraid of any danger because of you. You will improve every business, and industries wait impatiently for your talents.”



IV INTERNATIONAL CONFERENCE “MATHEMATICAL PHYSICS AND ITS APPLICATIONS” IN SAMARA

The event took place at Ivushka camp on the 1st of September, and was again sponsored by SSTU. The science and mathematical forum coincided with the 100th anniversary of the university.

At most conferences, only 20-30% of participants are actually present, while the rest participate in absentia. However, this conference attracted 85% of the invited participants.

At the conference, new results in the theory of differential equations, cosmology modelling processes, and high-energy physics were presented. New research results about the Large Hadron Collider were also published.



SSTU IS AGAIN ON THE LIST OF THE BEST UNIVERSITIES OF THE COUNTRY

In the summer of 2014 the rating agency Expert came out with its list of the 100 best universities of Russia.

Four universities of Samara made the list: Samara State Technical University, Samara State Medical University, Samara State Aerospace University and Samara State University.

According to Expert, this research is more encompassing than any other ratings made over the last few years. One of the advantages is the scope of universities and the diversity of estimation methods. Expert included in its evaluation the number of academic papers, a financial performance evaluation, as part of its 40 parameters.

THE EUROPEAN UNION WILL HELP CREATE AN EDUCATION PROGRAM AT SSTU FOR THE ELDERLY

On June 20th, a seven-day visit by the representatives of SSTU in Zvolen, Slovakia ended.

The purpose of the visit was to learn about the Technical University of Zvolen’s education

programs for non-traditional students. This project has been in place for about 20 years, so the delegation from SSTU had much to learn.

The SSTU delegation led by the director of the Center of International Connections, Irina Kuznetsova and the head of the Economic and Organization Management department, Galina Gagarinskaya.

“We had a look at what courses they have for the elderly, and studied the peculiarities of teaching and holding activities for this category of citizens,” Irina Kuznetsova said. “We were surprised that their students are interested in the Russian language. While there, we delivered a few lectures and participated in the Olympiad. We took recommendations and samples of documents necessary for opening at our University an educational program for the retired, and discussed with our Slovak colleagues the way this project could work at SSTU.”

Irina Kuznetsova pointed out that SSTU reached an agreement with the European Union (EU) for project support. The EU will donate money for the classroom audio equipment. It has been already decided that the first students of the university of the third age will be alumni.

On July 3, 1914 the Russian Emperor Nikolai II signed a decree establishing Samara State Technical Institute. 100 years later, in memory of this event, a monument to the Russian engineer was erected between the main and the eighth campus buildings.

At the unveiling of the monument, a theatrical reenactment of the signing of the decree was performed by students of the university.

Vladimir Albokrinov, a former electrical engineer at KuibyshevNeft, addressed the future engineers. For the unveiling of the monument the head of Samara and a graduate of SSTU in 1992 Dmitri Nazarov and the rector of the university Dmitri Bykov were invited. Together with alum Vladimir Albokrinov, they unveiled the monument, a figure representing a pre-revolutionary engineer with blueprints in his hands.

“It’s important to note that the monument was funded by donations from the faculty, alumni and students,” Dmitri Bykov pointed out. “This monument is a tribute to the Russian traditions of engineering. It is dedicated to our graduates, who are no longer with us, and to the present and future generations of engineers, representatives of this profession.”



A MONUMENT TO THE
RUSSIAN ENGINEER IS
ERECTED

IN SSTU BUSINESS AND INNOVATIONS ARE COMBINED

On April 2, SSTU unveiled the new Politechnopark. At the park, scientists, business representatives, and manufacturers have a unique opportunity explore the newest developments in the fields of oil production, and metalwork.

Dmitri Bykov, the rector of SSTU, pointed out that real ideas have come to life in the Politechnopark. “Developments can be touched and seen at work. Every device and technology represented here can be applied in plants and factories,” he said.

Vladimir Tian, the dean of the oil-technology department, presented the technology of transfer pipeline repair, where the main idea is in its opportunity to bind the shank bore of a pipeline securely and efficiently. The department of Chemical Engineering and Industrial Ecology has displayed a model of complex biological degradation of oil sludge waste and contaminated soil.

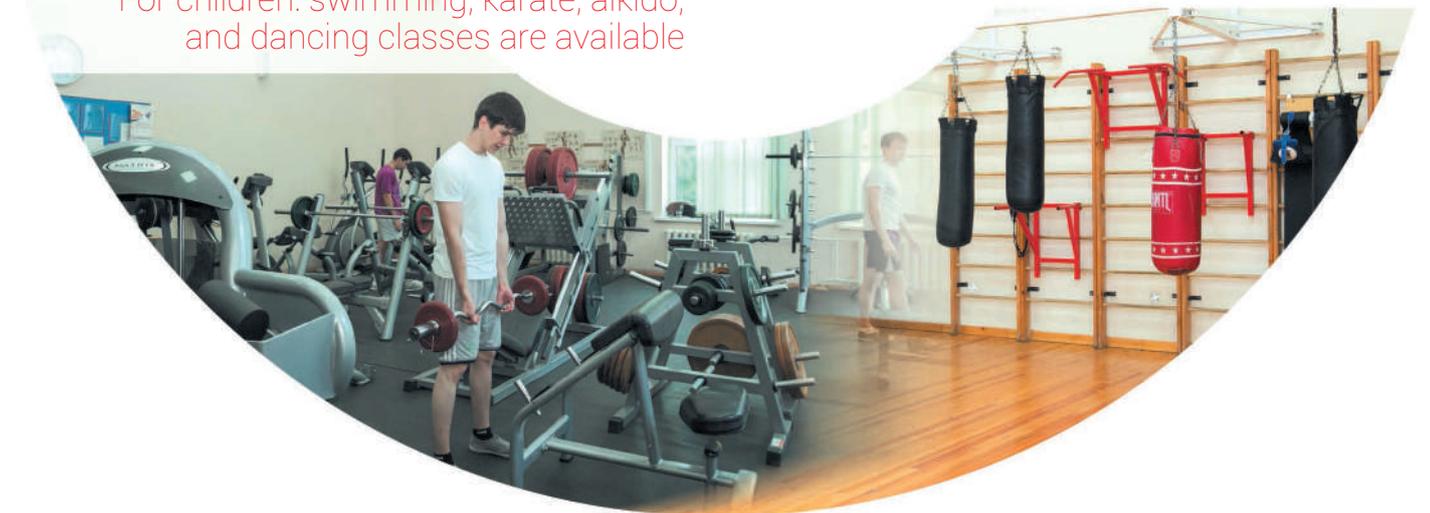
Many of these developments have already been implanted in a number of Russian companies.



Samara Technical University Sports Center

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



THE CORE OF SSTU



FOOD PRODUCTION DEPARTMENT – 2003

Manufacturing laboratory for food staples and technological laboratory for fermentative processes

DEPARTMENT OF METAL INDUSTRY, MACHINE BUILDING AND TRANSPORT – 2015

Training Center «SSTU – Volgaburmash»
Training Center «SSTU – EMAG»
Academic Center «SSTU- Dentistry»
Training Center «SSTU – Delcam»
Authorized training center «ASKON»
Training Engineering Center «SSTU – DMG Mori»
Academic Center of foundry technologies

CHEMICAL-TECHNOLOGICAL DEPARTMENT – 1930

Training center «Modern technologies in oil-refining SSTU-AXENS»

PETROLEUM-ENGINEERING DEPARTMENT – 1947

Technical training and exhibition center «Neftegasbezopasnost»
Training center of SSTU – «Gazprom transgaz Samara»

AUTOMATION AND INFORMATION TECHNOLOGY DEPARTMENT – 1959

ELECTRICAL-ENGINEERING DEPARTMENT – 1956

Training center «SSTU-ElektroSchit»
Training center «SSTU-Schneider Electric»

HEAT-POWER DEPARTMENT – 1956

Engineering center «Computer modeling and energy audit»
Power saving and certification center
Inter-industry and scientific research laboratory “Computer power technology”

ENGINEERING-TECHNOLOGICAL DEPARTMENT – 1961

Training and production facilities «Roscha»

THE HUMANITIES DEPARTMENT – 1990

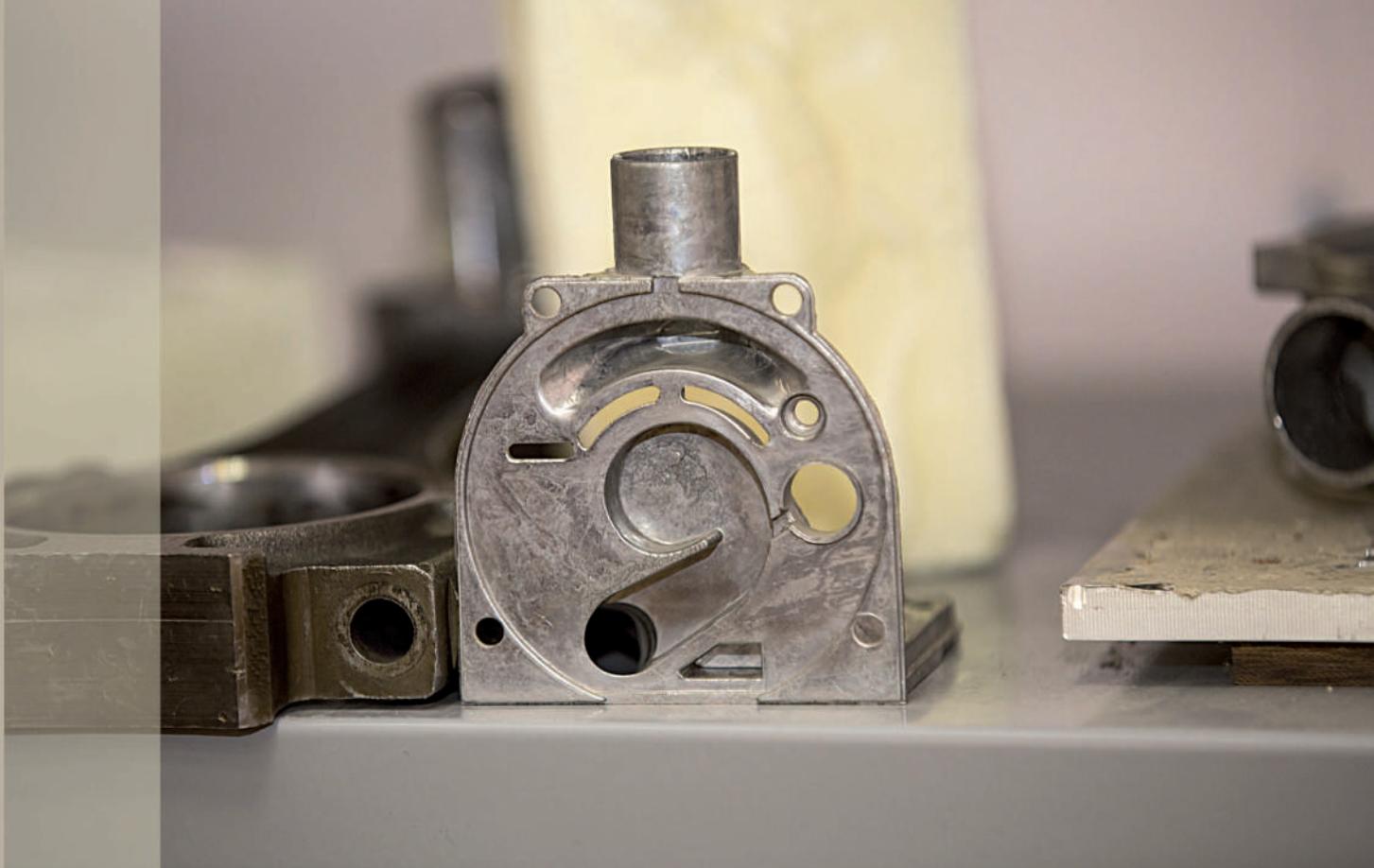
ENGINEERING-ECONOMIC DEPARTMENT – 1992

DEPARTMENT OF PART-TIME LEARNING – 1960

DEPARTMENT OF DISTANCE AND SUPPLEMENTARY
LEARNING – 2010

SSTU BRANCH IN SYZRAN – 1962

SSTU BRANCH IN NOVOKUIBYSHEVSK – 2014



YOU PRODUCE MACHINES, WE PRODUCE IDEAS!

By Andrei PTITSYN

Two years ago, a SSTU delegation headed by the rector Dmitri Bykov took part in the Partner Day of the APK Higher School of Management, located in Neuchatel, Switzerland. The slogan of the event, which was supported by the Swiss-Russian industrial business club, was "Cooperation as driver of successful innovations". As part of the Partner day, several meetings were arranged – at the Lausanne 'Ecole Politechnique', the Swiss center of electronics and micromechanics and the high-precision machine building enterprise Tornos SA. The result of the visit was an agreement for student exchange, joint research projects in the field of metalworking process control, and creating a scientific and research center at Samara State Technical University equipped with the tools by Tornos SA (Switzerland).

Machines from Neuchatel

On February 20th, representatives from Tornos SA visited SSTU. **Alexander Holrishter**, director of communication with the countries of Eastern Europe and the former Soviet Union, was introduced to the SSTU rector, **Dmitri Bykov**, and vice rector for international cooperation **Andrei Pimenov**. During a discussion about bilateral cooperation, our partners

confirmed that in the near future Tornos SA would ship a high-precision metal-working machine to our university. It was emphasized that this machine was to be used both for training as well as in the interests of Tornos SA. In order to become familiar with the high-precision machine, post-graduates of the Machine-building and Automobile Transport department **Alexei Smirkin** and **Pavel Tolstov** traveled to Neuchatel, Switzerland in 2013 to receive individualized training. Now, having returned to SSTU, they can teach students and specialists how to operate the machine.



This kind of cooperation benefits both parties; SSTU gets the opportunity to train skilled specialists to operate modern equipment, while Tornos SA is able to demonstrate its products in Russia. As soon as a company buys the machine, it will be shipped to them, and SSTU, according to the contract, will receive another Swiss machine to proceed with training and research work.

Pool of foreign corporations

The contract with Tornos SA was not the first example of such kind of cooperation. The university has established strong connections with a number of top-ranked foreign industrial enterprises that produce state-of-the-art equipment. Included among them is EMAG, one of the largest companies producing machine-tools in the world, Delcam plc, the world leader in CAD development, Axens, the international supplier of advanced technologies, catalysts, absorbents and services for oil refinery, petrochemistry, gas and alternative fuels; Weatherford International Ltd, one of the world leaders in providing technologies and services to oil and gas industry, the French machine-building company Schneider Electric, Mori Seiki, the Japanese machine-building company.

Nikolai Nosov, the dean of the Machine-building and Automobile Transport department, says that the university had to meet stringent requirements in order to cooperate with Delcam in 1999:

“The director of Delcam, **Hugh Hamphris**, stipulated that lectures on computer subjects had to occupy 40 per cent of our schedule. It was horrible figure for us. Back in those days, one such subject was considered a good index,” Nikolai Nosov recalls. “But nowadays, our students are always on the list of the best students whose projects go to the Delcam headquarters in England. They also won the Delcam-held international Internet-Olympics on modern computer technologies.”

Renewal of cooperation with Renault-Nissan

Using the English software, the students organize the production of... corrective insoles! The prosthodontics office is almost ready along with a jewelry-processing center.

“Once a curious situation occurred - AvtoVAZ suggested that their plant designer and our graduate student should have completed the same project in 48 hours. It took the professional worker all 48 hours to do that. Do you know how many hours it took our student to do the same? Eight! Nobody could believe that! That’s because he can use all technical potential of the equipment.”

At the beginning of the 21st century, SSTU founded a training center and a



SSTU machine-builders cooperate with top-ranked industrial corporations.

laboratory for AvtoVAZ because Renault complained about the lack of highly skilled specialists. The University and the plant cooperated for almost 10 years, during which period 106 specialists were trained, earning SSTU 16 million rubles. 20 other Russian universities were involved in the training but SSTU was always among the leaders. In fact, SSTU students designed 136 parts for the Chevrolet NIVA! Unfortunately, in the late 2000’s, the cooperation ended and the center closed down.

“At one of the recent AvtoVAZ science and engineering board meetings, the plant managers again complained that there were no skilled specialists. Currently, two SSTU graduates are undergoing training at the Renault headquarters in Saint-Etienne as part the training for engineers and technical specialists for AvtoVAZ,” says Nikolai Nosov.

The Machine-building Departments at SSTU cooperates with the world largest maker of machine-tools, the German company EMAG. According to Nikolai Nosov, this company gives its machine-tools to the university for free, allowing students develop software for these machine-tools, and then everything is sold. Specialists for these tools are in great demand.

The SSTU students also cooperate with the structural divisions of Samara City Hall.

“The University purchased the German PTV Vision system; this is the transport modelling system which is used by the transport department of Samara administration,” says the dean of the Automation and Information Technology Department, **Nikolai Gubanov**. “My post-graduates head the computer modeling subdivision. At the request of the transport department, they developed forecast models, for example, of how the traffic changes if a certain section of the city transport network is blocked. We have a model of the entire city and we provide services to the transport department to maintain this model”.

The Automation and Information Technology Department also cooperates extensively with well-known world-leading machine-building companies and negotiates shipments of their machine-tools to SSTU. For example, Mitsubishi recently gave state-of-the-art automation



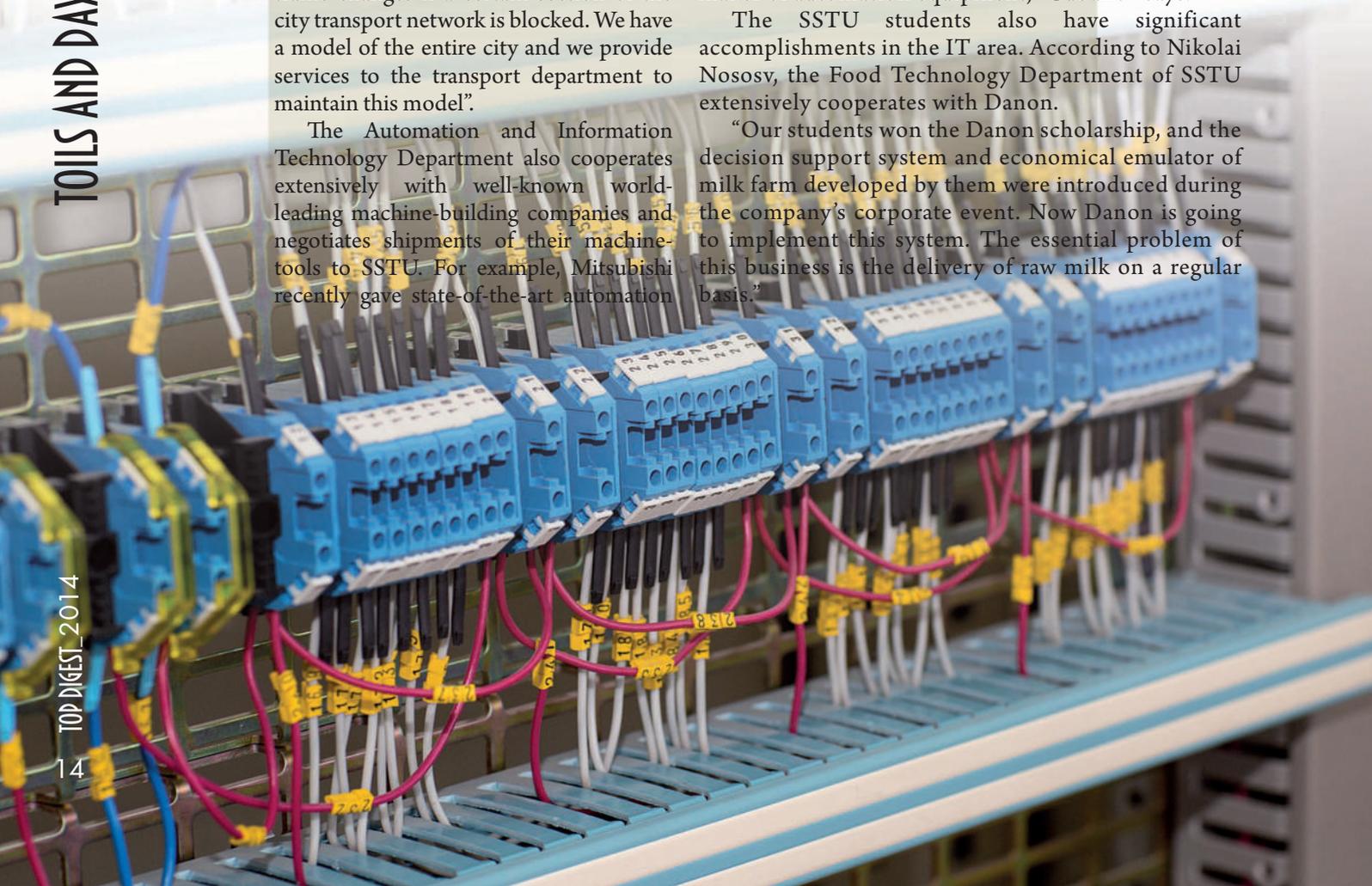
Nikolai Gubanov trained several highly qualified specialists in the sphere of transport network modelling.

equipment for training (the full value of this equipment is 1,600,000 rubles). These are software systems with controllers that each cost 1000 euro. Nikolai Gubanov says that this is a great support to help train students in the area of industrial automation.

“Specialists in the area of industrial automation and IT are in great demand today. With the upgrade of the petrochemical cluster of our region is underway. And we have contacts with almost every world leading maker of automation equipment,” Gubanov says.

The SSTU students also have significant accomplishments in the IT area. According to Nikolai Nosov, the Food Technology Department of SSTU extensively cooperates with Danon.

“Our students won the Danon scholarship, and the decision support system and economical emulator of milk farm developed by them were introduced during the company’s corporate event. Now Danon is going to implement this system. The essential problem of this business is the delivery of raw milk on a regular basis.”





Samara Technical University Education and Scientific Center offers jewelry design and manufacture based on CAD / CAM-systems Delcam.

This technology allows you to:

- design a complete jewelry line of men's and women's rings, bracelets, earrings, pendants;
- design a 3D-model of the product from a photograph;
- design a variety of high-quality products with difficult terrain from the photo or from the sketch with minimal manual polishing.



THROUGH SWITZERLAND TO THE RUSSIAN MARKET

Samara Technical University is developing cooperation with foreign partners

By Andrei PITTSYN

A powerful impetus in the development of relations between Samara Technical University and the Swiss industrialists took place in the framework of the exhibition "Metalwork - 2013". According to Andrei Pimenov, vice rector for International Relations of Samara Technical University, it was the exhibition where the delegation headed by rector Dmitri Bykov met Sergei Ganin, president of the Swiss-Russian Industrial business club and Mr Mori, owner of group DMG Mori Seiki. According to Alexander Kobenko, Minister of Economic Development, Investments and Trade of the Samara region, the interaction with the Swiss companies can significantly influence the development of the region's largest economic sectors - aerospace and automotive.

Nowadays Switzerland is one of the leading countries in the world in terms of innovation. One of the largest amounts of the developments belongs to the Swiss companies, research centers and scientific schools. They are very strong in micromechanics and electronics, aerospace fields, nanotechnology in a wide range of applications – from industry to medicine. So right now we are looking for partners in Switzerland that are willing to cooperate with our universities and companies in order to promote high-tech developments and create a base for implementation of all these projects.

Million dollars from Mori Seiki

The opening of engineering training center Technical University - DMG

Mori Seiki in May 2014 is a proof of rapidly developing partnership between Technical University and Swiss-Russian Industrial business club. Japanese company DMG Mori Seiki presented two metal processing machines that can be used for the production of parts applied in the engineering industry. Machines at cost of about one million euros were donated to the University.

"In addition to Japanese investments we consider investments from Weber Comechanics Volga region which is the dealer of DMG Mori Seiki in Russia. So, in total the Japanese-German corporation has invested about 40 million rubles in our university", said **Nikolai Nosov**, Dean of the Faculty of Mechanical Engineering.

Before the opening of engineering training center Technical University – DMG Mori Seiki we were on the third technological platform. Now when we have the new equipment, we can say with certainty that we are moving to the sixth technological platform. This is the fifth center in the world and the only one in Russia! Identifying the premises to house the center the Japanese have visited many cities of the country

from St Petersburg to Ekaterinburg. And they chose Samara Technical University because we have been implementing the best educational programs in this area.

“When working on the newest and the most perspective equipment it’s possible to train the right specialists for various sectors of our industry”, said **Sergei Bezrukov**, Minister of Industry and Technology of Samara Region on the opening ceremony. “The technological cycle has been closed: Samara Technical University trains qualified specialists on programming and design, and now we have the opportunity to apply this software to the equipment – robots perform a product that we can see in the drawings and 3D- models. I’m absolutely sure that the creative interaction between advanced Japanese machine tool company, Samara Technical University and Samara machine builders will promote the further development of machine-building complex and strengthening of the partnership”.

Mutually beneficial cooperation.

However, if we are talking about the equipment of the German-Japanese group, there is a logical question: why Switzerland? **Maxim Nenashev**, vice rector for research of Samara Technical University answered it. According to him, it is membership in the Russian-Swiss industrial business club that has opened up new opportunities of mutually beneficial cooperation with relevant corporations around the world.



Maxim Nenashev is responsible for science and research in SSTU.

But, in order to be just, we have to note that the Swiss themselves are very interested in opportunities at Samara Technical University. For example, in July last year, **Urs Chudin**, President of the Swiss company Tschudin visited our University. He spoke about his company’s product, in particular about high-precision grinding machines, which are used today in all major engineering concerns of the world and in Swiss watch



учебный инженеринговый центр амГТУ-DMG MORI



Business partners of the university visited the opening ceremony of SSTU-DMG Mori Center.

companies. Each machine is unique and meets individual needs and preferences of the customers. Various enterprises in automotive and aerospace sector can be potential users of this equipment in the Samara region.

Andrei Pimenov, vice rector for International Cooperation of Samara Technical University says that currently the University has been preparing a draft agreement on partnership with the company Tschudin. According to the document the University offers the Swiss company the opportunities for the placement of advertising and information materials. The University also determines the level of demand for its products in the Volga Federal District.

Samara Technical University is "the door" to the Russian market

There is an active exchange of technologies between Samara Technical University and a number of educational centers and enterprises in Switzerland.

These technologies are on display in the Politechnopark at Samara Technical University. According to Maxim Nenashev, two Swiss companies, Progress Industrial Systems and Swissnanocoat, currently have their equipment there.

"These companies have signed an agreement on scientific and technical cooperation, whereby we present our developments in their technology park, and they present their developments in our technology park. We therefore are building a bridge between the Swiss companies and Russian manufacturers", said Maxim Nenashev. "With an exhibition site in Samara, international companies have a chance to market their technology and products in Russia without much difficulty.

For example, Switzerland has advanced magnetic-impulse equipment, at a level higher than currently exists in Russia. The requirements for products manufactured using the magnetic pulse today are very high and the Russian equipment does not meet those requirements. The Swiss have donated the equipment, worth 45 million rubles, as part of the agreement.

For our part, we have to demonstrate the equipment to potential customers. The Swiss expect qualified specialists who are able to work on the high-tech equipment, who can explain how it works as well as the advantages. In addition, we can use this arrangement for scientific research and educational purposes".

According to Maxim Nenashev, part of the equipment in the Politechnopark is useful for the oil and gas industry.



University and the Swiss is taking place, strange as it may seem, out of Earth's orbit. In April, the international conference Man to Mars took place in the Swiss canton of Neuchatel. Samara Technical University, Samara State Aerospace University and Samara State Medical University presented research focused on the preparation and implementation of interplanetary flights, including expeditions to Mars. Key problems of such expeditions include maintaining the health and performance of the crew while experiencing prolonged exposure to adverse environmental conditions .

For example, ultrasonic technology can be used to increase the extraction of hydrocarbons. Several companies have expressed their interest in this technology.

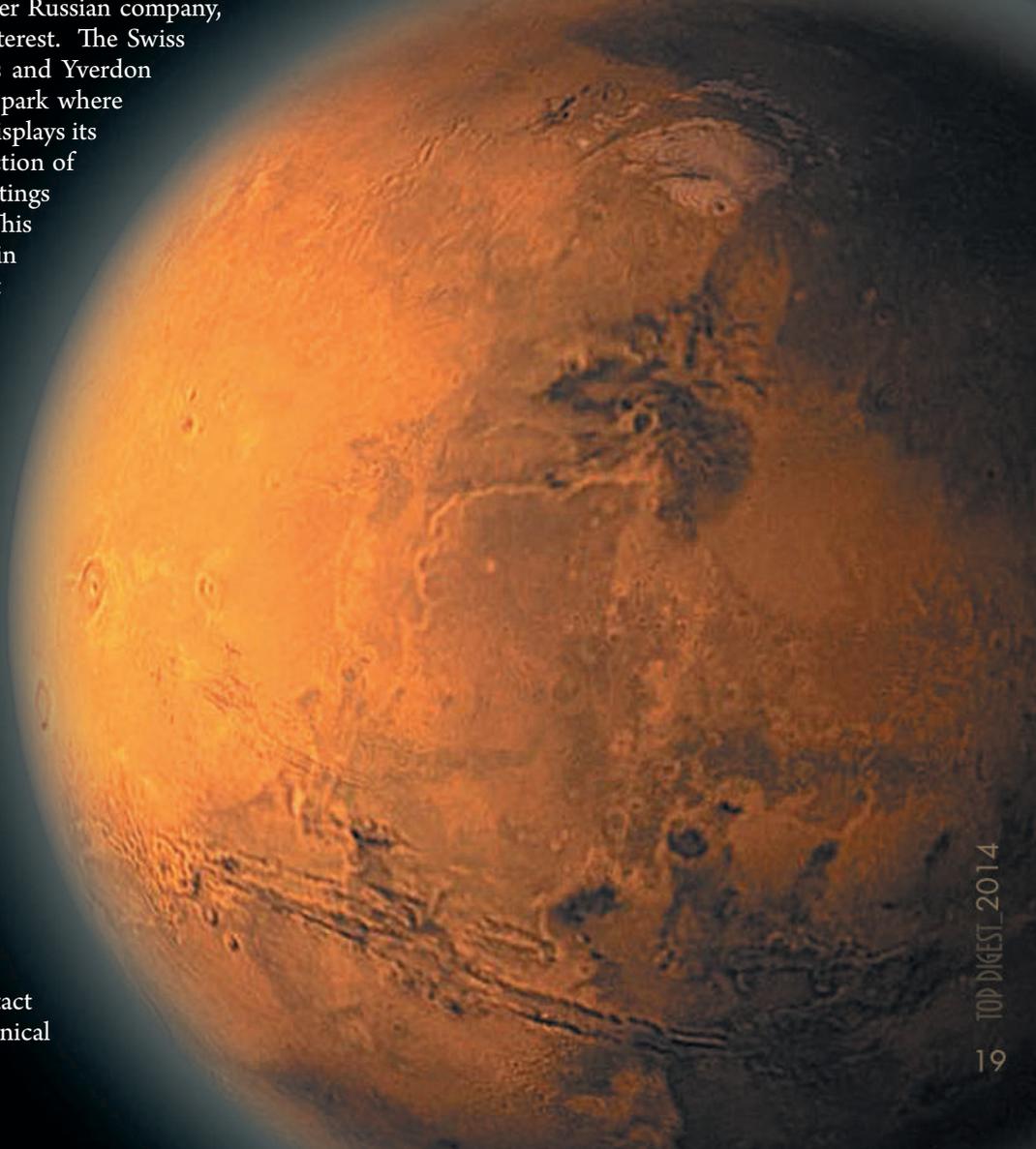
Samara Technical University has signed an agreement with Intech, and are in negotiations with Lukoil to conduct full-scale testing of the ultrasonic equipment. According to Nenashev, another Russian company, Slavneft, has also expressed interest. The Swiss towns of La Chaux -de-Fonds and Yverdon -les-Bains also have industrial park where Samara Technical University displays its technology used in the production of composite nanostructured coatings by gas-dynamic methods. This technology is widely used in Russia, including Elektroshchit and Volgaburmash.

“Our equipment for functional coatings can be used in a wide range of technical areas. For example, it can be used to increase the durability of electric conductivity in various machines. These coatings can be used in all areas of mechanical engineering, medicine, aviation, and metallurgy”.

Finally, the university offers several directions of development that may be of interest to companies around the world.

To Mars with our help

One more point of contact between Samara Technical





An interplanetary flight can result in a journey of at least 500 days for an astronaut, under conditions that are significantly different from those on Earth. **Adil Kotovskaya**, a professor at the Institute of Biomedical Problems and a member of Russian Academy of Sciences, successfully simulated Earth's gravity, using a short-radius centrifuge. Due to the limitations of the experiment, Kotovskaya was unable to replicate the gravity of the Moon or of Mars. **Vladislav Akulov**, a professor at Samara Technical University, has furthered the research using analytical methods. He designed a mathematical model entitled "Man as a Centrifuge", using computer technology. This model is helping to solve the problem of creating artificial gravity similar not only to Earth but also to the Moon and Mars.

"Previously, there were two separate fields in short-radius centrifuges: space and medical (for both gravitational and trauma therapy)," says Akulov. "These two areas have always been considered different. But we came to the conclusion that they have the same control system problem. We have managed to develop a methodology that solves the problems of both space medicine and gravitational therapy."

Professors **Gennadi Kotelnikov**, **Igor Makarov**, **Alexander Yakovlev**, Associate Professor **Alexander Sidorov**, and **Anna Shishkina**, the head of gravitational therapy at Samara State Medical University, have taken an active role in these medical developments. Akulov's research has successfully been tested at medical centers, such as the Volga Cliff Resort, the Center for Gravitational Therapy at Samara State Medical University, and the Samara Railway Clinical Hospital. Akulov does not know whether there are similar developments abroad, as the Americans have classified their research in this area. In Russia, however, Akulov was the first



to calculate the control parameters of short-radius centrifuges.

Vladislav Akulov's research in gravitational medicine was so complex that even Yuri Gagarin's personal physician, Adil Kotovskaya, did not believe in the possibility of its practical application. She doubted the ability to successfully measure the blood pressure in two limbs (e.g. arm and leg) simultaneously as the patient spun in a centrifuge.

It was **Valentin Lebedev** who brought to Akulov's attention this problem. Valentin Lebedev is a prominent scientist who has twice been named Hero of the Soviet Union, and has been awarded two Orders of Lenin. He is an officer of the French Legion of Honour, and is an honorary citizen of many Russian cities, as well as Fort Worth (Texas, USA), and is an astronaut listed in the Guinness Book of Records. He agreed to sit on the committee at Akulov's doctoral dissertation defense. He posed to Akulov the challenge of replicating the gravity of Earth, the Moon and Mars at the international

space station, in an effort to prepare astronauts for flights to Mars.

Now, thanks to the work of the professor from Samara and his colleagues, any scientist or student can assign the desired parameters of artificial gravity in the capsule, simply by pressing a few keystrokes on a computer.

Development of the intellectual environment

In 2014 the university reached an agreement with DMG Mori Seiki, which would allow Samara Technical University to provide technical training.

"The agreement emerged from the fact that many companies in Samara expressed interest in working with the equipment from DMG Mori Seiki," said Maxim Nenashev. "Companies in Samara have these high-tech machines but no experts who know how to use them." Samara Technical University can act as a training center to certify specialists, ensuring that they will know how to properly operate the expensive machine. In addition to the educational aspect, Samara Technical University can also undertake the equipment maintenance. The heads of DMG Mori Seiki generally agree with such cooperation proposal and are ready to begin the certification of our specialists who will then in turn certify the staff of engineering enterprises here in Samara.

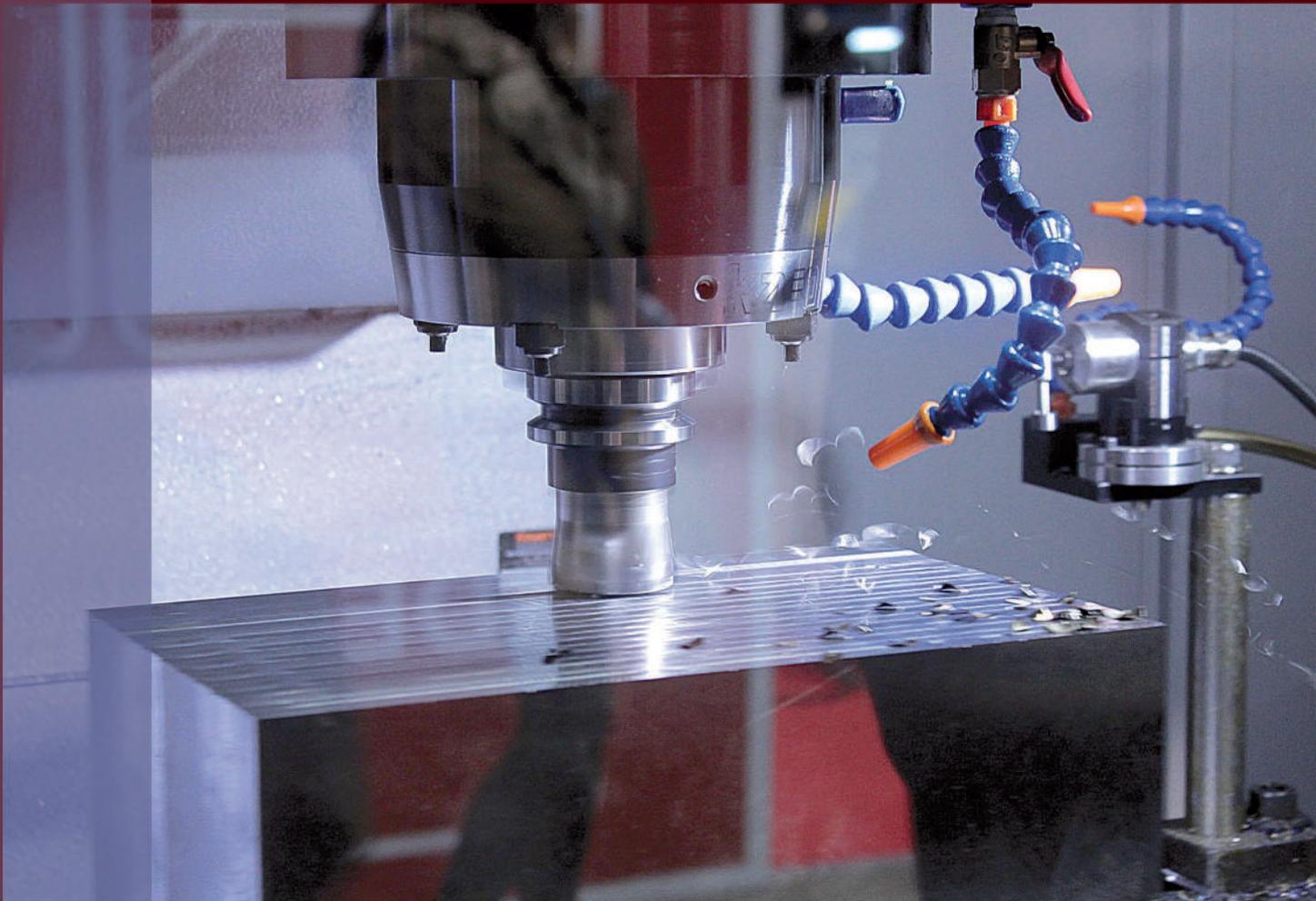
"Switzerland is a strategic partner for us today," said Dmitri Bykov, the rector of Samara Technical University. "Our entrance into the Russian-Swiss industrial business club has been an important platform in the development of relations. Our equipment is now exhibited in the industrial parks of Swiss companies." This is important to help attract international consumers. For example, Japanese companies cannot buy technology that is made in Russia because there is no peace treaty between the two countries. But there is no such restriction in Switzerland, where Russian companies have had recent success, due in large part to the fact that they are able to bring ideas to life faster than Swiss companies.

The office of the Swiss canton Neuchatel will soon open in Samara. The agreement will be signed by the Russian-Swiss industrial business club, which includes Samara Technical University.

PROPER COMMUNICATION PLATFORM

The Swiss-Russian Industrial Business Club intends to increase cooperation with Samara Technical University

By Andrei PTITSYN



Members of the Swiss-Russian Industrial Business Club visited Samara Technical University on October 9. The delegation included representatives of the Swiss canton of Neuchatel and prominent manufacturers Tschudin, Omera, Mikron and Millutensil.

We sat down for a talk with **Sergei Ganin**, the executive director of the club.

– **Sergei**, an agreement on economic cooperation between the Samara Government and the authorities of the Swiss canton of Neuchatel was signed at the XIII

International Specialized Exhibition-Forum “Industrial Show” which opened on October 7. Both the Swiss side and the industrialists of the region expect immediate results from this partnership. Was this agreement facilitated by the Swiss-Russian Business Club? How does it directly impact Samara Technical University?

Our club also helped the board of administrators at Samara State University organize some business meetings”.

– **Does the difference between “member” and “partner” of the business club affect the participants in practice?**

“Yes, it imparts a different status, format and depth of interaction. Samara Technical University is a full member of the club with all the consequences, in particular the right to use our business infrastructure in Switzerland. The level of contacts for a member of the club is much higher. This level of interaction means increased visits of Swiss colleagues to Samara Technical University, and university employees to Switzerland on business trips. We are talking not about business tourism, but about specific areas that we can develop. It is worth noting that not only Mikron, but also Tschudin, plan to cooperate with

“This was the first time such an agreement was signed in the history of Swiss-Russian relations. It is an interregional agreement and was organized by the Russian Federation Ministry of Foreign Affairs. The prospective agreement with Samara Technical University will be different”.

– **What results are expected from the visit of your delegation to Samara Technical University?**

“We have a longstanding relationship with Samara Technical University, which has special significance for us. The university has taken specific steps to increase cooperation between companies in Neuchatel and in Russia. Samara Technical University serves as a communication platform to certain Russian industries. In the Politechnical technopark, there are two Swiss companies – Progress Industrial Systems and Swissnanocoat. Negotiations are underway with the company Mikron to create a demo center at Samara Technical University. Mikron, in turn, has plans to create a system for working with their equipment in Russia. This Swiss company is known as a world leader in high-accuracy milling and multi-axis machines. This company has also created software for high-accuracy metalworking equipment. The center will be Mikron’s first office in Russia”.

Promising projects

– **How many universities in Samara, excluding Samara Technical University, are included in your list of members?**

“Another partner is Samara State Aerospace University. In addition, while Samara State University of Economics is not a member, we have some forms of cooperation.



The Swiss-Russian Industrial Business Club was established in 2011. It was created by the Russian Trade Representative in Switzerland, the Swiss association of mechanical and electrical engineering industries, Swissmem, with the participation of Swiss and Russian organizations and companies including CIM-INGENIA (Neuchatel), Ramenskoe Instrument Design Bureau JSC, EC Expo-Volga (Samara), Russian Mechanical Engineering Union, OSEC Business Network Switzerland, the Swiss Centre of Electronics and micromechanics CSEM (Neuchatel), Russian Venture Company JSC, the regional offices of the Chamber of Commerce and Industry of the Russian Federation, Support of Russia and others. The club works with government agencies and industrial enterprises of various cantons of Switzerland, as well as a number of regions of the Russian Federation including Samara and the Republic of Tatarstan. According to officials and business leaders of the two countries, the Swiss-Russian Industrial Business Club has already gained a reputation as an effective platform of Russian-Swiss business contacts. Intriguingly involved are the heads of the Swiss company CIM-INGENIA SA, Sergei Ganin and Yuri Khromov. The latter worked for six years as the Trade Representative of the Russian Federation in Switzerland. Sergei Ganin is an engineer and an economist. He was appointed as a delegate of the central office of the Russian Union of Mechanical Engineers to Switzerland. He has extensive experience in solving specific problems regarding setting up and developing business in Switzerland. Vladimir Gutenyov is the head of the Russian-Swiss interparliamentary friendship group, is the first deputy chairman of the State Duma Committee on Industry, first vice-president of the Union of Mechanical Engineers of Russia, and plays an active role in the business activities of the club.

Samara Technical University. Given the level of competence and qualifications of University staff, the Swiss partners believe it is quite a promising project. On the past trip, we brought our partners - two Italian companies – to meet with the administration of the university. It’s worth noting that the company Millutensil, headed by **Veronica Joost**, is also on the board of directors of the Italian Association

of Mechanical Engineers. The delegation included representatives of the company. Despite the current complicated political situation, the Italians have expressed their interest in maintaining business contacts and exploring further development”.

signed an agreement with a number of universities in Neuchatel. Among them are the Institute of Engineering and the Arc School of Management. We also organized a meeting with the Federal Institute of Technology in Lausanne (École Polytechnique Fédérale de Lausanne). It was an educational exchange between students and

faculty. And now during our current visit, we have had a meeting between the representative of the Embassy of the Swiss Confederation in Russia **Mr Tony** and the government of the Samara region.



Alexander KOBENKO, Minister of Economic Development, Investments and Trade of Samara Region:

- We have built a strong relationship with a number of manufacturers in Switzerland, starting with complex equipment manufacturers. It is important that this is not their first visit, that the equipment has been supplied, and that the cooperation between our universities is growing. We are sure that this cooperation, which has already been demonstrated by Samara Technical University, will continue.

- Yes, it was surprising to see the Italians among the members of the Swiss delegation ...

“The fact is that the industrial business club is becoming more international. We have some proposals from Italian and Czech mechanical engineers with the Samara Ministry of Industry and Technology. Mechanical engineers from Spain and France have also indicated their interest.

Unfortunately, the current political situation interferes with work and development of our partnership in the engineering industry. They difficulty in implementing contracts already signed have led to the worry about the possibilities of cooperation in the future. Companies are trying to build a bypass at the interregional level, which, of crouse, we encourage”.

Mutually satisfactory results

- Is Samara Technical University a member of the Swiss-Russian business as an industrial business area or as an educational institution ?

“Both. Members of the Club and Samara Technical University recently

Mr Tony is a Deputy Ambassador of Switzerland in Russia who focuses on economic issues. During the meeting, he stressed the importance of the participation of Samara universities in an inter-country exchange program. In 2015 this program includes funding for training and work in 15 areas for academic staff in Switzerland. SSTU will be extensively involved in this program”.

- Is it possible for Samara Technical University to expand cooperation with Europe given the current economic sanctions?

“Within this framework, Switzerland has a special status. It was only involved in the first round of sanctions, that targeted specific individuals and banking institutions. Consequently, Switzerland represents a unique platform that has a “corridor” of interaction. A number of European companies consider Switzerland as a point of entry into our market”.

- What will you tell your colleagues when you return to the headquarters of the industrial business -club?

“First of all, I will tell them that the university coordinates well the interaction between business companies and inter-institutional entities. That is, we have found that even in a difficult political and economic situation, there is an initiative, as well as partners, who are willing to help solve these difficulties. We found again that Samara Technical University is a vivid example of the fact that the activity of the Swiss-Russian Industrial Business Club is not simply a talking point. Our partnership has led to concrete and mutually beneficial results”.



3D-modeling Delcam Dental, DentMILL

Educational and Scientific Center
“ Samara Technical University- Dentistry “

(Mechanical and Automotive Engineering
Faculty) offers the design
and manufacture of dental prostheses
made of zirconium oxide .



Specialists make dentures using modern technologies, including the software packages Delcam Dental, DentMILL. Experts make bridgework of the buccal teeth in anatomical shape. If necessary they provide prosthetics of the whole patient's jaw.

The aim of the project is to make a model of the denture close to the ideal excluding the inaccuracy.

Our center takes orders for zirconium oxide coated prostheses from dental clinics throughout Samara.

34 a , Lukachev str., Samara, Russia
Tel.: +7 846 334 55 71.

THERE ARE SOME CONTRAINDICATIONS, YOU SHOULD CONSULT A SPECIALIST

FOREIGNERS WILL HELP US WITH MACHINES

Samara Technical University will train specialists to operate a machine

By Andrei PITTSYN

A new old partner

From October 14th to 17th, a delegation headed by rector **Dmitri Bykov** familiarized themselves with the advanced technology of European mechanical engineering in Lugano, Switzerland. **Bernard Gaspard**, the manager of Mikron, was a hospitable host. Mikron Group has several companies in Europe that produce high-precision

and high-performance machines, which are capable of producing small parts in large quantities. This meeting was not the first one between Mr. Gaspard and the Samara delegation. Previously, he worked as the deputy director of another Swiss company, Tornos, and often visited Samara Technical University to organize international meetings. As a result, Tornos and Samara Technical University reached an agreement on the supply of branded Swiss metalworking equipment for training centers. However, this agreement fell apart due to staff changes at Tornos.

Mr. Gaspar started to work at Mikron. Being familiar with the scientific potential of Samara Technical University, he proposed the same agreement about metalworking equipment, but from Mikron instead.

According to **Maxim Nenashev**, vice rector for Research of Samara Technical University, during the two-day visit the delegation became acquainted with the Mikron production area, its products, and technologies.

“We visited several areas of the plant that are responsible for the manufacturing of metalworking equipment,” said Nenashev. “In addition, Mikron has recently started manufacturing new products, including a high-precision tool capable of operating at ultra-high speeds while being cooled from the inside. While ordinary metal tools are cooled with fluids from outside the cutting area, Mikron’s tool has cooling lines inside the tool, increasing the cutting speed without overheating. This allows for the possibility of long-hole drilling. In addition, the drill is very malleable even though it is made of hardened alloy. Surprisingly, these drills are only 150 mm in diameter, barely thicker than a strand of hair!”

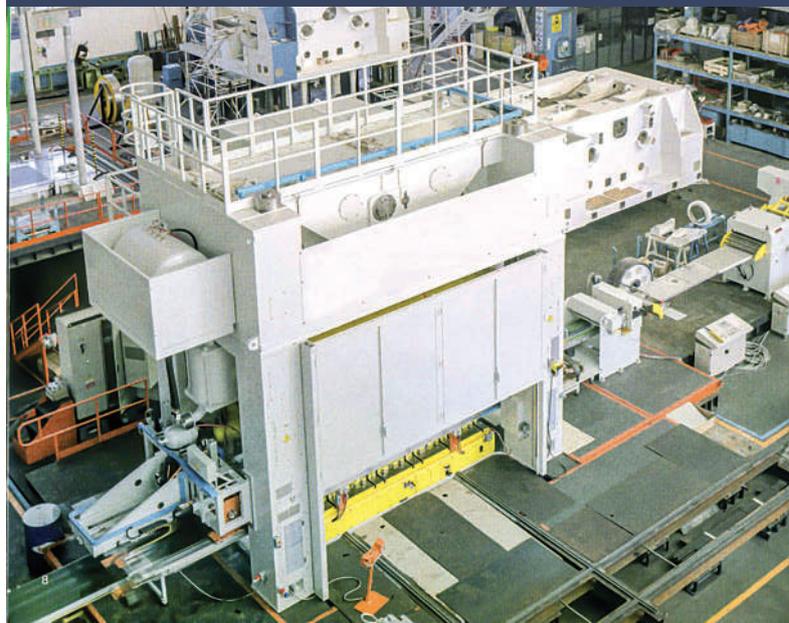
Expressing his willingness to share the equipment with Samara Technical University, Bernard Gaspard stipulated only one condition. As Mikron is relatively unknown in Russia, the university has started to promote Mikron’s machines in Russia. Shortly thereafter the agreement, while in Moscow, Dmitri Bykov, rector of Samara State Technical University, **Sergei Ganin**, executive director of the Swiss-Russian Industrial Business Club, and Mr. Gaspar met **Anatoli Tereznikov**, the head of the training and engineering center at Samara Technical University – DMG Mori. Anatoli Tereznikov is very experienced in the promotion of machine-building brands as he is also the head of Weber Comechanics Volga, which is the official representative of DMG Mori in the Russian Federation.

Mr. Gaspar fully approved of Tereznikov’s and, as a result, an agreement between Samara Technical University and the Swiss company is being prepared.

Milan is a trend-setter ... for the press...

The business program also included a visit to Italy. **Veronica Joost** leads the engineering company Millutensil, which is located in Milan. The company has, for its 60 years of existence, been in the hands of a woman. Millutensil, founded by Mrs. Joost’s mother, can be called a family business; Veronica’s sister also works here. The company produces press equipment. Huge, ten-meter tall presses are fully automated and their design can be designed to the exact specifications of a customer.

“The press-machine has an optional integrated lower rotary plate with the top plate opening 180 degrees for ease of maintenance,” explained Maxim Nenashev. “But the most interesting thing is that these high-performance presses are have additional equipment; sheet metal is unwound from the reel, passed through the unit which allows to straighten it perfectly. Then, completely flat sheets of metal immediately enter the press.” Millutensil offers a complete production. It ensures quick and precise positioning of sheets of metal before they enter the press at a certain angle, thickness, and bend. The company is



unique in that the automatic production line requires only two people to run. The high productivity is ensured by this rolling-feeder. Moreover, the metal thickness may be anywhere between 0.5 mm to 10 mm.

Maxim Nenashev noted that at the beginning of the meeting Millutensil made it clear that they were ready to sign an agreement with Samara Technical University with the same conditions as Mikron. But, before an agreement could be signed, the possible demand for Millutensil products in Russia needed to be measured. Maxim Nenashev believes that the interest of foreign partners in Samara Technical University to promote foreign brands in Russia is recognition of the university activity. The possible cooperation with Millutensil is important because Ms. Joost is not only the head of Millutensil, but also a board member of the Italian Association of Mechanical Engineers. In addition, there is no Millutensil office in Russia.



THE BEAUTY OF HOT METAL

The faculty of the casting technology center at Samara State Technical University proved that metals have heredity

By Svetlana EREMENKO

In September, the SSTU Casting Technology Center celebrated its 10th anniversary. For the anniversary of the Center and the university, they made a beautiful bronze medal using the most advanced technology, called investment casting. Today, the Chair of Casting and Enabling Technologies, together with the Casting Technology Center and Samara Division of The Russian Caster Association coordinates all types of work connected with casting production in the Samara region.

Every little bit helps

It all started in the early 2000's when the institute lost its casting infrastructure. **Vladimir Nikitin**, the head of the department, came up with the idea of

plant was shut down. When the branch closed, the





Specialists of the SSTU Casting Technology Center can cope with the most complicated theoretical problems.

building SSTU's own center. At first, the new building was supposed to be used by all of the departments of the Physical-Technological Department, but later the rector, at the time **Vladimir Kalashnikov**, made the bold decision to give it entirely to the casting department. It required a lot of movement. The equipment was moved from the former branch building while the foundation was under construction, and furnaces and machines were installed right after the construction work had been finished. Local enterprises were helpful in providing equipment for the Center's laboratories. The steel-casting plant gave pictures of its laboratory instruments, as well as molding materials. The 'Motorostroitel' plant gave the molds for injection casting, in addition to investment models and outfits for the creation of a sand mold. LLC 'Promlit' installed the injection casting unit. The Samara Division of the Russian Caster Association gave instruments necessary for melting and casting, while Yekaterinburg-based CJSC 'RELTEK' installed an induction melting furnace. The biggest contribution came from the university itself, which paid for more than half of the equipment.

Between 2004 and 2005, the laboratories were equipped with necessary instruments. In 2006, the department

was given a new branch of metallurgical study "Casting production of ferrous and non-ferrous metals". In 2009, the department of Casting was merged with the department of Laser and Plasma Technologies. Today, the department has three branches of study, each with its own laboratory in the Center.

Flavor and beauty of metal

The strongest point of the department is its unique line of research. For many years, the SSTU casters have shown that metals have heredity just like living beings. Indeed, everything on earth follows the same principles, and all objects of animated nature are just different combinations of elements from Mendeleev's periodic table. This means that the grain of metal can have positive and negative properties, just like a grain of wheat. There's a saying that "Bad seeds produce no good crops". The main points that the casters usually care about are providing for and maintaining the technological processes, but that's not enough. There is a very important belief in the technological process of casting about the preparation of alloy. This is the caster's craftsmanship. It's not enough to just melt the metal and cast it, the caster must prepare the source materials properly, consider special melting conditions – just like a good cook picks the right ingredients for the dish.

"The main thing about preparing an alloy is to consider the best properties, the good 'habits' of aluminum and magnesium and put these 'bests' into further casts," explains Vladimir Nikitin, whose son, **Konstantin**, graduated from the department and also works in the



Casting is a basic technology required for the production of all kinds of machines.

It is used in automobile production, machine-tool building, and aerospace engineering.



Cast parts make up between 40 and 70 per cent of total weight.



The cost of cast parts can account for 20 per cent of the machine's cost.



There are about 300 cast parts in an automobile.





Technological process of casting can last several hours.

Center. Recently, he defended his doctoral dissertation on the heredity in aluminum alloys.

Advanced casting technologies

The Center provides everything one needs to prepare a good alloy. The list of equipment shows its great potential. Included in the list is an injection casting machine, the only one of its kind currently operating in a Russian department, an automatic manipulator purchased in 2014 for 500,000 rubles (as part of a 6,000,000 rubles grant for the development of aluminum and composite alloys), a small production line for casting, a centrifugal machine, a roller crystallizer, and an outfit for immersion and vacuum casting.

It is very quiet inside the Center. Inside, one finds a tank with exotic fish, a computer classroom, high ceilings and a lot of sunshine – everything one needs for hard work. Indeed, the technological process – from the preparation of materials to a final cast – lasts for several hours.

Over the last decade many of the region's high officials, chief managers of Samara businesses, and guests from other Russian universities have visited the casting center. All of them have expressed their admiration for the scientific and technical level of the

laboratories. The Chair and the Center organized a conference among the casting departments of 13 Russian cities in 2004.

In April 2014, SSTU hosted the 6th regional research and technology conference on “Cooperation between science and casting production”. The participants discussed a number of measures to be taken in order to improve the situation in casting production both in the region and in Russia. Many of those measures formed the basis of the “Metallurgical production” section of the program “Innovative development of the machine-building complex enterprises of Samara region until 2020” which began functioning in July.

In May, a new engineering training center opened within the Center in association with the LLC ‘Veber Comechanics Povolzhye’ and Japanese company DMG Mori. The latter provided two high-technology metal-working centers to help train highly skilled professionals for the Russian industry.

THE NEW ASPECTS OF WELL-KNOWN CATALYSTS

II Russian Congress on Catalysis RUSCATALYSIS was held in the Samara Region

By Evgenia VASINA



The prospects of the catalyst industry in Russia was the main topic for the four day conference from October 2-5 at the Volga Cliff Resort. The Samara government sponsored the science forum, and Samara Technical University was one of the organizers.

The RUSCATALYSIS conference is held every two years. This year's conference attracted more than 300 representatives from research institutes and universities from Russia, Azerbaijan, Uzbekistan, Kazakhstan, Belarus, Germany, and Finland.

It is not a coincidence that RUSCATALYSIS 2014 was held in the Samara region. According to **Viktor Merdzhanov**, deputy minister of Industry and Technology, Samara not only has a developed oil refining and petrochemical industry, but also an effective university system that provides professional training.

“Our competitive advantage over other regions is that all stages of the technology cycle are present in our region, from mining and refining to manufacturing a wide range of petrochemical products. There have been more than 200 innovative projects with a total investment of 890 billion rubles. The Samara region is an attractive place for the testing of a company's scientific research,” said Victor Merdzhanov at the Congress

This large scientific event is essential for the scientific development throughout the country. **Valeri Lunin**, the deputy secretary of the Department of General and Technical Chemistry of the Russian Academy of Sciences, and **Valentin Parmon**, the chairman of the Scientific Council on Catalysis of the Department of Chemistry and Materials Science of the Russian

Academy of Sciences, stressed its importance. At the forum Samara Technical University had its leading experts and scientists in Chemical Engineering and Petroleum Engineering Faculties made presentations.

The conference was divided into four sections: physicochemical elements of the catalytic process, scientific basis of catalyst production, advanced catalytic process, and industrial catalysts. Of the numerous presentations given at the conference, the lecture "Adaptive molecular and cluster catalysis by transition metals in modern organic synthesis" attracted the most interest. It was presented by professor **Valentin Ananikov**, the Laboratory Head of the Zelinsky Institute of Organic Chemistry, and a

corresponding member of the Russian Academy of Sciences.

The report detailed the methods for the production of valuable products from natural sources.

"The preparation of the product under milder conditions is impossible without catalysis. We currently use catalysts that were developed in the 1960s," said **Igor Karagichev**, the head of catalysts production at SANORS Holding Limited. "The Congress brought together the leading scientists of Russia who are able to change the situation."

CATALYSTS are substances that cause a chemical reaction or accelerate its flow but which are not found in the products.

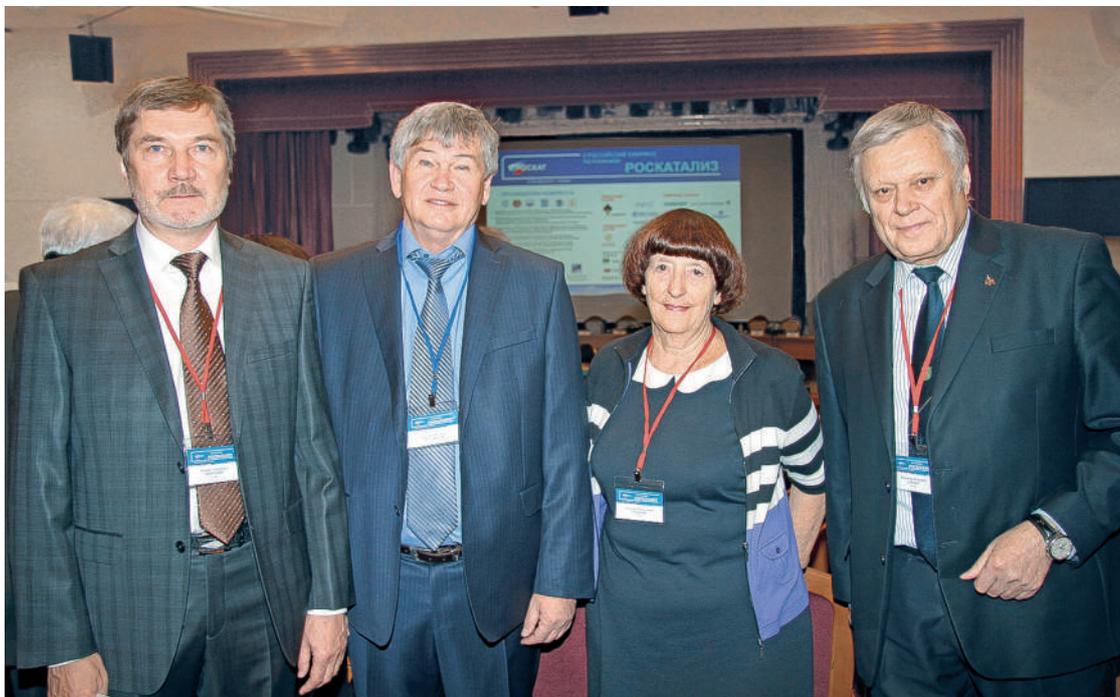
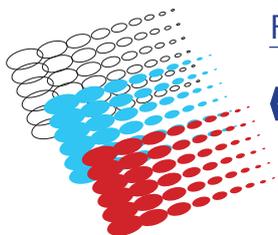
CATALYSTS ARE USED IN ALL KINDS OF

plastics

fuel

fertilizers





Samara Technical University has one of the country's largest catalyst research programs headed by Andrei Pimerzin (photo: Andrei Pimerzin, Victor Merdzhyanov, Svetlana Levanova, Vladimir Alenin).

Within the framework of RUSCATALYSIS 2014, some workshops and round tables were held. The first round table, dedicated in honor of the 100-year anniversary of Samara Technical University, there were discussions on the problems of

By the way

Samara Technical University has one of the country's largest catalyst research programs. The concept of controlled synthesis of nanoscale inflicted sulfide phases with given geometric parameters and electronic properties as catalysts for the hydrotreating of petroleum fractions has been successfully developed

Valentin PARMON, Doctor of Chemistry, Academician of the Russian Academy of Sciences, and Director of Boreskov Institute of Catalysis SB RAS said:

"The list of countries exporting catalysts is smaller than the list of nuclear powers. Russia is on both lists, but unlike the nuclear industry, it does not have 100% catalytic independence. In the face of the deteriorating political and economic relations, this self-sufficiency problem is becoming more important."

educational programs and training for the oil refining industry. Valery Lunin, dean of Chemistry Department at Moscow State University, chaired the meeting and Professor **Natalia Tomina**, from the Chemical Technology of Oil and Gas department at Samara Technical University, opened the meeting. During the discussion, experts and students from various Russian universities exchanged views and shared new methods and techniques for teaching.

The next time scientists and industrialists meet to discuss the catalyst industry will be in 2016.

at the department of Chemical Technology of Oil and Gas Processing. The department develops the compositions and methods of synthesis of catalysts and then patents the new methods. The developments have reached the testing phase.

For example, our scientists have developed a catalyst for selective catalytic cracking gasoline hydrotreater. This type of fuel has a high sulfur content and a large amount of the olefinic hydrocarbon, giving it a high octane number. The new catalyst can significantly reduce the sulfur content without the loss of octane number.

The hydrotreatment of vacuum gasoil at the stage of preparation of raw materials using a catalyst designed by our specialists produces catalytically cracked gasoline of such quality that it can be used in commercial gasoline without any additional hydrotreating.



SAMARA TECHNICAL UNIVERSITY PROPHYLACTIC SANATORIUM

The Prophylactic Sanatorium offers year-round treatment and prevention of musculoskeletal diseases, connective tissue, urinary system, digestive system, skin and subcutaneous tissue, gastrointestinal tract, and dental diseases.

Various massages, laboratory tests, physiotherapy, psychotherapy, acupuncture, hydrotherapy, baths (pearl, sea salt, pine), douche bath (circular douche, rising douche, Charcot's douche), ultrasound, manual therapy, electrocardiography, urological and gynecological offices, and thermotherapy are available.

Accommodations

The Prophylactic Sanatorium offers accommodations in single, double, and triple rooms in Standard, Junior Suite and Vip. There is a canteen (3 meals a day), a gym and a swimming pool.

42, Revolyutsionnaya str., Samara, Russia
Tel.: +7 846 334 33 72



G E T T I N G T O T H E O I L

By Ksenia GARANINA

It's rather difficult to arrange a meeting with Vera Zhivaeva, a Candidate of technical science, and the head of the chair "Drilling of oil and gas wells". She is constantly busy attending conferences, trainings, and courses. She understands how crucial it is to be aware of new trends and to meet the highest standards to manage properly the learning process associated with the oil and gas sector - the most important sector of the Russian economy

“Tomorrow, I’m leaving for Pushkin on a business trip and, attend a training course for managers of higher education. There are a lot of questions about new programs and legislation recently enacted, so some explanations are required,” says Vera Viktorovna.

The staff of the department is also interested in improving their professional level. The goal of SSTU teachers is to train specialists who can work in modern conditions with the latest equipment. Recently, Russian oil giant Rosneft sponsored a group to receive training in Texas, USA with Halliburton, one of the most influential oil production companies in the US. In addition, there were courses on horizontal, marine and offshore drilling at the University of Aberdeen, in Scotland which is a part of the famous six ancient universities in the UK.

“We have new targets all the time. The President has stated his goal of Arctic exploration. This is a very complicated process. There is a lack of specialists in this field, not only in Russia, but in the whole world, with the exception of Norway. Of course, we are doing our best within our department to prepare graduates who are qualified for these new projects. Consequently, we plan to model our courses from ones in Norway and Vietnam. We have much to learn,” says Vera Zhivaeva.

Contacts with foreign countries don’t only provide knowledge, but also offer a chance to share information. For the past several years, oil and gas specialists from Uzbekistan and other CIS countries have been trained at SSTU.

In addition, President Putin has recently launched a program to drill a well 15,000 meters deep in Kazakhstan. Scientists from SSTU are planning to take part in this program by using previously developed technologies and a reagent base that were created in the department.

The future generation of Oil Engineers

Today, many large Russian oil and gas companies are suspicious allowing foreign experts to work on their projects. As a result, companies have turned to SSTU to help prepare future skilled employees. This year, the “Drilling oil and gas wells” department opened a fully equipped laboratory to test drilling fluids. The modern laboratory, which cost more than eight million rubles, corresponds to the American standard APS, which allows the safe study of drilling fluids. A grant from “Rosneft” made it possible to open such an impressive laboratory for the first time in Russia. “Rosneft” is the largest oil company in Russia and is interested in training graduate and post-graduate students for offshore drilling as well as engineering wells on the continental shelf. Rosneft provided the modern equipment necessary to achieve this goal. The first undergraduates will start using this laboratory this year.



Vera Zhivaeva knows well the problems of drilling of oil and gas wells.

“This academic year, our graduates will be very good. Four years ago, a passing score for our specialty was 216, and so it allowed us to accept some especially talented students. Many have won various competitions. For example, **Alexei Kharitonov** won first place in a competition of young professionals held by three companies. Recently, he won first place in the semifinal of the All-Russian Perm Olympiad. There are many gifted students and they plan to become graduates”, explains Vera Zhivaeva.

For forty years at SSTU, Vera Viktorovna has managed to establish connections with all of the leading Russian oil and gas companies. She has been working for many years as an auditor of Gazprom



Vera ZHIVAEVA, the head of “Drilling of oil and gas wells” department:

“In September, we took part in a forum with the leaders of Kazakhstan’s oil and gas industry. They presented their research and development in the field of technology and education. All of the SSTU proposals were accepted. Based on the meeting, SSTU and “KazahGazprom” agreed to implement the research work in the oil and gas industry in Kazakhstan.

drilling technology. She has a patent for cementing offshore platform wells, which is used widely by companies in the UAE. The drilling oil and gas wells department of SSTU has connections all over Russia, including Western and Eastern Siberia, northern Yakutia, Sakhalin, Volgograd, Astrakhan, and Orenburg.



PAVILION OF INNOVATIONS

Students at Samara State Technical University 'wetted out' some 'dry' theories at 'iVolga 2014'

By Irina BOBYLEVA and Svetlana EREMENKO

In 2014, the youth forum 'iVolga' of the Privolzhsky Federal District (PFD) that took place near the Mastyukovskie lakes looked like a small town with a population of several thousand people. In fact, this event is a huge educational platform where young people aged 18 to 30 present their individual projects. Students and young scientists from Samara State Technical University took this unique chance. 47 students from SSTU spent ten days at 'iVolga' and took part in various forums, such as 'Information stream', 'Follow me', 'You are a businessman', and 'Innovations in technical creativity'. Judges carefully examined presentations and offered advice for the further development of these projects. At the end, many participants received certificates, while the best projects won grants.



Rector Dmitri Bykov introduced SSTU innovative developments.

Floating platform

There was a large pavilion at the forum where each region of PFD could present new technologies and developments. SSTU demonstrated several projects

that caught the attention of visiting delegations, including one from China. The main showpiece was a full-scale floating platform. The innovation is not



iVolga



about its design, but rather its solar panel and its ability to use both electricity and its internal combustion engine to move. The platform weighs 650 kilograms, and its payload capacity is more than 1.5 tons, and yet it easily moves across the water.

Alexander Mishenkov, the manager of the Innovational Center of Technology Transfer, and director of LLC 'Informatsionnye sistemy', believes that the "use of solar energy in such technology is a very interesting but not yet well-developed segment of the market. Specialists trained by SSTU may be able not only to create new technology, but also to use their knowledge to improve the performance of existing machines."

Guys with insoles

The orthopedic project by the group of students and postgraduates from SSTU, who fellow participants of iVolga called 'guys with insoles', was developed to eliminate foot problems. The students use english software to produce

corrective insoles. They examine the patient's foot, measure all necessary parameters and 3D printer produces the corrective insoles, which are ready to use. **Alexander Hinstein**, the Russian Federation State Duma member who visited the pavilion, received a pair of SSTU insoles and praised the students' work.

"As long as we have a solid model, we can produce insoles of all shapes, in any material, and any number," says **Ildar Zinatullin**, one of the developers of the technology and a member of the 'Computer biomechanics' SSTU research and development center. "This project has been functioning for more than a year, and our specialists regularly undergo training to advance the technology of orthopedic examination and production of orthopedic insoles."

Pure silicon powder

Ashot Navasardyan has been interested in silicon production since



iVolga

school, and has dedicated his life to learning everything he can about it. Silicon belongs to the 4th group of the Mendeleev's periodic table, is the second most common element in the Earth's crust, and is a very good semiconductor. Silicon is a basic material for photovoltaic energy, and is responsible for the conversion of solar energy.

"The modern method of silicon production is very complicated," says Ashot Navasardyan. "70 per cent of silicon in the world is produced in stages. The first stage is to concentrate the ore. Then silicon is deoxidized using carbon, which is then followed by a preliminary purification using hazardous chemical elements, which can occasionally result in dangerous explosions. Finally, silicon is purified by directional crystallization. For the last several years, silicon has been partially produced without the fourth stage but results in a massive carbon dioxide emission, with numerous cycles

of directional melting. We offer a new method to produce silicon of high purity. The process is performed in a single unit under normal atmospheric pressure, with raw silicon coming straight from the mine, without the preliminary ore concentration. This technology allows us to produce pure silicon powder that is ready for solar panel production. By multiple sublimation of silicon oxide we are able to get pure raw material for the electronic industry. In this case, the production cost will be lower than the current market cost."

However, Ashot Navasardyan's project has not yet won a grant. Potential investors believe that it is a very risky project, as it is extremely hard to reproduce heterogeneous processes in one furnace. However, if Navasardyan is able to produce even just one gram of silicon, the question of production will be revisited. For the time being, SSTU has provided the scientist with a special laboratory to conduct his experiments.



TWO RAILROAD CARS OF EDGAR RAPOPORT

By Dmitri DENISOV

You won't see numerous diplomas and certificates hanging on the walls of his study. Maybe that's because walls are not enough? He drops his voice, modestly lowers his eyes and says confidently: "Yes. I've got plenty of this stuff, enough to fill an entire railroad car, so to say. The main thing is that each of these finely printed pieces of paper has much behind it – help of like-minded people, acknowledgment by colleagues and apprentices and the belief that everything I have has a practical use."

He is a nice and interesting person to talk to, with a very easy-going demeanor. He is able to summarize complex ideas precisely and concisely. **Edgar Rapoport** published dozens of papers and is the holder of a number of patents in the fields of production, education and science. He is well known throughout the world, and has

lectured at a number of European universities, including at Padua University and the Leibniz University in Hannover. 15 years ago, one of his scientific articles published at the Samara State Technical University Bulletin was preceded by the following abstract (humanitarians take a deep breath): "The problem of parametrical synthesis of fractionally rational approximation of the transcendental amplitude-phase-frequency characteristics of the objects

with distributed parameters is reduced to the problem of minimization of the error of uniform approximation to zero of relevant imaginary frequency characteristics on the appropriate effective period. The proposed synthesis method is based on the Chebyshevsky properties of solution of such problem and prior information in the form of the corresponding characteristics. The paper gives the example of fractionally rational approximation of the amplitude-phase-frequency characteristic of the object described by the heat-transfer equation". (E.Y. Rapoport, A.V. Sergeev "Chebyshevsky approximations in the problems of approximation of frequency characteristics of the objects with distributed parameters)."

This is only one of the numerous products of the successful researcher. But where does "it" come from? What are the causes, roots and background?

Edgar Yakovlevich Rapoport was born on September 27, 1936 in Vitebsk, Belarus. His father, Yakov Vulfovich Rapoport, was a hydraulic engineer. Edgar was only four years old when the Great Patriotic War began. As a soviet engineer, Yakov Rapoport joined the army and was killed near the city of Tver in 1943. Edgar Yakovlevich has no memories about his father. But he clearly remembers the early 1940's and the atmosphere of pain and fear. The

terror of approaching war oppressed him, his mother Sofia Grigorievna and people around them, forcing them to hurriedly leave their homes. Edgar and his mother managed to evacuate from Vitebsk on the last train going east.

In Kuibyshev, where they settled, Edgar studied at schools number 72 and 38. He received a school medal along with his certificate of secondary education. His mother worked at the city committee of the Communist Party of the Soviet Union. In 1954, Edgar entered Kuibyshev



Edgar Yakovlevich RAPOPORT is a Doctor of Engineering Science and a professor at Samara State Technical University. He is a member of the New York Academy of Science and a member of the Russian Academy of Non-linear Sciences. He was acknowledged by the Volga region branch of the Russian Engineering Academy for foundation of the top-ranked school of thought in the field of control of the systems with distributed parameters. Finally, he is the holder of the 2014 award from the Governor of Samara for prominent results in solving technical problems.

Industrial Institute (now Samara State Technical University) and became an electrical engineer. He started his career as a wireman. He became accustomed





working in the Metallurgic plant where he worked on the automation of the furnaces for aluminum alloys and carried out experiments that were considered unusual, and possibly illegal. If the plant management had found out what was happening in the workshop during the night shift, what safety rules were violated, Rapoport would have faced severe discipline. But the young skilled workers were extremely interested in determining the thermal field characteristics of molten metal. They used various subterfuges and

negotiated with workers to build structures that were necessary for their experiments. One day, they built a huge “spider” which allowed them to move in close proximity to the red-hot melting furnace. The furnace was as high as a 4-story house and if something had gone wrong, the scientist would have been killed in a matter of seconds. But the “spider” allowed Edgar Rapoport to move between the thermocouple unit and the measuring instruments very quickly.

At that time the Metallurgic plant was different from other Soviet plants; it had a laboratory that could carry out a full range of work, from designing a prototype to building and adjusting it. At that time, Edgar Yakovlevich

was working on his candidate dissertation. There were different things in his life: the plant workshops, a young family in a small room in a shared apartment, and late nights with books and calculations. After the defense of his candidate dissertation, the next day at the plant there was a large poster congratulating the plant's new candidate of science.

Edgar Rapoport worked for seven years at the plant, before becoming a lecturer. He has remained on good terms with **Lev Zimin**, doctor of sciences, **Valery Saburov**, associate professor, and **Nikolai Semenkin**, the former chief power engineer of the Metallurgic plant. In 1966 Edgar Rapoport started to work as a senior lecturer in the Electrical Engineering Department at Kuibyshev Polytechnical Institute. In 1983, he defended his doctoral dissertation at the Moscow Institute of Steel and Alloys. In 1986, Edgar Yakovlevich became a professor and **Yuri Samarin**, then the head of Samara Polytechnical Institute, persuaded him to join the

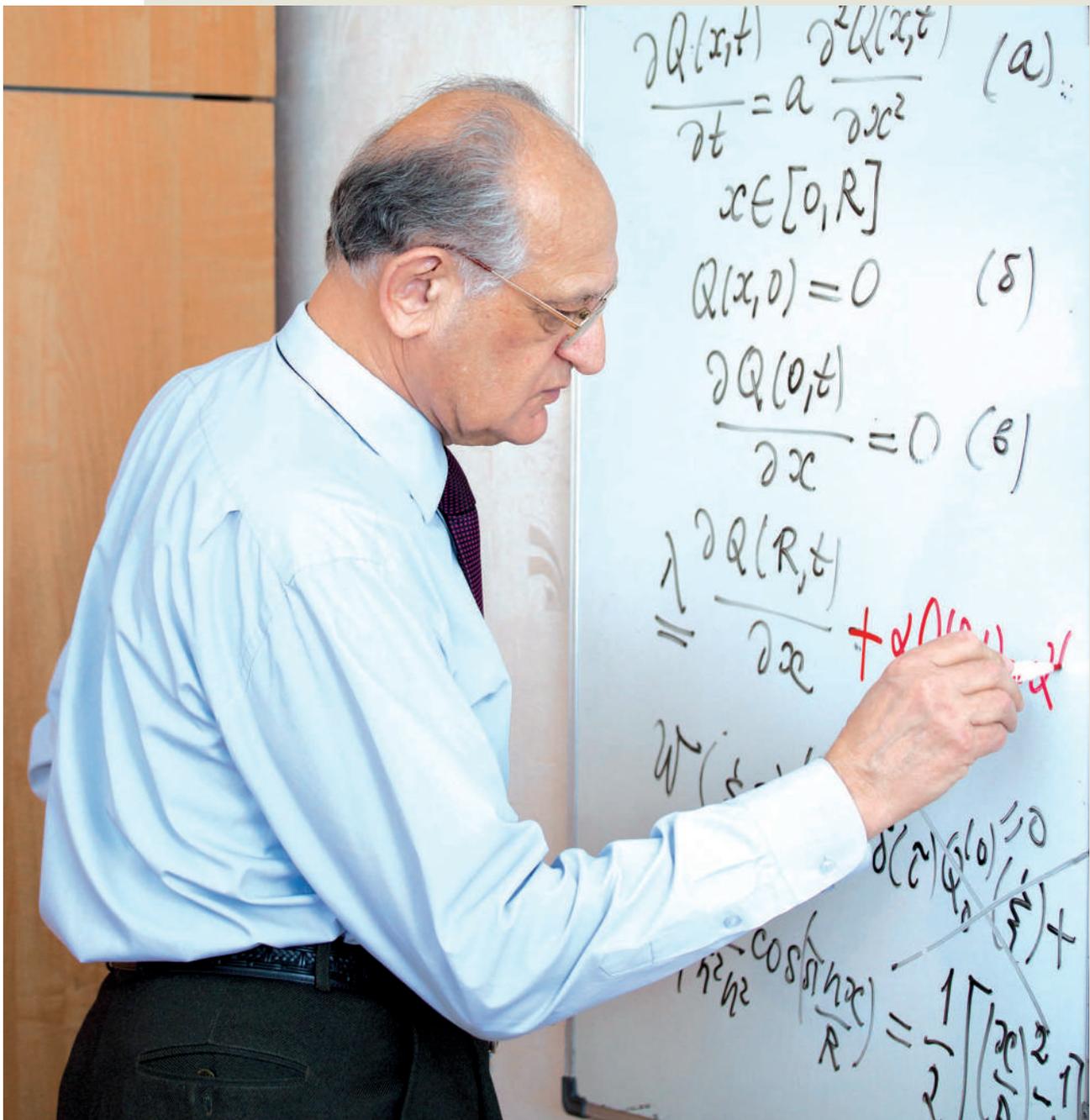
Automation and Information Technology Department. Edgar Rapoport was the dean of this department for three years.

Perhaps, Rapoport's "darling child" is the textbook called "Introduction to the



Edgar RAPOPORT has 69 USSR author certificates, 4 RF patents; he has supervised 6 doctors of sciences and 28 candidates of sciences; he has published 370 scientific papers including 7 monographs.

theory of distributed parameters system control". Published in three volumes, the work was extremely tedious and time-consuming. Edgar Rapoport sought the help of the world-class authority in this field, **Anatoli Bootkovsky**. Rapoport recalls, "Bootkovsky used to say that people



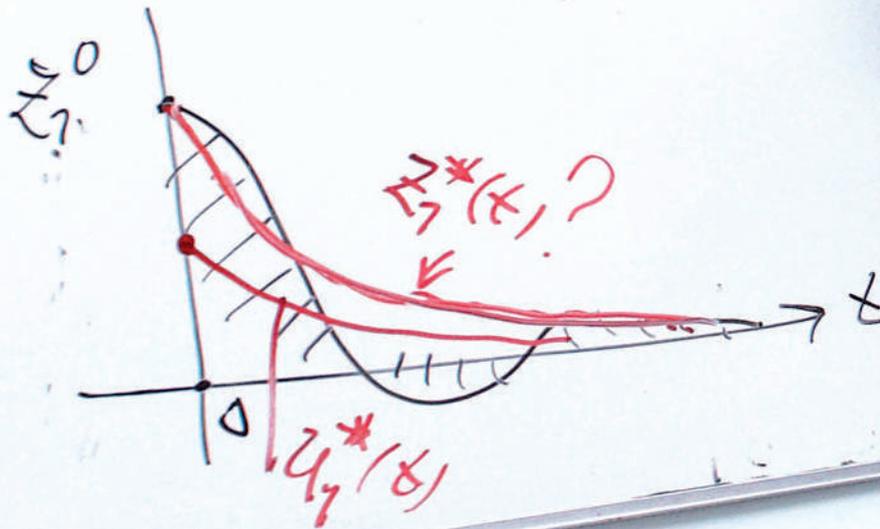
$$\frac{dz_1}{dt} = (az_1 + u_1) \quad (a)$$

$$J = \int_0^{\infty} (z_1^2 + cu_1^2) dt \rightarrow \min_{u_1} \quad (b)$$

$$z_1(0) = z_1^0 \neq 0 \quad (c)$$

$$\lim_{t \rightarrow \infty} z_1(t) = 0 \quad (d)$$

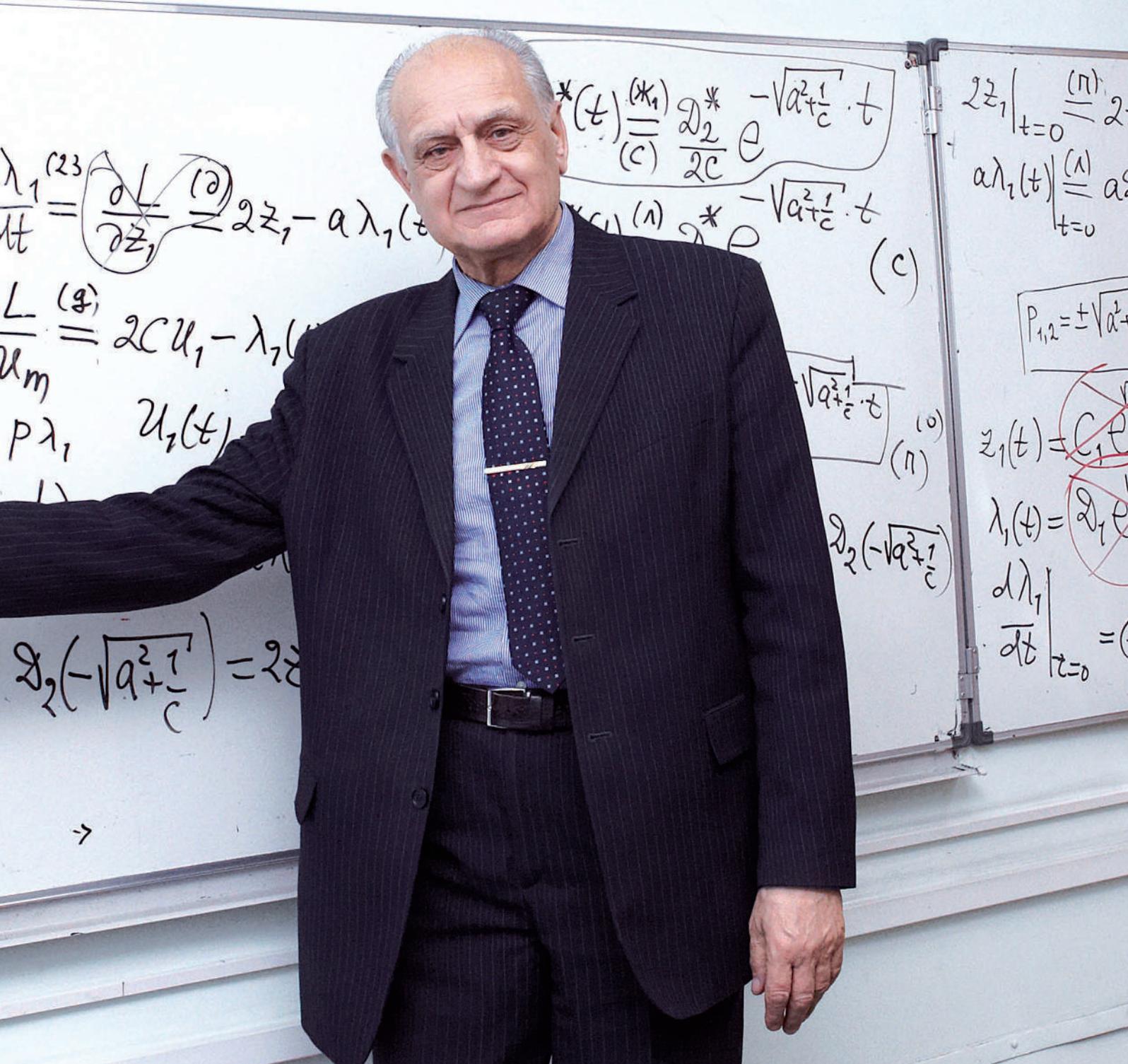
$$u_1^*(t), z_1^*(t)$$



would forget the monograph but not the textbook. Everything comes to the one who is patient, so to say." He also described the way he started teaching the subject. "I tell them that we're going to learn how to control the process of... frying a potato. So we have a system consisting of fire, a frying pan and potatoes. Each element of this system has its own parameters. Fire may be small or big, the frying pan may have a thin- or thick-bottom, the potatoes may be cut in slices or in large chunks, and we may fry for a long or short period of time. All these parameters need to be calculated in order to get the required result about the output of the system. What's the reason for

these calculations? The reason is that the same principle can be used, for instance, to determine the gas pipeline operation. Or to coat the electric cable with polymer insulation. Or to form the claydite. And it can be used in hundreds of other complex but absolutely necessary systems. Ever since I was young, I've always liked to simplify complicated problems. I was carried away by the idea of using graceful mathematical methods, as well as by the possibility of drawing conclusions and applying them to real engineering problems. That's how it started. And it is still like that."

His daughter Julia works with him. He is quite proud of her. She successfully defended her doctoral dissertation, speaks English fluently, and has received seven grants by the German Scientific Society. Edgar Yakovlevich says that she is in charge of "the bridge"

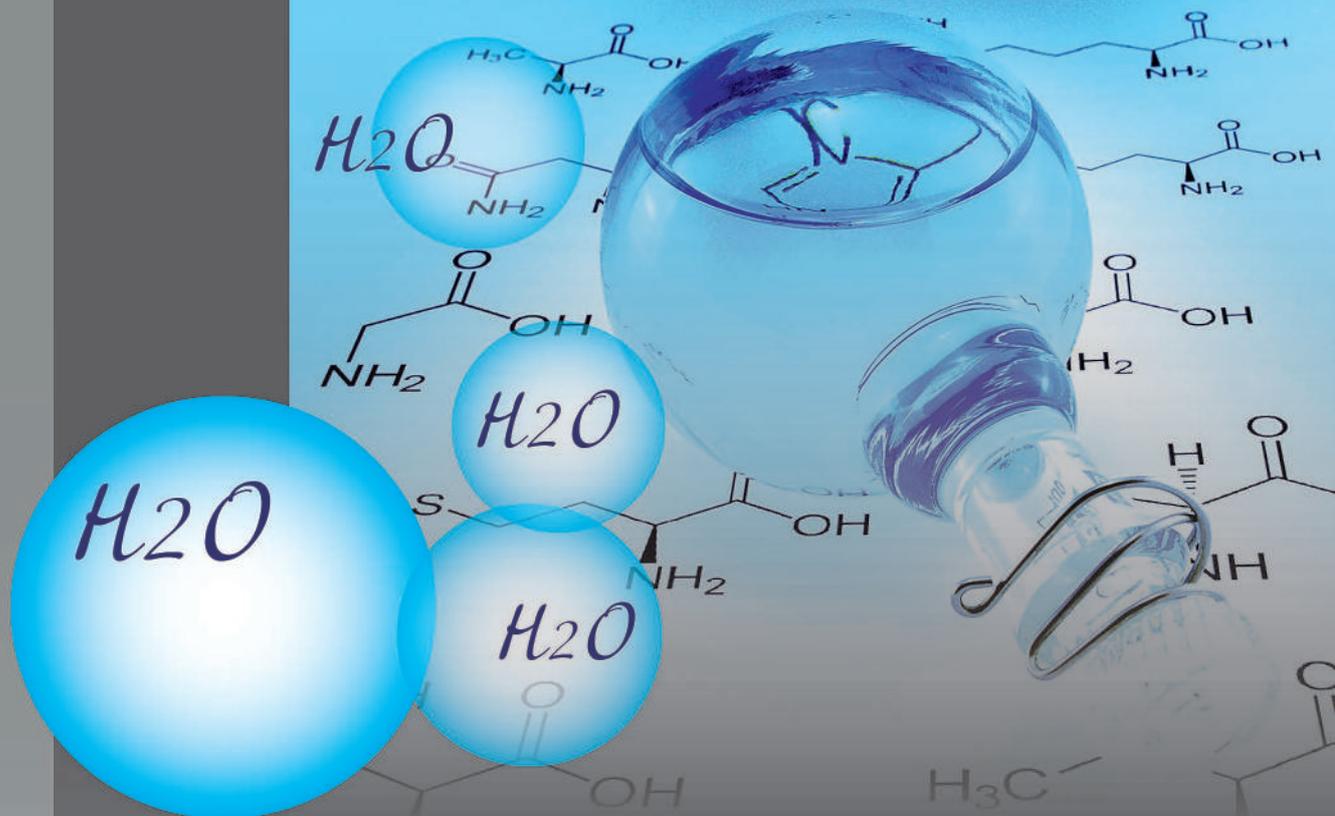


to Europe because it's she who organizes contacts with other countries.

"Quite often our foreign colleagues need the complicated processes to be explained in simple words. Europe is a good place in terms of the economic stability of development. They implement the equipment and technology quickly. We are weaker from the practical point of view due to some historically established reasons. But, contrary to popular belief, Russian scientists carry out scientific research on a very high level. We are as good as they, I tell you!"

He likes to take walk around, despite an old injury suffered while playing volleyball when he was young. In his infrequent spare time, he like to read detective novels. Boris Akunin's novels can be found among the scientific magazines, almanacs and reference books littering his study.

Edgar Yakovlevich reread the Dumas trilogy about the three musketeers recently. Samara Regional Scholar Library considers him to be one of the most active donators who supplement the library. With all his merits, titles and everyday work of many years he keeps saying: "I've always been lucky, both in life and work". And that's true: a man who, in his eighties, has enough certificates and patents to fill an entire "railroad car" can be called lucky. But something makes us think that luckiest event for Edgar Rapoport was when he and his mother managed to flee Vitebsk in the last car of the last train. That's the distributed parameters we are talking about.



SMALL GRANULES, BIG POSSIBILITIES

Can one become a “non-provincial” scientist in Samara?

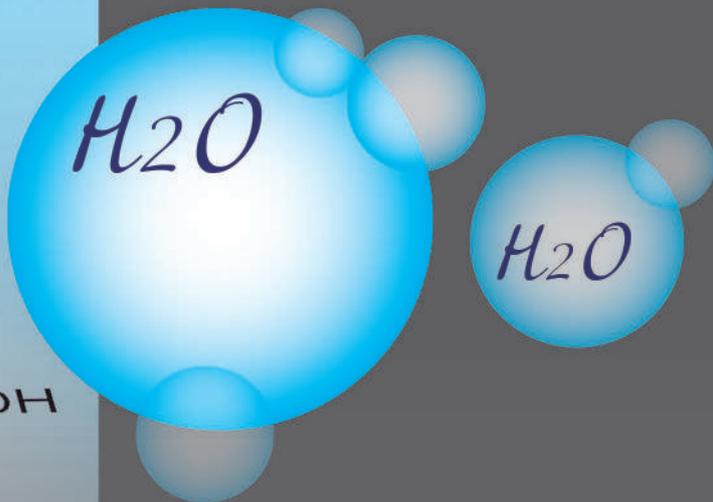
By Tatiana VOROBIEVA

In April 2013, SSTU graduate Alexei Pimerzin was given the highest award by the Russian Academy of Sciences for his scientific work. Over three years, he worked to solve the partial problem associated with the general line of the Chair of Chemical Technology for Oil and Gas refining – the development of catalysts for the oil refinery process. As the laboratory conditions must closely resemble the conditions of the oil refinery plant where units operate all 24 hours, the department has its own tradition of day-and-night duty. And, of course, Alexei Pimerzin has had his fair share of ‘night shifts’.

Small granules with big possibilities – that’s what is generally said about catalysts. **Alexei Pimerzin** was interested in finding new ways to enhance the efficiency of catalysts that are used in the production of diesel fuel by using new technology, including the hydrogen spillover. There is little scientific literature about the use of spillover in production of diesel. However, the young scientist was able to find out that this effect, together with organic additives, significantly enhances the efficiency of the catalyst. The result opened new possibilities. Russian refineries currently use foreign

catalysts, but recent Russian scientific achievements allow Russia to synthesize their own catalysts that have the same quality but are less expensive. Thus, if Russia is able to produce its own catalysts instead of buying them abroad, it can save money after changing to the ‘Euro-4’ and ‘Euro-5’ standard fuels.

Alexei Pimerzin believes that it is impossible to get obtain this result if a researcher works alone. “The target consumers of our research are the oil refineries and catalyst-making companies, which are major players in the modern market, and, they have very stringent requirements for the final product. Only a group of researchers is able to create a product that can meet all of these requirements. That’s why my award is the sum result of the collective work of many people,



Alexei Pimerzin hopes to defend his candidate thesis in 2015.

including the young scientists in the department of Chemical Technology for Oil and Gas refining.”

This award, a medal with the picture of Lomonosov and the words “Russian Academy of Sciences Award Winner,” is the second award given to the department. The first one was given in 2004 to Alexei’s research supervisor, **Pavel Nikulshin**. In 2012, Nikulshin won the regional contest “Young Scientist” in “Candidate of sciences” category, and Alexei Pimerzin won it in “Student” category.



The cost of a catalyst is about 0.1 per cent of the final product net cost (for diesel fuel production); yet catalysts can affect the efficiency of the entire process.

Nevertheless, Alexei was surprised when he was told that he had won the RAS contest. One of the best young researchers, the winner in the “General and Technical Chemistry” category, he was given his medal from the vice president of the Russian Academy of Sciences at the session of the RAS presidium.

In 2013, the SSTU holder of the gold medal won the RF Presidential Scholarship for “young scientists and postgraduates carrying out prospective scientific research and development within priority trends for the upgrade of the Russian economy”. Soon after, he won the personal grant contest by Haldor Topsoe (Denmark) for Russian postgraduates working on innovative dissertations dealing with heterogeneous catalysis and, as part of the grant, was awarded a three-week training course in the laboratories of the Danish company.

As a part of his dissertation, which deals with the research and development of catalysts for hydrotreatment and synergetic effects of oil, Alexei keeps researching the phenomenon of hydrogen spillover. He hopes to finish this work in 2015.



He believes that after solving one problem, one should immediately move onto a new one. His experience proves that one can become a successful “provincial” scientist in Samara. He believes that the technological infrastructure provided by SSTU “allows any scientist to solve world-class problems.”

A FIRST YEAR CHAMPION

By Lubov SARANINA



Alexander Lifanov happened to be an Olympic champion before he entered Samara Technical University. In August 2014, the pentathlon athlete from Samara won an Olympic gold medal at the Summer Youth Olympic Games II held in the Chinese city of Nanjing. Today, Alexander, a student within the Oil Department, attends lectures and practical studies while at the same time preparing for the upcoming sports season.

The way of a pentathlete

At 18, just when his classmates were starting to think about their future careers, Alexander's future was more or less defined. From a young age he started to swim, and at fourteen, he won his first competition. In 2009, Alexander won the Samara region pentathlon and took a second place in the nationwide championship.

Two years ago, the young sportsman from Samara was invited to join the Russian national team. As a member, he won a silver medal at the Old World championship and won his age group at the World Championship. It almost goes without saying that this past Olympic season was the most successful in Alexander's sports career.

Memories of Nanjing

Today, Lifanov recalls the Olympic as a grand and exciting part of his young life.

There were reasons to be nervous. After finishing third in the fencing competition, he had placed 16th in the swimming event. The situation seemed shaky, with horrendous weather conditions, the humidity in Nanjing was 97 percent.

He entered the final event, the combined run and shoot, sitting in fourth place.

"I was hoping to be in second or third. But, probably, I was a better shooter than others and I was the strongest in the combined run and shoot."

Lifanov is a tall, muscular, young man. But physical ability is not enough to become an Olympic champion. Alexander trains eight hours a day, and even other athletes envy his psychological stability.

"The psychological factor is critically important for an athlete's success. For example, on the final day of the event, I realized that my opponents felt very nervous. I, on the other hand, felt like I was ready for the final event. To tell the truth, I no longer worried about it. I hit five targets out of five and won.

Almost gone

Some time ago, Alexander was faced with a choice between training in Samara or leaving for Moscow. He was not the first athlete who was at such a crossroads. Many talented, promising athletes left Samara for the capital to continue their careers (e.g., the world champion **Sergei Karjakin**). According to some experts, the reason

for this is the lack of support from local authorities. However, that is starting to change. In 2013, construction began on a new sports complex for the pentathlon. It will be paid for out of the regional budget for the development of physical culture



Alexander LIFANOV is a first year student in the Oil Department at Samara Technical University. He was born in Megion, in the Tyumen region. He won a silver medal at the 2009 Russia Pentathlon and the 2014 Junior World Championship games. He was the winner of the 2014 Summer Youth Olympic Games II. In the individual competition of the Olympics, Alexander scored 1184 points, nine points ahead of the Hungarian Gergely Regosha. The bronze medalist, the Lithuanian Dovydas Vaivade, finished 33 points behind Alexander.

and sports. The sports complex will have multiple fencing halls, shooting galleries, a pool and equestrian facilities. It will be located at Mekhzavod.

It was not only the promise of a developing sports infrastructure that kept Lifanov in Samara. We should thank



The **modern pentathlon** is an Olympic sport that consists of five events: fencing, freestyle swimming, show jumping, and a final combined event of pistol shooting, and a cross-country run. The competitions include a Men and Women's Individual and Team event and is also divided into various age groups. The young athletes engage only in the Nordic combined event. At the age of 14, in addition to running and swimming, they start the shooting competition. The program of the 16-year-olds includes fencing. Show jumping is added only for 19-year old athletes.

Michael Polovinkin, the senior coach of the Russian junior team, and a member of the Presidium of the Russian Federation of Modern Pentathlon, for the fact that our region didn't lose a talented sportsman. He trains Lifanov and other athletes at the Samara Specialized Children and Youth Sports School of the Olympic Reserve №1.

"Michael is doing his best to ensure that our athletes are encouraged to stay in Samara. He helps me train. Actually, now I have five personal trainers for each sport," says Alexander.

Alexander is confident that one day Samara will be the capital of the pentathlon, because our athletes have proven that they are the best. The facts



Alexander Lifanov, a student at Samara Technical University has already tasted Olympic victory.

PEOPLE OF SSTU



TOP DIGEST_2014

don't lie; **Ilya Frolov** is a world champion in the oldest age group, and **Catherine Vdovenko** is the first in the world among juniors.

Without the “star fever”

It's easy for an athlete to get the “star fever”. Young talents are especially vulnerable to it. It's no wonder that some people suffer from this when they have so many titles and awards, as well as an abundance of attention from the public and journalists. But it turned out that Alexander has developed a strong immunity to such “viruses”.

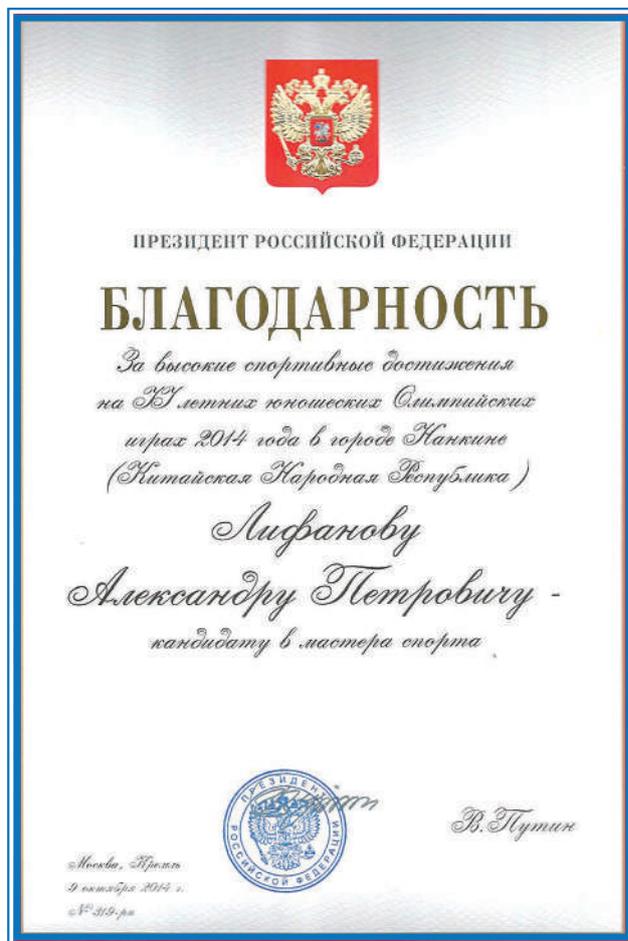
“If you become convinced you are a star, there won't be the results. You start to exercise less and underestimate your opponent.”

After personal contact with Alexander, one realizes that he doesn't suffer from this stardom. Despite the number of awards and attention from the press, Lifanov remains a simple and openhearted guy. He answers journalists' questions without any arrogance.

At University

“In early September I was in a panic about my studies and training regime,” remembers Alexander. “I thought the two were incompatible. I wondered whether I had made the right decision in attending Samara Technical University. It's been helped that the management of Samara Technical University made concessions and provided a free education.

Lifanov is going to continue his sports career and his studies at Samara Technical University. So far, there have been no problems in combining his academic and sports activities. While resting after last sports season, he already started preparing for the next competition.



Alexander Lifanov was awarded with letter of acknowledgment of the RF president.

MANJING

HEATPOWERMAN

Candidate of science from SSTU discovered Europe

By Maxim Eremin

PEOPLE OF SSTU



I'm in front of the governor who asks: "Are there any perspectives?" At first I want to recite a poem but confusion prevents me from doing it." 28-year-old Dmitri Paschenko, an associate professor of the heat power-engineering faculty at SSTU, smiles thinking about the story. "If I were to say that there weren't any perspectives, I wouldn't work at the university."
 "So what are the perspectives?" insisted the governor.
 "In around five years, you'll award me with the prize of the most distinguished power engineer."

Paschenko's memorable meeting took place on the stage of the Samara Opera and Ballet Theater on September 25th, 2014 during the Governor's Award Ceremony in honor of the 100th birthday of SSTU. Cameras captured Nikolai Merkushev's handshake with a young man in a light shirt, whose athletic figure resembled an ancient Greek warrior.

Scientist Dmitri, traveller Dima

Everybody knows Dmitri Paschenko in academic building №6 on Galaktionovskaya Street. Or nearly everybody. The study where you can see him is to the left along the corridor. His surname is easy to find in the students' schedule. His papers are in the reputable scientific magazines.

Dima has his own Internet blog, a cool mountain bike, and the experience of bicycling almost 14000 kilometers throughout Europe. In 2013, he traversed 13 countries from the west to the east before the new academic year started.

Dmitri can passionately explain the essence of his scientific experiments conducted under the guidance of Professor **Schelokov**. "Look," he says, "the final product of the thermochemical heat regeneration is a mixture of hydrogen with carbon monoxide. If it is possible to isolate pure hydrogen at the plant – in an automobile, in a furnace or somewhere else – then mankind will get an alternative, environmentally friendly heat energy source." Suddenly, he makes a confession, "It may be now that I am now just beginning to understand what an interesting thing heat power is."

Was seinsoll, schiktsichwohl!

Every bullet has its billet. On January 3rd, 1984 there was a MI-6 helicopter crash in Novoagansk. The helicopter was carrying geologists and mountaineers. 38 of 75 passengers died.

Dima's father had taken the previous flight. Two years later after his son's birth he gave him a safe conduct as if it was the Third Testament or parents'

revelation. Ever since then, Dima has been travelling around the world.

From Dima Paschenko's diary:

"Aug. 22nd, 2014. My cycling is coming to a close. Only one step was left before I got to Russia – all I had to do on the 20th was to reach the Caucasian range of Mount Kazbek. On the morning of the 21st, I wanted to descend and say good-bye to Georgia, before heading in the direction of Russia to complete my 7500 km summer journey. However, what happened was radically different than my plans.

That night, the mountain began to shake and cars, cranes, and even cement



Dmitry PASCHENKO, a candidate of technical science and an associate professor of the heat power engineering department at SSTU, was born on October 17 1986 in the Novoagansk village in Khanty-Mansiysk region. In 2007, he won the 1st prize of the All-Russian heat power-engineering contest. In 2008 he graduated with honors from Saratov State Technical University. The main concept of his scientific work is the effectiveness in the temperature of a technological plant by means of thermochemical regeneration of heat.



- How did you become a heatpower engineer?

- It happened by chance. When I wanted to enter the Automotive Department at Saratov Technical University, the administration refused to enroll me. I was told that I had already been enrolled in the Energy Department.

plants began to slide. The Terek river had turned from a small mountain river into a great stream of mud and stones. Just

a few hundred meters from where I was staying, the torrent came flooding down the mountain, bringing about six million cubic meters of stones and debris with it. It was happening in front of my eyes; floating cars, cement plants, broken roads, and a stream of stones, all just 50 meters from me. For the first time in my fifty-one day trip, I was really frightened.

This was how the events happened.

9:30 pm. It has started drizzling, and I decide to seek shelter at the entrance of the monastery, where there is at least some sort of roof. When the wind wasn't blowing, the raindrops didn't fall on me.

10:00 pm. The drizzle has turned into a torrential shower. I wrapped myself in the three sheets of foil that I had with me and started to count down the hours until morning. It was raining cats and dogs and lightning was flashing over my head.

10:40 pm. The earth began to shake. It was shaking so hard that I thought that the monastery would fall down on me. My first thought was that this was an earthquake. It was raining harder and harder.

10:45 pm. I heard some terrible explosions. I realized that it was the torrent of water that was crashing down the mountain. A cannon seemed to fire near my ear. The earth was still shaking. There was pitch darkness. It was impossible to think. The river was roaring and I couldn't hear my own thoughts.

11:00 pm. Several explosions are heard again and sparks are raining down from the hydroelectric turbine hall. (It was the

Daryalskaya hydroelectric station that had exploded.) After that, I saw people running, with the howling alarm siren in the background.

11:30 pm. I'm still sitting at the entrance of the monastery. I became frightened when, in a flash of lightning, I saw a river of huge stones flowing just 50 meters away from me, just where the road was. Some Armenians ran under the shelter to me. As I found out later, they had crossed a few minutes before. Armenians said that there was no road any more and that it had been washed away.

12:00 am. The noise from the Terek continued, but it wasn't raining hard. The Armenians left to look for their bus.

1:00 am. The rain has stopped. All this time I was looking at the phone as in the darkness it was impossible to understand what was happening around. Was it a war? A flood? An earthquake?

5:30 am. As usual, I woke an hour before the sunrise. The sky was cloudless. From the corner of my eye I saw no sign of the road. I thought I could reach the check point by walking along the mountain. I took the pack and moved down.





1. When crossing the Alps by bicycle, it is possible to wander into the small principality of Liechtenstein.
2. The gothic architecture in Estonia looks quite modern.
3. The benevolent appearance of Kurdish children is very deceptive; they can steal your camera and throw stones at you.
4. Old Gdansk made leaves a memorable impression.
5. The Adriatic Sea is the main attraction of Montenegro.
6. You can endlessly observe the pastoral paintings of Saxony.



The best invention of mankind

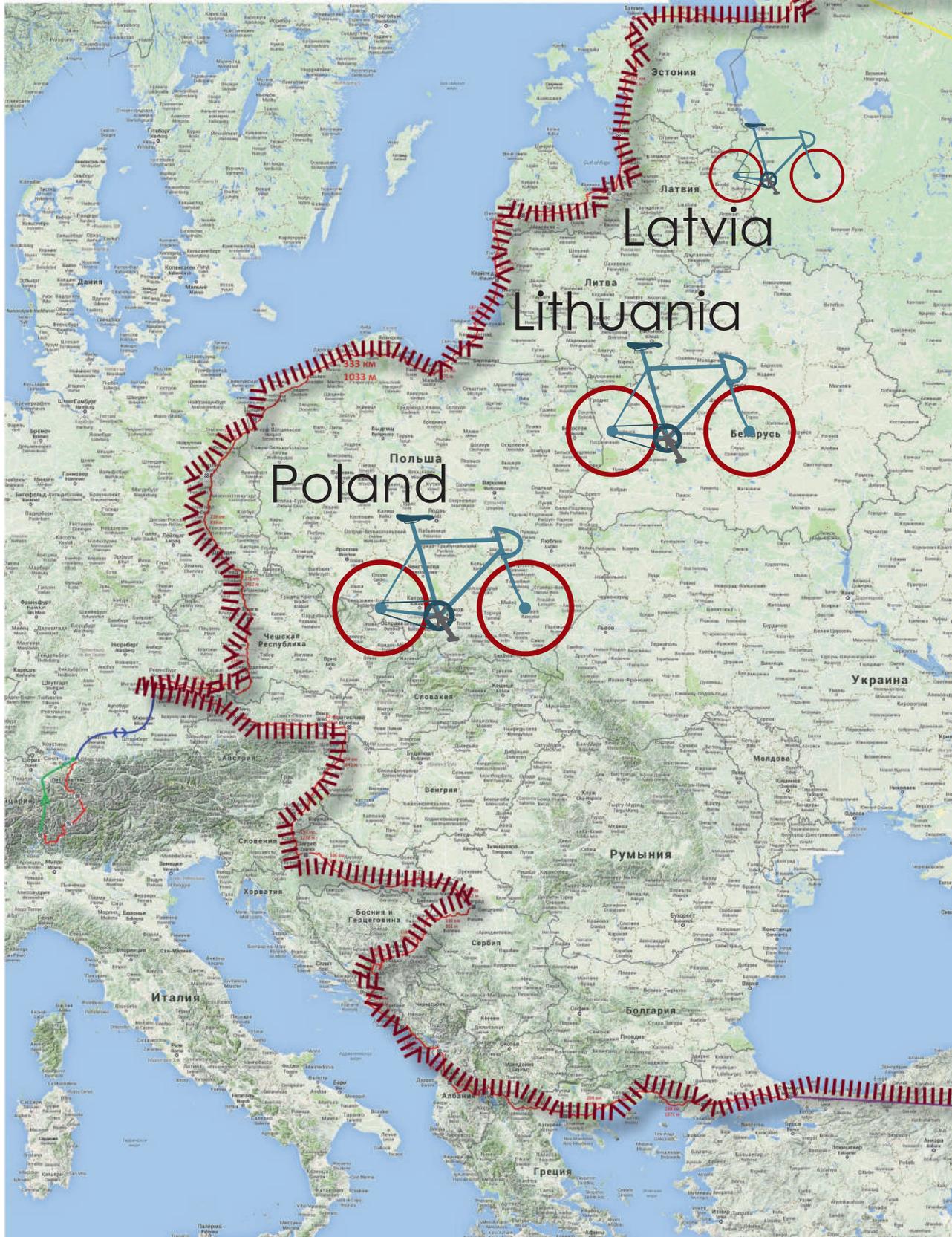
Anyone who disapproves of the idea of an adventure has never ridden a bike. You

have unforgettable feeling, you try to bicycle every kilometer faster in order to understand what there is around the corner, behind the pass, and in the following countries. Distance was of little importance. It is of little importance that Dima Paschenko can cover up to three hundred kilometers a day.

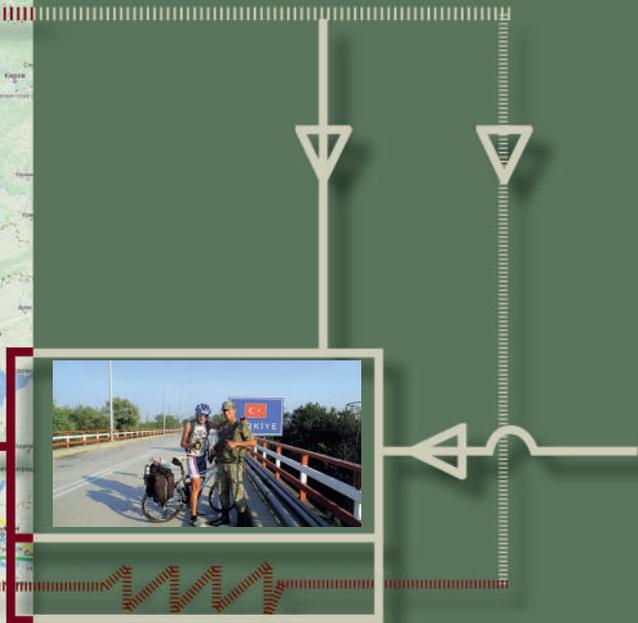
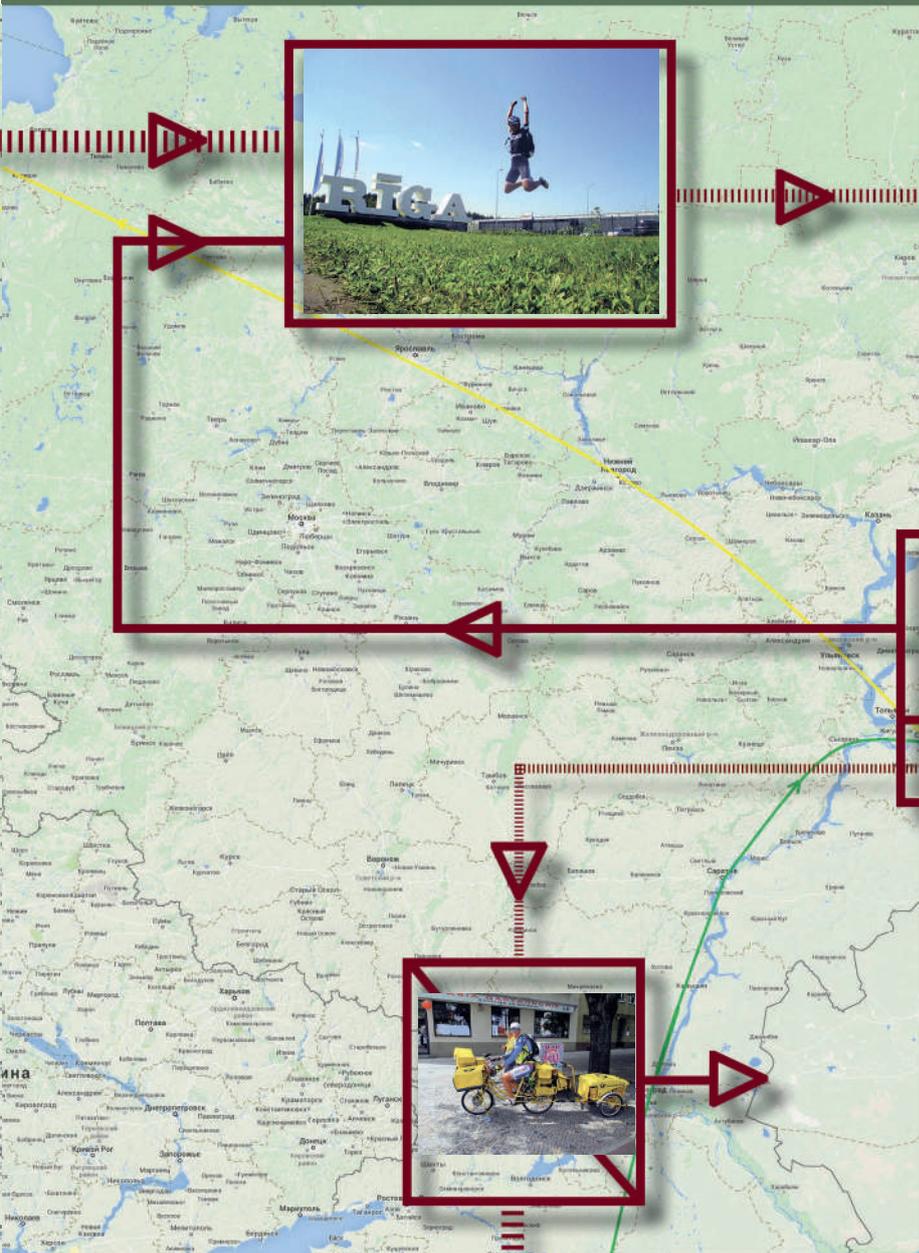


- In your opinion, who are the most hospitable people in Europe?

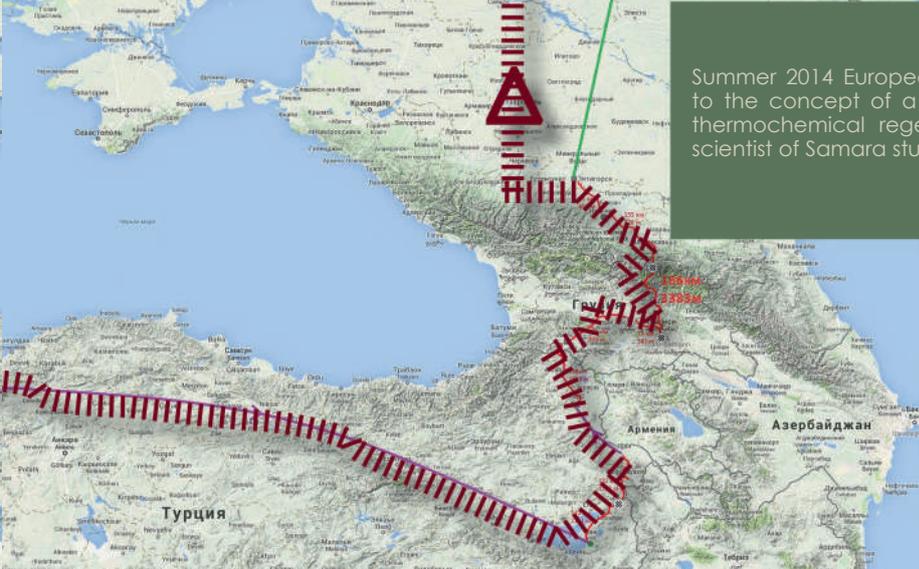
- Serbs. They are more hospitable to Russian than Russians themselves. If a Serb finds out that you are from Russia, he will be sure to feed you, give you a shot of rakia, the traditional Balkan alcoholic drink, and ask how he can help you.



For him, bicycling through Europe is roughly the same as a trip to the bakery. Perhaps, it may seem irrational in the age of super-fast Bugatti, super cheap bus tours and trendy ship cruises. But rationalism sometimes destroys the dream, in the name of which it is worth giving it up .



Summer 2014 European Route of Dima Paschenko is somewhat similar to the concept of a high temperature heat technological plant with thermochemical regeneration of flue gases heat, which the young scientist of Samara studied in his dissertation.





INDEPENDENT CRUISE

Scientists at Samara State Technical University built a general-purpose vehicle to explore the depths of the sea

By Svetlana EREMENKO

Last year at the Naval showroom in Saint Petersburg, a foreign delegation was surprised to see that Russians had a glider. It happened when the foreigners saw the 'MAKO' underwater glider and the 'FUGU' overwater glider that were on display in the Samara State Technical University booth. The department of Informational and Measurement Technology built both vehicles, which are currently one-of-a-kind.

Long-distance cruise

Various types of robots have been exploring the sea for years. Most of them are equipped with a steam propeller

or a hydraulic propeller. Some vehicles are connected to the control ship with a cable, while others operate independently, just like small submarines. But all of them need to be regularly taken to the surface in order to change



the 'FUGU' overwater glider

or recharge the batteries. As a result, the cost of operating these vehicles can be quite high.

The independent unmanned underwater glider is a special type of marine equipment. American naval engineers claim to have invented the underwater glider, but it was actually **Nikolai Zhukovsky**, the founder of hydrodynamics and Russian aviation, who came up with the idea in the late nineteenth century. His idea was to use gliders to bring mail from one shore of Lake Geneva to another. But his idea of underwater gliding went unrealized until today.

The 'MAKO' glider, which looks like a winged torpedo, is named after one of the most aggressive sharks. With no steam propellers, it utilizes another principle; the glider moves almost like a fish does, by changing the volume of its polymer 'fish-maw' into which the oil is pumped from a special reservoir. The vehicle can glide down for several hours until it reaches its maximum depth of 1000 meters. The submergence/emergence angle is 18-25 degrees and the vehicle is able to cover five kilometers within one trip.

The control system of the underwater robot allows it to avoid collisions with coral reefs and other obstacles. The top speed of the vehicle is 0.6 meters per second. The vehicle is equipped with an auto-pilot, a navigation

system, a communication system, and a CTD probe (conductivity, temperature, depth). In addition, the vehicle has a 5 dm³ compartment for other types of sensors to explore the ocean waters.

The 'MAKO' and 'FUGU' gliders underwent the first tests in the waters of the Volga River three years ago. Prototypes of these underwater robots were presented at several international marine vehicle forums.

"An American underwater robot costs about \$100,000, but our vehicle is more affordable," assures **Eugeni Tatarenko**, one of developers of the underwater robots, and head of the department of Informational and Measurement Technology. "Moreover, we think that such vehicles must be non-reusable. Thus we can avoid the problem of lifting it up to the deck, recharging its batteries and cleaning it from seaweed, shells etc. Once the vehicle accomplishes its mission it self-destructs."

The 'MAKO' vehicle. Length – 2 meters

wingspread – 1.3 meters

top speed – 0.5 meters per second

own mass – 50 kilograms

payload mass – 5 kilograms

submergence depth – up to 1 kilometer



MADE IN SSTU

'Terminator' at the bottom of the sea

The Samara scientists are quite able to organize the manufacturing of underwater robots, of which our university provides the basis.

Underwater gliders are developed in association with St. Petersburg Marine Technical University, Samara State Aerospace University, CJSC 'NPP OKEANOS' and others. The first task for developers is to build the most affordable unit using modern domestic electronic components and modern composite materials.

The main task for the scientists from Samara and St. Petersburg is to achieve a level of behavior that each part of the robot's system is 'aware' of its specific task and is able to accomplish the mission even if another part does not function properly. In other words, the vehicle must become a 'Terminator' – a robot able to make decisions, reprogram and reconfigure itself in order to fulfill its task.

Independent unmanned vehicles can be used to solve a variety of tasks including climate forecasting, ecological monitoring of underwater conditions around the oil platforms, bioresource control, mineral deposit research, and emergency alerts.

The scientific and production centre of Samara Technical University

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E-mail: zinnat.ildar@gmail.com



GO SUN!

By Eugenia VASINA

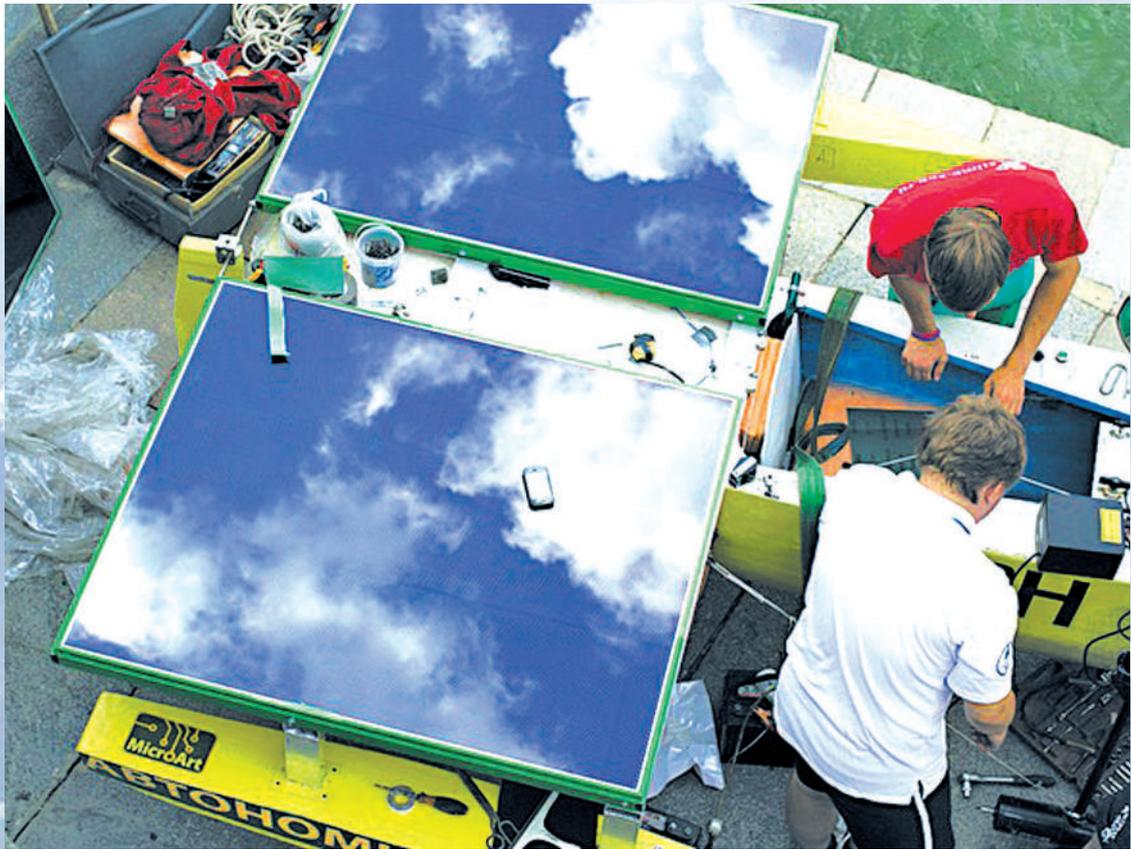
At the end of July a trimaran named 'Bersh', which had been built in the Innovational Centre of Technology Transfer (ICTT) at Samara State Technical University, won the solar boat race "Solar Regatta" which took place in Moscow. The designers of this boat hope to make it available to consumers in the near future.

Faster than champions

It is no longer only Europe that can create new means of transportation that uses renewable and eco-friendly energy sources. On July 26th, an unusual race took place at the 'Luzhniki' sports complex between solar boats, vessels that run

exclusively on the energy of the sun. The SSTU team and their 'Bersh' solar boat won two first places, both in the overall standings as well as in the 2kWt engine category. The trimaran was piloted by SSTU graduate **Anastasia Alexeeva**.

"The team of Samara State Technical University started work in March, I think," says **Eugeni Kazanov**, the manager of the 'Solar Regatta' project and CEO of 'Skolkovo'. "These guys built a unique vessel and were able



to beat a number of teams, including the team from Ryazan, whose boat was powered by a 10 kWt engine, as well as the ‘Sinergia’ team, who were the current world champions.” (Author’s note: at the beginning of July, the ‘Sinergia’ team won the Solar 1 Monte Carlo Cup 2014 race in Monaco). I think this project is worth further exploring, and that this boat can represent Russia at international regattas of this kind.”

10 teams took part in the race, seven of which came from Russian universities. Race managers believe that four boats, including SSTU’s, deserve to become commercial projects.

At the beginning of August, members of ‘Skolkovo’ came to Samara to congratulate the winners with gift certificates from the race sponsor Langvik, the Finnish Hotel corporation (the cup, medals and certificates had already been awarded in Moscow) and take a look at the innovative boat.

Designed to win

Building an innovational competitive product is no simple matter. It’s impossible for a single person to do it, and the ‘Bersh’ trimaran was built by ten people over the course of a few months.

“The experience of 100 years in specialist training at our university helped the ICCT-based SSTU team to design and build this unique solar boat in the shortest possible time,” says **Alexander Mishenkov**, the ICCT manager and supervisor of the ‘Belsh’ solar boat team. “We used the best practices of Samara shipbuilders in the process of designing and building the body of the boat. The ‘Talisman’ design office, the partner of our team,



SSTU team made a furor at “Solar Regatta”.

did the bulk of the work. SSTU students, postgraduates and faculty all took part in the construction.

It is interesting to note that all of the solar trimaran components were made in Russia except for the engine, which is a standard German-made model, with some modifications made by SSTU scientists. “The sectional design of this boat is unique,” says Mishenkov. “It is 6 meters long, 2.4 meters wide and weighs 75 kilograms, and yet you can fit it into the trunk of your car. By the way, that’s how it was transported to Moscow and back to Samara.”



Three members of the team assembled the boat right on the pier. The electric motor of the boat is superior to the engines of its counterparts, largely engines made in Italy, which is the traditional leader in this branch of industry. 'Beluga', the boat belonging to the world champions 'Sinergia', is powered by an Italian engine. Samara designers used their experience in the development of the environment-friendly power unit for the multifunctional floating platform (MFP), which was launched shortly before the regatta. The results of its sea trials has led to new research of using the electrical power unit to power vessels with a cargo of two tons.

The whole body of the trimaran is covered with light-weight solar panels made by Zelenograd-based company 'Telekom-STV', which lent the panels to the Samara team for the competition.

One of the participants says that they followed the basic principle of bio-engineering when they were designing the boat. The reduction of energy consumption is accomplished through

the maximum optimization of design and the use of engineering solutions found in nature.

Dmitri Bolshov, the head of the 'Talisman' design office is certain that "this boat is designed to win."

The farther in, the deeper

"Winning that race is good, but now we have a great opportunity to make project commercial," says Alexander Mishenkov. "Our short-term task is to launch the eco-friendly 'Bersh' boat into production and promote it. These boats must be affordable for ordinary people and this is a segment of the Russian market that is not occupied yet, and we have the advantage with our experience, knowledge and energy of young developers."

The trimaran, which participated in the "Solar Regatta", is a single-seater, as it was designed specifically for the competition. Its top speed is about 30 km/h, which is quite good for a vessel that doesn't use fossil fuel and which moves noiselessly.

If the weather is cloudy, the power of the engine decreases and the boat moves slower. At night, the power unit uses batteries. A fully charged battery can last for 3-4 hours. But when the sun is shining brightly, the solar boat owner doesn't need to worry about the nearest gas station or the gas price.

Currently, the ICTT researchers are working on a four-seater solar trimaran.



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MILK IS CONTROLLED ONLINE

An innovative project led by young scientists of Samara has a bright future

By Tatiana VOROBIEVA



Anastasia Melentyeva performs dissertation research under the direction of Andrei Bogomolov.



The quantitative analysis of the nutrients contained in milk (fat, protein, lactose) is of great importance to the dairy industry. It is necessary to measure them at different stages of production, as they affect not only the quality of the milk, but also its purchasing and selling price. It is obvious to specialists that the existing methods of analysis do not meet these requirements. Dairies require compact and affordable analyzers that are capable of providing accurate measurements electronically.

Anastasia Melentyeva and **Vladislav Galyanin**, postgraduate students at Samara Technical University, have proposed a solution to the problem. Their scientific adviser is **Andrei Bogomolov**, a specialist from a German company, as well as a Doctor at Samara Technical University.

How to help the technician?

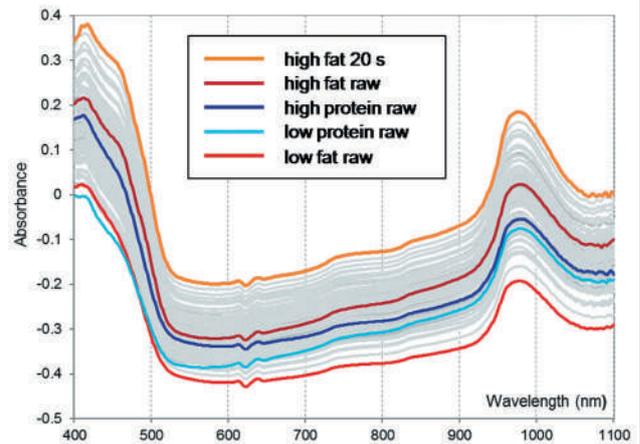
At JSC Samaralacto, the largest dairy plant in Samara, where Anastasia Melentyeva did her practical training,

the content of the milk is measured by the spectrometer MilkoScan, which uses infrared rays and costs several million rubles. In addition, there are additional necessary expenses associated with the regular calibration of the instrument. Due to the cost, not every dairy can afford such a high-tech piece of equipment.

On top of it all, the work is not effective. It takes half an hour to deliver a milk sample



Our scientists perform an analysis of milk using a prototype of the fat and the protein analyzer.



Milk Spectrum: different colors illustrate the difference in composition and degree of milk homogenization.

to the laboratory, to deliver the results to the workshop, and to wait in line for the measurement. The technician has to do a lot of work during the day; 20-30 trucks with milk from different manufacturers come to the company every day.

Some physical and chemical analysis of the protein can take 3-4 hours. These time expenditures stand in the way of an effective control system.

Science seeks a solution

Scientists around the world have been trying to design a more productive device that combines high-speed analysis and reasonable price. “Shortly after I joined the German firm J&M Analytik, I was put in charge of developing a milk analyzer that provides information in real time,” said **Andrei Bogomolov, Ph.D.**

Bogomolov is a native of Samara, his parents worked at Samara Technical University. He graduated from Moscow State University with a degree in chemistry, and worked for a long time in Moscow as a researcher. It was this scientific activity that led him to Germany, where he first he worked at the European Molecular Biology Laboratory in Hamburg and then in the industrial sector. Bogomolov has lived with his family in Germany for over 9 years, but he retains his Russian citizenship and keeps in touch with his native city and Samara Technical University by participating in various collaborative projects.

“The purpose of the project, which is financed by the German government, is to

develop an analyzer that could be installed in the pipe on the production line or, for example, in a milk tanker that takes milk from suppliers,” said Bogomolov. “The purpose was economically justified, but it suffered from a lack of ideas. I invited **Andrei Kalinin** (Institute of Spectroscopy, RAS, Troitsk) to join the project as a consultant. Andrei shared his expertise of the experimental analysis of milk, while I applied my knowledge of multivariate data analysis. Due to this collaboration, we were able to successfully complete the project.” The results of this collaboration formed the basis of the technology that is being developed by Anastasia Melentyeva at Samaralacto.

Scattering medium

A prototype for an industrial milk analyzer was designed using the specifications of the first project. When implemented into the production line, it can measure the composition of the product every few seconds. It was tested in a German dairy factory. Now the second-generation device is being developed by Melentyeva, using a prototype of a compact laboratory analyzer. To carry out her experiments, she made several trips to J&M Analytik in Germany. Samara Technical University recently signed a cooperation agreement with J&M Analytik.

Given the fact that the size of fat particles in natural milk varies widely, the turbidimetric method does not work. This method is based on the measurement of scattered light but measures only a single wavelength. Only multidimensional data analysis can recognize the small differences in the shape of the spectrum of the scattering particles.

What perspective does Anastasia’s and other scientists’ research bring?

“Most important has been the implementation of a low-cost laboratory instrument that is much smaller and cheaper than existing solutions. One can carry it in your pocket,” said Anastasia Melentyeva. “In the future, we will be able to measure the content of fat and protein in milk using an application on our phone.” The research shows

that an accurate quantitative analysis of the nutrients in milk can be performed using visible and infrared light. This will considerably reduce the price of the technology. As already mentioned, the current analyzer, which uses mid-infrared light is much more expensive. "In the course of our research, it was necessary to measure a huge number of milk samples," said Melentyeva. "We had to build a global model where our device could "predict" values of fat and protein in a variety of real samples.

The research is trending!

Project participants agreed that the project should involve experts from different fields: chemists, physicists, and computer programmers. Andrei Bogomolov highlighted the work of a current team. Vladislav Galyanin, a postgraduate student in the Faculty of Automation and Information Technology, performed computations for portable analyzer design. He considered various factors, including having a commercially viable element base as well as cost optimization.

"Our goal is to reduce the cost of the analyzer to around 10,000-20,000 rubles," said Galyanin. "We have already completed all the calculations, and the prototypes are currently being designed in Germany. I think we'll see a new generation analyzer in the near future."

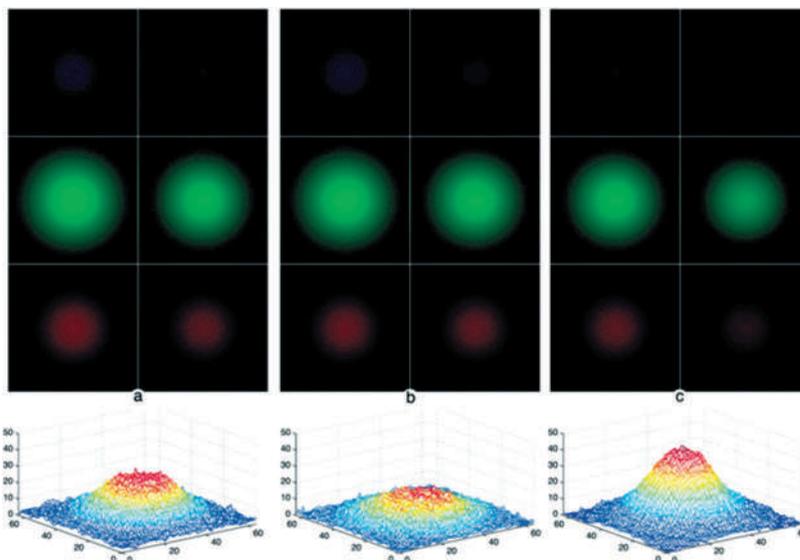
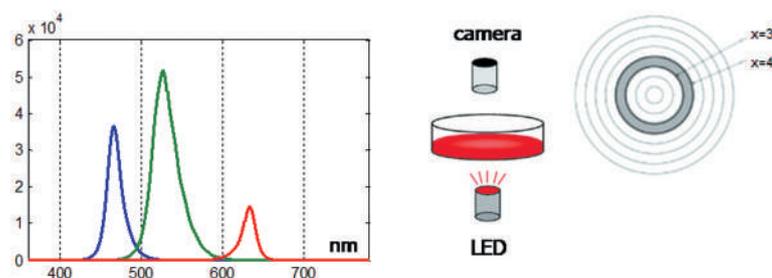
Vadim Belikov, a postgraduate student also in the Faculty of Automation and Information Technology, was responsible for software development (software for the multidimensional data analysis is a separate project) and data information. **Elena Savinkova**, a student in the Faculty of Food Production was responsible for taking the readings of fat and protein at Samaralakto over the course of the experiment, which ran for one year.

From Vladislav Galyanin's point of view, the portable sensor analyzer fits in a larger trend of production control, as requirements for quality control are increasing. With more stringent controls, one of the main challenges is the automation and speed of analysis.

From America with victory

Over the past two years, Andrei Bogomolov has lectured on this new method of milk analysis in China, Australia and the United States. Anastasia Melentyeva was also invited to take part in the Conference on Spectroscopy, held in Chambersburg (USA) in August 2014.

"During this time, a new method was also presented in Europe. In 2013 we participated in the Conference on Spectroscopy held in Montpellier (France) and presented our innovative method of analysis," remembers Bogomolov. "At the conference we met **Donald**



The operating principle of the LED analyzer is illustrated by lab prototype data.

Damm, an American professor who was impressed by Anastasia's experimental data because they illustrated his proposed theory of scattering. We have written an article together and were invited to Chambersburg."

At the International Diffuse Reflectance Conference in Chambersburg, the Samara Technical University's representatives Andrei Bogomolov and Anastasia Melentyeva were the only participants from Russia. While there, Andrei and Anastasia participated in Shootout, a competition for young scientists and professions, that analyzed multidimensional data. The "youth" category of the competition included several dozen promising scientists from different countries. Using an algorithm for designing a calibration model developed by Vladislav Galyanin, Anastasia Melentyeva, won her category. Using a control data set, her model had the highest predicted accuracy. Andrei Bogomolov was awarded second place in the professional category. These results are evidence of the high level of scientific research occurring at Samara Technical University.

SAMARA-STYLE CALVADOS

SSTU has patented a new method of apple brandy production

By Tatiana VOROBIEVA

MADE IN SSTU





The dean of FPD, Vladimir Bakharev, monitors the quality of his products.

Not every technical college has a Food Production Department (FPD). This department was created in 2003. Today, the FPD conducts large-scale research and develops new technologies for the production of high-quality food products from local raw materials.

From the Zhiguli gardens and the Kinel vineyards

When the department was founded, a fermentation laboratory and a mini-brewery were created. At first, while teaching the “Technology of Fermentation and Winemaking”, attention was focused on training the brewers. Since 2011, significant developments have been made in the field of winemaking. Naturally, the question of raw materials has been raised.

“The first studies in the new stage of research were connected with the technologies development for processing raw apples, which are the main fruit crop in the Middle Volga,” says **Vladimir Bakharev**, the dean of FPD. “For several years, we have worked closely with the Zhiguli Gardens Institute, which supplies us with different kinds of apples. The director of the institute, **Oleg Azarov**, is the head of the FPD at SRI Zhigulevskie gardens.

In a short period of time, faculty members mastered the technology of

cider and Calvados apple brandy production and tried to make its own flavor.

“Calvados is a French regional product, and the rules of “Appellation d’Origine Contrôlée” apply to it, which means that the name “calvados” can be used only for the alcoholic drink which is produced according to certain rules in one of three French appellations,” said Vladimir Bakharev. “In addition, we have produced a one-year-old drink, but a real Calvados should be three years old at least.

Grapes grown in our region have become another type of raw material

“Kinel Grapes, headed by **Viktor Klimanov**, supplies us with our raw materials. In 2012, there were only two varieties, Crystal and Citron Magaracha, which was brought from Crimea. Now there are four varieties, with the addition of the Platovskiy and Levokumskiy varieties. Of course, before producing wine, cider, and calvados we analyzed raw materials. For example, during three years of cooperation with the Research Institute Zhiguli Gardens, we recorded the characteristics of the different apple varieties. The same information was collected for grapes. After analyzing four varieties, we found that the local grape are sufficient for winemaking. Based on the sugar and dry substance content, Kinel varieties are not worse than the Crimean ones.



Effectivement j'ai eu la possibilité de goûter ces produits parfaitement élaborés et de qualité indiscutable. Il faudrait à mon sens poursuivre les recherches pour développer une plus grande complexité mais dans leur expression actuelle ils sont très agréables à déguster. Les consommateurs russes aiment l'arôme et le goût des produits à base de pommes et ceux-ci sont susceptibles de trouver un marché en Russie. Bien à vous **Christian Drouin** *

Best in Russia

Last year our food industry workers set a goal to produce sparkling wine from local raw materials. As a result, we produced samples of pink and white champagne.

According to an excerpt from the protocol number 32 (June 4, 2014) of the Tasting Industry Commission

Massandra, our sparkling wine Rose Brut "Jubilee" received a mark of 8.6 out of 10, and our dry white wine received a score of 8.25.

"It should also be mentioned that it's only our second year producing wine," says Vladimir Bakharev.

It was even more flattering to hear the opinion of the owner **Christian Drouin**, the famous Normandy trade house, which is considered a "trendsetter" in the production of cider, calvados, and other alcoholic beverages.

In the early 1980s, Christian Drouin was famous throughout the world due to its Calvados brand. In October of this year, the head of Christian Drouin visited Samara with a presentation of his products. During the meeting, SSTU rector **Dmitri Bykov** and the Dean of FPD Vladimir Bakharev offered him a taste of SSTU's apple brandy and cider. After tasting, the famous specialist remarked that "these are among the best samples that I have tasted in Russia."

Such high praise encourages the FPD staff to pursue further research. In June 2014, the work done resulted in a patent for a new method of apple brandy production.

The "Heart" of Calvados

What is the difference between the manufacturing technology of the traditional Calvados and the Samara brandy?

"The traditional technology of producing Calvados involves a double distillation. Fresh apple juice is fermented using yeast to produce a cider material, a dry apple wine that is then distilled," reveals Vladimir Bakharev. "The second distillation is carried out in steps. Usually the second step, the "heart", is used to produce the calvados. We have added the third step in order to isolate the alcohol from it and to flavor it with the apple peel. We then combine it with the second step, which ensures the drink will have a more pronounced apple flavor. At the same time, we do not use artificial flavorings or colorings. All the drinks we manufacture are natural. In developing this way of production, we wanted to use only natural products. For example, in our brewery beer is produced without any pasteurization.

Recently the information about the drinks produced in SSTU has been published in a specialized edition of the Italian internet magazine TreBicchieri, which means "three glasses". The Italian Honorary Consul in Russia, **Mr. Dganguiddo Breddo** in a visit to Samara, tried our

* I had an opportunity of tasting these perfectly prepared products of high quality. I suppose it's necessary to continue the research to get a more complicated bouquet as Russian consumers like the scent and taste of apple-based products. These products are sure to find their place in the market", Christian Drouin says.



drinks and was pleasantly surprised at their quality. He emphasized the fact of the wine-making developing in Samara, which is not a region where grapes are cultivated.

Tasty and healthy

In addition to the studies in the field of alcoholic beverages, the department is engaged in producing large quantities of natural apple juice. The students in the department take an active part in this process. They pour juice into glass containers, seal and glue labels. They learn to work with the appropriate equipment in order to analyze raw materials and the finished product, and to learn about the different stages of production. Both the juice and cider have been certified by the Certification and Metrology Center and are fully standard compliant. The SSTU project for the complex processing of raw apple materials has won a gold medal at the 15th Annual Volga Region Agricultural Exhibition.

FPD is currently exploring an internship for SSTU students with the Institute of Vine and Wine "Magarach", which has a modern scientific center and a winery in Crimea.



MATHEMATICAL ANALYSIS HAS EXPANDED THE POSSIBILITIES OF TRAUMA MEDICINE

A SSTU graduate student has devised a solution for femoral neck fractures

By Andrei PTITSYN

An international forum "Innovations in Medicine" was held on the 24th of October in Novosibirsk. Anatoli Matveev, a trauma surgeon from Novokuibyshevsk, presented a report on the "Methods of preventive reinforcement of the proximal femur in old age for preventing fractures". However, the doctor was unable to attend the conference due to a lack of funds. Instead, he told us about his work that staff from SSTU has assisted on.



50 % mortality rate

Anatoli Matveev has been working in the Novokuibyshevsk central city hospital for more than 30 years. In 2006 he began to research the problem of preventive reinforcement of the femoral bone.

"I began dealing with this problem on my own. I had an idea; why not try to strengthen the osteoporotic bone with some kind of implant before the bone is broken."

It turns out that the problem of femoral fracture in elderly people, especially

those suffering from various diseases, is a question of life and death. The femoral neck is the most vulnerable part of the bone. In addition, numerous diseases, ranging from childhood ones like osteogenesis imperfecta to osteoporosis and oncology, increase the weakness of the femur neck. A bone fracture, which is attacked by a disease is called a pathological fracture. This is a very widespread injury. According to the statistics, there are more than 100 hip fractures per 100,000 people. However, at the recent Tenth Russian Congress of Trauma Surgeons and Orthopedists, the Samara trauma surgeon **Gennadi Kotelnikov** reported that the frequency of such injuries in Samara has already reached 270 cases per 100,000

people. In Yakutia, this figure is about 300 patients per 100,000 people.

“Considering that not all patients go to the hospital, many of them stay at home and die from fracture complications, the real figure may be much higher,” says Anatoli Matveev. According to the international statistics, mortality as a result of such an injury in the first six months is 50%. According to the World Health Organization, in 2050, the number of patients will be 6 million people per year.

The risk of a femoral neck fracture is because that part of the bone is poorly supplied with blood. If there is a fracture, the main blood vessels nourishing it are damaged and the only artery, which runs from the pelvis, cannot supply enough blood to the bone. In the year following the injury, the destruction of the femoral head takes place, followed by a total destruction of the hip joint. That is why the task of femoral neck fracture prevention and joint preservation is of utmost priority for trauma surgeons. Dr. Matveev’s survey showed that more than 50 % of people at risk do not take any preventive measures to avoid possible injury of the femoral neck. Moreover, this figure is likely low; at the Tenth Congress the figure presented was closer to 90%.

The mathematical description of the anatomy

In 2008, Anatoli Matveev patented the idea of preventive reinforcement. Since then, the program has been used to calculate the ten-year probability of femoral neck fractures within the at-risk elderly age group. Surgeons are then faced with the question of creating implants that would preserve bone strength without disturbing the blood circulation in the bone tissue. Matveev asked for help from SSTU to develop implants and a way of securing the implants in the femoral bone. **Anatoli Nekhozhin**, a post-graduate student in Engineering- and Economics Department majoring in Applied Mathematics and Informatics, and his department head, Professor **Vladimir Radchenko**, who helped Dr. Matveev.

The young specialist faced tough problems. There was a lack of natural bone samples to work with and it was not possible to gain access to them. Bones from cadavers could not be found for the study. Additionally, artificial dummies did not work because of their parameters. It was necessary to buy the publications of American scientists in order to find the physical and mechanical properties of bones. After that, the so-called “boundary problem” had to be tackled. Using mathematics, the researches had to determine the optimal implant location and to find out how and what forces influence it. Anatoli had to calculate where are

the most vulnerable points in a bone if a patient were to fall to the side, forward or backward. While creating a mathematical model it was clear that a bone couldn’t be considered as a uniform object; in reality, a bone is a complex structure that has different features that must be taken into account. The bone has a hard outer cortex layer, an inner spongy layer, and cartilage that cover the joint.

“I had to go deep into the anatomy and visualize the larger picture; it is common practice in mathematics. A mathematical



Anatoli NEKHOZHIN is a graduate student in the Engineering - Economic Department at SSTU:

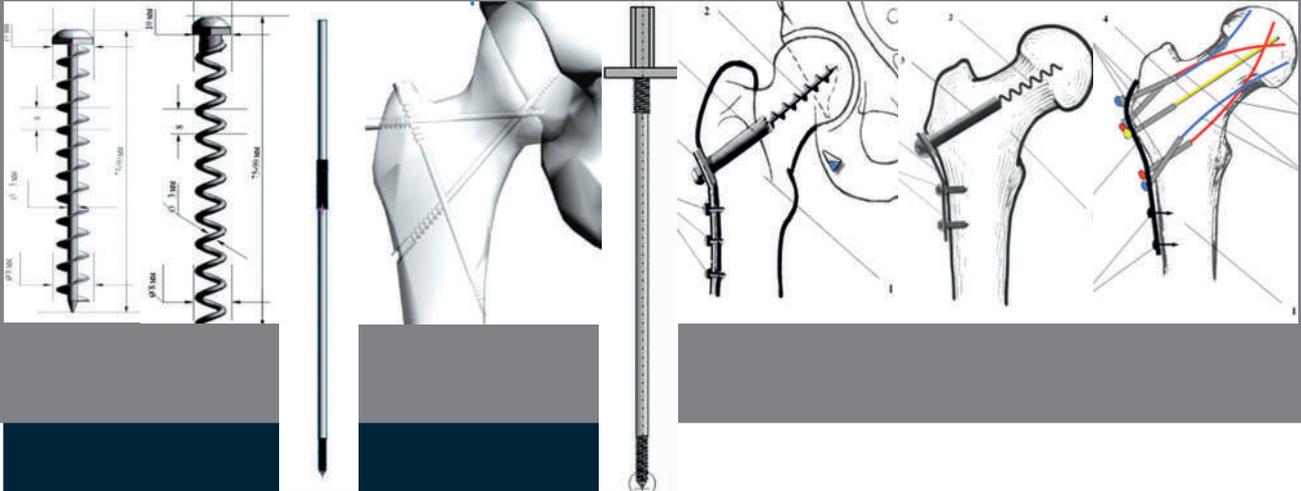
“When I entered graduate school, I had the opportunity to choose one of two research directions. One of them was connected with medicine. Having decided to work with bone modeling, I thought that this course of study will be useful to people and that it was a great opportunity for me to work with new programs. At the beginning of my studies, my grandfather Anatoli Nekhozhin helped me to map the geometry of bones. He worked for SBP (State Bearing Plant) №4 as a chief engineer, then as the safety engineering chief of Aviation Bearings Plant. A few years ago he died, but I decided to continue our work. As a result, this year I will defend my thesis on “Methods for calculating the strength of biocomposite materials with complex rheological properties.”

calculation program was written to assess stress development in the bone, which allows us to predict how to achieve stress reduction by placing an implant in one or another weak point of the femoral neck,” says Anatoli Nekhozhin.

However after creating a mathematical bone model, the SSTU graduate student faced more problems. The young scientist realized that working manually on complex calculations would be impossible, and he needed some way to automate the process. However, there are no ready programs that can solve this particular problem.

“The existing programs were not great, so I decided to write my own, which converted the points of the 3D-modeling format into ANSYS commands. This problem has been successfully solved. Some time ago, I had to make up the list of commands manually. Now they cannot be input manually; subprograms created by me produce lists of commands that are performed by the ANSYS. Now I can build the geometry of a bone in 30 minutes instead of 5 days. Using this program, I have an opportunity to model the internal structure of the bone. Researchers from Ufa Medical University asked me to convert the virtual model into the bone pattern, only of a different kind. It is a cool feeling to see the application of my program expands. I submitted a patent for this command generator program, and a month ago I was given a certificate.

Implants for preventive reinforcement



Unexpectedly high result

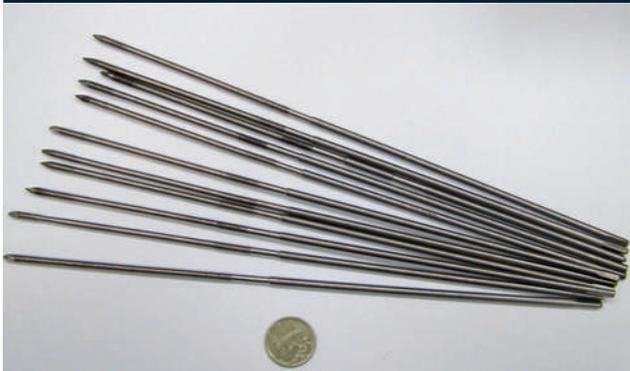
After receiving the digitized model, Anatoli Nekhozhin began to calculate what form the implants would take, at what angle and in what place the bones should be introduced to increase the strength of the femoral neck. They created many variants of the bone to examine how the bone would handle different implants. It was twenty-four-hour work: going to work, the graduate student started a computer task, on coming home he launched the other task, and when he got up in the morning, he started another one. While modeling the object Anatoli made two layers of the bone: a hard outside layer and a soft inside one. Each layer has its own characteristics. Having done the calculations, he determined the areas where the greatest stress was. It turned out that the femoral neck suffers from the heaviest load.

“The presence of the weakest points of vertical and horizontal loads was mathematically proven by the chair of Applied Informatics at SSTU, but other than that, we showed how the percentage of bone strength increases when applying our methodology and what the positive effect of its implementation will be,” added Matveev.

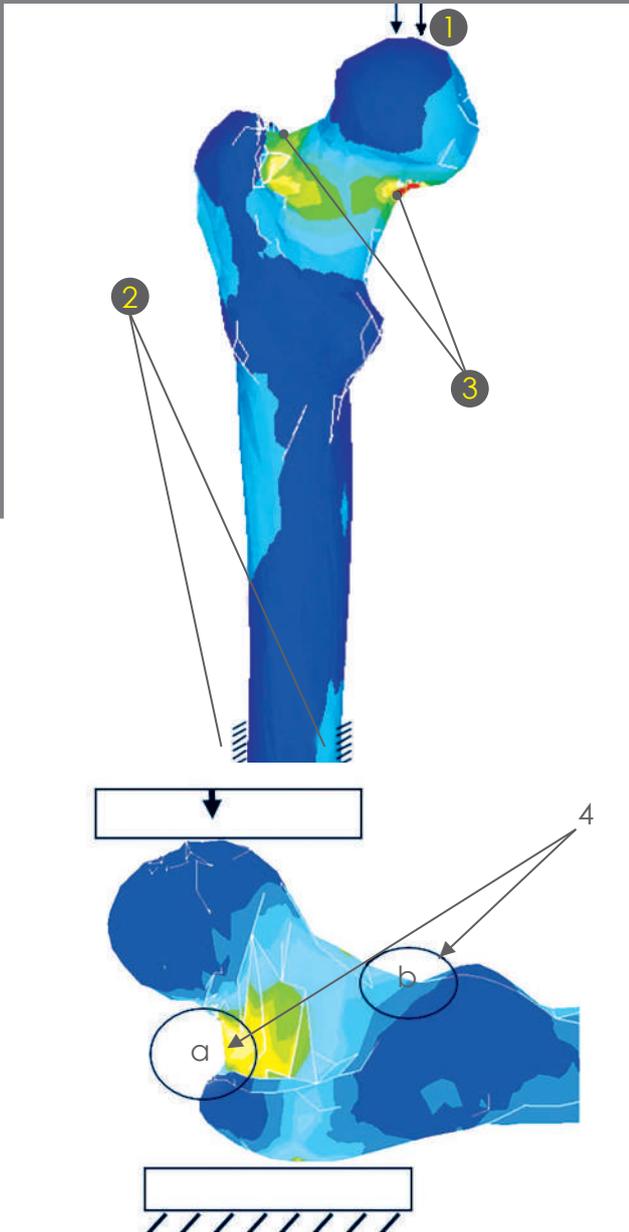
“But the computer worked very slowly with a set of detailed digital bone images, and I thought, as a programmer, I can do all sorts of things such as caching, accounting and elimination of impossible variants, calculating the bottlenecks, etc. After doing this work, the calculation process accelerated, and I was able to get the material required. As a programmer, I enjoyed it very much,” said the SSTU graduate student.

After several years, the result of Anatoli Nekhozhin’s work resulted in the optimal implant shape, determination of the optimal material, and the calculation of its insertion angle. Anatoli Matveev’s colleagues from Bashkir State Medical University, Professor **Bulat Minasov** and his son, an assistant professor of the orthopedics and traumatology department, **Timur Minasov**, conducted tests.

“The tests showed us how the strength characteristics of the bone were changing. The scientists from Ufa



Nanostructured titanium for medicine



Loads that cause bone deformation

1 Load

2 Fixation

3 Starting point of break

4 Points of system breaking start and continuation

There is nobody to thank

The only question now remaining is when this method will be commonplace for elderly patients. Unfortunately, not any time soon because the authors of this method don't have enough money to manufacture the implants.

Colleagues from different medical universities in Russia and abroad are ready to conduct clinical trials. In the meantime, Dr. Matveev has only drawings created together with Anatoli Nekhozhin. Of course, the work on this method is in progress; the number of reports and publications are growing, and different discussions take place. Recently, the Priorov Central Research Institute of Trauma and Orthopedics offered Matveev the chance present his research at the February international conference on osteoporosis.

Unfortunately, medical officials in Samara are not interested in the method of preventive reinforcement of the proximal femur in older age for the prevention of pathological fractures. This is despite the fact that the problem of osteoporosis and fracture prevention is being researched by scientists at Samara State Medical University. The leadership at the Basic Medicine department at Lomonosov Moscow State University has noticed Dr. Matveev's work. Since 2013, Anatoli Matveev has been carrying out his research and development under the auspices of the main Russian Federation university.

were confident that there would be positive results, but they did not expect them to be so high. The strength of the femoral neck implant increased by 73 % under the vertical load and by 93% under the horizontal one. Today, it's impossible to get these indicators of the bone strength increase by any existing method.

No wonder that Anatoli Matveev has already received 12 patents in Russia and one in Germany. It would be wrong to assume that the use of this technique is available only for wealthy people. In 2011, the calculation of the efficiency and high cost of preventive methods of the reinforcement was conducted.

In Russia, the method of treatment is considered to be economically feasible if the cost for one patient a year does not exceed 650 thousand rubles (using 2006 data). The cost of this operation according to 2012 data does not exceed 9000 rubles. According to statistics, the cost of patients' treatment with fractures of the proximal femur fractures, including the rehabilitation period, is more than 1 million rubles in Russia.

Make your presentation!

Overview of new theses

20 graduates and staff of Samara Technical University received PhD and DSc in 2014. The development of the research capacity at the University is carried out in several areas of natural science, economic and humanitarian fields.

Author: Olga Tupitsyna, assistant professor of chemical engineering and industrial ecology at Samara Technical University

Subject: Evaluation and restoration of the natural and man-made systems disturbed by construction and economic activity

Scientific adviser: Professor Konstantin Chertes, Doctor of Technical Sciences

Date and place of presentation: October 22, 2014, Moscow State University of Civil Engineering

Presentation of Tupitsyna's

doctoral thesis

The purpose is to develop a comprehensive assessment of recovery technologies of natural and man-made systems (NMS) disturbed by construction and economic activity.

Practical implications

1. On the basis of the proposed methodology of natural and man-made system assessment as a binary system, the scientifically based technologies of managed recovery with minimal impact on the natural geological environment can be developed.
2. The use of parametric groups of characteristics allows us to assess the condition of damaged NMS at selected stages of the life cycle, to set the appropriate direction of territory development of the selected stage, and to offer technologies of controlled recovery with minimal geo-ecological financial costs.
3. Basic principles of recovery are taken as the basis for the creation of new technology of managed impact on NMS, including aggregation technology of geo container slime treatment, conversion technologies for treatment of hydrocarbon man-made formations, liquid man-made formations using storage with aeration stations as well as inoculation of array of municipal solid waste.



Olga Tupitsyna :

- I deal with an integrated assessment system of disturbed areas. It will allow us to develop technologies return distressed sites back to economic value. This subject is particularly relevant for large cities and industrial centers. Currently, many regions and towns have a number of uncontaminated areas that are unavailable for development. In almost all major cities, there are large contaminated areas that require an integrated system of recovery solutions. As a rule, these sites (landfill waste, accidental spills of pollutants, decommissioned facilities) are the result of the activities of past generations.

My thesis gave scientific credence to the cost-effective tools that can aid in the recovery of impacted areas. These tools have been tested in the Samara region in the course of project works and were implemented in Samaraneftgaz in 2008-2011, JSC Kuibyshev Oil Refinery in 2006, 2009, 2011, Novokuibyshev refinery in 2010, and OJSC Syzran refinery in 2000, 2006. For example, at the Kuibyshev Oil Refinery and at the Novokuibyshev refinery, the industrial sites were prepared for new construction, and municipal waste landfills were fixed at Timofeevskoye and JSC Otradnensky GPP. More than 200 hectares of areas disturbed by construction and housing and municipal activity were restored and prepared for future economic use.



4. The possibility of using technologies for managed recovery of disturbed NMS as part of recycling complexes includes the aggregation of TPP sludge, conversion of oil-contaminated materials, and reconstruction of buildings.

These systems are designed and implemented as part of the measures to restore the disturbed TCP in Kuibyshev Refinery, Novokuibyshevsk Refinery and Otradny Refinery, which could have an overall economic impact 273 million rubles.

Presentation of Yashkin's

doctoral thesis

Author: Sergei Yashkin, assistant professor of analytical and physical chemistry at Samara Technical University

Subject: Chromatographic separation and thermodynamic characteristics of sorption of adamantane and its derivatives

Speciality: 02.00.04 - Physical chemistry, 02.00.02 - Analytical chemistry

Date and place of presentation: October 16, 2014, National Research Saratov State University

The purpose of this study is to establish the interactions between the structure of adamantane derivatives with other carbocyclic compounds and their ability to intermolecular interactions under the conditions of equilibrium gas chromatography (GC) and high performance liquid chromatography (HPLC) as well as the optimization of chromatographic separation process of the polyhedral compounds on sorbents with different types of structural selectivity.

Practical implications

The practical significance of the work is shown by a set of experimental and theoretically calculated data on the basis of adsorption-chromatographic and thermodynamic parameters of adsorption of adamantane derivatives and other carbocyclic compounds under the conditions of GC and HPLC on various sorbents. The methods for regulating





Sergei Yashkin:

Chemists have long learned to identify, separate, and concentrate the isomers of different types. Without a doubt, the leading role belongs to chromatographic methods. However, there are some problems connected with the creation of highly selective sorbent. The materials are sensitive to even slight differences in the structure of the compounds.

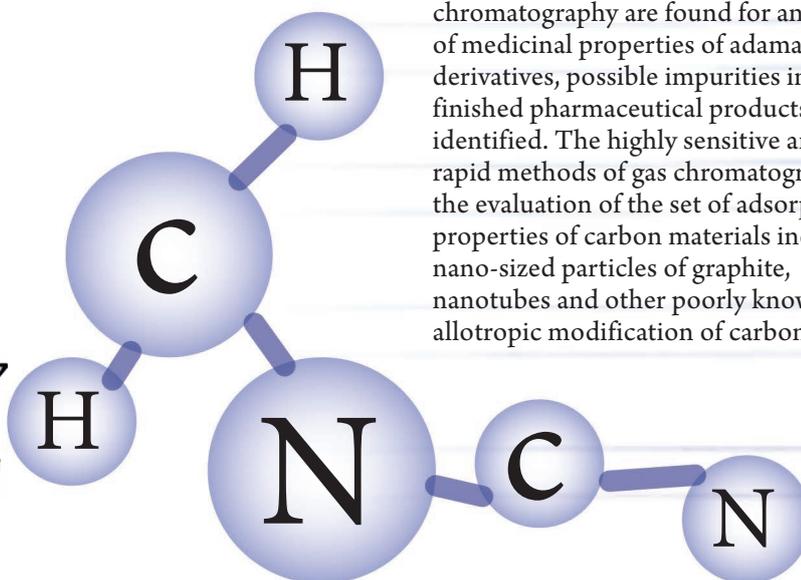
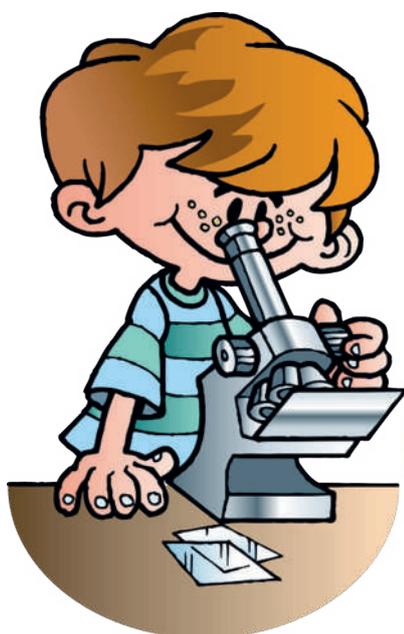
My doctoral research concerns one of these common chromatography problems for a particular class of organic compounds. The objects of study were compounds characterized by a huge variety of molecular architecture, unusual physical and chemical properties, and high biological activity.

Adamantane is the simplest representative of a large class of synthetic compounds that have been very popular in recent years due to their use in various areas of nanotechnology, petrochemistry, pharmacology, etc. It turns out that the hydrocarbon framework is a convenient molecular building block that satisfies a number of necessary conditions for creating nanomaterials, namely its high-strength carbon framework and easy formation 3-D structure, relative synthetic accessibility, chemical modification, low toxicity, stability at high pressures and temperatures in various solvents.



general and structural selectivity used developments of highly selective chromatographic separation and relative isomer concentrations of framework hydrocarbon derivatives from complex compositions of synthetic and natural compounds.

The defined and adjusted parameters of atomic potential greatly improve the functionality of molecular statistical approach of absorption allowing to perform theoretical calculations of thermodynamic characteristics of adsorption for the adsorption of organic compounds different in composition and structure. The conditions of chromatography are found for analysis of medicinal properties of adamantane derivatives, possible impurities in the finished pharmaceutical products are identified. The highly sensitive and rapid methods of gas chromatography in the evaluation of the set of adsorption properties of carbon materials including nano-sized particles of graphite, nanotubes and other poorly known allotropic modification of carbon.



Presentation of Borisova's

doctoral thesis

Author: Anna Borisova, a postgraduate student in the department of the technologies for food production, perfumery, and cosmetic products at Samara Technical University

Subject: Development of the technology of fruit and vegetable puree with high antioxidant properties and their applications in food production

Speciality: 05.18.01 - Technology of processing, storage and processing of grain varieties, bean cultures, cereal products, fruit and vegetable products and viticulture.

Supervisor: Associate Professor Nadezhda Makarova, Doctor of Chemical Sciences

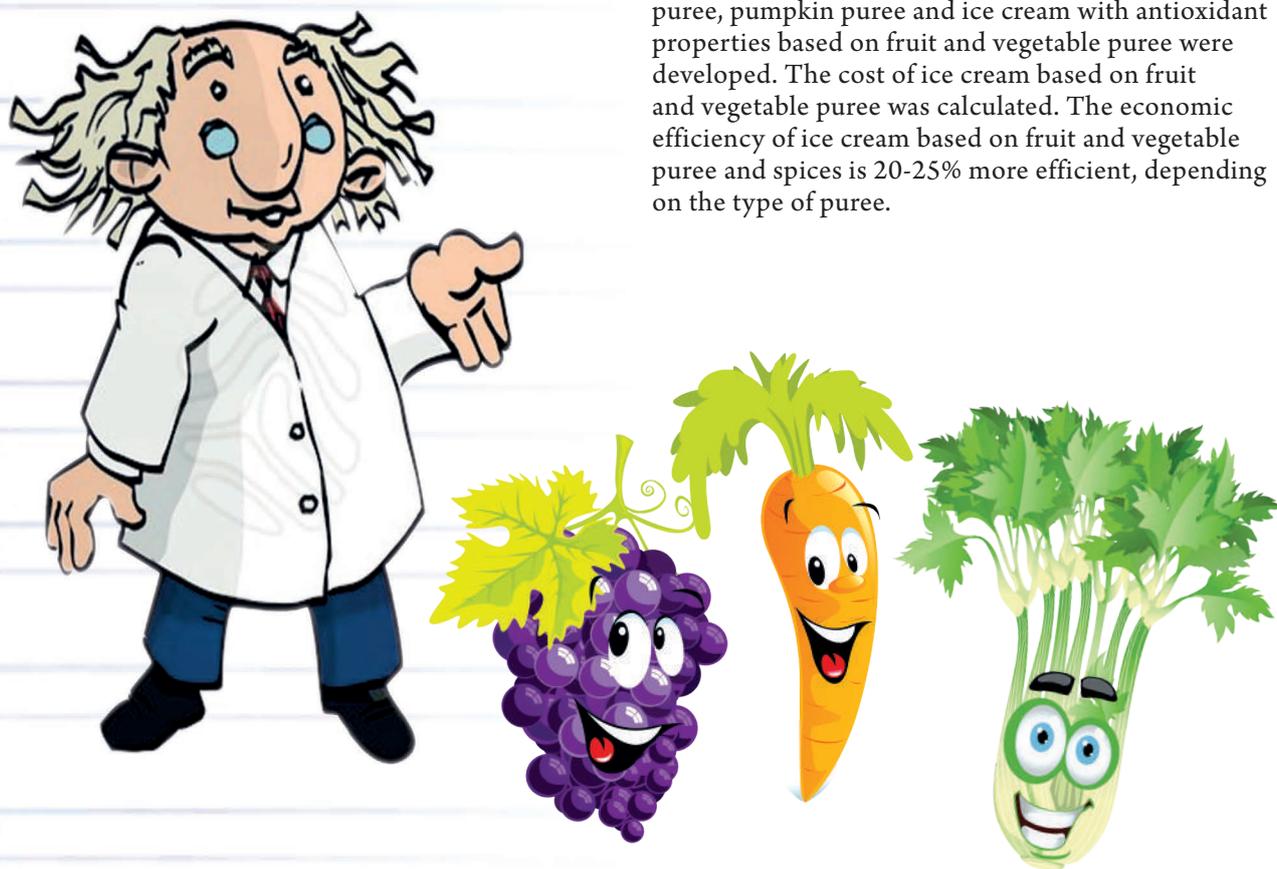
Date and place of presentation: September 24, 2014, Voronezh State University of Engineering Technology

The purpose is aimed at developing an innovative approach on how to process fruits and vegetables in a way to provide the most complete extraction of antioxidant components.

Practical implications

Apples with the highest antioxidant properties are recommended for manufacturing. The possibility of using tomatoes in their milky stage prior to ripening was shown. We defined the storage time for frozen tomatoes and peppers at a temperature of -18°C for not more than 6 months, for carrots at $+4^{\circ}\text{C}$ and pumpkins at $+18^{\circ}\text{C}$ and a humidity of 80-85% for no more than 3 months. Technological regimes are selected and a modified process chart using microwave sterilization for fruit and vegetable puree with high antioxidant properties was developed. We made the production batches of experimental ice cream of two types. The first one was with apple puree and cinnamon, the second one was with pumpkin puree and vanilla at SAM-PO Ice Cream Factory Ltd, located in Samara.

The projects of technical specifications and technological instructions for the production of apple puree, pumpkin puree and ice cream with antioxidant properties based on fruit and vegetable puree were developed. The cost of ice cream based on fruit and vegetable puree was calculated. The economic efficiency of ice cream based on fruit and vegetable puree and spices is 20-25% more efficient, depending on the type of puree.





Anna Borisova :

The relevance of my work is conditioned by the need for high-quality and healthy food. In recent years the mortality rate from malignant tumors and cancer has increased. Scientists have observed that the formation of tumors is due to the accumulation of free radicals in the cells of the people who suffer from metabolic disorders. Improper diet and the reduction of consumption of fresh fruits, vegetables, and berries are harmful. It is known that people need to eat more organic foods that are rich in vitamins and polyphenols, also called bioflavonoids, for the prevention and treatment of malignant tumors and for general well-being.



Improper diet and the reduction of consumption of fresh fruits, vegetables, and berries are harmful.

For the first time, we considered local fruits and vegetables, including new varieties of apple trees from the SRI Zhigulevskie gardens as a source of raw material to produce fruit and vegetable purees with high antioxidant properties. We have studied in detail the chemical composition of local varieties of apples, pumpkins, carrots, tomatoes, pepper, dried spices and the changes during storage and processing of them. We also developed technology for puree production using microwave sterilization. We also proposed to use the fruit and vegetable purees not only as a standalone product but also in the production of other food products such as ice cream. We were able to reduce the amount of oxidative deterioration of fat in ice cream with the addition of spices and fruit puree and the increase of antioxidant activity. These sorts of studies have not been conducted before.

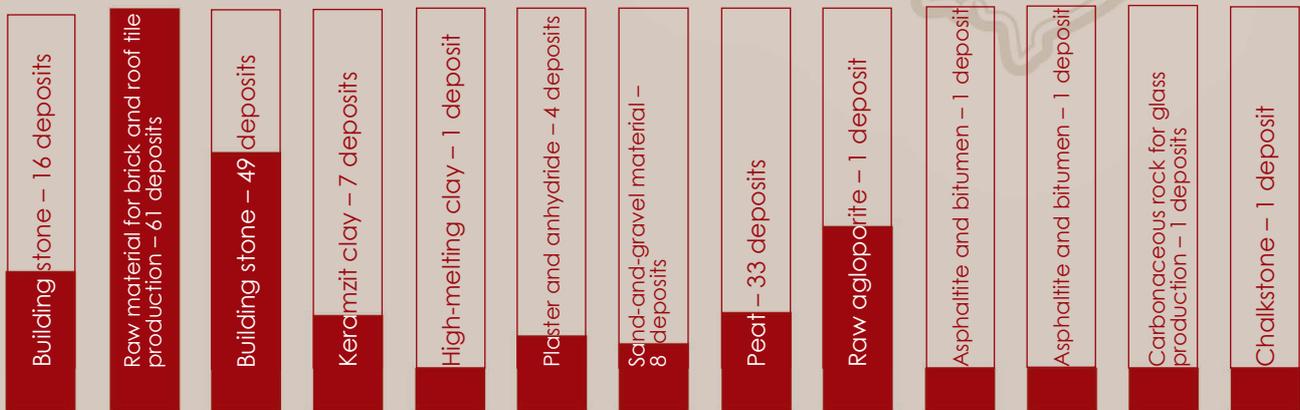


GETTING IT FROM UNDER THE GROUND

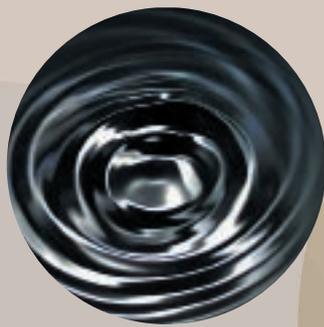
By Svetlana EREMKO

If Samara region owned its deposits, the citizens of Samara would be rich people. 'Technopolis of the Volga region' recently discovered that our region has massive deposits of hydrocarbons, crystals, and rare earth minerals.

There are 192 proven deposits of widespread minerals in the Samara region:



SCIENCE AND ...



Oil

Oil deposits of Samara region are focused at **327** oilfields. **15.2** millions of tons was produced in 2013. Productions doesn't cover **11** per cent of deposits.



Sapropel

Sapropel is an organic mineral found in the sediments of fresh-water lakes. Sapropel is most commonly used in medicine as a therapeutic mud, extracts and in medicinal preparations. In the future, sapropel can be used as biologically-active preparations and protein substances. There is an estimated deposit of **2** million tons of sapropel in Samara.



Vladimir GUSEV, head of the Chair of Geology and geophysics of SSTU:

"Samara Region is very well explored by geologists. People who work in the gardens along the Volga in the summer also explore the underground spaces and have drilled all the way down to the Paleovolga; its bed is much wider than the Volga itself, there are enormous reservoirs with fresh water there. Deposits of the best oil – Devonian oil – are not very large but we have already been exploring other layers. Moreover, oilmen come close to the deposits of so-called viscous oil. We didn't produce it before but now we can do it using modern technologies. We will always need oil. It would be perfect if we started using hydrogen fuel in the future and didn't use oil as fuel, but even then we would need oil as raw material for chemical industry and food production. It is a very vital issue especially considering recent 'food' scandals in Europe that show that there is world shortage of natural foodstuffs."



Building stone

Building stone is produced from deposits of quarr and clay in the Samara region. Eight deposits are being excavated, while **50** more sites are awaiting exploration.



Keramzit

Keramzit is a rock that heaves when heated to 1050-1250°C. Clays of upper quarternary, upperpliocenic and middle-jurassic periods are used as raw material for keramzit production in Samara region.



Mortar sand

Mortar sand deposits are located in **21** districts of Samara region. Only Hvorostyansky, Shentalinsky and Kamyshlinsky districts do not have enough sand for production.



Peat

Peat is used extensively in agriculture and machine-building (protein and feeding stuffs, granular fertilizers, active carbon and absorbers, raw and modified waxes, investment compounds for precision casting etc.).



Gravel

Gravel is used in construction as a coarse aggregate for concrete and asphalt concrete, for various bankings, levelings and dam construction, which don't require high-quality materials. The best gravel is produced in Volzhsky, Syzransky and Stavropolsky districts of the region.

ANCIENT SLAVIC TREASURES ON THE SAMARSKAYA LUKA

By Alexei BOGACHEV

The Samarskaya Luka is considered to be the pearl of the Middle Volga. Its natural beauty is wonderfully combined with the unique monuments of history and culture. The archaeological history of this land has been studied for decades by Samara archaeologists. Towns, settlements and burial ground from the early Middle Ages are the focus of the SSTU Center of industrial archeology, museology and tourism. I happened to be a member, as well as a leader of several expeditions, that explored various sites of the Sarmatian Alans, Slavs, Germans, Turks and Finnish-Ugric peoples.

Slavic, German, Finnish, Turkic, and Ugric tribes were active participants in the Middle Volga from the 4th to 9th century. Some of them came to the region from the west, while others came from the east. Some tribes found a new home in the Volga region, while others rushed through the land like a fiery whirlwind, leaving behind only the ashes of burned villages and the graves of those killed in battle.

Alas, we do not know the names of these ancient settlements or the names of burial mounds. Tools, weapons, utensils,

and decorations are silent witnesses of these ancient events. However, certain research skills can help glean more information from the artifacts

During that time, Slavs stood out from other people for their patriarchal rules of family life, their tools, weapons, pottery, amulets, talismans and special funeral rites - they burned their dead relatives on funeral pyres.

For a long time, Slavic early history was thought to be connected with the areas between the Oder, the Vistula and the Dnieper rivers. However, in the 1980s, the founder of Samara archaeological school, **Galina Matveeva**, suggested a bold hypothesis, suggesting that the Slavs had actually explored the Middle Volga. She



Slavic settlement in Podgory. Archeological expedition of SSTU. The excursion is guided by professor Alexei Bogachev.



Strengthening (two banks and a moat between them) of Karmalinskiy settlement. The height of the bank (more than 12 m) can be judged by the archaeologist figure standing on it (pictured in the upper right corner).

believed that Imenkov archaeological culture, named after the monument explored near Imenkovo in Tatarstan, was left by Slavic people who had migrated to the Dnieper and Polesie regions in the second quarter of the first millennium AD.

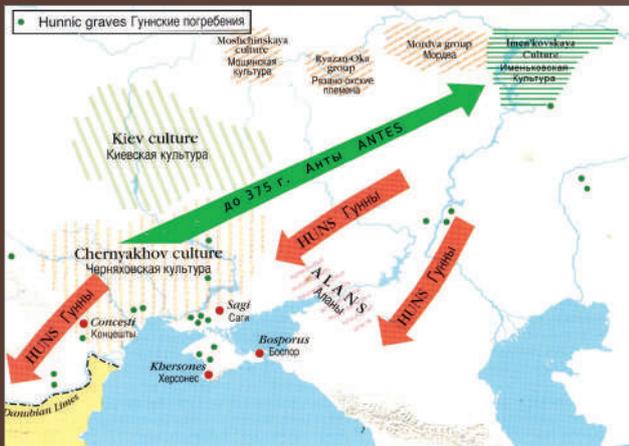
This theory of Matveeva caused a heated scientific debate between the leading researchers from Moscow, Leningrad, Kiev, Kazan, Ufa and other cities in the former USSR. But in the 1990s, Matveeva's viewpoint was supported by a number of scientists, including the leading Russian Slavic archaeologist **V.V.Sedov**. The idea that a large group of Slavic tribes lived in the early Middle Ages in the Middle Volga region has since been firmly

established in archaeological science, and has even been entered in the official modern encyclopedia.

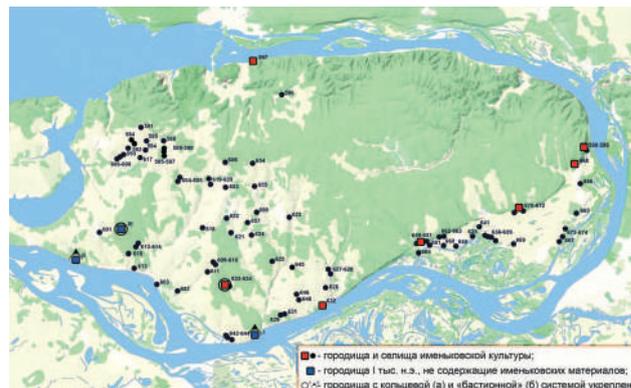
But who were the people behind the Imenkov culture? First millennium AD sources tell about three great Slavic nations: the Sklaviny, Ant and Wends. The Wends are sometimes regarded as the ancestors of the Sklaviny and Ants. Notes from the sixth century historian Jordan: " ... from the source of the river Vistula (Wisla - Ed.) a numerous tribe Veneto inhabit vast territories. Although their



The burial of the VI century. The Slavs burned their dead relatives on funeral pyres. Then the dust was cleared of coals and ashes and poured into the small holes of oval shape. Near there were objects filled with funeral food. VI century.



Map-scheme of settlement of the tribes at the end of the IV century.



The map showing the location of the Slavic monuments in Samarskya Luka.

names now vary according to different families and habitation, mostly they are still called Slavs and Ants ... Ants are the most powerful of them ... “

But at the same time, Byzantine Emperor Maurice wrote about these peoples, “ Slavs and Ants tribes have the same way of life and morals; they are free and they are in no way inclined to either become slaves, especially on their own land ... the most valuable things they keep in their vault.”

In my long archaeological practice, I have only twice had the chance to directly explore these kinds of treasure caches. It happened on the Samarskya Luka, which more than a thousand years ago, was the southern-most edge of the Middle Slavic world.

In the early 1980s, as a student I participated in the excavation of the Slavic fortified settlement in the modern marina of Lbische. The Lbische settlement is a complex system of defensive structures. Human skeletons discovered there proved the fact that the settlement was destroyed as a result of a nomadic raid, perhaps by the Huns. The raid was a sudden one. Utensils prove this idea. According to Karamzin, the Russian historian, when there was a war “against each other or against an outside force “, the expected danger forced people to hide their valuable property. An iron hammer, pliers and two axes were found by archaeologists in



Things from Karmalinskiy treasure (jewelry scrap and finished products)-neck-ring, a silver tip of the belt, the wreckage of the silver ring.

Pendant amulet. Imenkov culture. Early Middle Ages.V-VI centuries.



Solar amulet.

a shallow pit, which were the means of manufacturing and the production of an Old Slavonic blacksmith.

In 1984, during the Karmalinskiy settlement excavations, I discovered a treasure hidden by an ancient Slavic jeweler. The town was located in the upper right spur of the Askulskiy ravine. It is protected by a complex system of fortifications, consisting of three ditches and two banks. The treasure was in a deep hole, under a layer of charred millet next to a large millstone stone and ceramic pots. It



Silver coins (Iranian drachma of the Casanidov era) of Karmalinskiy treasure.

included seven silver Iranian coins, drachmas, the tip of a belt, as well as a piece of a silver plate and a small roll of gold foil. The Drachma, which was minted during the reign of the Iranian Sassanid dynasty, was in good condition and had no serious damages. Three drachmas were minted during the reign of Kawada (488-497, 499- 531) and four drachmas during the reign of Khosrow I (531-579). Sixth century coins had no value for the Slavs, who turned the silver, from which the coins were made, was melted into pendants, rings, and other types of jewelry,. The Karmalinskiy treasure contained finished jewelry product as well as material for future products. Unfortunately, judging by the fact that he did not return for his treasure, that goldsmith never had the chance to finish. But his products, excavated from their underground resting place, have a bright future on display in our local museums.



Pot ceramic vessels of the household pit of the Karmalinskiy settlement .



Who were these people who lived on the Samarskya Luka 1500 years ago? What language did they speak? Professor Matveeva believes that they were Slavs. But from what tribe, Wends, Sklavins or Ants? A comparative analysis of the written and archaeological sources enables me to conclude that the Slavs migrated here were ethnic Antes. They left because of the terrible war between the Germans and Goths, some of which are described by Jordan. A particular passage describes the invasion by the Ostrogoth leader Vinitar, who "wanted to show his own valor [and] moved the troops into the Ants' territory. And when he came to them he was defeated in the first skirmish, then he became braver and crucified their king named Boz, his sons and 70 nobles to frighten the conquered people."

Perhaps it was this evil that compelled the Ants to move to the Middle Volga region at the end of the IV century. The archaeological monuments left by them are called "Imenkov culture."

The author of these lines was lucky enough to explore IV-VI century treasures of the "Imenkov" ants on the Samarskya Luka.



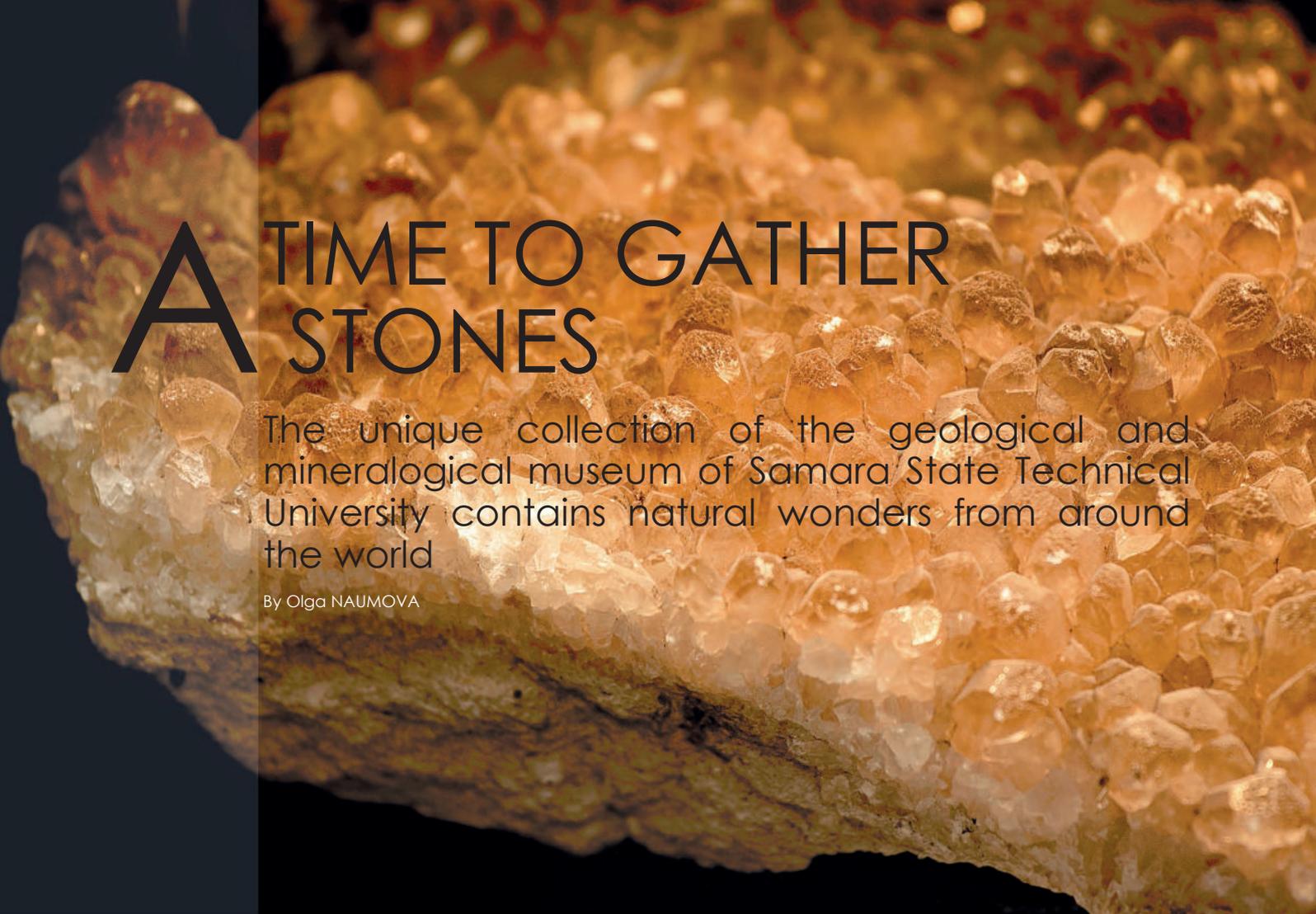
Anthropomorphic amulet of VI century was found in the base of the home on the settlement of Osh-Pando - Ner II.



Bronze figure of a man with a loop for hanging - anthropomorphic amulet.



Dwelling remnants ("big house") of the columnar structure. Hillfort Old Main. VI century.



A TIME TO GATHER STONES

The unique collection of the geological and mineralogical museum of Samara State Technical University contains natural wonders from around the world

By Olga NAUMOVA

IN FOCUS

Agate from Antarctica, rheniite from the Kuril Islands volcanoes, chkalovite from the Kola Peninsula, oceanic jasper from Madagascar, arboraceous opal, bituminous quartz, and lutcite from Samara region. This journal doesn't have enough pages to list all of extremely rare types of rocks, minerals, and crystals that are on display at the Geological and Mineralogical Museum at Samara State Technical University. There are more than three thousand unique showpieces at the SSTU museum, located at 1 Pervomaiskaya Str. The curator of the museum, Alexander Sidorov, is a candidate of physical and mathematical sciences, and an associate professor of the Physics department, where he conducts exciting experiments.

The Geological and Mineralogical Museum at SSTU was opened on October 15, 2004. For ten years Alexander Sidorov has collected an enormous number of extremely rare rocks, minerals, and crystals from every corner of the planet. These showpieces tell many stories. Some of them were brought from various scientific expeditions in Russia and foreign countries, others were given by colleagues and friends, and still others were exchanged and even bought from other museums. Some of these stories could have been taken from the plot of an adventure movie. One of them, seemingly a detective story, involves Sidorov and his student taking some minerals from the Sokolovo-Sarbaiskoe deposit in Kazakhstan in 2004.

"The beauty and variety of these minerals made my eyes blaze," the geologist recalls. "After buying 17 of the most important and affordable rocks, I decided that I would return for the rest of the minerals later. To my surprise, when I returned to Russia, the customs officers didn't pay attention to my minerals. They only asked if I had any sacred books. I was kind of outraged by that attitude. But it turned out that the customs officers were interested only in 17th or 18th century books, so they ignored me pretty quickly, and I was able to bring the rocks without incidents to the museum."

Ichthyosaurus skeleton and tourmaline crystal

In 2007, the Ministry of Natural Resources and Environmental Protection of the Samara region donated money to help the museum buy the mineral collection of the famous Samara geologist **Nikolai Nebrity**. It allowed the museum to organize an expedition to the Polar Urals

from where garnet, lazulite, actinolite and other rocks were brought.

One of the most reliable partners of the museum is “SamaraNIPIneft”. Company managers, together with the director of the geological museum, have planned and conducted geological seminars, which helped expand the museum’s collection. The minerals added included vug with calcite from the Pecherskaya gallery, polychromic calcium fluoride from the Suransky deposit, and silicious stalactite with small crystals of Bristol diamond.

Alexander Sidorov remembers the fall of 2008 when he and SSTU rector **Dmitri Bykov**, who at the time was the dean of the Oil Technology Department, went to Undori, a village in the Ulyanovsk region, to visit the famous paleontologist Vladimir Efimov. As a result of this trip, the SSTU museum received the maquette of ichthyosaurus skeleton from Efimov’s laboratory. “As a chemist and environmentalist who took part in many expeditions, Dmitri Bykov not only displays a keen interest in adding new rocks to the museum, but also in inviting guests there. He loves to tell detailed stories about the exhibitions, pointing out their unexpected features,” says Sidorov. “He also has donated extensively to the collection. He gave the crimson crystal of tourmaline, ornamental larimar and oceanic jasper from Madagascar to our museum.”



Geologist Alexander Sidorov is a real enthusiast.





Beautiful agates and Samara suiseki

One of the favorite minerals is agate. This stone is attractive because of its fine color blends, decorative rhythmical patterns, and mysterious origin. The true beauty of agate is seen when it is cut in two. The collection of agates in the SSTU geological museum has been growing since the museum opened. The stones come from Chukotka and the Urals, and from Kazakhstan, to name only a few places. "One of the agates we've got is of very simple color and pattern but very valuable as it is very rare," Alexander Sidorov says proudly. "I talked with my old friend Sergei Busygin, a famous stonecutter and the head of the stonecutting workshop. He was one of those who built a research station in Antarctica. Suddenly he said that he had brought some rocks from the distant continent. I asked him to sell me one of them for the museum but he said, "You don't have enough money" and just gave it to me – agate from Antarctica. Minerals from that continent are quite rare."

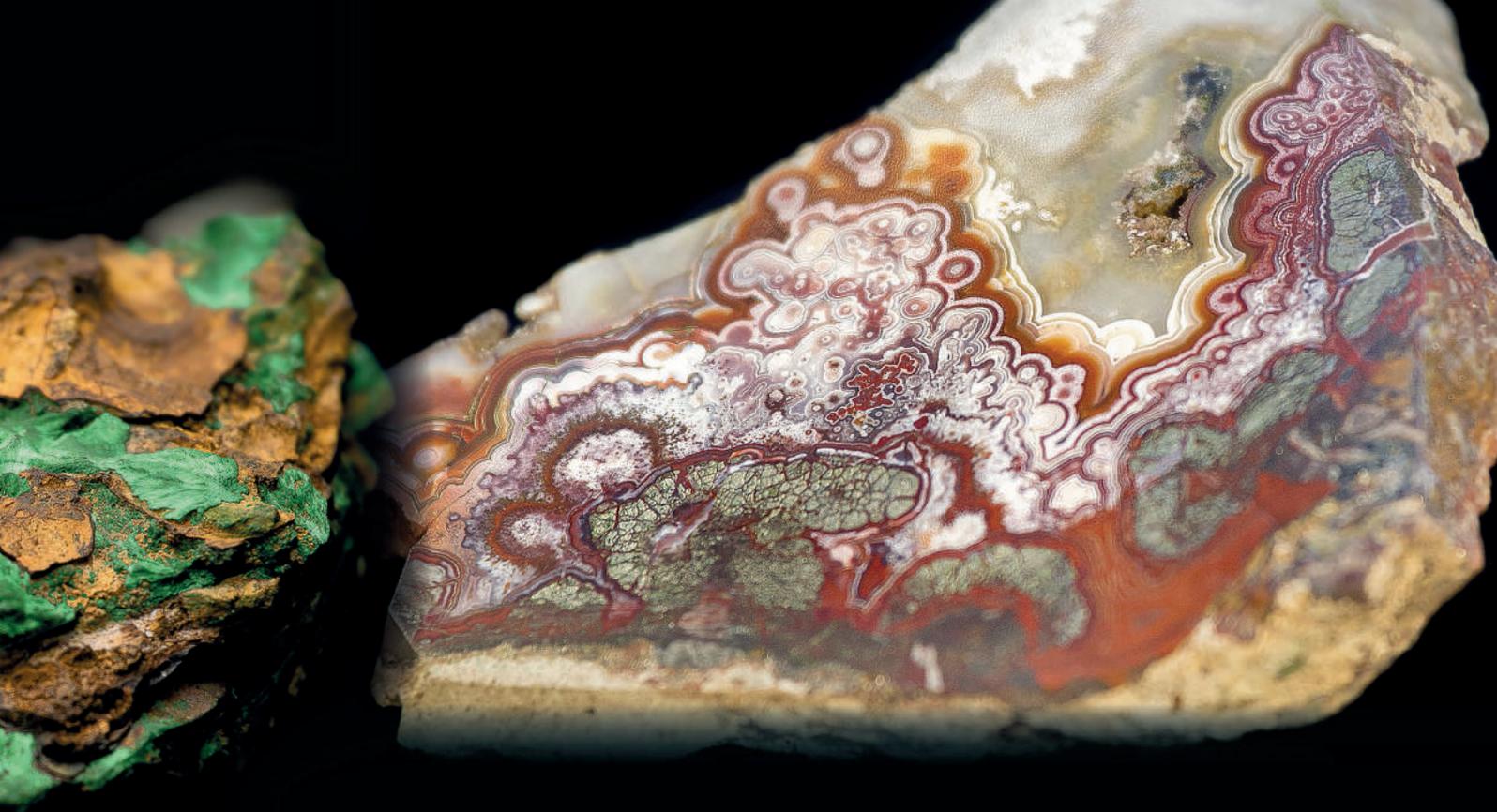
The abstract-shaped stones, which don't look like anything familiar but which are too beautiful to ignore, hold a special place at the SSTU geological museum. Such naturally shaped stones are used in Japan in traditional 'seiseki' art for meditation and inspiration. There are two types of the stones: chu sho ishi stones, which are not like anything familiar, and

Chin-seki stones, which resemble a human, an animal, a hut, a boat etc. Children, whose fantasies are usually unexpected and interesting, are especially keen in trying to recognize what this or that stone looks like.

Treasures of the Sulfur Mountain and fossilized wood

"The next most important minerals of the Samara region after oil are sulfur, Volga agate, and fossilized wood," says Alexander Sidorov. "Native sulfur has been produced for hundreds of years in our region. You still can find mines from Tsar Peter I's time in the Sulfur Mountain. There was a plant near the mountain where sulfur was melted to purify in order to produce gunpowder. The Russian natural scientist **Mikhail Lomonosov** and German researcher **Johann Gmelin** described the samples brought from the Sulfur mountain to the Kunstkamera Museum."

Alexander Sidorov visited the Sulfur Mountain three times and eventually proved that it was here where the first Russian celestine was found. Alexander Sidorov made another unique discovery in the early 2000's when he, as part of an expedition to the north-east of the Samara region, found fragments of fossilized tree stems and molds of leaves in the rock. These samples allowed him to make conclusions about the natural conditions of Samara 300 years ago. The complex fossil flora found by the geologists date back to the Permian period of the Paleozoic era, when the territory of Samara was situated on the periphery of an ancient continent called Angarida. The fossil flora is quite diverse, with remnants of sporophytes, gymnosperms, and even some unknown plants. "I really want the people who come to our museum to look at the exhibitions and realize the beauty of the Earth. I want the future and present-day experts to realize that it is their duty to keep Earth safe,"



says Alexander Sidorov. “These rocks have something special that you perceive not with your eyes, but rather with your heart, with that feeling of warmth or kind of electric current coming from them. Some people call it magic because of the unusual nature of the stones, but I

don't like such kind of comparison. The experiments I participated in show that most people are able to feel the influence of a mineral or metal. You just need to 'tune in' and listen to yourself.”



O R N I T H O L O G I C A L N O T E S F R O M T H E P O L Y T E C H N I C F O R E S T

The Polytechnic SSTU hostel is one of those wonderful places in Samara that is not influenced by the heavy breathing of metropolis. Of course, the asphalt road along the fence of Polytechnic from the west is a reminder of the proximity of the big city. However, on the other side of the tourist center, there is a beautiful oak forest.

Our photojournalist **Antonina Stecenko**, a candidate of life sciences, the chair of the zoology and anatomy department at the Volga State Social-Humanitarian Academy, along with **Sergei Pavlov**, the chairman of the Samara Branch of the Russian Bird Conservation Union, ventured into the oak trees to observe the lives of some of the 70 different bird species that inhabit the forest.

▼ Some people believe that, this winter, bullfinches (*Pyrrhulopyrrhula*) did not migrate to Samara. However, that's not true. They come every year, because wintering in central Russia is very comfortable for bullfinches. There are more bullfinches in our forest now because in the taiga, their place of permanent residence, there is a lot of snow. Bullfinches migrate in flocks of as many of 200 individuals. Sometimes, they stick to the branches of mountain ash and other trees that have preserved berries and seeds, to grab a quick snack before flying further south.

IN FOCUS



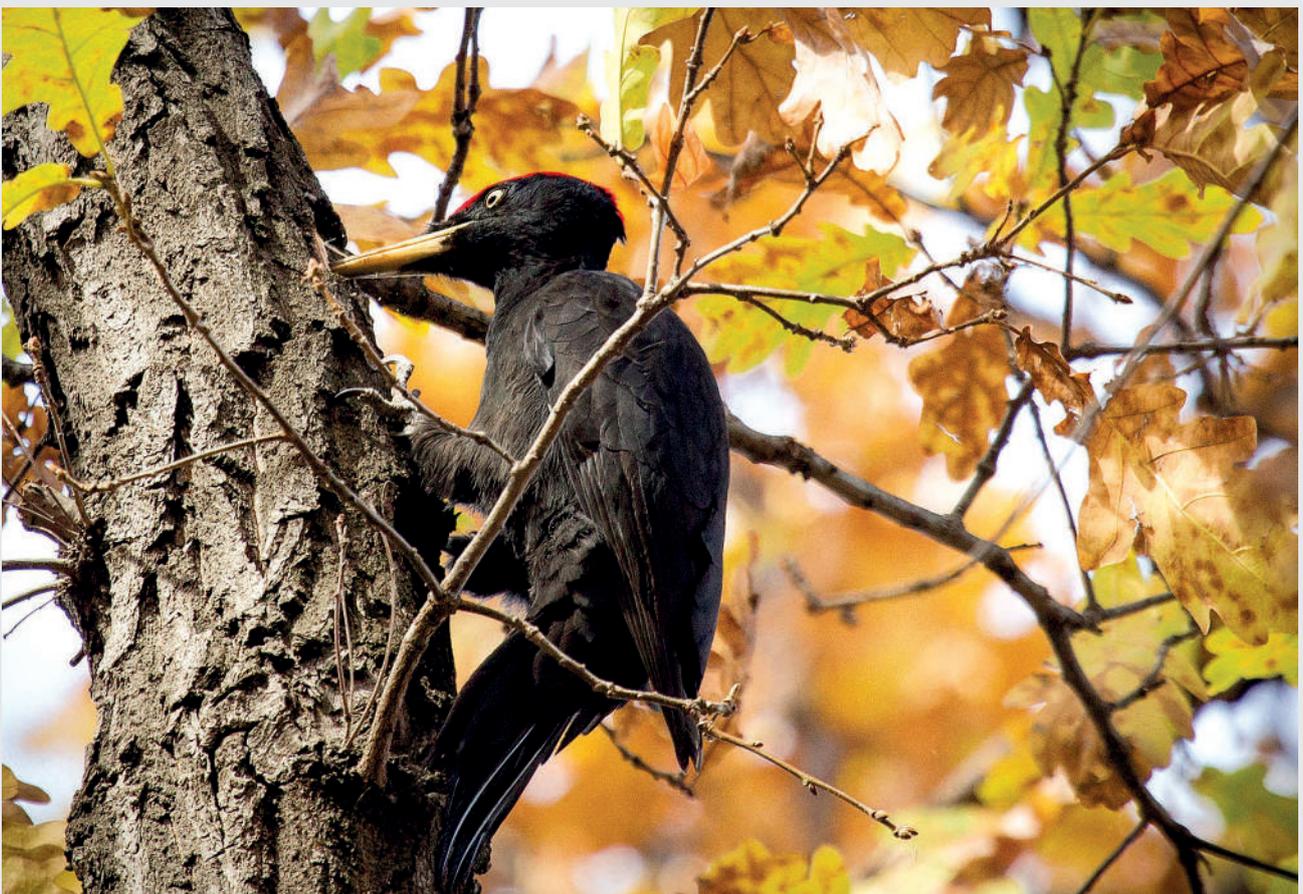
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▲ Thrushes (*Turdus*) live all over the globe. They live in Antarctica and in the most severe areas of the Arctic. According to one story, the Russian name of the bird has an onomatopoeic etymology. The cry of the thrush is a bit like a combination of the sounds, "dr-r-ti, dr-r-ti". In general, blackbirds have very melodic voices. Blackbirds eat insects, worms, and berries.

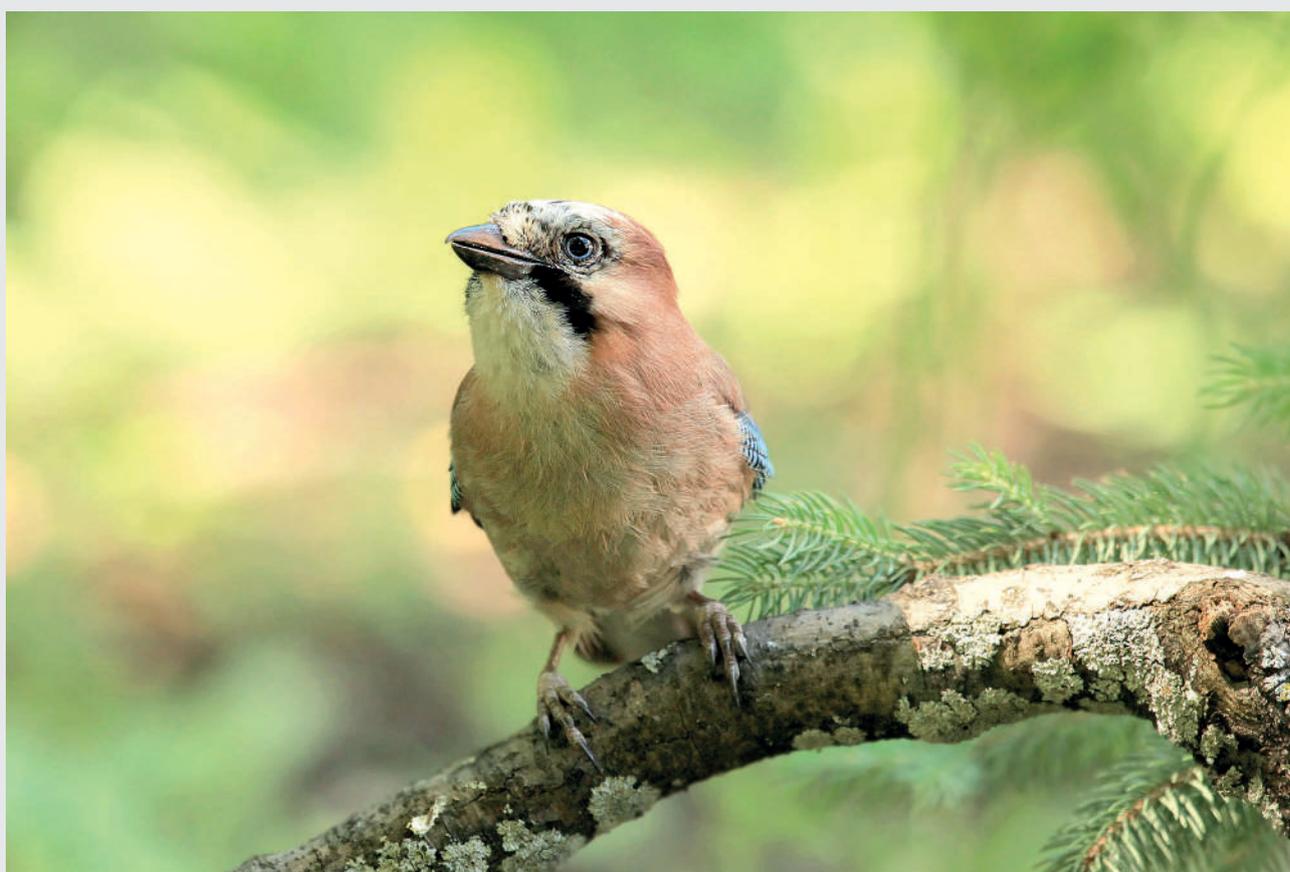
▼ A black woodpecker (*Dryocopus martius*), is considered to be the largest representative of the woodpecker family. These sedentary birds live alone; the pairs are formed only during the breeding season. A woodpecker is easily identified by its perky staccato; the speed of its beak strokes on a tree is 10 - 15 times per half a second. Using staccato woodpeckers communicate to one another, invite female birds to their territory or, on the contrary, lay claim to another bird's territory. A scared or irritated bird utters a sound like a "kick-kick". However, woodpeckers have weak vocal cords, in the forest, their cries can be heard only at a distance of 50 - 100 meters, while the drumming on the tree bark can be heard from two kilometers away.





▲ A nuthatch (*Sitta*) is considered to be a first-rate tree-climber. Perhaps this is the only bird in our region that can crawl upside down as well as up the trunk and even around the trunk in a horizontal position. A nuthatch, using its long, tweezer-like beak, pulls ants, bugs, caterpillars, and beetles from the cracks between the bark.

▼ A jay (*Garrulus glandarius*) is one of the finest representatives of the Corvidae family. In the spring and summer, it eats harmful insects, rodents, frogs and lizards, and in the fall, it eats berries and seeds, as well as collecting acorns for the winter. The total weight of the jay's reserves can reach 25 kg. The bird hides seeds and acorns in different parts of the forest and during the winter, periodically visits these caches.



▼ In the winter, the Sparrow Hawk (*Accipiter nisus*) can be observed. In ancient times, this bird was used for hunting quails. Wild hawks catch mainly sparrows, starlings, and mice .





Science and Innovation are
for the prosperity of Samara and Russia!

