

innovation

Science + Business

#5 Autumn/Winter 2018

ON THE
BRINK OF
BIG DATA
REVOLUTION

01.11 The grand final of *ClimateLaunchpad 2018*, the Global Green Business Ideas Competition, starts in Edinburgh, Scotland, where more than 130 finalists from all over the world, including three teams from Latvia, will present their ideas. Authors of the *TreeHouse Place* business idea won the *Latvian national finals*. *TreeHouse Place* enthusiasts, under the guidance of Matija Babra, a master student of RTU Faculty of Architecture, created multifunctional and environmentally-friendly platforms made from tree logs and ropes that they put on tree-tops to promote environmentally-friendly construction and lifestyle. The competition is one of the *Climate-KIC Climate Research and Innovation Community Initiatives* of the European Institute of Innovation and Technology, which focuses on mitigating climate change while contributing to the global growth of green companies. This year, *ClimateLaunchpad* has participants from 35 countries.



21.11 *Green Expo Riga 2018* will be held for the first time in Riga. Its goal is to support, shape, and direct the development of Latvia's green economy in the next 25 years, to position Latvia as a green state. At the conference, Latvian green policy makers, business people, and specialists will discuss the goals of Latvia's green economy in a European context, simultaneously a networking forum will take place, where representatives of the green economy will present their achievements.

26.11 The *US-Baltic High Tech Forum* will be held in Boston, the US, organized by Latvia, Lithuania, and Estonia in collaboration with the Massachusetts Office of International Trade and Investment (MOITI), US Chamber of Commerce, and the Information Technology Industry Council (ITI). The forum is being organized as part of the visit of the President of Latvia and Latvian businessmen to the United States, and life sciences and IT professionals are invited to participate.

30.11 The *Digital Freedom Festival* starts in Riga. It's a global technology, startup, policy and lifestyle festival gathering new technology and startup entrepreneurs, experts, policy makers, investors, journalists and inspiring speakers from all over the world. The organizers promise to encourage debate on how technologies can truly «make the world a better place», creating greater digital dividends for everyone.



29.11 *Tech Industry* is the biggest international trade fair for mechanical engineering, metalworking, automation, electronics, electrical engineering, industrial supplies, tools, and innovative technology in the Baltic states. More than 270 companies from the Baltic states, Western and Eastern Europe, Scandinavia, the CIS region, and other countries will take part in the exhibition. The trade fair allows one to get acquainted with the latest scientific achievements and innovations: *Tech Industry* collaborates with educational institutions that offer study and training programs in metalworking and mechanical engineering, support research and development organizations and contribute to the development and innovation in related branches.



26.11 The *Creative Business Cup* global finals will start in Copenhagen, Denmark, gathering IT and creative industries startups from all over the world, including Latvia. *Creative Business Cup* is the global initiative that empowers entrepreneurs in the creative industries, connecting them to investors and the global markets. Each year over 100 participating startups from all over the world join the *Creative Business Cup*. The finals take place during the *Global Entrepreneurship Week*.

13.12 For the fourteenth year in a row, the Investment and Development Agency of Latvia (LIAA) and the Ministry of Economics congratulates Latvia's most export-oriented and innovative companies – winners of the *Export and Innovation Award*. There are awards for several categories: *Most Export-oriented Business* in large, medium, and small business categories, *Best Import Replacement Product*, *Most Innovative Product*, *Best Industrial Design*, and *Export Champion*. The winners of the competition will be announced at the award ceremony in the *Zuzeum Art Room*. To date, more than 350 awards and letters of appreciation have been presented to the best and most innovative companies in Latvia as part of the competition. Among the participants of the competition all main export sectors of Latvia are represented: wood industry, furniture manufacturing, metalworking and mechanical engineering, electronics and electrical engineering, light industry, printing, construction materials production, food production, textiles, chemical and pharmaceutical manufacturing, design of goods, as well as information technology, and other services.

4.12 One of Europe's leading startup events *Slush 2018* starts in Helsinki, Finland. *Slush* has grown from a 300 person assembly to a world-renowned event, now spreading globally. In 2017 it gathered over 2600 startups, 1600 investors, and 600 journalists from over 130 countries.



cover photo — shutterstock.com

STAND OUT IN THE NOISE

«Science, in my opinion, is too important to be left in the hands of scientists only, which, of course, is the right place for it, because science is developing thanks to scientists. But the perception of science of society is just as important,» pointed out Dr. Vaira Viķe-Freiberga, the former President of Latvia, before the IV World Congress of Latvian Scientists this summer.

I completely agree, but, how in the era of information overload, when it becomes more and more difficult to distinguish between what is true and what is a skillfully twisted lie to manipulate people, do we ensure that scientific news reach the ears that want to listen, thereby boosting knowledge, stimulating the economy, and advancing prosperity? How do we achieve this in an era when cat videos and pseudo news about the *crème de la crème*, who have participated in the opening of an extremely modern cafe or clothing store, that actually have zero value, receive more attention than the announcements about new scientific discoveries that could help treat severe illnesses, protect buildings from collapsing, saving lives of many people, or significantly increase business efficiency?

By discussing. By explaining. By mentioning facts. By giving expert opinions. Working on the magazine, I was deeply touched by the statement made by Janis Sārts, Director of NATO Strategic Communications Centre of Excellence, that currently we are experiencing a major change in the consumption of information in human history, and scientists must be the ones who help society not to get lost in the new reality, not to let emotions win over facts. We must be proud of factual information, but it may be difficult to do so in an environment where news are served quickly, brightly, emotionally, and simply. «I do not want to say science should be the same, but remember that if we do not talk to people, they will become more and more subject to emotion and will appreciate facts less and less. And such a society has no prospects for the future,» reminds us Sārts.

Let's converse!

Lāsma Vaivare,
Editor of *Innovation*



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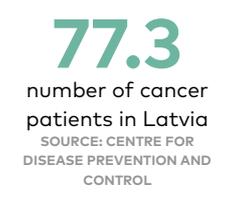
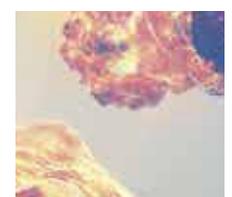
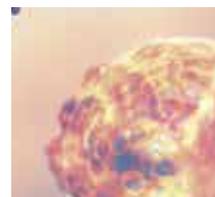
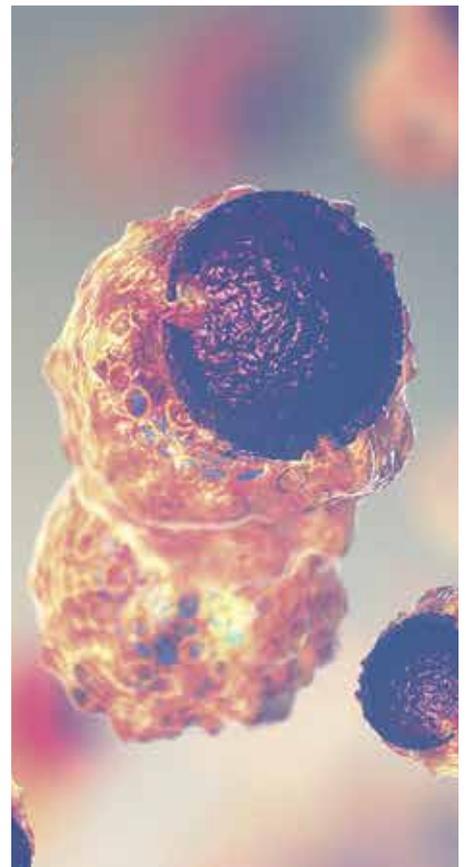
CALCULATING CANCER

Over the next ten to twenty years, genetic analysis and big data will change medicine forever; Latvia has a pilot project in the works that pertains to the development of methods for lung cancer risk assessment, early diagnosis and prognosis based on big data

Lung cancer is one of the most common oncological diseases in Latvia: each year more than 1,000 people get this diagnosis, mostly late, when treatment is much more difficult. Consequently, the mortality rate is high. Last year, bronchial and lung cancer was the cause of death of 987 patients – the highest rate among cancer patients, according to the statistics of the Centre for Disease Prevention and Control. Doctors say early diagnosis of the disease is hindered by the lack of specific complaints at the onset of the disease. Although active or passive smoking is still considered the most common cause of lung cancer, environmental pollution, harmful working conditions, lung diseases, and others pose a risk, too.

Change the Basics

Finding an effective and convenient method for early diagnosis of lung cancer would make it easier to treat patients, says Signe Bāliņa, Professor of the Faculty of Business, Management and Economics, Deputy Rector for Digital Society Matters of University of Latvia (LU). Together with her colleagues, including cardiologist Andrejs Ērglis, Professor of Department of Internal Medicine of LU Faculty of Medicine, and international partners from the pharmaceutical company *Roche*, health segment of technology giant *Microsoft*, and the gene research company *BGI*, they are studying the possibilities of using genome and big data in medicine and health care.



77.3

number of cancer patients in Latvia
SOURCE: CENTRE FOR DISEASE PREVENTION AND CONTROL

«Over the next ten to twenty years, genetic analysis and big data will change medicine forever, promoting the transition from the principle «one medication for all» to individualized treatment, finding the most effective medication and therapy based on the patient's physical condition, genetics, prior treatment responses, and other factors. We in Latvia have to keep up with the trend,» Bāliņa is assured.

To do this, we need to create a comprehensive and secure data infrastructure architecture model – a data lake, which would «hold» information from public registers, hospitals, data patients submit themselves and information generated by different devices. Currently there are various types of structured and unstructured medical data in the Latvian health ecosystem, which are not always available in digital format and are stored, for example, in medical history. By putting all the data together, we could create a national platform. By integrating data, it would become possible to analyse how everything is interconnected.

A data platform could serve as the basis for creating new knowledge and solutions in both medicine and IT. «Using this platform, technology companies could create new solutions for data analysis, visualization, input, and security enhancement. Medical institutions could use data sets and data analysis technologies to provide data and interface solutions for more effective decision-making on the most appropriate therapies, thus contributing to the development of cost-effective health care systems. This is how we see medicine in the future – a variety of artificial intelligence tools recommending the right therapy to be carried out, of course, the final decision is made by the doctor. The essence of artificial intelligence is to do what a person cannot do in real time. We in Latvia have expert knowledge: we have strong IT research, a strong IT industry, the IT industry is the third most export-oriented and the third largest taxpayer branch of national economy, we have innovative thinking and competent medical professionals. When doctors meet IT specialists, new ideas may arise – doctors come to them with a problem, technology people see how to come up with the solution. My father was a medical professor. When I was studying computer science, he said that only when several branches of science meet, they can create something new. Time has passed and I have reached medicine and found

FOR INFORMATION

__Creation of cancer prediction infrastructure based on genome and health data

__Goal: to develop an early-stage cancer diagnostic service model based on gene and health data by creating the necessary IT infrastructure that can integrate and analyse data

__Team: Signe Bāliņa, Guntis Arnicāns, Edgars Salna, Ģirts Karnītis, Jurgis Šķilters, Uldis Bojārs, Alvis Krams, Sergejs Isajevs, and others.

__The project is supported by LIAA program Support for Commercialization of Research Results

SOURCE: UNIVERSITY OF LATVIA

__Development of methods for lung cancer risk assessment, early diagnosis and prognosis based on big data

__Goal: to develop a new method for lung cancer risk assessment, early diagnosis and prognosis based on big data (product, lung cancer risk calculator), which would allow to identify the risk of developing lung cancer and help choosing the appropriate treatment method more effectively individually for each patient, as well as to create a lung tumor biobank

__Team: Andrejs Ērglis, Alvis Krams, Sergejs Isajevs, Ints Siliņš, Inese Poļaka, Edgars Salna, Vineta Arnicāne, and others.

__The project is supported by LIAA program Support for Commercialization of Research Results

SOURCE: UNIVERSITY OF LATVIA

how IT can help healthcare professionals develop new, innovative approaches,» says Bāliņa.

Be First

LU scientists had the idea of building a data infrastructure for more than a year and a half. The scientists had their first discussions on lung cancer research with *Roche*, last summer in the United States they discussed the creation of a medical and genetic data infrastructure and collaboration with *Microsoft* gene experts,

in January, *Microsoft*, *Roche* and BGI researchers met to jointly develop the idea of a pilot project on testing data infrastructure capabilities, in support of the development of a new method for assessing lung cancer risk, diagnosis, prognosis, and therapeutic efficacy methods.

After the meeting at the beginning of the year, GERALYN MILLER, head of genomics direction of *Microsoft Artificial Intelligence and Research*, pointed out that, «*Microsoft* involvement in this project is a logical next step after the creation of the Innovation Centre. Latvia has defined its strategic vision for data-based development, and we are ready to become one of its partners on this path – by enlisting our researchers, allocating technologies and resources for scientific development and innovation with international potential.» *Microsoft* has provided access to its cloud so that a prototype for data infrastructure could be created there. Bāliņa says that this is the first time they are supporting scientists in the Baltics. «*Microsoft* has a gigantic research capacity, its research budget is bigger than our government budget. Big international corporations see genetics as one of the future directions, the question is which corporations will have the best tools for data analysis, which corporations will develop the best algorithms for data processing. Our researchers can improve algorithms, they can help understand how to improve usability,» LU Professor justifies their interest.

Because of the sensitivity of medical data, the issue of data security is currently important worldwide. Researchers use pseudo anonymized data stored in a safe cloud in the European Union. Their use is possible only with the consent of patients. It still has to be decided how to manage permissions, because there may be patients who consent to have their data used in one study, others – in several. It is also necessary to provide a solution for patients, if they so wish, to report the results of the data analysis, for example, if there are any identified health risks.

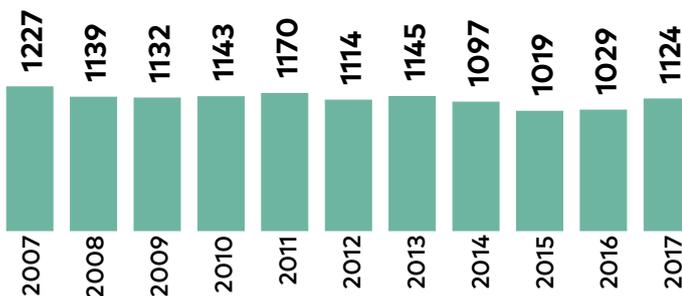
Pilot and Replicate

Why was lung cancer selected for the pilot project? It is one of the most common malignant tumors, with a high incidence of late diagnosis. It is an aggressive disease affecting many people, moreover, a large amount of lung cancer tissue material has already been accumulated in Latvia – formaldehyde-fixed and paraffin-embedded tissue samples. Bāliņa says



«Combining the knowledge of Latvian universities, hospitals, and of large international corporations, we can create something new and good. The world is absolutely open, the question is whether we are open to it,» says Signe Bāliņa, Professor of the Faculty of Business, Management and Economics, Deputy Rector for Digital Society Matters of University of Latvia (LU).

The number of newly registered patients with bronchial and lung cancer in Latvia



SOURCE: CENTRE FOR DISEASE PREVENTION AND CONTROL

this information cannot be used without the consent of the patients, which in most cases is no longer possible. Therefore, it is planned to hold a discussion as part of the project on the use of retrospective material for research. «If we have such useful material and want to use it for the good of the people, why not?» asks Bāliņa. They also plan to create an innovative lung cancer biobank by collecting both retrospective and prospective materials: the above-mentioned formaldehyde-fixed and paraffin-embedded tissue samples, as well as fresh frozen tissue samples, blood, plasma, clinical, laboratory and histopathological data. Until now, Latvia's standardized lung cancer biobank has not been available.

So far, a lung cancer risk calculator has not been developed in Latvia. It is a methodology for risk assessment, early

FOR INFORMATION

—In the European Union (EU), the economic impact of big data in high-growth development scenario will grow from EUR 50 billion or 1.8 % of the EU gross domestic product (GDP) in 2015 to EUR 111 billion or 4.7 % of GDP in 2020, according to IDC data. A similar development scenario in Latvia would mean that in 2020 the economic impact of big data will be EUR 1.26–1.38 billion, depending on the GDP growth rate.

SOURCE: MICROSOFT LATVIA

diagnosis, and prediction based on big data. Diagnostic imaging methods and a biopsy are used to diagnose the disease



Nowadays, together with mathematicians, physicists, biologists, IT specialists, and artists, we are already working on genetic research and regenerative medicine, with virtual and robotic technologies, to increase human well-being. This cooperation has enabled us to take the next step in the field of personalized precision medicine, taking into account the specific biology of the patient (genes), environment, and lifestyle.

ANDREJS ĒRĢLIS,
CARDIOLOGIST, PROFESSOR OF THE DEPARTMENT OF INTERNAL MEDICINE
OF LU FACULTY OF MEDICINE, IV WORLD CONGRESS OF LATVIAN SCIENTISTS
IN JUNE 2018

during which a tissue sample is taken for examination. LU scientists offer to use the latest generation of sequencing techniques to evaluate tumor specific mutations not only in tissues but also in blood, which determines the development and risk of lung cancer. Finding correlation in the tissues and blood, prospective blood tests («liquid biopsy») could be used as an early diagnostic method, which would be more affordable and less painful (invasive) for the patient.

If the two related projects develop successfully, Latvia could become an example of good practice and replicate the principles of data usage in the medical and health infrastructure for other illnesses, by inputting more and more varied data, as well as help other countries. «That would be a revolution in medicine,» thinks Bāliņa. ●



«Science has two ways: develop a product but have no idea where to use it, or you have a problem you need to solve. This is the second case,» says Andra Blumberga, Professor of the Institute of Energy Systems and Environment of Riga Technical University (RTU).

text / Lāsma Vaivare
photo/ Elīna Karaseva

Life with a Plastic Bag on Your Head

Insufficiently ventilated rooms reduce the productivity of an individual person, which may endanger economic growth in the long run

For over a decade, the European Union has been investing millions in insulation projects in public and private sector buildings with aiming to reduce energy consumption along with greenhouse gas emissions (GHG), extend the lifespan of buildings and make its rooms more comfortable. The houses are becoming warmer, heating costs are becoming lower, residents and building managers are becoming happier. Understanding the fact that the building has become almost airproof after insulation comes afterwards. Same with the realization of what kind of energy resources and costs are needed for mechanical ventilation that is installed to achieve air circulation in an airproof building. To avoid new expenses instead of planned savings, some people choose not to ventilate, others open their windows. Windows do not stay open year-round, especially in the cold months of the year, sometimes windows cannot be opened fully for security reasons. In addition, when you open the window, indoor heat flows out into the atmosphere, which basically contradicts the objective of energy efficiency projects.

It is not as pronounced in residential areas, but in buildings where a lot of people congregate, for example, schools, pre-schools, offices, and convention centres, air quality is significantly reduced due to increased amount of carbon dioxide (CO₂) and volatile organic compounds (VOCs). «On the one hand, there are regulatory requirements for indoor climate, on the other hand – high costs. It is called the energy efficiency, indoor air quality, and thermal comfort dilemma,» says Andra Blumberga, Professor of the Institute of Energy Systems and Environment of Riga Technical University (RTU). Together with her colleagues, she



Studies have been carried out in Portugal to show that windows are kept open in schools, providing normal ventilation when the outdoor temperature exceeds 16 degrees Celsius. If the temperature drops to 11 degrees, they keep the windows shut. In a large part of the world, the average air temperature during the school year is below 11 degrees. The problem is the sufficient air exchange in the rooms, and it is severe, says Andra Blumberga, Professor of the Institute of Energy Systems and Environment of Riga Technical University (RTU) and Ritvars Freimanis, scientific assistant, with *dummies* – a breathing tubes that are simulating a human.

has been studying energy efficiency issues from technical, social, and political perspective for years. «Science has two ways: develop a product but have no idea where to use it, or you have a problem you need to solve. This is the second case,» she adds, stressing that this dilemma is currently important to the whole world and that it still lacks a proper solution.

Brain cannot function without air

«It is like breathing inside a plastic bag,» Blumberga finds a comparison for insufficiently ventilated rooms for daily use. Substantially increased CO₂ and VOCs levels affect health – they may lead to eye and respiratory irritation, headaches, nausea, movement coordination impairment, visual impairment, allergies. There may be damage to the liver, kidneys, blood circulation, and the central nervous system, serious illnesses may develop. Insufficient air circulation greatly decreases the productivity of people inside the building. «CO₂ is not poisonous, but it is making people tired, decreasing productivity. In the long run, what does that mean for the GDP? A number of foreign studies show that high CO₂ levels in schools lead to labour productivity decline, which results in

lower grades that make young people unable to enter good universities. This raises the question: what kind of added value can such an incoming labor force create? In the UK, the relationship between the grades students get in schools and salaries they receive when entering the labour market has been studied, concluding that there is a strong link in the long run,» she says. A 15 % reduction in productivity in schools equals one school year. PhD student Liva Asere has created a system dynamics model for evaluating the long-term impact of the presence or absence of ventilation on students' grades and GDP. Previously, she modelled the cost of ventilation in relation to productivity.

Sounding the alarm for years

Pēteris Apinis, President of Latvian Medical Association, a few years ago emotionally proclaimed that during the cold months of the year, children in schools do not have enough air. Health Inspectorate, which implements the study of environmental quality and safety in educational institutions since 2017, also draws attention to the fact that the ventilation quality of the schools surveyed during the school year 2017/2018 only partially complies

FOR INFORMATION

— The ventilation of school premises plays a very important role in ensuring the quality of the study environment. Insufficient ventilation and low-quality indoor air is a fairly common occurrence in schools, especially when it is cold outside. Students and teachers most often complain about the lack of oxygen and fresh air, stale or stuffy air. Non-ventilated rooms have excess moisture, increasing the concentration of carbon dioxide (CO₂), and increasing the risk of infectious diseases, as due to insufficient air exchange, disease-causing microorganisms multiply in the room. All of the above can seriously affect the health of both students and teachers, as well as the quality of learning and teaching, because increased CO₂ level can have a direct impact on physical and emotional/psychological well-being, can worsen cognitive processes in humans: attention, perception, representation of knowledge, problem solving, creativity, etc.

SOURCE: HEALTH INSPECTORATE



FOR INFORMATION

__Developing an indoor air purification biofilter equipment to address the energy efficiency dilemma in buildings (BIACRED)

__The goal is to develop innovative biofilter equipment that would solve the energy efficiency, indoor air quality, and thermal comfort dilemma in buildings – it is typical for buildings where a lot of people congregate: schools, convention centers, offices, etc. CO₂ and volatile organic compounds (VOCs) are the main indoor pollutants.

__Team – Andra Blumberga, Ritvars Freimanis, Didzis Rūtītis, Sarma Valtere

SOURCE: RTU

As part of the commercialization strategy, we were carrying out market research. We visited schools, met with principals, assistant managers, mayors as owners of buildings, university specialists, went to offices, window manufacturers, architects, and designers. We talked with everyone. The conclusion is that the extent of the problem is dramatic. But, mayors are not too interested, and principals understand the seriousness of the situation, but do not know how to deal with it. Consequently, our target audience is parents who have the right and authority to request changes in schools.

ANDRA BLUMBERGA,

PROFESSOR OF THE INSTITUTE OF ENERGY SYSTEMS AND ENVIRONMENT OF RIGA TECHNICAL UNIVERSITY (RTU)

with the standards recommended by the World Health Organization and the type of ventilation in schools or their ventilation regime is only partially capable of maintaining the health of the students and safe indoor air quality.

Performance indicators are not as great – according to the Ministry of Economics, in most sectors of the economy, productivity is well below the EU average. In addition, there is an increasing gap between productivity and labour costs in Latvia.

Bring an artificial tree in the room

How do we solve the problem of having no air? Blumberga is considering various possible solutions, such as creating a green wall equipped with a watering and irrigation system inside, so it would absorb CO₂ and turn it into oxygen. Research has led to the conclusion that it is not feasible from a technical standpoint, because in order for it to be effective, one person would need 5 m² of the green wall. Artificial photosynthesis also holds the researcher's attention – individual scientists in the world are trying to create a big artificial leaf, but a lot is still unknown about it. She has more information from the researchers at the University of Columbia, who

have been developing the idea of an artificial tree for several years: it uses intelligent materials – membranes – and absorbs the CO₂ in the environment, thus combating the problems caused by global warming. «Why can't we use the artificial tree principle inside, and, using ion-exchange membranes, carry out CO₂ absorption and desorption without energy consumption?» the professor remembers the moment the idea was born. Biofilter equipment could be located in the ceiling, its membranes would have pores that absorb CO₂, which, when influenced by moisture, would be released and disappear outside the building. Combined with the green wall, the result could be even better, as plants are not only able to absorb and release CO₂, but they can also absorb VOCs.

Experiments have already been carried out under laboratory conditions, the researcher is showing a *dummy* – a *breathing tube* that is simulating a human. By raising funds available thanks to the Investment and Development Agency of Latvia (LIAA) program *Support for Commercialization of Research Results*, it is possible to develop more extensive experiments, carry out tests under different circumstances, for example, what happens if

they simultaneously turn on the mechanical ventilation and open the windows, etc.? The technology will be optimized during further development, making it more attractive to its users. As part of developing the commercialization strategy, a business consultant has joined the researchers; they have also approached entrepreneurs, for example, Normunds Bergs, CEO of JSC *SAF Tehnika*, producer of microwave data transmission equipment, evaluated the project positively, says Blumberga. It is important to mention that last year the company launched *Aranet*, which offers innovative environmental monitoring solutions. This wireless, industrial grade environment monitoring solution measures temperature, humidity, and CO₂ levels in a large area. The researchers have also analysed the market and designed a factory where they would manufacture the biofilter equipment, to understand how much investment they would need.

Even though the technology offered by RTU researchers will not provide fresh air circulation in the room and it cannot be considered an alternative to ventilation, it solves a problem that no one managed to solve any other way. ●



Facts are Facts

text / Lāsma Vaivare
photo/ Elīna Karaseva

Just as a bridge cannot be built on the basis of fictitious physics, public debate cannot be based on fictional facts, however now it is happening – facts are more and more often replaced by emotions. Who else, if not scientists should be able to say that facts remain important?

Jānis Sārts, NATO Strategic Communications Centre of Excellence director, addresses the question to scientists. «The problem is that public trust is declining, because what they say often does not fit the format for receiving news that people are accustomed to – quickly, brightly, emotionally, simply. I do not want to say science should become the same, but remember that if we do not talk to people, they will become more and more subject to emotion and will appreciate facts less and less. And such a society has no prospects for the future, Therefore, I urge you to think about what you say to the public, how you explain what you are studying and doing,» he emphasizes.

Why is it of immediate interest to talk about the changing habits of information consumption?

We are currently experiencing the most major change in the consumption of information in human history, more important than when Gutenberg invented the printing press. At the moment, the changes are

even more fundamental as the environment in which the information circulates changes, and thus books no longer serve as the means to understand the world and gain knowledge. Here I see problems for science, which is shaped by the circulation of information the way it was in the old world, where books were sought after. Many science institutions and universities are in fact being excluded from public processes: there is a sense of frustration that nobody is listening to them, so they are increasingly retreating into their own shells and no longer engaging in current day-to-day processes outside of science. It won't do! Society needs knowledge. Society needs expert opinions. Therefore, scientists must adapt to the new environment. This does not mean that if you have a *Facebook* or *Twitter* account, everything is fine – it also applies to the ways we interact.

We are collaborating with King's College London in strategic communication, they are struggling with the same challenges as our scientists. Together we created a very popular product, *Fake News: a*

Roadmap, a book written by researchers about fake news, but in a way and form that is understandable for a person who does not read scientific publications. The book has become compulsory literature for the English Government communication professionals. So it was perceived as easy to read but substantial enough to use it on a daily basis.

There are scientists who are only concerned with scientific publications and the ability to cite them – their narrow field of study will only be known to the scientists themselves. This leads to what was said at the *Brexit* debate, «Britain has had enough of experts.» And then we leave these experts aside, because we do not like their opinion, and if we do not like it, why listen to it? It threatens society's ability to navigate the information environment, because the main reason why we are listening to someone is not their knowledge, ability to prove what they say with facts but whether we like them or not.

The environment is changing, we can no longer do anything with it, and scientists,



in my opinion, have a duty to adapt to this environment for the benefit of society. I do not mean that we must abandon scientific research, but scientists must try to transform it and make it comprehensible for the environment where information is currently circulating. People make videos where they explain things, they use other formats to explain intricate science publications, because society is still interested in knowledge, only the way they receive it has changed. How do people in their twenties gain knowledge? First, they go on the Internet, watch a *YouTube* video, a series of videos, at the end, they might come across a book. If you start with books, your ability to address society diminishes.

Scientists can be different: there are more open and more communicative ones, and there are more reserved ones. Additionally, older scientists were educated when a different system was in place, they have acquired knowledge in a totally different way, it is perhaps more difficult for them to adapt to the new reality. So what should we do? Wait for the generation of scientists to change?

No. I greatly appreciate scientists, I know they can adapt. It is their job to explore and use other ways to find out what was previously unknown. The ability to explore new things and accept them is what makes a true scientist. In order to be respected in the scientific environment, you must have a certain amount of publications, others must cite your works, but we can gradually move towards making the ability to address a society one of the criteria for the quality of a scientist. Knowledge is valuable when it is available. The

fact that one person knows something does not make the knowledge available. At a time when the public is increasingly confused because it has trouble coping with what is happening around, scholars must be a pillar on which we can rely – if necessary, they can simplify the information to explain things to a person without prior knowledge, or, if necessary, they can use highly nuanced facts for their reasoning.

The concept of expert has now devalued. We see that a person learns some refined terminology and begins to blog about topics he or she has no clue about, and it fascinates people. I usually ask young people how many self-diagnosed illnesses they have thanks to reading the Internet. How do you know that on the other side of the computer screen there is someone with at least minimal medical knowledge, and not a magician from South Africa? It's impossible to tell.

We must remind society about the role of scientists, but scientists must adapt, too.

How would you assess the ability of Latvian scientists to communicate with society?

There is a wide variety of scientists. Some are very interesting, for example, listening to Vjačeslavs Kaščejevs made me rediscover physics.

Journalists have the habit of asking attractive and famous people to comment on a wide range of issues, including those that are not related to the professional competence of the individual. Is this not slightly devaluing the role of an individual as an expert?

People are asked for opinions about

different things, the question is whether you speak about it as a member of society or as a scientist and expert. It is not a bad thing that they ask for opinions on various things, it is important to prevent them to call people experts in that specific field. In my opinion, I am qualified to speak about strategic communication, I can quite well talk about military matters, but if I was asked to comment on physics, I could only share my point of view, perhaps it would be silly, and it definitely would not be an expert opinion. If the question is about physics and they define me as «Jānis Sārts, expert» the result will be horrible. But this is a question of media responsibility.

You have repeatedly spoken about the information bubble in which the society lives, both in the media and during various events. Do scientists also live in their own information bubble?

Definitely. It is not only scientific information bubbles, there are bubbles related to specific topics and those who are interested in them.

Each of us is in a bubble, created by both our contacts and social media algorithms that deliver information similar to what we have previously liked. Taking into account our cognitive tendencies, we easily believe it. So, first of all, you must be aware that what you see and what appears to be your information space is not an information space, but your informational bubble. A typical example: people in Latvia were shocked when Donald Trump was elected president of the United States. Wherever you looked at, everyone was laughing, no one will vote



Using the term «truth» is counter-productive. To say «everyone has his or her own truth» means that facts can be like this and like that. Facts are unchangeable! I draw a hard line: everyone has his or her own opinions, but facts are unalterable.

JĀNIS SĀRTS,

NATO STRATĒGISKĀS KOMUNIKĀCIJAS IZCILĪBAS CENTRA DIREKTORS

for him, they said. He became president. It was our own information bubble, we did not consider there were other information bubbles nearby.

For people who want to be up to speed on different issues, I say – go outside. Consciously become part of another information bubble. Sometimes it is physically unpleasant because it is contrary to your existing belief system. You want to stand up and go away. On an instinctual level, our cognitive tendencies act up – we do not want to listen to opposing views. You must learn to deal with it. And scientists know how to do that, they objectively look at facts, whether they want to or not.

There are times when it seems that you have done an important job, but it is not important to anyone outside of a narrow group. Do you have the slightest idea what other people are thinking about, why they are not perceiving your thoughts? Maybe listen to them. You might ask me why, I do not want to spend time on it. Then do not be shocked when it turns out they also do not want to spend time on you. To burst the bubble, you have to go through a deliberate process, and it is not easy.

I suspect that a person who has extensive knowledge and a certain vision will feel unpleasant, but it is easier for them to escape from the bubble as they understand why it is necessary. What do you propose we do with the segment of society that does not understand or does not want to understand the need to blow up the bubble?

This is a paradox. We assert that we are living in the Information Age, but we do not equip society with knowledge on how to function in this age. It is a question of educating people – what they need and do not need in this environment, whom they can or cannot believe, and how to

understand whether and how other people perceive information.

It is necessary to invest in educating society, for example, by organising public campaigns. The first example – campaigns against fake news. For example, we had a *Facebook* game that makes it easier for people to distinguish between what is true and what is not. We should talk about it in schools, universities should also have at least a basic course in order to understand the system of human perception. (Smiling) So to say – are you one of those who believe that it is impossible to verify whether Earth is ruled over by lizards from other planets. The education system needs to have more knowledge and methods that can be used to navigate the information environment, to follow facts rather than emotional waves that talk about the world.

Latvian parliament pre-election battles showed that not always fact-based reports attract a broad public interest. Is society at all interested in understanding and recognizing that facts stay facts?

This is not a matter of interest. We are who we are, we take the easy way out. However, the fact that we do not care about facts is contrary to public interest. Will you or your children cross a bridge that was built not according to the laws of physics? I would not do that. But this is exactly what we are doing right now. We build *bridges* not based on the laws of physics. Afterwards we will be shocked that they collapse. Science says that 80 % of our actions and decisions are not rational, they are emotional and instinctive. People were the same 20 years ago, the difference is they were corrected by the environment where information was circulating. 20 years ago, when you picked up newspapers *Diena* and *Vakara Ziņas*,

you clearly knew what you were reading. The editors checked whether there are facts, offered opinions from both sides, separated the opinion of the journalist from quotations of another person. In the new informational environment, it does not really exist anymore. Moreover, the traditional media, seeing that their business model is no longer popular, are scrambling and making the situation worse.

The new technological flow of information... It does not mean that now it will only be like this and nothing will change. Technology is neutral, the question is how people use it; they can create and develop algorithms in ways that show corrections just as well. Sadly it has not happened yet.

Yes, people will act based on emotions and instincts, and unfortunately, in the current informational environment, extremely emotional messages have the greatest impact. You need to understand that whatever we see on *Facebook* was calculated by an algorithm, the same goes for *Google*. We need to adopt rules that place responsibility for misconduct in this informative environment, too. There is a phenomenon before us that has not been corrected. Yes, these parliamentary elections take place in an environment where everything is possible and many players use it deliberately or unwittingly, but I hope that after some time we will be able to correct the situation.

Latvia's situation is not unique, it is similar to other countries in the world, right?

Right. We are a typical representation of this phenomenon, our unique feature is that we are a small country, but we have a certain amount of skepticism towards everything. Consequently, the degree of immunity may be higher for us than

for some other societies, but it does not mean we are immune as such.

There is a certain correlation, which is not entirely true, between the quality of the education system and listening to your gut when making decisions.

At what age should children be taught how to differentiate between facts and emotions in the information environment?

We must definitely talk about it in school. Additionally, we should be aware that education must provide a strong foundation, as the technological environment is constantly changing, we are already talking about the technology of yesterday, but the technology of tomorrow will bring new changes. Therefore, it is primarily necessary to develop thinking, ability to think independently, evaluate information, and understand the parameters for judging information. I have a background in history, we always had to criticise sources to understand whether or not we can rely on them. I think it has to be part of compulsory basic education for everyone who consumes information.

The interpretation of big data and the development of artificial intelligence will affect the changes in the information environment. I believe in the future information will have an opportunity to affect millions of people at the same time, however, it will be tailor-made for each individual, using in-depth knowledge of the personality of each person. Science and technology are increasingly offering opportunities to create things that have not been possible before.

Technology is not bad in itself, big data for example provides phenomenal analytical opportunities. The problem is inside people: there will always be someone who wants to use good things for bad purposes.

In the Silicon Valley I have noticed such positive thinking – how we will change the world for the better with the help of technology, but often in the end... In order to avoid this, it is essential to add risk assessment while the technology is developing. For example, I take the latest developments in the field of neuroscience and generate a code to change people's behaviour, which stops them from smoking and drinking alcohol in large quantities. Great! And then someone else appears, uses the same technology and makes people commit suicide for example. We must add modules in the development

phase to make it impossible. This would be a responsibility for universities, where they teach how to build a system, and an obligatory parameter in the internal rules for technology groups.

We also need to look for ways to make the so-called hole, which forms between the moment the technology is created, and the moment when the rules for its use arise, shrink. We cannot issue rules at the same time when technology is born, but the hole should be smaller than it is at the moment.

Finally, society needs moral and ethical debates led by experts to agree on what is permissible through technology. The example I just mentioned: using technology to motivate people quit smoking is good; to induce suicide – unacceptable, because it is unethical. There is a lot of such contradictions. There is a website called *The Spinner* where you can buy a campaign and send it to someone to influence them on a subconscious level. For example, a child may buy a campaign that says «Get your kid a dog!» How ethical is that?

We need a debate about big goals and the egoistic goals of an individual.

Yes, but the product is already available on the market. Before starting to regulate technology, there must be moral and ethical debates. Also keep in mind that fundamental things will change in the future, and it will happen more quickly, we will have to be able to quickly navigate and talk about them.

Do you think people who primarily think about what to have for lunch today will engage in the debate? What if a narrow group of people engages in the debate, and the common view will again be skeptical, «why did you have to decide for me?»

There have always been leaders who lead the way for the people. This debate must also have leaders. Yes, the leaders are not always people with good intentions, but this is how the system works. Therefore, we have a democratic society that makes processes transparent and inclusive. Not everyone takes part in all processes and activities. But that is not a reason for not holding debates. And now we are returning to the starting point – scientists must be leaders because we can rely on them. If they say something related to their field of knowledge, you understand and trust them, as they would base their arguments on data that you might never understand.

So this is a question of trust. As a society, what is our ability to trust like? We do not trust politicians, we do not trust the media, we do not trust in judicial power, we almost do not believe anyone, except...

...except Janka who lives next door, we believe him, right?

How do we build trust?

Trust previously existed, this parameter simply does not work in the new environment. I return to the fact that technology is neutral, a person can create a technology and receive its help, to create a guidance system that has disappeared in our new environment. For example, you can create algorithms that, each time you share something on social networks that is nonsense, or want to read something that is nonsense, it offers you the opposite story, one that is based on facts. We must work on it, such products must be created. If social media does not benefit from this kind of business model, there must be regulations that ensure that in cases that are dangerous to society, businessmen must adapt even if it is not profitable for them.

The Internet is unregulated and it created a lot of benefits, but we are close to the point when the situation needs to change. It will not come easily because we do not want to stop freedom of expression for example, so moral and ethical debates are required before regulation begins.

Is society prepared for stricter regulation? At present, there is a policy of all-permissiveness when freedom of speech is being argued, even if people talk nonsense, so to say, «it is my truth and I have freedom of expression so I am saying it.»

Each person has his or her own opinions, but facts are absolute. Using the term «truth» is counterproductive. To say «everyone has his or her own truth» means that facts can be like this and like that. Facts are unchangeable! I draw a hard line: everyone has his or her own opinions, but facts are unalterable. It is important to distinguish your own opinion from «opinions», which is a tool for achieving change in how society behaves. You may have an opinion that aliens have conquered Earth and control humans in the form of lizards, but if it is a systematic, coordinated action, and many subscribe to it, a change in society has been achieved, it is disinformation. ●



When testing the natural thermal packaging samples at the laboratory, we found out that the result is equivalent to the existing natural thermal insulation materials and it is worth developing and perfecting the idea, Indra Muižniece, RTU Institute of Environmental Protection and Heat Systems lead researcher, comments on their accomplishments.

*text / Lāsma Vaivare
photo / Elīna Karaseva*

Packing in Needles

As the world is drowning deeper into plastic waste, scientists are offering to produce thermal packaging from an undervalued, but a very widely available material – fine needle foliage

Essentially, needle foliage is logging residue, its application possibilities are considerably wider than the ones currently used. «Developing a forest, small branches with needles remain in there. After cutting down trees, the needles and branches can be used for the production of wood chips or under ground cover, so that in case of bad weather the equipment could move through the forest. In small quantities, needles in Latvia are also used in the production of needle extracts,» says Indra Muižniece, RTU Institute of Environmental Protection and Thermal Systems lead researcher. Vecventa Ltd processes needles in Piltene, several companies use processed needles for their products, such as needle extracts and chlorophyll paste, as raw materials for the production of cosmetics and pharmaceutical products. According to RTU researchers, in order to obtain maximum economic, social, and environmental benefits, nee-



40.3

thousand tons of plastic packaging was used in Latvia in 2016, of them only 16.8 thousand tons were processed or incinerated at waste incineration plants.

SOURCE: MINISTRY OF ENVIRONMENTAL PROTECTION AND REGIONAL DEVELOPMENT

700

thousand m³ of needle foliage is the theoretical and technically available extraction volume from forestry in the Baltic States.

SOURCE: RTU IESE

0.8

million tons of needle foliage remain inside Latvian felling sites each year.

SOURCE: LATVIAN STATE FOREST RESEARCH INSTITUTE «SILAVA» RESEARCH



dles should be fully utilized, simultaneously creating several high added value products. For example, after obtaining the extract, the material left behind, which usually turns into bio-waste, could be used for the production of thermal insulation materials. And there would be nothing left behind. «That would be a perfect plan for the sustainable use of resources, in parallel producing several different products from a single material flow. Moreover, it would be economically viable,» says Muižniece, recalling the basic idea of biotechnology – making the most out of resources by creating new products with added-value using technologies, instead of disposing resources or their residues in landfills. A certain pharmaceutical company seems to like this philosophy, as they are already using needle-based substances for their products; the company has expressed interest in collaborating in the development of the sustainable use

FOR INFORMATION

_Natural Thermal Packaging
_The goal is to develop natural thermal packaging from needle foliage – logging residue, that is a widely available bioresource in Latvia.
_The team consists of Dagnija Blumberga, Indra Muižniece, Krišs Spalviņš, Lauma Žihare, Kaspars Ivanovs, Ivars Veidenbergs, Sarma Valtere, and Kārlis Valters

SOURCE: RTU

FOR INFORMATION

For several years, the European Commission has been fighting against plastic waste, which poses a particular threat to the water ecosystem around the world, by restricting the circulation of bags, disposable tableware, cutlery, and other goods, attempts are also being made to use micro-plastics. To mitigate the release of plastic waste into the environment, a plan was announced at the beginning of this year to reuse or recycle all plastic packaging by 2030.

SOURCE: EUROPEAN COMMISSION

INDRA MUIŽNIECE

RTU Institute of Environmental Protection and Heat Systems lead researcher

When we present an idea to business people, we feel that they are mostly interested in whether they will be able to earn and how fast. It knocks scientists off-balance as they place a high emphasis on the environmental, climate, socio-economic benefits of technological development and product manufacturing. It is negligible from the business point of view. We should get used to this, and it is good practice to understand that our scientific ideas sometimes tend to be utopian, what is important to us might be unimportant to other people, that economic justification is of paramount importance. We must adapt to the situation, accept that business people and scientists think on different levels. With this program, LIAA, is trying to bring together business and science, and it is very welcome, because until now it was missing in Latvia. I think the program will nurture scientists who are able to think like business people, but I am not holding out hope that business people will be reeducated. Thanks to LIAA we are looking at things outside our comfort zone, and it makes us stronger.



● Professor Dagnija Blumberga, director of the RTU Institute of Environmental Protection and Heat Systems, is Head of the natural thermal packaging project; she has extensive experience both in scientific work and in business, which is one of the prerequisites for the implementation of the project.

of needles in production, adds the RTU researcher.

Replacing food containers

The thermal insulation material made of needle foliage and an organic binder, which is still kept secret, is environmentally friendly and harmless to human health, biodegradable, and thus does not create new waste mountains, its thermal conductivity is equivalent to other heat insulation materials available on the market, says Muižniece, who has been studying the use of needles for years. Having originally studied the possibilities to create materials for building insulation, she and her colleagues are now focusing on the development of thermal packaging material, which, as the researcher points out, «is essentially a thermal insulation material, but for a narrower application.» At the moment, research and development is being carried out thanks to the EU financial support for the programme Support for Commercialisation of Research Results administered by the *Investment and Development Agency of Latvia (LIAA)*.

«We have identified all our weak points and we are working to find a compromise between the various factors that affect properties. We are planning experiments

where we will look at how the factors interact in order to obtain the optimal result. It is essential that the physical and mechanical properties meet the requirements of the thermal packaging and that the end product is user-friendly,» explains Muižniece. Packaging must also protect the product from fluctuations in external temperature during transportation or storage, and its mechanical resistance is also important. «At present, there are different sizes of thermal packaging: from small boxes for ordering takeout at restaurants or grocery stores to huge containers for transporting large-scale products. Therefore, the material must be strong enough to produce large-scale packaging. We are focusing on packaging of similar size and shape to compete by offering an alternative to existing ones. Large-sized thermal packaging is mostly made from polyurethane. The main value of our material is that its life cycle does not have an adverse effect on climate, the environment and human health, it decomposes in nature,» emphasises the researcher.

Currently, they are working on secondary packaging material – one that does not come into contact with food or medication. It is necessary for transporting various food, pharmaceutical, cosmetic,

chemical products and other substances. They plan that in the future it will follow the primary packaging, which will replace lunchboxes made from synthetic materials.

In the name of development

To make sure that there is market demand, a number of processors of wood resources working in Latvia have been introduced to samples of thermal packaging created in the laboratory. «First of all, we contacted local companies, because we want to use Latvian resources and to develop our national economy,» the researcher is patriotic

Business interest is an essential prerequisite for the commercialisation of scientific ideas, which in turn is the goal of the programme administered by the LIAA. Over the next two years, scientists are planning to develop their technology to a degree of readiness to conclude a license agreement with one or more manufacturers. Researchers do not want to start their own company because «scientific institutions do not prioritize starting a business, we focus on selling the idea, we are looking for buyers who will bring our innovation to life. In turn, we will invest the money back in research and science to develop new ideas.» ●

text / Lāsma Vaivare
 photo / Artis Mihailovs, Elīna Karaseva

CREATORS OF SOUND EFFECT

Although everyone in the room falls silent when they hear sales figures from the sound effects company *Gamechanger Audio* during the national selection semi-final of the startup competition *Creative Business Cup*, the company's founders say it is just the beginning





The presentation shows a sales revenue curve – since the summer of last year it only goes up and in August of this year reaches almost 920,000 EUR. Soon there will be a reason to celebrate, says Didzis Dubovskis, presents the *Gamechanger Audio* achievements to the *Creative Business Cup* jury. The company creates innovative, new guitar pedals – the *Plus Pedal* and the *Plasma Pedal* – that have already gained recognition; both industry media and world-renowned musicians took an interest in them, even guitarists from *The Rolling Stones* and Roger Waters. They have a steady flow of new product ideas, including an ambitious plan to create a premium-class musical instrument.

It is just the beginning

Still, Ilja Krūmiņš, Chairman of the Board and co-founder of *Gamechanger Audio* says the following: «All of us live thinking that this is just the beginning.» To date, the number of pedals already sold and those to be sold by the end of

BUSINESS CV

- SIA *Gamechanger Audio*
- Field: electronic equipment manufacturing
- Founded: December 2016
- Owners: Ilja Krūmiņš, Didzis Dubovskis, Kristaps Kaļva, Mārtiņš Meļķis
- *Creative Business Cup* national selection finalist

SOURCE: GAMECHANGER AUDIO LTD

the year (which may be around 10,000) is very far from the number of guitarists in the world. There are about 50 million guitarists and a large part of them might want to try using the company's innovative pedals. Why? «These products have value,» Krūmiņš quickly finds the answer. The development of the *Plus Pedal* began at the end of 2015 and its production started last summer; similar to a *smart looper*, it uses a special sound synthe-

sis algorithm to take the sound coming from an electric guitar or other melodic instrument and prolongs it similar to how a *sostenuto* pedal on a grand piano would work. Even visually, the *Plus Pedal* is similar to a piano pedal: Fricis Kalvelis' design was praised by the *National Design Award of Latvia 2018* jury, who recognized it as one of the award winners. In turn, the *Plasma Pedal*, the production of which is only at an early stage, is a *distortion-type* pedal that converts sound into a series of continuous high-voltage electric discharges within a xenon-filled tube. This is the first guitar pedal that uses this technology – this special concept allows the musicians to see electric discharges as they play.

A musician strives for perfect sound throughout his life, his relationship with equipment is like an endless story, Krūmiņš speaks from personal experience. «When we were studying at school and university, our band was the most precious thing in our lives. First you buy



Gamechanger Audio team – Didzis Dubovskis, Mārtiņš Melķis, Ilja Krūmiņš, Kristaps Kļava and Frīdis Kalvelis - is convinced that being a niche product is great, especially if the niche is huge.

are buying *a pig in a poke*. In the case of *Plasma Pedal*, *Gamechanger Audio*, as part of the crowdfunding campaign also created a unique online platform that allows to upload a sound file, choose pedal settings, and remotely test it in real time. Krūmiņš shows us how it works and ponders – it could actually be a separate business project, because nobody else had ever thought about creating something like this before. They had no opportunity to test the product before announcing it on the international market – the company had to win the trust of their potential customers and the media. Krūmiņš recalls the beginning of 2017, when they debuted at the National Association of Music Merchants in the US and presented the *Plus Pedal* concept. «We had two copies of the pedal. The website was completed the night before our flight, we created a pre-order option – pay now and get the pedal after a few months when it's ready. We were still adjusting things at the airport and the hotel, uploaded a *Facebook* video on the pedal and asked our friends to share it. After four or five hours we received a message that a guy from Singapore bought our pedal – we were sitting there, totally speechless. It started a chain reaction. In the morning there were already five purchases, the next day – about 80,» tells the co-founder of the company and I cannot shake the feeling that he still cannot fully believe in everything that happened. What motivates buyers to engage in crowdfunding campaigns by buying something that does not yet exist? The feeling of exclusivity, says Krūmiņš. Some people like to be pioneers, they like owning things others do not own yet. The second reason is much more rational – when buying in advance, the price of a product is much lower. *Gamechanger Audio* earned nothing from selling their first pre-orders. «But it is of no consequence, the key is the cash flow, it allows us to work,» says Krūmiņš.

True, the cash flow limits the size of pedal batches, which somewhat slows down the expansion of sales to traditional stores. As the Chairman of the Board says, «we are constantly sold out.» There is also a plan to expand the network of

shops, which would sell pedals, and distributors from distant markets are beginning to show interest. The company has distributors in Japan and South Korea. *Gamechanger Audio* has no problem with English-speaking markets, as there is no language barrier.

We asked Dubovskis whether they consider attracting investors under such circumstances, he responds negatively, as he sees no point in doing that – the company is still very young, there is no plan to use human resources on finding investors.

Land of intelligent people

Gamechanger Audio is collaborating with *Hansamatrix*, one of the most advanced electronics systems manufacturers in Europe. Before that they collaborated with craftsmen who created pedal plates. Krūmiņš says that Latvia is a great place for creating technological companies: it has intelligent and technically-minded people, attested by the company itself, whose two co-founders Mārtiņš Melķis and Kristaps Kļava graduated from Riga Technical University (RTU). Another plus they mention is Latvia's relatively cheap labour and rent, good hardware infrastructure, various options for getting support, easy access to different professionals and practitioners. «To develop a prototype, you can go to RTU Design Factory,» Krūmiņš mentions an example. He studied music in London and he can say with full confidence that starting a business there would be much more difficult. «I would have no clue how to begin, how to get a metal sheet cut with a laser and folded with holes for screws in London. Without GBP ten thousand there would be no point to leave the house. When we started working, we drove to Jugla to some mustached guy's place and for 20 EUR he twisted the metal piece exactly as we needed. This is not a story about production, but about availability and speed, which is very good in Latvia. And there are people who can work. Latvia is a cool place to start a business: the possibilities of the Internet, social media, and crowdfunding allow us to present ourselves to the whole world, receive first investments and go places,» he summarizes. ●

a new pedal for your guitar, and only then think how you are going to pay for rent,» he says.

Pioneers

The company received a seed loan from *Imprimatur Capital Seed Fund* and support from the *Atspēriens* program. The latter was used to start the production of parts in China. The company has been developing so far without investors or borrowing funds – they ran two crowdfunding campaigns. They were successful, for example, this spring, they started a *Plasma Pedal* campaign on *Indiegogo*, and on the first day alone managed to collect more than 100,000 EUR. Altogether, both campaigns have brought in 400,000 EUR. that they will use for production, mentions Dubovskis. The company's operating model is to create a prototype, run a crowdfunding campaign, produce and deliver the product to clients and move forward.

To a certain extent, the customers of the company, especially the first ones,



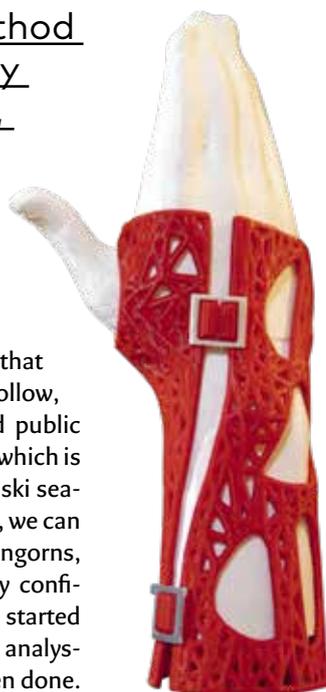
The main problem during the first year was to survive, we were working non-stop in an apartment, we started renting our first office at the beginning of the year, and now we found a new one because we want to expand, say *CastPrint* co-founders Sigvards Krongorns and Jānis Oliņš.

text / Lāsma Vaivare
photo / Artis Mihailovs

Riga is under our Thumb

A 3D printed cast is an alternative to the traditional method of encasing limbs in traumatology – having convinced clinics in Riga, CastPrint Ltd is thinking about exporting

«Since the beginning of summer, when we understood that Riga is under our thumb and the rest of Latvia will soon follow, we have been actively communicating with private and public clinics in Finland, Estonia, and other Northern countries, which is our first target market. Next is the rest of Europe, Alpine ski season will start soon... The business model in Latvia is clear, we can replicate it in other markets as well,» says Sigvards Krongorns, co-founder of *CastPrint*. He and his colleagues are very confident, they are very ambitious. Two years ago, when they started their business, they were even more ambitious, however, analysing the work done so far, it can be said that much has been done.



CastPrint developers are enthusiastic, they complement each other, make a lot of jokes, you can see that their progress inspires them. They are getting ready for Midsummer festivities, because their former office lacks space for a significantly larger and more powerful 3D printing machine, which they were able to buy with the funds from the *Atspēriens* grant program. The new office is located in the immediate vicinity of a health care institution owned by a large country. Perhaps, this means that soon the 3D cast will be available not only in private health care facilities, such as the *Health Centre 4*, the *Polyclinic of Health Centre Union* in Pļavnieki, and others, but also in state clinics. «National hospitals know who we are and where to find us,» says Krongorns, the *CastPrint* solution was also brought to the attention of insurance companies.

The new industrial 3D printer allows making larger casts, which opens the way to expand the use of 3D casts – at the moment it is primarily used for fractured fingers and hands, sometimes for fractured feet, but now it is possible to print braces for treating leg injuries. In turn, it means capacity building, opportunities for experimentation and new solutions.

The Eilands factor

The *CastPrint cast* is made from polylactic acid for each patient individually. It is flexible, lightweight, thus less restrictive of movement, reducing time and financial resources, which are needed for full rehabilitation after the injury has healed. It is also waterproof and allows the skin to breathe. At the beginning of this year, the 3D cast was prominently featured by musician Ralfs Eilands, he basically became a walking *CastPrint* advertisement – since then, user interest has increased dramatically. Having learned about the musician's trauma, Janis Oliņš, the co-founder of the company, looked him up through acquaintances and offered to try the 3D cast. The musician not only agreed, but even sent the *CastPrint* guys a video from Thailand, where he was enjoying his holiday, praising the solution they had offered. «Now he redirects his acquaintances to us,» Oliņš is happy. This summer's hot weather also contributed to the customers' interest. «In the summer heat, when it was 30 degrees outside, it was twice as scorching for us. We had to come in in the middle of the night to print the next cast. Those were pleasant problems. We understood that we were doing something right,» adds Krongorns.

The second boost to the accelerated business boom was the participation in the *Startup Wise Guys* accelerator last fall, which provides training, mentoring, and EUR 20,000 initial investment. In total, they attracted investments worth EUR 50,000 from several sources.

CastPrint also got acquainted with other support instruments for new companies, and their opinion is that Latvia is a cool place to start a business, but in order to grow, you have to consider international opportunities. Not everything is as beautiful in a start-up's life as it looks like in social media and magazines. The start-up environment and system have significantly improved over the last two years, «hats off to LIAA and the Ministry of Economics», however, the tax system in the country is still changing, and it must also be taken into account that everything is based on hard work, which will give no results 99 % of the time.

Listen to the doctors

Developing a medical technology start-up is time-consuming. «If an app goes wrong, it's a trifle – one misstep in medicine, and it is all over. We have to check multiple times before we do anything,» explains Krongorns. Also take into account

BUSINESS CV

__SIA *CastPrint*

__Field: medical 3D printing

__Founded: September 2016

__Owners: Jānis Oliņš, Sigvards Krongorns, Matijs Babris, and *Startup Wise Guys*

__*Creative Business Cup* national selection finalist

SOURCE: SIA CASTPRINT

AFTER TEN YEARS

Anyone in the Northern countries will be able to enter a private clinic or public hospital and choose *CastPrint* or any other innovative fracture fixation method, without being subject to the technology that appeared in the Victorian era. The company will become a medical technology platform that will offer clinics new, innovative solutions in the field of 3D technology – for rehabilitation, prosthetics.

Will the company still belong to the same people? Jānis Oliņš would like to think that it will, but life can play all kinds of jokes on us. If an offer is made by a large pharmaceutical giant, it may be difficult to resist, admits Sigvards Krongorns. He wants *CastPrint* to become Latvia's first unicorn.

that doctors are more conservative than app users – if casts have been proving their efficiency for 200 years, why replace them with something else. It takes a long time to persuade them to try something new. So how did they manage to do it? Krongorns says the following: «We do not persuade them, we learn from them.» During their first year of business, they proactively met with medical staff, learned all about the treatment process, costs, due dates, identified all the parties involved, their needs, and studied clinical terminology. The investor and the company's medical consultant, who has a background in the pharmaceutical industry, suggested not to act quickly, because in medicine you cannot try and see what is going to happen. It was the doctors who told them not to compete with the cast that doctors put on the patient immediately after the fracture. They offer *CastPrint* as an alternative used during the long-term treatment phase, which often lasts for several months. Namely, the 3D cast is made after the second visit, when the surgeon verifies that the fracture

is healing. Then the patient might have to wait a bit: in order to make a 3D cast, the injured limb is cased in the clinic and the information is sent to the company, which commits to deliver a ready-made cast within three days. The printing process is not that long, but it is necessary to ascertain the quality and safety of the product, because only if the product is necessary for all the parties involved, convenient to use, and integrated into the common medical system, it may become sought-after.

Fascinating 3D Technology

Did the idea of a 3D cast come from personal experience? Did you break your arm? Yes and no. «We left our previous jobs, related to audit. For half a year I annoyed Jānis, I told him I wanted to print something, I find this technology fascinating,» admits Krongorns. «We started with virtual reality, then we switched to 3D printing,» adds Oliņš, who has been indirectly related to the medical field all his life. His mother and grandmother are physicians, he previously worked for *Silvanols*, a pharmaceutical company. It was Oliņš who, after several months of brainstorming, has come up with the idea of printing casts. They found a million pictures on the Internet, but it turned out that one is a designer project, the other – a prototype. Nobody had a full-fledged product, which does not mean that there is no one in a garage out there working as hard as the *CastPrint* guys. Other innovative solutions for fracture fixation are also available on the world market, such as thermoplastic, glass fiber and cork products, the air bubble method. The Latvian company also estimates that in the future they could offer the thermoplastic method, which would not be a cast substitute for fixation of fractures, but a way to help with chronic illness, such as carpal tunnel syndrome or scoliosis.

The story of how the idea was born also features a broken arm. Oliņš once broke the tip of his elbow, he still remembers how unpleasant it was, because the huge cast did not allow him to wear a formal shirt or jacket – an auditor's uniform. In addition, it happened during winter, which is an active season for auditing. He was basically chained to his house for more than two months, he could not visit his clients, although the injury itself was not as severe.

After two years of work, co-founders of *CastPrint* say that anyone can print out one cast, but not everyone can create a working system. It requires medical knowledge, financial resources, and *inside knowledge*. *CastPrint* has the needed components. ●



text / Lāsma Vaivare

STRATEGIC PROTECTION

By building up closer cooperation between scientists and businesses and a stronger startup ecosystem in Latvia, the issue of strategic protection of intellectual property rights comes to the forefront

«The protection of intellectual property rights in many companies and research organizations is regulated: it is already determined who holds the intellectual property rights, how these rights are distributed in relation to property generated in partnership with partners, how income from the use of intellectual property is shared, etc. This cannot always be said about the intellectual property management strategy – which markets and growth areas are primary, what they are going to do if they do not find an investor in time for the innovation, in which cases the research organization might set up a spin-off company, etc. Even in universities in the United States, where technology transfer is part of their active work, has developed the strategy. An irresponsible strategy, patenting for the sake of patenting, regardless of whether the innovation will have its market and buyers, and long-term maintenance of patents without using them can lead to significant losses because protection of intellectual property rights is not cheap. In turn, a balanced and proper strategy will bring benefits,» says Lauma Muižniece, lead expert of the Tech-

nology Transfer Department of the Latvian Investment and Development Agency. She mentions that strategically sound protection of intellectual property rights is essential for new businesses, as it can play a critical role in attracting investors.

Being caught in the same trap

There are several common mistakes startups tend to make. Among them is a lack of attention to the development and implementation of the strategy and the desire to do everything on their elsewhere in the world. Just imagine: you have an idea, you are working on a prototype, you have to think about your business plan and how to attract funding, at the same time you are learning how to present yourself, to address potential investors, organise various meetings, create sales channels, but you have limited resources, etc. This is the everyday life of a startup, where the issue of intellectual property rights may not be a priority – «I will deal with these issues, then I will focus on protecting the invention, trademark, industrial design or copyright.» However, potential investors often ask the question of property protection first. By

investing funds, the investor wants to be sure that the innovation will provide him with exclusive rights, that there are no other products or services equivalent to the ones they are investing in, which could suddenly enter the market, that no one will demand compensation for violating their intellectual property rights, that in cases when a startup develops innovation based on a license agreement with a university, the university does not suddenly change any conditions, etc. «It is wonderful if a startup team has an intellectual property rights specialist, but it is not a typical situation. The issue of intellectual property rights is multidimensional and complex, as it features various legal aspects as well as business aspects. Someone may have an understanding of legal conditions, but be less familiar with the business side, management, how to better manage the company and maximize revenue using intellectual property. All intellectual property rights are difficult to master in depth in a short time, so there are professionals, businesses and organizations, that provide support and give advice so that nobody becomes hostage to the situation,» says Muižniece.

Growing awareness

In general, there is a growing awareness regarding the protection of intellectual property rights in Latvia: informational and educational measures for various target groups are being implemented, including technology transfer experts, which promotes turning scientific developments into real products. This is the opinion of Laila Eliņa, Head of Riga Technical University (RTU) Innovation and Technology Transfer Centre, who points out that the Patent Office does a large chunk of the work: they listen to the interests of scientific organizations and organize more in-depth workshops and training, attract high-level experts and use the expertise of the European Patent Organization (EPO) and the World Intellectual Property Organization (WIPO). Eliņa believes that there is a lot of value in the technology transfer training organized by the Patent Office, which also helps with intellectual property rights, patenting, and licensing issues within universities and scientific organizations.

«Over the past three years, we organised more than 130 different events during which we inform people about intellectual property rights, and they have gathered more than 7,000 people,» Sandris Laganovskis, Patent Office director, talks about the training. He admits that the level of knowledge is very diverse, but, for example, participants ask questions and show interest in various events which shows that there are more and more people with a deeper understanding. In order to raise the general awareness level, it would be valuable to integrate intellectual property rights into curricula. «This is a prerequisite for western higher education institutions, regardless of what the student is studying – chemistry, engineering, or law. In parallel, they provide knowledge about the intellectual property system, its advantages and disadvantages. We often encounter instances when people admit that in universities, they had not talked about intellectual property rights when they were students. Consequently, they acquire the necessary knowledge through self-study or come to consult with us. It would be valuable for students of various study programmes to receive information about the system: how it works, that there are national, European, and international levels, IP rights costs, what they need to know and what to look for when starting to manufacture and market a single product so as not to violate the rights of others,» thinks Laganovskis.

Checkmark vs. experience

Laganovskis and Muižniece share the opinion that in essence, the patenting process can be understood as you progress. Thus, for example, the very large number of Latvian and international patent applications received from 2011 to 2013 can be seen as not only fulfilling the administrative requirements by concluding the implementation of projects financed by the European Union, but also as the experience gained and the development of the patenting culture in Latvia. There have been applicants who have asked to make a patent public prior to the required 18 months, which, according to Laganovskis and Guntis Rāmans, the director of the Invention Department of the Patent Office,

FOR INFORMATION

- The five biggest IP mistakes startups make:
- Failure to create and implement an IP strategy.
- Failing to implement appropriate confidentiality controls.
- Ignoring standard IP practices in the race to market.
- Improper document foundation.
- A piecemeal, «do-it-yourself» approach to IP.

SOURCE: WIPO MAGAZINE

suggests that patenting was primarily done for the sake of financial reporting, and not for introducing innovation. «Applicants are often confused, «Why can't you make it public, for example, within half a year, why does it take 18 months?» Then we explain that the system is built in favour of the inventor, because when they submit an application, they get their foot in the door, during this time they can seek partners or investors, and within a year they can choose the geographical area of patenting. After 18 months, the patent will be public and everyone will be able to see its insides,» the Patent Office director reminds us.

Active licensing

According to the Patent Office statistics, universities and research institutions in Latvia are the most active patent applicants. Of all patent applications, half comes from universities, the other half is split between companies and individual patent applicants. The Patent Office

would like to see greater innovation activity on the business side.

RTU stands out among universities and scientific institutions with the largest number of filed patents. Last year, it submitted 22 patents, eight of them were related to materials science and chemistry. In general, the university maintains 159 patents, which is less than a few years ago. Eliņa explains that they are arranging a portfolio by maximizing the focus on high value-added patents and market potential. Now, more and more attention is being paid to licensing, which is due to the more active implementation of technology transfer projects. After interviewing scientists who implement projects as part of the *Support for Commercialisation of Research Results* programme administered by LIAA, we can conclude that the establishment of *spin-off* companies is rarely discussed, more often than not, the conclusion of license agreements is considered as a solution to the transfer of benefits to third parties. «Licensing agreements are a relatively new practice, which has been on the rise in Latvia for the last five years due to commercialisation projects. The development of license agreements is extremely complicated – it is somewhere between art and science. There are no two equal agreements, there are no pre-made agreement templates where you only need to input the amount and interest. Contract development is based on negotiations between the two stakeholders – the licensor (the seller) and the licensee (the buyer). Each technology is individual, for every company that is potentially interested in technology acquisition, and the scientist has his own desires and interests. The license agreement may have different terms, conditions, the payment can be calculated from the turnover percentage, number of pieces sold, etc. It is a great art we want to continue developing further, providing scientists with full spectrum support for intellectual property rights,» says Eliņa. RTU has six valid license agreements.

No one fights in Latvia

Muižniece discusses the complexity of license agreements and related risk factors. Before concluding an agreement, it is important to understand the strategy of the potential partner, for example, there are cases in which licenses are obtained by companies that do not produce anything and are not willing to do so, but the agreement provides a payment for each unit sold. Then, if the agreement is drawn

FOR INFORMATION

- __ Solutions for protecting IP:
- __ Inventions are protected by patents.
- __ Appearance of a product is protected by industrial designs.
- __ Distinctive signs are protected by trademarks.
- __ Not only literary, musical, and artistic works and their performers are protected by copyrights – it also covers software.

SOURCE: PATENT OFFICE

up the wrong way, the patent owner will be left with nothing. There are also cases where patents are only purchased to earn money by litigating, limiting the opportunities to produce for other companies, rather than producing themselves. It is a good idea not only to research the patentability of your idea, but also a *freedom to operate* analysis to understand how freely you would be able to use the invention, whether it will violate the rights of another owner – this information will be important for investors or, for example, those who wish to conclude a license agreement or own the intellectual property. LIAA recommends that technology transfer projects carry out this analysis while they are working on the commercialization strategy and the technical and economical feasibility study, or soon afterwards.

In Latvia, intellectual property disputes are mostly related to the use of trademarks. Scientists and businessmen are not at odds with each other. Eliņa says that collaboration with companies is strictly regulated before it even starts. As for contract research cases, there is no reason for discussion at all: the client pays the university and owns the rights. Eliņa mentions: «The rules of the game are clear. Young scientists do not ask questions at all, because they already think like scientists/entrepreneurs and they feel comfortable in a multifunctional collaborative environment.» ●

RECOMMENDATION

LAUMA MUIŽNIECE

Lead expert of the Technology Transfer Department of the Latvian Investment and Development Agency

Not only is the information described in the patent important, but also additional data available to technology developers. There is knowledge described in the patent, and knowledge, such as clinical trial data or experiment data, that is not directly included in the patent. Without further transferring the knowledge to an investor or technology developer, there may be problems with product development – they have the technology, but what can they do with it? Therefore, when purchasing a patent or concluding a license agreement, it is important to understand if additional knowledge is needed.



Find the best solution for everyone

KRISTAPS BANGA

Head of *Accenture* innovation in Latvia

As a large IT company, it is important for us that all members of the ecosystem are motivated to work and bring new inventions to the market. *Accenture* and other big companies have the opportunity to launch Latvian inventions and innovations onto the global market, but it must be in line with the best international practices. At the moment, observations show that in Latvia, quite a lot of energy is devoted to reaching an agreement that has all the parties involved satisfied, including the scientist. Often, a scientist is very interested in the project, but does not have much experience in legal and IP protection matters, so the best model would be following examples of good practice and the system as a whole that shows how to deal with such cases. I am pleased that this topic is of immediate interest in Latvia, all parties are aware of it and are trying to find the best solution for sorting out the issues not only in theory but also in practice, which is reflected by the growing motivation from the scientists. *Accenture* takes the global science area of focus seriously, we are supporters, cooperation partners, and are actively engaged in research work in the company. It is relatively easy to reach an agreement when both parties are involved. A greater challenge is the tripartite or multiple parties cooperation model involving educational institutions, research centres, businesses, industry associations, and scientists, when there are multiple applicants for the intellectual property rights of the invention. At the same time, I believe that Latvia needs way more R&D centres in different fields where scientists could work and create new products and innovations. There are various models around the world dealing with IP issues – there is no need to reinvent the wheel. A rather popular model is when large companies and associations pay membership fees to R&D centres and have the opportunity to see the demonstrations first, but they are supporters, they do not own intellectual property rights, they only have the rights to be the first entity to agree on the commercialisation of the idea. The best model in Latvia should be negotiated, involving all ecosystem participants, while not neglecting the interests of scientists. It is important to understand that if a scientist feels at risk, he will not be motivated to spend time and energy to create something new and meaningful. At the same time, intellectual property rights are very much related to business ethics – similar to startups, scientists are sometimes afraid of engaging in a project, so as not to implement ideas without them, however, we all want Latvian inventions to be launched onto international markets to compete with goods and services of other countries. Consequently, Latvia must create a healthy and open ecosystem, so that all parties – scientists, educational centres, startups, companies, the public sector – come together for a common purpose and work – develop Latvia as a powerful environment for creating and implementing innovations.

IS IT EASY TO BE A YOUNG SCIENTIST IN LATVIA?

IEVA SILIŅA

Association of Latvian Young Scientists chairwoman

«The history of recent times in Latvia is exciting, while looking at it from the outside. It has been interesting to live in these times, but it was not easy, which is particularly reflected in areas that are not a matter of survival. One of them is science – it defines the welfare of society, but only after many years. The shortage of scientists in bumpy years has created an interesting situation when scientists in Latvia are divided into *young ones* (here we take into account their scientific age) and the *old ones*, who have a lot of experience. Being a young scientist is both an advantage and a challenge at the same time. They live in a global environment, they are citizens of the world. They are pragmatic because they know they need to earn funding for their research on their own. The global research environment offers a lot of benefits, but it also has a very high level of competition. Young scientists want to be informed and make informed decisions. They are aware that personal experience and information provided by colleagues is no longer enough, so they join groups of like-minded people, follow up-to-date information, and use technology, such as *Elsevier SciVal*, an analytical tool for

scientific information. Scientists evaluate both their scientific performance and the relevance of their research interests in relation to global trends, seek partners and sources of funding, and choose scientific institutions to further their career development. In general, young scientists are pragmatic, logical, well-informed, and have extensive contacts in Europe and the world. Most have studied or worked abroad, and collaborate daily with colleagues from other countries. They choose the topic for their research not only depending on their own interests, they take into account the possibilities to obtain funding, partners, and global trends.

For example, all *PostDoc Latvia* studies comply with the state-defined smart specialization (RIS3) priorities. It implements 199 postdoctoral studies worth more than 26.5 million euro. Topics are of immediate interest to the world, such as the development of a non-invasive methodology for the early diagnosis and control of skin cancer, the development of new magnetic functional nanomaterials for use in medicine and biotechnology, the development of new, significantly faster quantum algorithms, the development of a solution for visualization of Internet elements in outdoor and indoor conditions, the creation of a database for describing the warming and cooling of interstellar dust from cosmic rays.» ●

Types of studies

Industrial
156

Fundamental
43

SOURCE: STATE EDUCATION DEVELOPMENT AGENCY

199

Number of studies carried out with PostDoc Latvia

26.5

The value in millions of euro of the projects implemented with PostDoc Latvia

POSTDOC STUDIES IN SMART SPECIALIZATION AREAS

Area	Number of studies in stages 1 and 2	Research funding (million EUR)
SMART MATERIALS, TECHNOLOGIES, AND ENGINEERING SYSTEMS	55	7.36
BIOMEDICINE, MEDICAL TECHNOLOGY, BIOPHARMACY, AND BIOTECHNOLOGY	51	6.80
GROWTH PRIORITIES	28	3.72
INFORMATION AND COMMUNICATION TECHNOLOGIES	26	3.48
KNOWLEDGE-INTENSIVE BIO-ECONOMY	24	3.17
SMART ENERGY	15	2.01

[Find out more about three *PostDoc* scientists, who, while presenting the work of Latvia's young scientists this year, took part in the special *ResearchSlam* event during the *IV World Congress of Latvian Scientists*. The goal of *ResearchSlam* is to introduce the public to research and scientific work, carried out by young Latvian scientists in an easy to understand, interesting, and entertaining way.](#)



text / Lāsma Vaivare
photo / Elīna Karaseva

Head Cannot Be Disregarded

People want to be able to smile and live their lives to the fullest at any age, says Anda Slaidiņa, Associate Professor of Riga Stradiņš University, who has been researching osteoporosis of the jawbone for a long time; thanks to modern diagnostics, namely the condition of the jawbone could be the first indicator of osteoporosis

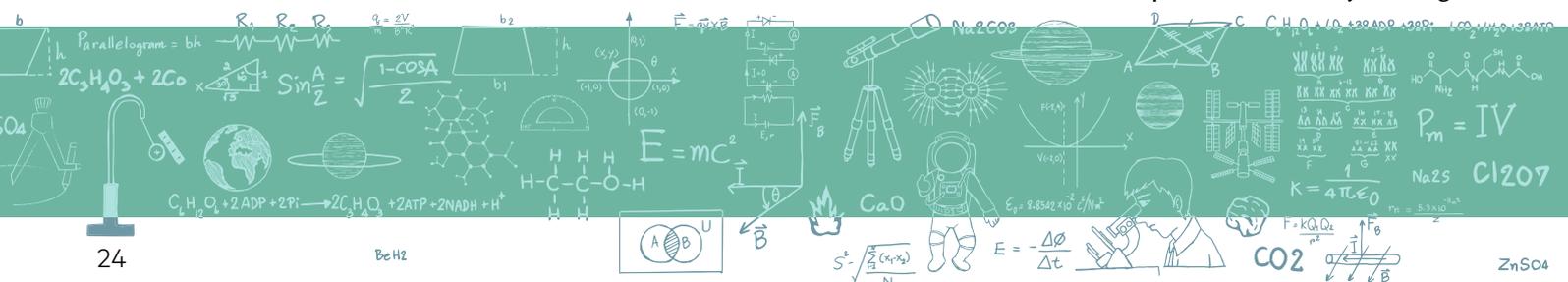
«Osteoporosis-induced fractures could cause disabilities, they could even lead to death. Consequently, early diagnosis and treatment of illness is important. For us, dentists and dental prosthetists, timely treatment of osteoporosis is also important, so that the strength of the jawbone is maintained for longer and our work is more productive,» explains Anda Slaidiņa, Associate Professor of Riga Stradiņš University.

Every year, osteoporosis is the cause of almost 9 million broken bones; this disease, characterized by bone density loss, results in fragile bones prone to fracture even when performing light physical activities or receiving minor injuries. It affects about 200 million women worldwide; after turning 50, one out of three women and one out of five men worldwide experience bone fractures induced by osteoporosis – International Osteoporosis Foundation statistics are harsh. They also show that in the future, the situation will become increasingly complex, which for the most part is related to population ageing and a longer life expectancy. Osteoporosis is closely related to age: its most common form is osteoporosis in postmenopausal women.

For a long time it was believed that osteoporosis did not affect the jawbone, when eating and chewing, it is under a heavy workload, says Slaidiņa. And then she adds that for a long time, the jawbone was not viewed in tandem with the rest of the skeleton, oral and dental health was not part of the overall picture of a human's general health status. Now, the situation has changed.

Keep your smile

For dental implants or removable dentures to be comfortable and functional, and for the patients to avoid complications and be satisfied, the volume and quality of the jawbone are extremely important, explains the Associate Professor of Riga Stradiņš University (RSU). The bone has to have enough mass and density – porridge would not hold teeth in place, she uses a comparison. «Besides, you can get





implants at any age – all people want to be able to smile even when they are 85 or 90 years old. It is obvious that at that age, a person's health status is worse, there may be chronic illnesses, they constantly use a variety of medications, all of this should be taken into account,» the scientist highlights the importance of research.

Often patients with osteoporosis have fewer teeth or have periodontal diseases. However, some research results showing correlation between reduced bone mineral density and the number of lost teeth are contradictory. Research carried out as part of Slaidiņa's Doctoral Thesis did not give an unambiguous clarification why postmenopausal women with reduced bone density might have fewer teeth, even though it showed some trends, such as x-ray examinations showing changes in the structure of the mandibular cortical bone in case of osteoporosis – it becomes thinner and more porous. Likewise, the research did not show that reduced bone mineral density significantly affects the speed of bone deterioration after losing teeth. At the same time, the research concludes that x-ray examinations carried out for creating a dental treatment plan are tools for determining the risk of osteoporosis. However, a test targeting osteoporosis is not readily available to everyone – there is not enough equipment, financial resources, and professionals, while people go to the dentist more regularly. When the dentists detect changes in the jawbone, they can recommend undergoing specific tests for determining bone density. «Osteoporosis-induced fractures could cause disabilities, they could even lead to death. Consequently, early diagnosis and

treatment of illness is important. For us, dentists and dental prosthetists, timely treatment of osteoporosis is also important, so that the strength of the jawbone is maintained for longer and our work is more productive,» she explains.

Dentistry is evolving: currently 3D x-ray examination has become the standard for dental implants, orthodontic treatment, and root canal quality evaluation. It allows us to measure bones more accurately and detect osteoporosis, that is why Slaidiņa is continuing her postdoctoral studies and using the diagnostic capabilities of 3D. She also has high hopes that further research gives answers to controversial issues.

The advantages of having bad teeth

Oral and dental health indicators in Latvia are lower than in many other countries in Europe, and dentists regularly remind us to form proper dental health habits from an early age. Scientists think that having bad teeth has its advantages – there are a lot of patients with toothless jaws, so it is possible to measure the remaining amount of bone, study the correlation with osteoporosis. «Latvia is a good place for this type of research,» Slaidiņa admits.

Research participants were selected among the patients of RSU Institute of Stomatology. In parallel with research, Slaidiņa also trains new professionals and works at the Institute of Stomatology – she is an Associate Professor with the Department of Prosthetic Dentistry and a certified dentist and dental prosthetist.

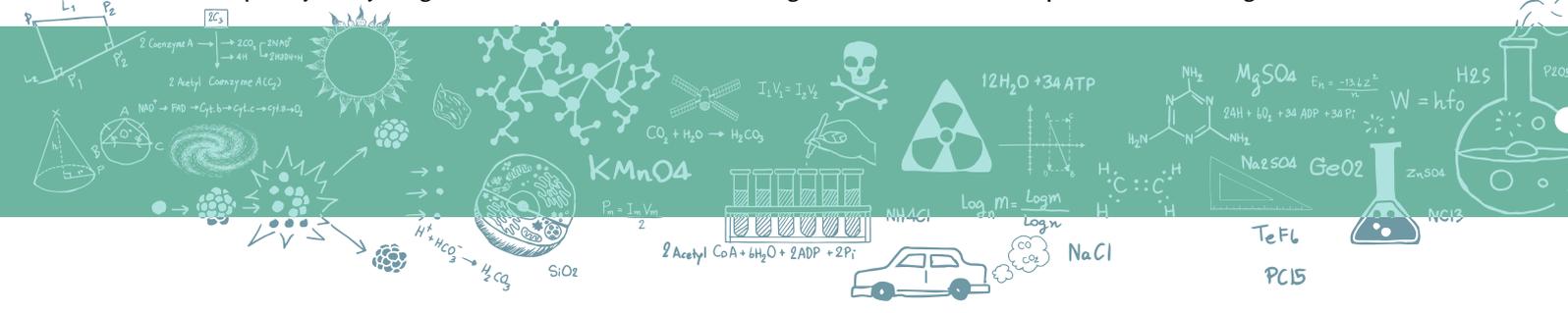
«I do not work in a laboratory, I conduct clinical research. I also provide medical treatment and training, so I do not achieve

research results as quickly as I would have, if I were 100 % devoted to science. On the other hand, working in several fields is never boring, besides, I see the importance of my research, its benefits for the patients, and how it works in practice. The results are satisfying because my patients gain an attractive smile. Whereas scientific work makes my life colourful, it makes me use my brain more,» she admits.

No dental anxiety as a child

Slaidiņa admits that as a child, she did not think of becoming a dentist – she decided on this career path when she was a high school student. «I had good teeth, my first cavities appeared when I was a teen, when dental equipment was already modern, dental offices pleasant to look at, all drills shiny. I thought it was so beautiful! I had a positive impression of dental care. During school years I liked drawing, I was interested in biology, thought of studying it, at the same time I thought about medicine, because my grandad was a professor, and my grandma – a dentist, who I sadly did not meet because she died before I was born. Starting studies at medical school was slightly scary – you have to study for a very long time, but the pay was small at the time. Dentistry seemed like a good solution. In addition, there is no shortage of work for dentists – dental health in Latvia is not too good,» she says. During university years, both orthodontics and prosthetics seemed equally interesting to her. The year she graduated, graduate medical training was not available for future orthodontists, she had to choose – wait several years or choose prosthetics. She chose the second option and did not regret it for a moment. ●

No.1.1.1.2/VIAA/1/16/139 Contract No.9.-14.5/189





«Work really excites me,» says Kristīne Šalma-Ancāne, Lead Researcher of the Institute of General Chemistry of Riga Technical University

Šalma-Ancāne, Lead Researcher of the Institute of General Chemistry of Riga Technical University (RTU) has already made a name for herself: in 2016, her research on the development of bone implants was awarded the *L'Oréal Scholarship for Women in Science*, she was also named the RTU Young Scientist of the year. She is regularly invited to give presentations about biocomposites, the role of women in science and how compatible it is with family life. She is perfecting her knowledge and sharing it with school and university students, happily admitting that it is great to get feedback.

She talks about science with enthusiasm and says she has never regretted the path she has chosen in life. From time to time she asks herself whether the choice was right, but only to make sure that her research is exciting and to feel the uniqueness of the scientific environment and to «touch the scientific values.»

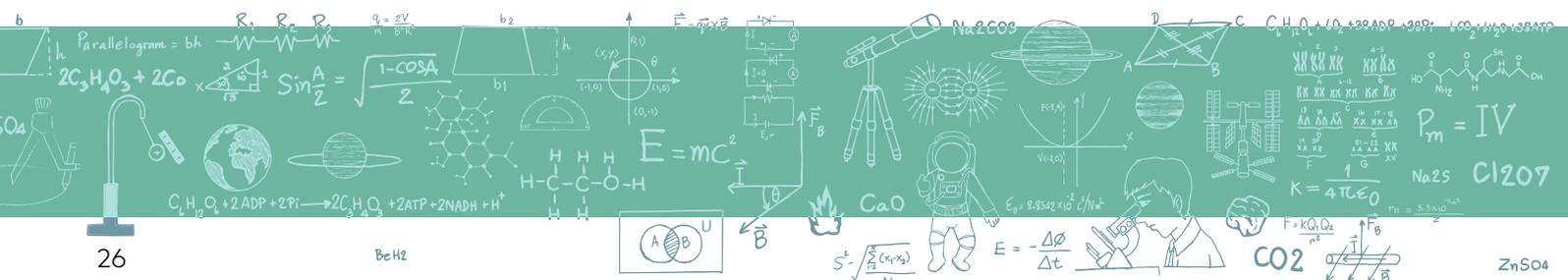
text / Lāsma Vaivare
photo / personal photo

Expert of Human Spare Parts

Kristin Šalma-Ancāne, a Riga Technical University researcher, is hoping to create a composite material in the near future that would promote healing and regeneration of broken osteoporotic bones, while also treating the destructive disease

Research continuity

«The patients will see what we are now investigating in the laboratory after fifteen years,» says the researcher who will finish her post-doctoral research project on multifunctional composite materials based on calcium phosphate and biodegradable polymers for the treatment of bone tissue engineering by 2020. «Osteoporosis-induced bone fractures do not heal well. It creates huge problems for patients because the bones do not renew themselves. The developed composite material will operate in two ways: it will heal the broken bone and treat osteoporosis, providing local input of osteoporotic medication where it is needed,» the researcher outlines her work, adding that this is a continuation of her and her colleagues' long-term research at RTU Rūdolfs Cimdiņš Riga Biomaterials Innovation and Development Centre. She is convinced that a few years after completing the post-doctoral project, research in this area will continue.



At the moment, they are actively developing the material, checking whether they are displaying the correct characteristics, so it is not yet possible to say what the final form will look like. Šalma-Ancāne does not rule out that they might create a material that could be injected in the injured area. Namely, it could be a foamy material that fills the injured area. The material would stimulate the formation of new bone cells and, partially dissolving, topically administer medications to damaged bone tissue. The researcher says that minimally invasive injections for cartilage repair surgery are already known, as well as bone void fillers, individual drug-containing implant materials have been developed, such as stents, which are used to expand vessels in case of cardiovascular disease. The uniqueness of her research lies in the structure and specific properties of the composite, in its dual nature, to simultaneously regenerate bones and treat osteoporosis.

«It would be easier to fill the bone fracture with implants, but the main idea of the study is to promote bone healing. When people break bones, the surgeon initially evaluates how the fracture can heal without using auxiliary materials. The most important thing is to secure the fracture by firmly joining the bone fragments. Therefore we use casts, plates, and in very serious cases we use screws. Synthetic bone resuscitation materials are only used if some bone fragments are so severely broken that they can no longer be put together like puzzle pieces. The injection material would give the right impulse for the bones to heal on their own. Depending on the severity of the disease, osteoporosis patients develop bone cracks, bones become more fragile, in very severe cases the bones heal very slowly or do not heal at all; they break even when people perform simple movements, fractures happen even without strenuous exercise, and as a result, people become disabled,» the researcher explains.

However, adding drugs to composite materials is challenging. Namely, it limits the technological processing of the material, because the medication is often thermally unstable.

Copying bones

RTU scientists have gained extensive knowledge of osteoporosis by collaborating with Riga Hospital No. 2 doctors on scientific research projects for several years. The hospital is interested in collaborating in search for better substitute materials than those currently on the market, and they are already successfully using bone implants developed by RTU scientists – calcium phosphate granules. Even when the material has proven its effectiveness, hospitals are not in a hurry to use it, doctors trust certain suppliers and materials whose *behaviour* is safe. «I always tell students that there are three factors that determine the success

of implant materials: patient's health status, material, and doctor's medical experience. Consequently, a doctor can never guarantee a 100 % success rate, because a human's specific attribute will always be present,» says Šalma-Ancāne, continuing to study new materials. Her new composite material is made to fully copy the natural bone structure: its organic and inorganic part. Composite materials consist of calcium phosphate, which is the inorganic part of the bone, and polylysine and polyvinyl alcohol, the natural and synthetic polymer. The components are already used separately in biomedicine, the challenge is to combine them into new composite materials with certain properties.

Be responsible

I am often asked at what stage of osteoporosis disease implants should be used, the scientist admits. At the beginning, bones are not that prone to breaking, doctors recommend taking medicine. Unfortunately, the problem in Latvia is late diagnostics, says Šalma-Ancāne. She believes that people should be more responsible when it comes to their health: «They say – my health, so I do what I want. That is true. However, the impact of osteoporosis on the socio-economic situation in the country is disastrous: people of working age become disabled, which brings huge losses to the state budget, then there are regular manipulations that are carried out at hospitals. Everyone should take responsibility for their lives and understand what the consequences of inaction can be.» ●

KRISTĪNE ŠALMA-ANCĀNE

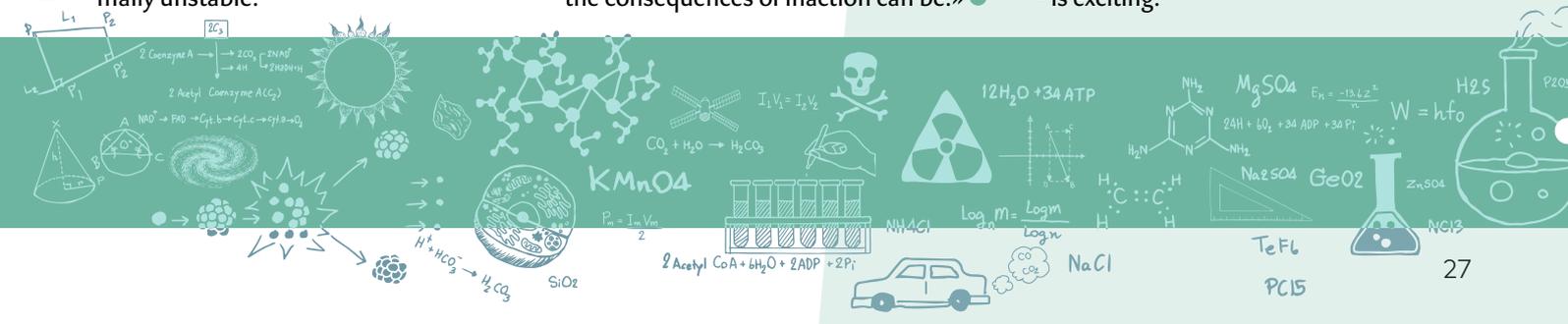
Lead Researcher of the Institute of General Chemistry of Riga Technical University

Young scientists in Latvia have become very active in recent years, they are committed to their goal, and most importantly they are ready to stay in Latvia. They attract funding to stay in Latvia or, if they go abroad, they gain experience and return to Latvia. This has been affected by financial circumstances – we had difficult moments, but it has helped us understand the situation and act in a different way. If we want to work in science, we need to find funding on our own, we need to be competitive in the international scientific community. When I started on my scientific path, it was not talked about so much, there were no such thoughts. Now we understand – we can do it. Everything depends on us: how much we want and what we are able to do. Association of Young Latvian Scientists is also actively working on issues that have not been talked about and resolved for many years. It is essential to change the public opinion that scientists only know how to spend budget money. We attract funding from the European Union funds and let it circulate here, we are keeping the economy warm. And no, science is not a hobby, it is not a leisure activity.

Scientists collaborate with entrepreneurs or become entrepreneurs themselves by setting up new businesses. There is a trend to collaborate closely with industry, of course, the situation in Latvia is not similar to Western European countries where the industry is tied to the academic environment, but the importance of the principle of collaboration is therefore no less important.

Latvia needs practical science, but it does not mean that fundamental science should disappear. This aspect – where my knowledge can be applied practically – is very important for young scientists. An opportunity to fulfill a dream – to create something real, something useful to many – is exciting.

Post-doctoral research project Nr.1.1.2/VIAA/17/16/045





«Scientist's job is not dry, we are not simply sitting in our offices, we explore areas, implement trials, it's all very interesting and exciting, but of course it takes time,» Assistant Professor Līga Proškina, researcher of the Institute of Economics and Regional Development of Latvia University of Life Sciences and Technologies (LLU)

These are the first conclusions made by Assistant Professor Līga Proškina, Eesearcher of the Institute of Economics and Regional Development of Latvia University of Life Sciences and Technologies (LLU), who is doing post-doctoral research on the bioeconomic efficiency of feeding legumes – gray peas, beans and lupins – to red deer.

To ensure the sustainability of agricultural land use in Latvia, increase of the competitiveness of the sector and independence from the fluctuations of feed prices on the world market, producers of food of animal origin need to fulfill several conditions: the product must be of low cost, high productivity, it must be healthy and of good quality. From an economic point of view, in order to increase competitiveness, we need to find solutions to improve productivity while reducing costs. Since fodder accounts for a large part of the total cost of livestock production, the cost of production is partly reduced by using cheaper fodder. This can be achieved by using local food.

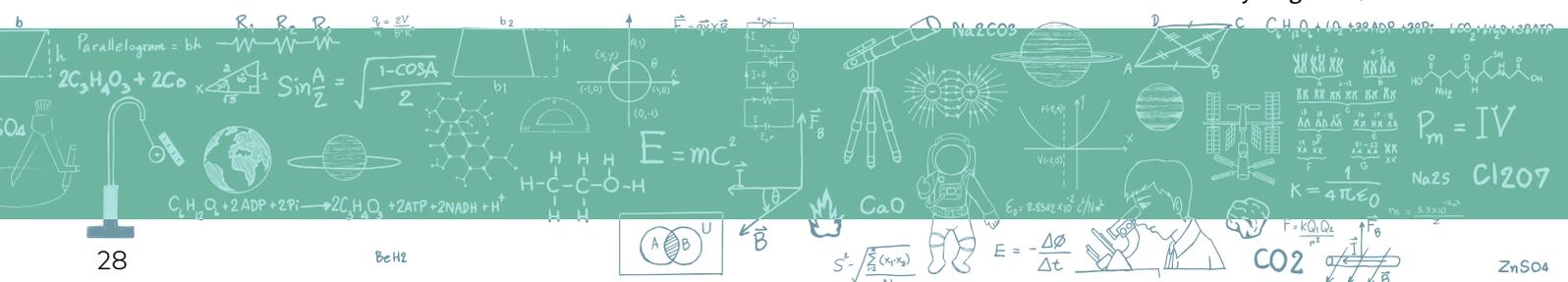
text / Lāsma Vaivare
photo / Ieva Leiniša, LETA

Feeding Animals in Economically Viable and Environmentally Friendly Way

By supplementing the animal menu with legumes grown in Latvia, it is possible to achieve the production of high-quality meat that can be sold for higher prices, and less environmental damage

Feeding deer

«Protein is a very important source of food for both animals and humans. Protein deficiency in Europe is very high. European Union member states (EU) are able to produce only about one third of the protein required for livestock production,» says Proškina. It should be mentioned that LLU scientists have studied the use of protein-rich legumes in the menu of animals, such as birds and dairy cattle, as well as people. Emphasizing that these products have been underestimated and unreasonably forgotten, scientists



have also made snacks from legumes that attract the interest of investors: these snacks can be used similarly to breakfast cereals, bars, and legume spreads.

Proškina's post-doctoral research draws attention to the economic efficiency of the propagation of legumes in a non-conventional, but growing and prospective agricultural sector – deer farming. «In 2000, Latvia had fewer than ten deer farms, but at the beginning of this year, there were 190 deer farms. These farms have a total of about 15 thousand red deer and fallow deer, and around 3000 other wild animals,» the LLU scientist shares data with us. In non-conventional fields of agriculture, there is often a lack of research on the utility of nutrient utilization, the use of leguminous crops in deer farms has been studied minimally; the question of whether it is possible to use legumes to provide farms with higher incomes, increase profitability and competitiveness in Latvia, has not been analysed at all.

From the beginning of this year until the middle of summer, an experiment was carried out in the farm of *Maras deer* fodder beans, gray peas, and lupin seeds were added to the animal menu. «The farm not only provided the facilities for research but also professional zootechnical support and advice on calculating the dose of experimental fodder,» Proškina praises their collaboration.

Lupin seeds are not obtained from flowers that gorgeously bloom in all meadows in the summer, explains the LLU researcher. Seeds of meadow flowers are small, while seeds of specially grown lupin are as large as gray peas. Lupin seeds have a high protein content, animal bodies digest them better than grains, beans, or peas. Soy beans are also a great source of protein. LLU is currently studying the cultivation of soy beans in Latvia – whether it is possible to grow a sufficiently high quality and, importantly, genetically unmodified soy – and use it in agriculture, adds the scientist.

Providing protein to captive deer is a topical issue, especially during winter, when the metabolism of animals decreases, the energy balance is negative and the living weight decreases, as well as during

FOR INFORMATION

Legume planting areas in Latvia in 2017 (thousands of hectares)

__Field beans	42.2
__Peas	14.2
__Lupins	0.5

SOURCE: RURAL SUPPORT SERVICE

Quantity of protein in experimental legumes and fodder (g/kg)

__Field beans	339
__Peas	268
__Lupins	349
__Oats	94
__Barley	112

SOURCE: LLU



the period when deer are growing horns – at the end of winter, during spring and summer, when they need a healthy and balanced diet.

More meat

Three deer groups were created as part of the experiment – beans, peas, and lupin seeds were added to their everyday fodder. The results were compared with the control group, where the legumes were not included in the fodder. Although the results of the trial are yet to be calculated in detail and compared according to their cost, quantity of produce (meat) obtained, etc., they can already assert that legumes added to deer fodder provide both live weight and meat increase. «While we initially thought that lupin would give the best results in terms of productivity, the test group with beans had the greatest increase in meat. Conversely, the increase in the test group with peas was insignificant, which is to some extent a surprise, because in previous birds experiments, peas showed the best results. Of course, birds are not comparable to deer in their structure, but also in studies on cattle, the inclusion of peas in their fodder has yielded an increase in productivity,» Proškina reveals the first results.

At present, we continue to study in detail whether and how the amount of high

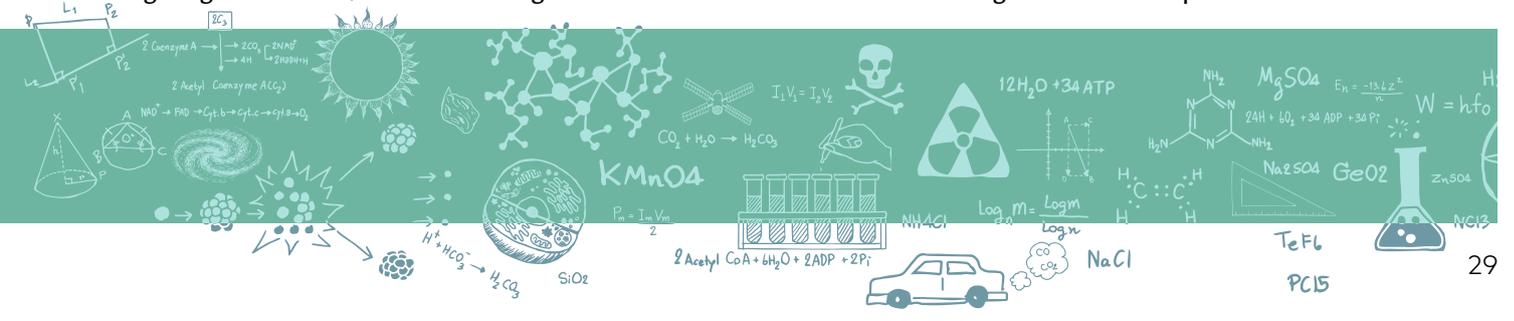
quality meat – ham, fillet, meat chop – changes with the addition of legumes to the animal's diet. This aspect is important for business people, as it gets them higher profits. Although we can use all kinds of meat in our diet, the scientist even says that «oxtail soup is delicious», fillet and ham can be sold for higher prices. The first results suggest that feeding animals with beans and lupin seeds can help increase the proportion of high-quality meat.

«The first results also suggest that legumes are among the nutrients that animals can better digest and use, thus also reducing the environmental impact of agriculture,» she reveals and adds that research is still ongoing. It is important to remember that in Latvia, agriculture is the second largest source of greenhouse gas (GHG) emissions, but the unused nitrogen that animals release (protein food) accounts for about 5 % of total nitrogen oxide emissions, which creates greenhouse gas.

Linking science with business

«We do not carry out tests to simply put the results in a folder and archive them. Research is meaningful only if farms can use it to create additional benefits,» says the LLU scientist. That is why one of her goals is to transfer the knowledge they gained to farmers through various informative activities and research results. As deer farming is developing quite rapidly also in Lithuania, Proškina believes that it would be worthwhile to carry out joint research and produce publications covering the entire Baltic region. It is equally important to make young people – both those who are yet deciding on a path and those who are studying to become farmers – interested and explain the importance of research work to promote an early understanding of the link between science and production. ●

Post-doctoral research project Nr. 11.1.1.2/VIAA/1/16/181



text / Lāsma Vaivare

Hackathon Metamorphosis

When assessing the effect of joint activity of people with different skills in solving a problem in a very limited time, traditional sectors of the economy that are interested in promoting technology and innovation are embracing hackathons common to the start-up environment

Hackathons or technology marathons have no restrictions: they can be local, regional, or global, as demonstrated by the international *Copernicus Hackathon and Climathon*, creating thousands of ideas based on satellite data and practical solutions to problems caused by climate change in 100 countries around the world at the same time, including Latvia, where hackathon is organized by the Institute for Environmental Solutions and the Design Factory of Riga Technical University (RTU). It can happen with equal success in a university auditorium, scientific laboratory, business consulting hall, or inside a TV tower spire and a train car. The way it happened this autumn when 97 meters above Riga the Investment and Development Agency of Latvia (LIAA) in collaboration with Latvian Open Technology Association held a 24-hour open-data software development marathon *Open Data Hackathon 2018*, or an international five-day hackathon *Minsk-Riga Startup Train* organized by Imaguru Startup Hub Minsk and LIAA at the end of summer. There seem to be no limitations regarding topics and fields – while it has already been the second year that the Vidzeme University of Applied Sciences accepted participants of the unique augmented and virtual reality marathon in the Baltic states created by *Overly*, a few years ago Stanford University (USA) hosted a hackathon that offered ideas for using technology for the development of a sustainable meat industry.

Be open to technology

It is not necessary to look across the ocean to find an example, surprisingly here in Latvia there are sworn notaries who organized the *GoatSmartNotary* hackathon. «Notaries are open to new technologies and see the importance of innovation in their work. Latvian notaries are pioneers, as evidenced by a number of recent innovations in Latvia's notarial system. We are the first and currently the only ones in Europe that carry out notarial acts remotely. Soon notary services will be available as a mobile app. We are the only European notaries who introduced a regular proficiency test for ourselves. Soon we will open the Power of attorney register as an online service available for everyone. And we are also the first ones, not only in Latvia but in the whole European judicial system, who are looking for innovative ideas with the aid of hackathons,» proudly tells Vija Piziča, Managing Director of the Council of Sworn Notaries of Latvia. *Go2SmartNotary*, the first Latvian notary hackathon, was organized to enable Latvian notaries to operate in a way appropriate for the era, which is inevitable, given the impact of contemporary society's development trends and technologies, she continues. It was also an opportunity to look at the notary field and its services from the point of view of other sectors.

The winner of the first hackathon was the idea about quickly identifying a person. An app would need a 10-second online session after making a picture of an ID with a camera to collect data about a person from all possible registers and databases. At present, it takes the sworn notary almost two minutes to determine the client's identity in an online consultation, Agris Jaunpujēns, the captain of the winning team and sworn notary, explains the idea. According to the jury, the introduction of such a tool has potential, and it could also be useful for other institutions that need to identify a person.

B2B

«Such events are no longer a novelty, they are a necessity. In the era when technology and industry are growing rapidly, growth is based on open collaboration between industries and companies, where customer business needs-based solutions arise. Participation in hackathon showed us that there are solutions to almost all conditional business problems or challenges,» Evita Breča, Head of the Development Division of State JSC *Latvijas Dzelzceļš*, expresses her opinion. This year, the company participated in the first X-industry hackathon organized by the Latvian IT cluster, and afterwards it continued collaboration with *Datakom Ltd*, implementing a project for the development of intelligent railroad crossings. To improve safety on railroad crossings, they plan to make an intelligent video surveillance system capable to track objects in motion and warn the infrastructure provider of potential dangers at railroad crossings. This system will consist of three components: video camera to capture the signal, video analytics applications, and systems that process

OUTSTANDING HACKATHON IDEAS

__App that would help process requests for vacant pre-school places faster in Riga, facilitate the processing of related documents and inform about the availability of private pre-schools and nannies near your home or workplace. *Open Data Hackathon 2018*

__Augmented reality solution that would transform a paper sketch into a digital solution – you can also see it, instantly. In addition, this information can also be shared with, for example, developers. *Minsk-Riga Startup Train*

__Forest monitoring system using *Copernicus* satellite data. *Act in Space 2018*

__Virtual reality game where you explore a health resort's greenhouse and, by solving puzzles, discover the secrets of the place. *AR/HR Hackathon 2018*

__Smart personal budget planner that retrieves data using the bank's API and other online banking solutions, reducing the amount of manual data entry. *Startup Slalom* fintech hackathon 2017

__A spherical home smart device that is able to move and follow its owner. *Garage48 Hardware&Arts Riga 2017*

__A device that allows deaf people to feel music thanks to tactile feedback and see a visualization of any piece of music. *3D Printing Technology* hackathon

SOURCE: LABSOFLATVIA.LV, IZM, DB.LV, LATA

the signal by handing it to the control centre, the train driver and, in the worst case scenario, the railway signal, Breča explains.

The X-industry hackathon format is different from technology marathons – its participants are mature companies, so everything happens in a friendlier to the corporate business environment. Namely, the n must be found not within 24 or 48 hours, but within five weeks. «We wanted to engage in a meaningful dialogue with companies about the need to focus more on technology deployment. We chose to take practical actions, because educational activities and workshops alone cannot bring us results. In turn, we wanted to show IT companies how to create and implement a new product in collaboration with another industry. Hackathons allow you to get to know the issues of other industries from the inside, because you work in teams, and it's possible to reach a meaningful outcome if you go through the creative cycle under the lead of experienced mentors,» Aiga Irmeja, Latvian IT cluster executive director, explains the idea.

This fall the second X-industry hackathon is taking place, with the participation of construction and healthcare companies. Next year the cluster would like to work on digitizing food industry processes.

Open Your Eyes

You cannot impose innovation and technology on companies, says Irmeja. The company has to come to



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EVITA BREČA,

HEAD OF THE DEVELOPMENT DIVISION OF STATE JSC LATVIJAS DZELZCEĻŠ

FOR INFORMATION

Linking the Future to Innovation

Since 2014, *LDz Cargo* the subsidiary of *Latvijas Dzelzceļš* (LDz) is implementing a modernization project by introducing a technology that controls rail freight – train commercial inspection and wagon number recording system. To install and configure the system, the company collaborates with *Kleintech Services Ltd*, one of the leaders of Latvian IT industry in visual material processing, analysis, and machine reading. Technology shortens the time of technological processing and increases the competitiveness of railway transport.

One of the most important ICT tools for *LDz Group* to achieve its business goals is the automated timetable control system for train movement (KIGAS), which is planned to be implemented this year. One of the benefits of the system is the ability to digitally create and maintain lists of goods and passenger train timetables, thus significantly shortening the time needed to prepare timetables, reducing the amount of human resources involved in the process and improving the accuracy of information.

In 2016, an agreement was signed with the Czech company *CZ LOKO* and the Canadian company *Ballard Power Systems* to develop a solution for a hydrogen-electric locomotive based on the ČME3 maneuver locomotive. *The* prototype was developed in cooperation with the Latvian Hydrogen Association. LDz's subsidiary *LDz Rolling Stock Service* is co-operating with *Baltic 3D.eu* in search of solutions for replacing auxiliary locomotive parts with analogue parts printed on a 3D printer. *LDZ ritošā sastāva serviss* and *LDz Cargo* in cooperation with *DiGAS* is currently implementing a project for equipping diesel locomotives with a dual fuel system.

SOURCE: LATVIJAS DZELZCEĻŠ



LIENE BRIEDE

project manager of RTU Design Factory

Historically, people organized hackathons to create solutions or new IT products by combining different competencies. In view of the surprising results achieved by combining different professionals, experts, environment, and support, the variety of industries hackathons has multiplied, offering challenges in space technology, wood constructions, smart city projects, robotics e.t.c. Hackathons are an excellent platform to meet like-minded people, gain new experience, test your work capacity and the ability to think innovatively and creatively under stress. The greatest challenge is to ensure the continuity of the ideas generated. For for small innovation parties to increase their returns and efficiency, it is essential to involve an industry that not only offers the topic of the event, but also is interested to implement solutions and develop them in the long run.

a decision on its own, but often you are so busy with solving your problems that you cannot find time to think about more effective problem-solving models. It creates a vicious circle. Engaging external partners can help break it, says the IT cluster executive director. Breča also confirms that such events should be considered a good tool for creating an innovation-friendly culture in the company, encouraging employees to think about their daily routines outside the box. «Latvijas Dzelzceļš is changing, it has a particular focus on technological development can end with successful business enhance the company's competitiveness and development,» she thinks.

Hackathon's business aspect was also appreciated by Andris Anspoks, Deputy Director for Innovation of the Institute of Solid State Physics. Organized by the institute, this year the first *Deep Science Hackathon* took place, won by the idea of a non-invasive method for evaluating vitamin D levels in human body – a bracelet with a built-in optical sensor. As Anspoks has pointed out, the hackathon showed that scientists have ideas that can be turned into successful products with business support, and not only for the Latvian market, but for the whole world. This hackathon was the first activity using the Institute's new *Materize* platform; its aim is to promote the export of scientific services and cooperation with the industry in the field of high-tech. «Historically Latvia has always been a centre for high-tech. I believe that we have all the prerequisites for making it so again,» he says. ●

The Role of the Team

MĀRA LASMANE

developer of FoodyCheck, an app for scanning and evaluating food.

The idea was the winner in the *Startup Wise guys B2B SaaS* hackathon, and *Ideju Kauss* competition, it was successfully completed the pre-acceleration program *EstLat-Accelerate*.

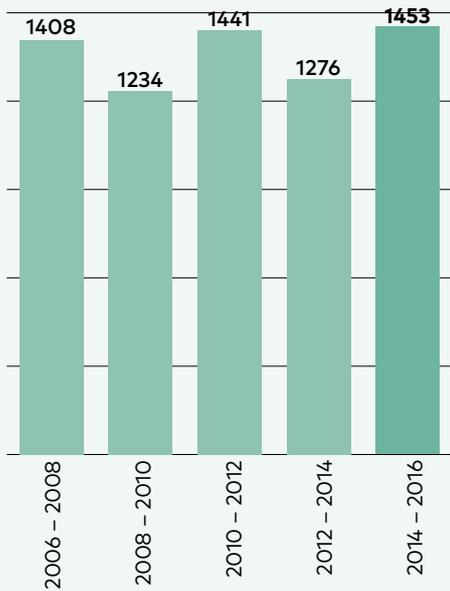
Participating in the hackathon was the right decision. By participating in this kind of event, you get an opportunity to make sure that your idea is valid and understand that you are not the only one who seems interested in this idea and think it is worth it to develop the idea further. The benefits are contacts, an opportunity to meet professionals who you could safely ask all the questions that interest you, get their contact information, and communicate with them even when the hackathon is over. It was also a great opportunity to meet authors of other ideas, programmers, marketing specialists, and other hackathon enthusiasts.

Since the *Startup Wise guys B2B SaaS* hackathon was my first and only hackathon, a lack of experience and an inadequate strategy were my *stumbling blocks*. I went to the hackathon with the idea to participate and find a mobile application developer who would design a prototype for an app based on my idea, but I was not ready for such a big number of people who wanted to join me – my team had eight people altogether. During the team building process, I was warned that my team is too big. I did not listen to warnings, because it seemed that the bigger the team, the more we could do. That was my mistake. We had a problem after winning, because we did not know how to divide the prize. I believe that when you participate, you need to know precisely how many professionals you need and you have to be able to say no to the rest. I had difficulties with team-building and leadership: I had to assign responsibilities to each member and figure out how to keep them busy, although it would have been more useful to do more on my own.

After winning *Startup Wise guys B2B SaaS* hackathon, I continued developing the idea and looking for opportunities. We successfully completed the pre-acceleration program *EstLat-Accelerate*. It seemed we are all on the same wavelength. We took part in *Ideju Kauss* and won. During the competition, I did not feel the team working to the fullest, and thoughts about the development of the idea differed significantly. Unfortunately, our team fell apart. I am disappointed in myself that I could not motivate the team enough, but I realized that we needed more experienced and professional programmers. This year, we redid the design for *FoodyCheck* and are currently looking for an iOS mobile programmer who would be able to put it all in the phone. I have not abandoned the idea, but I am looking for the right team member who could join us. I believe that people are becoming more and more interested in a healthy diet.

Innovation in Latvia

Active Innovative Companies in Latvia (number)



Enterprises most actively collaborating with equipment, materials, components, and software suppliers, followed by other companies in the group, competitors or other companies in the same industry, as well as private sector customers and consumers.



262.7

million EUR was spent on technological (product and process) innovation in 2016.

32.6

million EUR of total expenditure for technological innovation was assigned by the companies for research work in the company in 2014–2016.



29



percent of companies collaborated with other companies or institutions as part of carrying out innovative activities in 2014–2016; collaboration partners were mainly companies or institutions in Latvia and other European countries.

130.7

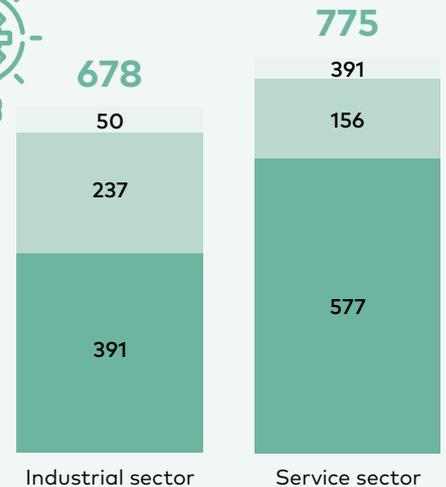
thousand people are working in active innovative companies in 2016



Active Innovative Companies in Latvia in 2014 – 2016

Companies with

- 10–49 employees
- 50–249 employees
- 250 or more employees

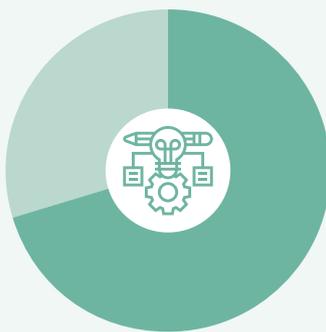


Rarely collaborate with state or public research institutes and private research institutes.



Breakdown of technological innovation expenditure (% in 2016)

- Internal research 12
- Purchase of external research services on other innovative activities 3
- 13



Active innovative companies by type of innovation (% in 2016)

- Companies with technological (product and process) innovations 70.5
- Companies with non-technological (marketing and organizational) innovations 29.5



What hinders innovation?

(Factors hindering innovation activity in companies that considered innovative activities, but decided against it, % of total number of companies, 2014 – 2016)

- costs for innovation activities are too high 52
- lack of funding for innovation activities in the company 50.6
- difficulties in obtaining state grants or subsidies for innovation activities 43.7
- additional burden caused by legislative/regulatory enactments 29.5

