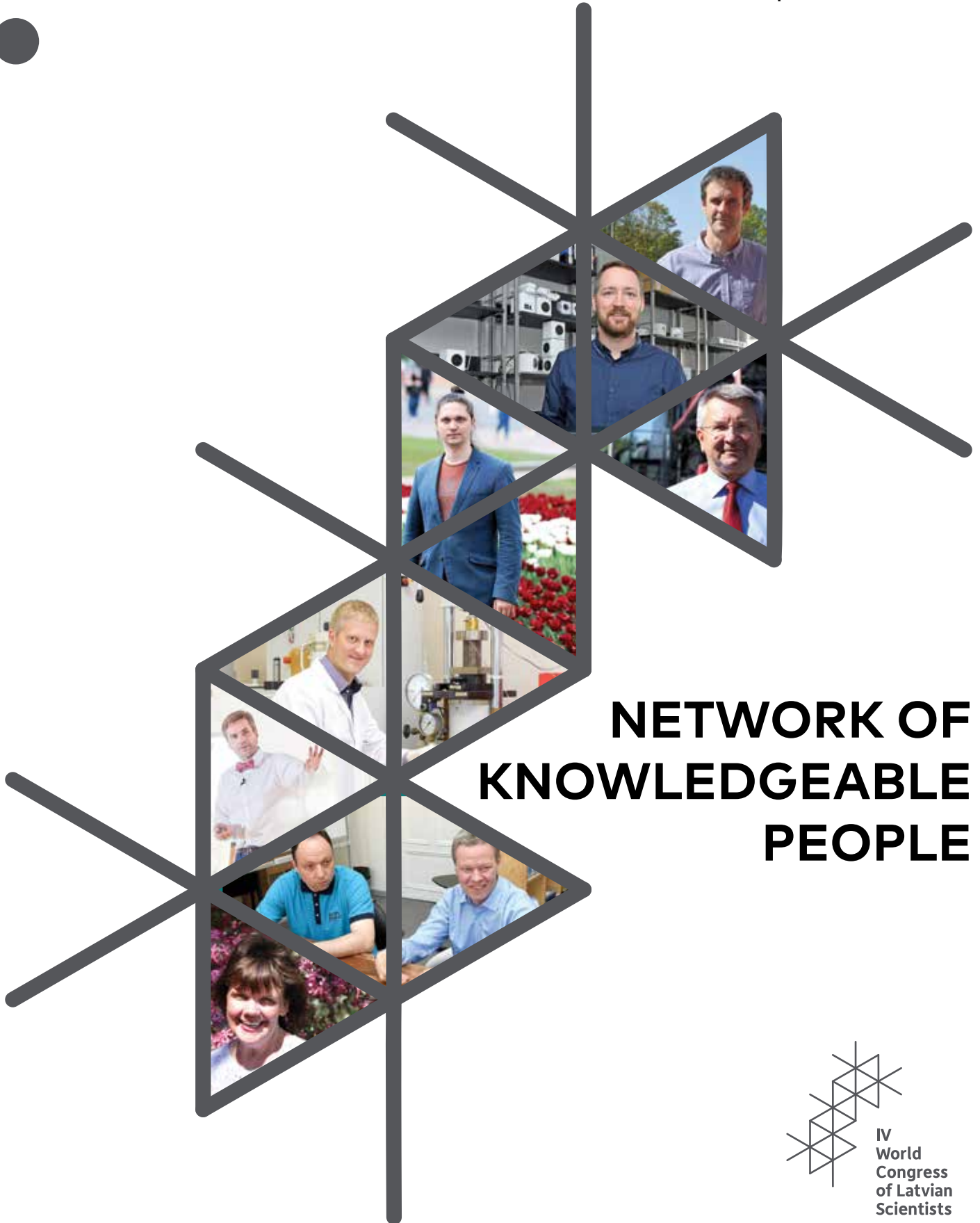


innovation

Science + Business

#4 Special Edition 2018

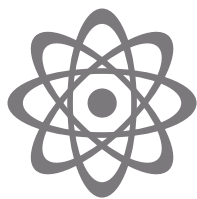


**NETWORK OF
KNOWLEDGEABLE
PEOPLE**



IV
World
Congress
of Latvian
Scientists

LATVIAN SCIENCE IN NUMBERS



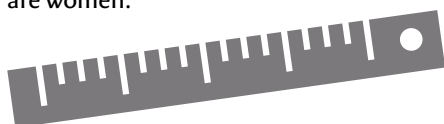
21

The number of publicly funded research institutions in Latvia.



52% The percentage of women amongst scientists in 2013. This is the highest number in the European Union where on average 33 % of scientists are women.

58% The number of PhD graduates in the period 2013 to 2017 are women.



81.6 thousand the number of students in higher education in Latvia during the academic year of 2017/2018.

11%

The percentage of international students during the academic year of 2017/2018.



110.4 million EUR the amount of investments made in research and development in 2016, making up 0.44% of GDP. Target set for 2020 - 1.5% of GDP.



25.5%

The number of active innovative companies in Latvia. Companies are considered active innovative if they have implemented at least one technological (product and process), marketing or organisational innovation and/ or have performed innovative activities during the reporting period (2012 – 2014).

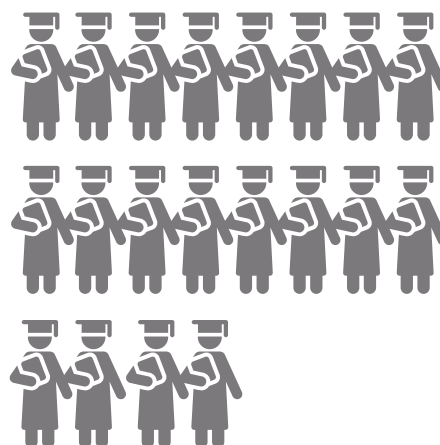


7.4 Thousand the number of scientists in Latvia in 2016.



1192 The number of people obtained a PhD in the period 2013 to 2017.

20 Thousand the number of students studying STEM (science, technologies, engineering and maths) subjects during the academic year of 2017/2018.



In the medium term, challenges of the sustainability of Latvian society must become the uniting reference points for scientists, policy-makers and for innovation companies. There must be focus on this criteria in the following research fields:

ICT, cyber security and smart materials

ICT is not just a new branch of information technology and development of commercial products, it is also a cyber security area, which is a research priority for engineering and natural sciences, as well as medical, healthcare, social sciences and humanities.

Independent and effective energy

Latvian energy policy should be focused on diversification of primary energy resources, increase of the proportion of renewable energy resources and increase of energy efficiency.

Demographics and public health

One of the greatest threats to sustainable development of Latvian society is the negative demographic situation, both negative natural growth and negative migration balance.

Social protection, equality and security

This criterion focuses on issues involving socially disadvantaged groups and on action policies targeting specific and often marginalized segments of the society.

Research on education quality

Educational policy makers need support from researchers to regularly monitor education quality and improve teaching methods.

Research on Latvian identity values: Latvian language, Latvian history and cultural heritage

In the future, the regions and countries that will strengthen and develop their unique identity will gain an important comparative advantage in the global race.



02 PERSONALITY
To ask and answer. Agrita Kiopa



06 PARTNERS
Being part of a network

09 PERSONALITY
Agnis Stibe: a new profession — welfare ambassador

16 ANALYSIS
There can never be too much security

22 SCIENCE
What does quantum physics, Internet of Things and security have in common?

30 TECHNOLOGIES
Brain centre

EDITION

EDITOR
LĀSMA VAIVARE

GRAPHIC DESIGN
ALEKSEJS SMIRNOVS

PUBLISHER
RTU PRESS

TYPOGRAPHY
ADVERTS LTD

Print run 300

ISSN 2592-821X

In case of reference,
reference to the magazine
©innovation

BEING SAFE

During the hundred years of Latvia's existence, the issue of safety and security has never lost its topicality. To fight for our country, to keep our country, to rebuild our country. Not to collapse physically and emotionally when overpowered. Remain Latvian when leaving and remain Latvian when staying. Teaching children abroad and children at home to be Latvian. To build economy, to rebuild economy, to reach for the same level of economy that more developed countries have.

In recent years, in the discourse between Latvia, Europe and the world, security is discussed every day, referring to the geopolitical situation, the need to allocate a certain part of the state budget to defence, international terrorism, cyber threats, and information warfare. And yet, although the word «security» primarily makes us think of professional soldiers and improving their combat skills, the country's, society's and every individual's need to feel secure creates a much more comprehensive set of questions and answers.

It would be hard to argue with the fact that the energy sector has the most direct link to security. Our country in general, the various institutions, companies and each individual citizen's security in this modern technology era cannot be imagined without permanent, safe and affordable existing energy resources, which at the same time do not cause irreversible damage to the environment. Public health is not less important either. An increasingly innovative approach to both environmental protection and medical development plays an important role here. By developing ever more new technologies, diagnostic methods, medications, enables us to fight diseases that used to claim centuries and decades ago. Clean environment, sustainable use of resources, clear water, high quality, safe and at the same time accessible food, which does not purely consist of ingredients that only chemists will have heard of, stable political environment, growing economy, excellent education, positive demographic indicator, still alive intangible heritage, Latvian language and culture, national self-awareness... The list could go on and on. What role does science play here? Invaluable, besides not only by creating commercialised solutions and technologies, but also by finding and offering answers to the major challenges of the country and society.

Lāsma Vaivare,
Editor of Innovation



PHOTO: GUNDEGA PREISS

text / Lāsma Vaivare
photo / Edijs Pālens, LETA

TO ASK AND ANSWER

It is clear what role science has in promoting growth in Latvia – to create a knowledge base required for various sectors and a human capital that is both rooted in Latvia and global at the same time. Namely, a network of competent people who are in one way or another connected to Latvia, enabling them to freely function at the global level

Acknowledges Agrita Kiopa, the Deputy State Secretary of the Ministry of Education and Science, Director of the Department of Higher Education and Innovation, whilst emphasising the significance of the 4th World Congress of Latvian Scientists in strengthening this network. «Geographically Latvia, our mother land, our father land, is where it is on the map of Europe, but we live everywhere in the world. We have scientists in England, France, Australia, USA, wherever we look we see our colleagues. It is important that many of them have strong roots and we hope that the congress will strengthen these roots even more. That is mainly due to the commitment universities have to form human capital that is rooted in Latvia and globally involved. What does that mean? We are talking about people who are connected to Latvia in some way, but at the same time also have work, friendship, project, business relationships all over the world. A prior acquaintance, a common place of study is basis of a relationship, even when physically being in different parts of the world,» she explains. This network is already quite broad and the thought of a Latvian scientist being a small brother on the sidelines of Europe is categorically rejected.

As long as the scientists maintain their Latvian roots, do we not need to be worried about the drain of knowledge capital?

We do need to be worried, and significantly so. We are losing probably even more than other areas as we are losing our best ones. Both the scientists who are in Latvia as well as the ones outside of Latvia are part of our excellence, they are our elite. If the elite have nothing to do here they look for work elsewhere in the world as science is global. We are very competitive and that is evidenced by the fact that we hold positions of professors, researchers, company managerial positions everywhere in the world. Concepts

of *brain drain* and *brain gain* are used to talk about the relationship between peripheral and more central countries in science. Finding a way to make the concepts of *brain gain* and *brain circulation* come to life is what we do and it is the only way to make globalisation processes work to our advantage. We network, work together, find attachment and perceive ourselves as one whole unit, not thinking in categories of – you left, you came back.

Although science has the most to worry about with the labour market being global, it also has the greatest potential to turn globalisation into an advantage. The global nature of science and participation

of Latvian scientists in international projects gives Latvia a chance to contribute not only to finding solutions for European and global challenges, but also gives an indication of the level of economical development in Latvia and the possible return on investments. We have unique knowledge and resources that are only characteristic for our geographical location and climate. That is what makes us appealing to others and enables us to be players in global networks.

Besides that, science shares results – the more we research and get to know here, locally, the more and easier we receive from the whole world. Science is not the place where people live behind locked doors not knowing what is happening on the other side of the ocean. They do know. Of course, there are topics, technologies, secrets that are not being revealed, they can only be fully understood being present. That is why we need to identify our network and work as much as possible with people around the world. For this reason the topics covered at the congress have been picked thinking about the safety and development of Latvia, but above all – the development of all areas of science. We look at what the most interesting issues in the world are and what our opportunity of getting involved is.

Are you able to highlight what the most important issues are, for example, in the field of engineering science?

We would need to ask the area leaders. We have invited two leaders for each science section to the congress – a Latvian specialist and a foreign specialist who has originated from Latvia. Engineering sciences are being represented by Tālis Juhna from RTU and Mārcis Jansons from Wayne State University. Their task will be to highlight where in the world the greatest movement is happening currently and what Latvia's chances are to join in on these processes and ride the wave of development. As our social sciences section leaders we have invited Gundars Bērziņš from the University of Latvia and Julia Ellen Melkers from Georgia Technology Institute. She is going to talk about *entrepreneurial university*. It could be said that these are not new news in the world but they are news that never get old. Universities are increasingly expected to have an entrepreneurial spirit – they have to search for, think about how to develop economy, ask questions that matter to us as a society, be that public body that plays an active role in advancing development.



The global nature of science and participation of Latvian scientists in international projects gives Latvia a chance to contribute not only to finding solutions for European and global challenges, but also gives an indication of the level of economical development in Latvia and the possible return on investments.

AGRITA KIOPA

DEPUTY STATE SECRETARY OF THE MINISTRY OF EDUCATION AND SCIENCE, DIRECTOR OF THE DEPARTMENT OF HIGHER EDUCATION AND INNOVATIONS



FOR INFORMATION

It goes hand in hand with one of the big issues of the congress — what is the role of science in Latvian society?

Science creates knowledge and people who can think abstractly and critically. Science plays the same role in Latvia as it does elsewhere in the world — asking questions that matter to the society and looking for honest, quality answers, which are obtained using scientific methods and therefore are trustworthy. Why do we need it? So that we can exist, develop, be truly independent and truly safe. Safe in all aspects of security — safe as a community and as individuals in their personal lives. I really like the concept of resilience. It directly relates to an individual — how safe do individuals feel in their life, about their future, their children, grandchildren, their options, their development, in order to live a meaningful life, growing and contributing to the society.

Should these topical questions come from the society or should they be fixed and generated by scientists themselves?

Scientists are part of the society. Scientists do not live in an isolated vacuum.

The reason I am asking about who asks the question is because the research commissioned by the Ministry of Education and Science *Topical issues for development of Latvian society, economy and science, trends and opportunities for their future development* reveals differences in the society's view of which fields of research should be supported more, for example, health care, sustainable lifestyle, and the security issues raised in political documents.

Whoever pays for the research will word the question. Most often the society pays — with the taxpayer's money the state has to commission science in the best possible way. Scientists, on the other hand, when it comes to issues that matter to the public, have to try to offer solutions in the best possible way. There will be programs where scientists, when they see what interests the society, will offer solutions, for example dealing with health or environmental issues; and there will be programs where the state will clearly state the research sector, as is the case, for example, in the field of defence or security. It is very important to ask for the society's opinion and likewise it is important to show results. A study in cultural consumption in France shows that people regard being interested in science as part of their culture. The desire to know

__4th Congress of Latvian Scientists

__The Aim — to bring together scientists from Latvia and of Latvian origin and their friends from all over the world to offer solutions for Latvia's development and promote long-term cooperation.

__The Task — to create a platform for discussion and a pragmatic innovation forum in which the participants of the Congress have the opportunity to:

- meet one another, build relationships and collaborations to achieve common goals and launch projects in various areas of science
- Inform the Latvian society about the outstanding achievements and success stories of scientists from Latvia and of Latvian origin, discovering the strength and potential of Latvian human capital.
- strengthen the roots in Latvia, discover Latvian culture and traditions;
- enhance the prestige of Latvian science and institutions.

SOURCE MINISTRY OF SCIENCE AND EDUCATION

is also in our nature. The population survey that you mentioned, although it was small and could be regarded more as a conversation, not a representative study, confirms that the society cares for research on matters that directly affect people. People care about issues to do with health, environment, our history, future opportunities.

In the survey, my attention was drawn to the fact that areas of research that the society already considers to be quite advanced, such as medicine or engineering, at the same time were also mentioned amongst those that should be developed further. Is this not a contradiction?

Science is a constant process. For scientists to ask questions, science constantly needs investments. When it comes to social sciences and humanities, I think we have not emphasised their crucial role enough. Humanities play an important role in developing a society's spirit and soul. Social sciences let us understand how society functions, how organisations

function, how a number of processes happen — be it growing old, health, technology and product consumption processes.

Can you name areas where our scientists are particularly strong? I often hear it said that we are like a little brother.

We are all proud of Andris Ambainis and his work on quantum, we are strong in cell and drug research, at the Institute of Organic Synthesis, virus research at the Latvian Biomedical Study and Research Centre and Riga Stradins University, at University of Latvia and elsewhere... I do not know why anybody would speak about the role of a little brother. In science you either exist or you do not. If we open up international databases and search how many Latvian scientists have published work and how often it gets cited, we can see that we are very respectable in the world average, in many areas — even above the average. We will never reach the same numbers of publications as China or America, we are a small country.

To what extent do Latvian scientists stress their Latvian origin elsewhere in the world?

European Latvian Association has a very attractive idea about professional Latvian origin that brings together professionals of different fields. It is exactly the same with scientists — excellence and Latvian origin is what unites. Of course, the sense of belonging will not be the same for everyone, it will be different from person to person, and it will differ based on what connects the person to Latvia. World Congress of Latvian Scientists is our first attempt to position ourselves as one whole unit. Thinking about the hundred years of Latvia and its major challenges, including security and future development scenarios, this is a unique opportunity to bring together the elite from all over the world and contribute to the strengthening of the state. I very much hope that we are united by our interest in Latvia as our joint ambition and joint project. Agreement on the joint idea and willingness to share one's resources is very important here. Scientists have such resources as knowledge, competences, contacts, opportunities, also reputation at their disposal. If scientists use these resources for their joint project — for Latvia, then that is a major strength. After the financial crisis in 2008 many people have left Latvia with great bitterness and resentment. People should really try to get over

it, because it is not Latvia or an abstract «country» that has made wrong and inhuman decision, but specific people. Instead of abandoning the idea or Latvian state and origin, these specific people should be held responsible.

At the end of the congress a resolution will be made. Is it possible at this time already to indicate what it's direction it is going to be and what purpose will it serve in the future?

The congress is being organised with contribution and offering of science to the development of Latvia in mind. We would like to ascertain what science can give the society, what are the development scenarios going to be until year 2050 and which areas still need a supportive shoulder.

During the hundred year celebrations we celebrate, look back into the history, but equally we also have to think about what we are going to be like in the next hundred years. That is the big question that we need to find an answer for. And who else, rather than scientists, should wreck their brain over it. In my view, the resolution should move in this direction, but what the direction will actually be — it is impossible to say at this time. What is the resolution going to change? I think it is going to be like an agreement between the scientists themselves about the vision of development. It is also going to be a signal to politicians about the issues that need investment to be studied.

Why is year 2050 chosen as the year of accountability for the third day discussion about the development of Latvia?

Our planning documents and those of the European Union mark development up to year 2030. Scientists have to predict the next step.

What is your vision — in year 2050, will science as the driving force for development of economy, politics, society, play a greater role?

Certainly, because it is impossible for it to be even smaller than it is now. If it is going to be even smaller, then there will be no us as the society. This role needs to grow; we are on the right path: we have invested a lot in the capacity of science — infrastructure, research that strengthens the gearing between science and companies, in innovations and study development programs. Now is the right time for science to demonstrate more actively the

results of its work and to tell about itself. We can already see the snow-ball effect — there are more questions being asked, higher education institutions understand more fully that it is impossible to provide quality education without research and science. It is a necessary foundation for the quality of higher education, as well as gives an opportunity to use the knowledge and technologies created in the whole world to develop economy and to reach other goals of ours.

When the lowest point has been achieved, it can be used as a stepping stone to climb higher. However, is there a real demand for science in society and business? Investments in new equipment will pay off faster than in research.

One has got to be able to work with new equipment. They are complicated enough nowadays and building and servicing them requires competency. But, yes, that is a problem. Currently Latvian economic sectors use the so-called low competitiveness advantages and companies do not invest in development. Neither private local companies, nor foreign, nor state owned corporations do this. Instead private companies secure around 8 % profit for themselves, which is more than elsewhere. Whereas the profits of state organisations go to the state. This is partly due to the geopolitical situation, which is not what we would like it to be. Besides, we as a society, are young. But there are ever more people who have gone further in development of business and thinking, and they understand the value of science. Unfortunately, there is also part of the society who are uneducated, without work, who have

complications, with few opportunities, or who are not able to see them, who have practically given up. It is the duty of universities to highlight opportunities. It is a huge research field for social sciences. The congress is also a tool that creates opportunities.

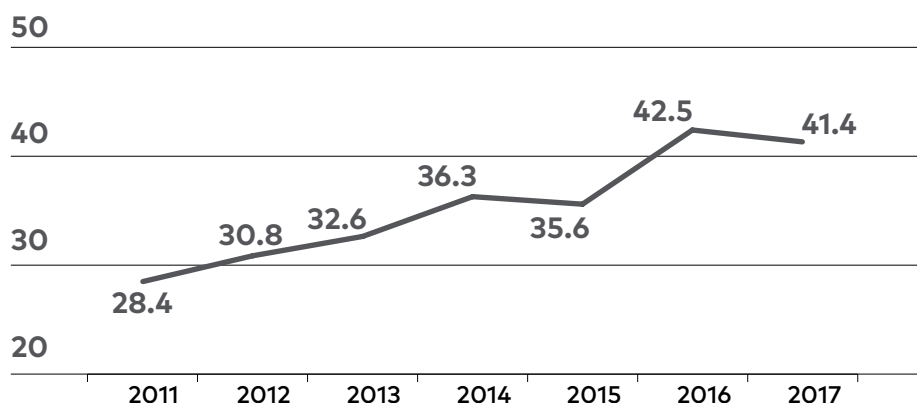
Discussions on the next budget period of the European Union, which promise more funds for research and development, have just begun. What does our country need to be able to achieve in order to attract as much money for Latvia as possible?

We need to invest in state funding so that we could have more scientists who could get involved in a larger number of projects. The less state funding we have, the less scientists we have. The less teams we can form and less projects we can submit, less funding we can receive from the European budget for science. Both our studies and those of the European Commission show a direct correlation between the investment of each Member State nationally in science and the amount of European funding received. We are used to passing responsibility on to somebody else. In the case of financing science, politicians argue that science should be financed by companies in the sector or the European Union. Global practice shows that countries that have decided to develop their economy, investing in research and technological development.

What does resilience mean for you?

Everything that makes a person feel secure in life, gives confidence for the future and opportunities. ●

Scientific articles written in international collaboration by Latvian scientists, indexed by SCOPUS (%)



SOURCE: MINISTRY OF SCIENCE AND EDUCATION



text / Lāsma Vaivare

photo / Elīna Karaseva, personal photo

Being part of a network

«If you do not know what others are doing, then you will be building a bicycle in your shed while your neighbour is already riding a motorcycle»

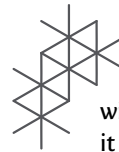
This is a comparison used by Jānis Ločs, the Director of Riga Technical University (RTU) Institute of General Chemical Technology, leading researcher and project manager of the Baltic Biomaterials Centre of Excellence (BBCE), explaining why there has to be a great focus on international collaboration and creation of a network of professionals in science. He is a board member of the Scandinavian Society of Biomaterials and works at the European Society of Biomaterials Young Scientist Forum, therefore his words about the benefits of networking have a definite weight to them.

Printing of spare parts

Research and work on development of biomaterials to replace damaged human tissue and organs, such as bone tissue, has already been successfully happening for years at RTU. Working together with Riga Stradiņš University (RSU), synthetic biomaterials that grow bone are experimentally being used in dentistry, maxillofacial surgery, but in collaboration with Riga 2nd Hospital, studies are being carried out on osteoporotic bone strengthening in the event of fractures in which materials developed by the RTU are being used for surgical treatment of large bone

fractures. Putting materials to new use is also being planned in collaboration with Trauma and Orthopaedic Hospital. J. Ločs makes a comparison «sugar does not have just one function — to sweeten tea. There are other functions and, quite possibly, some of them might be much more valuable than sweetening tea.» Therefore, in cooperation with the Trauma and Orthopaedic Hospital, a solution could be sought for the use of biomaterials in situations where an implant is needed, for example, a hip prosthesis has been replaced and there is an inflammation, an unfavourable environment. Rūdolfs Cim-

«A doctor has to be confident that whatever they use in their research, is going to be safe and tested for the patient,» says Jānis Ločs, Director of Riga Technical University (RTU) Institute of General Chemical Technology, leading researcher and project manager of the Baltic Biomaterials Centre of Excellence



diņš Riga Biomaterials Innovation and Development Centre, which forms part of Institute of General Chemical Technology have developed various compositions and uses of biomaterials, including complex biodegradable materials with medication supplying properties. They provide a local supply of medications, such as antibiotics, after manipulations. It is a trend of biomaterial research and development not only in Latvia, says J. Ločs and mentions a few other topicalities. «Medical sciences and biology are gaining more and more understanding about how cells «communicate» with one another, giving each other signals. The materials that we are developing act as a foundation for tiny little molecules that can be sown upon them to tell other cells where to come. What makes it complicated is the fact that each organism reacts to communication differently. The question is — how to control, how to predict the cells' response,» he says. It is hard for material scientists to deal with these challenges on their own, therefore research is becoming increasingly interdisciplinary.

Another topicality — 3D printing of biomaterials. This area is developing, although it is limited by the European Union (EU) regulations on materials that can be used. There is technology available on the market for printing metal products, but metal remains in the body for life, it does not degrade. There is huge potential to develop degradable materials. The question is though — how to keep 3D printed human spare parts sterile. There is also a question of what kind of ink to use. RTU scientists alongside their foreign partners are working on the composition of the ink, the focus is on hyaluronic acid.

Side by side, not behind

J. Ločs does not hide that Latvia is currently somewhat lagging behind Europe in researching and using 3D printing to develop biomaterials, which is due to the limited funds. To achieve a higher standing the plan is to purchase a 3D printer and to send the new specialists to gain experience from foreign partners.

J. Ločs is currently managing an international project for the Baltic Biomaterials Centre of Excellence (BBCE). The founding principles of the BBCE are emphasis on cooperation and exchange of knowledge with local and international partners, and the industry by pooling the competencies and developing the industry of biomaterials. The Baltic Biomaterials Centre of Excellence is a research project funded by

FOR INFORMATION

—A promising interdisciplinary area of science that can promote the creation of new products with high added value is the research of smart materials. This opens up opportunities to find innovative solutions for use of local biomass to create smart building materials. Smart materials will be available for use in a wide range of fields - civil engineering, electrical engineering, electronic technologies, information engineering, chemical technologies, mechanical engineering and material engineering. Latvian science policy planning documents define smart materials, technologies and engineering systems as a separate area of smart specialization, within which it points out implant materials, composite materials, thin layers and coatings and smart materials on glass fibre base as niche research and innovation areas.

SOURCE: STUDY ON THE CURRENT ISSUES DEVELOPING
LATVIAN SOCIETY, ECONOMY AND SCIENCE, FUTURE
TRENDS AND OPPORTUNITIES

the EU *Horizon 2020*. There is an international team of scientists involved in the project — representatives from AO Research Institute Davos, Switzerland, Institute of Biomaterials of Friedrich-Alexander Erlangen-Nürnberg University, Germany, RTU's Rūdolfs Cimdiņš Riga Biomaterials Innovation and Development Centre, Riga Stradiņš University (RSU), RSU's Institute of Stomatology and the Latvian Institute of Organic Synthesis. EU funding provided to the centres of excellence is not for research but for support, for example, to give them opportunity to attract international post-PhD and PhD students and being able to offer them a competitive salary. «Currently, international researchers rarely come to Latvia to gain work experience. If we had the financial means, we would be able to advertise a position with a competitive salary internationally. It would be an exchange of knowledge — we would learn from the international researcher, he or she would learn from us. After two or three years, when the researcher leaves, we would offer the post to somebody else. Perhaps, ten years later this scientist will become a dean at Oxford University and

will remember their experience in Latvia, it will be mentioned in their CV. It would make us more recognisable internationally and would let us form a network of agents. This philosophy is much more widespread abroad,» says J. Ločs. Besides, welcoming international researchers regularly would also widen the network of specialists who are competent in biotechnologies, and possibly, make Latvia an interesting market for investors, where a biomaterial plant could also be built.

By learning from the experience of colleagues and co-workers, it is possible not to repeat the mistakes that they have previously made and move forward faster. According to statistics we are working at lower efficiency; this is also due to the fact that we do not tell others what and how to do to find the solution faster. In order to change this, we are hoping to create electronic student workbooks that will accumulate information on the progress of the research and will enable other researchers to use it. «After graduating students will have kept notes on their Bachelor and Master's theses, but they are difficult to read. Theses itself is polished work, but the ground work is not reflected there, their note books should have complete information,» the researcher says. To be able to exchange knowledge it is also valuable to attend various seminars, conferences. .

Affects even more

Due to several reasons implant technologies and methods is a growing market: the world's population is growing, life expectancy is increasing, therefore there is a need for a fulfilled life at the older age; at the same time there is more financial stability and increased availability of medical technologies. Meanwhile, people are diagnosed with various illnesses at a much younger age, for example, osteoporosis, heart attack, much younger people are given hip endoprosthesis. Research shows — the younger the patient, the sooner the implant wears out. The reason for this is that younger patients are physically more active. This is where another area of research opens up — it is complicated to replace biomaterial implants that have grown onto the body.

Since life expectancy is increasing and population in both Latvia and Europe is getting older, early diagnosis of various diseases and therapy is very important. «Cancer and dementia at the moment are the most acute diseases as they are connected to old age. Cancer is largely an age-related disease, of course, it can



In the next ten to fifteen years, 80–90 % of cancers will be treatable. The most difficult part usually is stepping over the tale, the last 10 % will probably take another 20 years.

ALVIS BRĀZMA

THE LEADING RESEARCHER AT THE EUROPEAN MOLECULAR BIOLOGY LABORATORY AND THE HEAD OF GENE EXPRESSION DEPARTMENT AT THE EUROPEAN BIOINFORMATICS INSTITUTE



FOR INFORMATION

not be applied to all types of cancer, but certainly to many. In the spring I came back from America where I attended the association for cancer research meeting. Around fifteen years ago, it was a fairly small meeting; this year around 20 thousand registered participants gathered at a major conference centre in Chicago,» Alvis Brāzma, the leading researcher at the European Molecular Biology Laboratory (EMBL) and the head of gene expression department at the European Bioinformatics Institute (EMBL-EBI), points out a research topicality. EMBL is Europe's leading life sciences laboratory, an intergovernmental organisation with more than 80 independent research groups. One of EMBL's goals is to integrate European life sciences by providing researchers and students with opportunities to practice research. Latvia's participation in EMBL would increase the opportunities for Latvian PhD students to study in this laboratory, as well as for Latvian scientists to participate in top-level international research, including opportunities to apply for grants to the European Research Council. Being a part of EMBL would also mean an opportunity to participate at the laboratory board meetings, enabling a better understanding of current research trends and potential cooperation, he says. Of course, there is a risk that a Latvian student or a scientist involved in EMBL studies would not return back home straight away, but even staying outside of Latvia, they would form a network of scientists, which has a major impact in the development of science, attracting funding and exchanging knowledge. «The only way to get this information and experience is to find one's way into the European scientific elite circles,» he believes. Participation in international research organisations should be looked at also from the angle of security strengthening, emphasises A. Brāzma. Namely, connections with

Research and innovation in the health sector should improve patient diagnostics as well as easier access to and effectiveness of treatment through personalized approach and smart diagnostic tools and methods. The latest biomedical research achievement approbation and further implementation in clinical practice throughout Latvia would also help bring to life innovations in the field of healthcare. Research on antibiotic molecular resistance and public health aspects, life threatening children's diseases and development of prevention plans also need to have more support.

SOURCE: STUDY ON THE CURRENT ISSUES DEVELOPING LATVIAN SOCIETY, ECONOMY AND SCIENCE, FUTURE TRENDS AND OPPORTUNITIES

international science organisations will strengthen the image of the Latvian science community, help to gain contacts at different levels and in different societies. At the moment, though, network of Latvian and Latvian origin scientists is still thin and there is still lots to be done in order for «Latvia to integrate more deeply into European science».

«For physicists it is important to be members of the European Organization for Nuclear Research (CERN) — an organisation where Latvia is about to become involved; similarly, for biologists and medics involvement in EMBL is important,» says A. Brāzma, calling for consideration of Latvia's membership in this or related organisations. Since 2015, Lithuania is a potential member state — a status which

allows them access to laboratory services and programs, as well as to observe laboratory board meetings. Estonia, in turn, is a member of the European Life Sciences Infrastructure for Biological Information ELIXIR. As A. Brāzma says, «it is easier to get involved in the international bioinformatics circle than it is with other sectors, because no major investment is required. Bioinformatics is more of a bit and byte rather than an atom and molecule world. Therefore you don't need much more than a computer and internet».

Not to let a cell commit suicide

In life sciences, bioinformatic methods and data analysis is taking on a more important role. One of the branches of the EBI is cancer genome research to understand what changes in cancer genomes take place, how to classify them, what the potential molecular mechanisms are that lead from the changes in the genome to cancer, and how to potentially use this knowledge in therapy, A. Brāzma explains. «At the bottom of oncological diseases is the unwillingness of cells to submit to the body's control. They are no longer controllable and start growing, «working» in their own favour. In all multicellular organisms, including humans, there are various mechanisms that cause cells to, so to speak, commit suicide, when attempting to go out of control due to genome mutation. And there are also different ways in which cells try to avoid these mechanisms. The idea of molecular cancer research is to understand what the potential paths are that cells choose to avoid suicide and how to block them,» explains A. Brāzma using simple comparisons. He is confident that in the next ten to fifteen years, 80–90 % of cancer types will be treatable, it will, probably, remain a chronic disease, but it will not be lethal and patients' quality of life will not suffer as much. ●

text / Anda Asere, Dienas Bizness, for Innovation
 photo / ESLSCA Business School Paris, Benjamin Brolet Photography, Vera Goldberga

A NEW PROFESSION — WELFARE AMBASSADOR

The overall long-term welfare of the society will be driven by technologies that have been ethically created and well-intended



In the future social engineering is expected to become just as natural in our everyday lives as internet is. Internet was unknown, unfamiliar and scary to us in the early days, as it is the human nature to be alarmed about everything that is new. That is why people often take a very cautious view on many modern technologies. Indeed, there is a possibility that they have been developed by people with bad intentions. Nevertheless, Agnis Stibe, professor of ESLSCA Business School Paris and social engineer, believes that this fear will gradually disappear and there will be ever more examples of ethically developed and properly used technologies creating significant innovations that contribute to growth. «Any state and local government body that looks after people and their welfare at any level, needs at least one social engineer or welfare ambassador whose daily task would be solely reviewing and developing society welfare processes, and connecting them to technological solutions which essentially are being purposefully developed in order to move into the direction of welfare,» he maintains.

You will be participating at the World Congress of Latvian Scientists with a lecture. What are you going to talk about?

My lecture is on the subject of *Transforming sociotech design — help for people to change successfully*. Breaking it down into terms: design means creating and everyone is fairly familiar with this word. We can split the term «socio-tech» into two parts — social and technical, which are also fairly self-explanatory terms — technologies and their interaction with people, social environment, society. As for the term «transforming» it needs to be said that when we talk about change in behaviour, the result often fluctuates backwards and forwards. For example, if a person follows a specific diet, at first they may lose weight, but after a while they will put it back on, because the human nature dictates that we need to eat to be able to survive. This example demonstrates that there is no permanent and purposeful movement in the set direction. The goal of transforming technologies is to help support individual goals for them to move in the desired direction without much fluctuation.

What does social engineering actually mean?

I have recently been wondering whether I want to continue calling myself social engineer. It is still a very fitting description, as well as welfare ambassador. If we stick to the term *social engineer*, I like this title as it brings out the engineering competency, which is important in developing socially influencing technologies. Nevertheless, the social component and understanding of people, their nature, behaviour, relationship and interaction with technologies is equally important in order for technologies to help people change in the direction of welfare, whatever that means for different people. If we asked anybody what welfare means, we would always get an answer. We would also always get an answer to the question — is there anything that could contribute to welfare. If there is a social engineer present when asking these questions, by listening carefully their task becomes clear.

How old is this scientific discipline?

A book titled *Persuasive Technology* was published in 2003. Based on this

book and on the interest in this field by many researchers, the Persuasive Technology Conference was founded in 2006. I have been attending this conference since 2010. Interest in persuasive technologies first started at the Department of Psychology at Stanford University where two elderly social psychology professors came face to face with a technological innovation — a computer. Their department started using computers and they were posed with a question — if they are researching people and how individuals can influence and persuade one another, then the question of how to build a persuasive computer arises. I would not say it is a big conference, around a hundred people attend it every year, but this area of research is also represented in other computer related conferences on interaction between a person and computer. For many years I have been involved in business as well as in academic sector and I can see that these nuances and characteristics overlap at conferences of both areas. One might think that forms of behaviour differ in business and the academic field — it is profit in one case and creating knowledge in the other, but the basic instincts that drive interaction, rivalry, cooperation, competition and similar, exist in both sectors, because people work in both sectors.

How many social engineers are there in the world?

I think few people have this title. In essence, they are people who have skills and understand both social psychology and technologies. Most of the participants at the conference could in some way belong to the group of specialists who could be called social engineers. Counting all the conference participants from previous years, around a thousand people are probably involved in this area in depth.

The first book on the subject was published 15 years ago. How has this subject evolved in this time?

We had discussions about this at the last conference. Thanks to my initiative a seniors' meeting was convened and we discussed the fact that, unfortunately, the characteristic figures of the conference are stagnating. Even though in the last few years the environment where persuasive technologies first appeared was promising, and we should be seeing increase in the numbers of participants at the conference, in more scientific research, in reality it is not so. I believe that the conference next year will be much better.



There need to be ethical and highly moral standards adopted in developing technologies that aim at improving people's wellbeing, says Agnis Stibe, professor of ESLSA Business School Paris and social engineer.



Where do you see this field in the future?

I think that in the future persuasive technologies will flow into our everyday life as naturally as internet has; it was unknown, unfamiliar and scary to us in the early days. It is the human nature — everything that is new is frightening, as our instincts react to everything unfamiliar with fear and initial anxiousness. Many see technologies as possible manipulation, because people are scared of being influenced. Indeed, people with bad intentions can use technologies to manipulate but, at the same time, I think this fear will disappear in the future as there will be ever more examples of technologies helping the society when used properly and if innovations are developed by people with high ethical standards. They can help in many areas, for instance, health. There are smart tooth brushes that assist in brushing teeth and, if you are not doing it right, suggesting you to hold the brush differently. The more people will be pleased and will find the inner balance due to technologies, the more people will become ambassadors. Another controversial example is a smart fridge that can evaluate the contents of the fridge and, for example, compare it to the contents of other fridges in the same block of flats, based on the collective informa-



tion. As a result, the person knows what they are eating themselves and what their neighbours are eating and how healthy it is. If you are doing worse than your neighbours, the fridge will constantly inconspicuously show you that.

I believe that those technologies that come into our everyday life properly, ethically and morally, will be the ones that contribute to our common welfare. Of course, I have to be honest and admit that there will always be the other spectrum as well where somebody will always want to make more profit, have more power, influence and in principle nothing will stop them from using these same technologies to implement their dark patterns.

How do we fight that?

There need to be ethical and highly moral standards adopted in developing technologies that aim at improving people's wellbeing. Technologies have to be transparent. When people who aim for positive environment start building transparent persuasive technologies, any other technologies appearing on the market that are not transparent, will expose and disqualify themselves. The main thing is to give everybody an opportunity to quickly determine what is the developer's intention for the technology that the person has acquired. If the intention



CV

Agnis Stibe

_Work Experience: Professor at ESLSCA Business School Paris. Previously Scientific Fellow at Massachusetts Institute of Technologies Lab, Persuasion Engineer at University of Oulu in Finland, Business Development Manager for First Data International, Graduate Association President at RTU Riga Business School, Technology Sales Manager for Oracle, Customer Relationship Manager and Consultant for Hewlett-Packard, Customer Relationship Manager for MicroLink, Interactive Department Manager for Bates ADM, Director for ADM Interactive, Deputy Director and Senior Rapporteur of the IT Department of the Latvian Ministry of Foreign Affairs

_Education: Bachelour's and Master's degree in Computer Science (University of Latvia), Master's degree in Business Management (RTU Riga Business School), PhD in Philosophy (University of Oulu in Finland)

_Hobbies: self-knowledge, transforming, hockey, poetry

is to help and they are not afraid of the transparency of technology, the users will be able to see how it is built, why, what the intention is etc. Every time a person sees a transparent technology, they will know that the developers are aiming for welfare. As soon as they see a technology that cannot provide this transparency, it will be clear that the intention here is different. By giving everybody an opportunity to easily determine transparency of any technology, in the long-term we can arrive at the transforming vector that helps everybody recognise all the persuasive technologies that increase welfare.

You have previously worked as a scientific fellow at Massachusetts Institute of Technology Media Lab, now you are a professor at ESLSCA Business School Paris. What are the similarities and differences in the understanding of social engineering on both sides of the ocean?

I have been in Paris since July last year and my scientific activity is still global; more often than not I talk to people who are not in France. I am developing my collaborative network throughout the world; therefore, I often do not feel a direct bond with the place I am based at. My French at the moment is not at such level that I would be able to follow the local news, but there are some certain nuances that I

have noticed. France, with their president at the forefront, emphasises its commitment to sustainable science and ecology. I see urban innovations every day. Right now, sharing economy is very popular in Paris, for example with bicycles and cars. At first, I did not pay much attention to sharing schemes, but when I started finding out about ice-hockey halls and how to get to them, the local hockey players suggested using a car sharing scheme. Practically every four blocks have a parking lot with electric cars for sharing. I am getting an impression that somebody is very strategically looking after and thinking about a sustainable urban environment, especially when it comes to transport.

What is your social engineer's vision on sustainable urban environment?

In my view the very basis of a sustainable urban environment is people who think sustainably. It is an unconventional answer as a common answer would be clever equipment, reactive systems, accountability and feedback. Indeed, all that forms part of sustainable urban environment, but unfortunately, or should I say fortunately, the central element will always be people. Our behaviour dictates how we behave within these smart urban environments, how we use the technologies available to us. Therefore, in my

view, at the basis of a sustainable urban environment is a sustainably minded inhabitant, guest and society in whole. Certainly, the urban environment itself can be purposefully built, using all kinds of technologies, in order to help these people become sustainably minded people.

And what is a sustainably minded society and individual? How would you measure whether what a person does is or is not sustainable?

Here we come to essential core values. In my view long-term is paramount to being sustainably minded. We all make decisions — individually, in our families, businesses, society, organisations, regions, countries. Each of these decisions has an impact date. Decision makers, when choosing one or another option, determine what the effect and timeline of this decision will be. Every decision and action taken impacts on welfare and it has a predictable timeline. Sometimes a decision you make will have an impact for a day, while another decision will have an impact lasting for years. Therefore, I would say that a measure for being sustainably mindful is decisions made by any member of public, their actions long-term.

What is your view, as a social engineer, on what is happening with social

media, Cambridge Analytica and Facebook scandal, Brexit, Trump winning the election?

It is all to do with ethics and morals. We try to convert as many people as possible to our own set of values, values that we form, we invest time in promoting our own view of these values individually, in our families, at school and work. The same thing happens at the other end of the spectrum, where there are other ethical and moral values and those people believe that that is the norm; they use all technological tools to achieve and promote their values. Everybody thinks that their set of values is the best; similarly, there is also different views on ethics and morals. But people who do these things most probably believe that that is the norm and everybody else who do not do it are stupid. Psychologically they have a need to support their conviction and views and they will use all technological tools possible to achieve it.

What are your own values?

As I said before, everybody thinks that their own values are the best. As a person who has studied social psychology, technologies, management, forms of persuasion and gained other knowledge, I can see several sides to myself. Our brain is the central control centre, but at the same time there are some basic instincts within us — if we had not eaten for three days, our values would somewhat change.

When people reach my age they often have to think about the meaning of life, and values are at the basis of the meaning of life. My values are selfcare, caring for my welfare in the way that would enable me to be a productive and mindful member of my family, organisation and society, so that I could add value to global developments and value scales. My core value is welfare and that includes feeling well, being in good spirits and being satisfied with what is happening around me and with myself. If a person is looking after their inner balance and welfare, straight away it naturally reflects on all their interactions on the outside.

Therefore, the more stable a person's inner balance is, the more everybody else, who may have not achieved such balance, will feel it. Those who are not balanced, when interacting will naturally transfer their anxiety onto the balanced person. The same goes for the balanced person — the more balanced a person is, the more they will permit and encourage the unbalanced person to seek their own balance.

What subjects do you teach your students in Paris?

I teach subjects that are directly linked to my work — Transforming Sociotech Design, Socially Influencing Systems and Dark Patterns and Persuasive Backfiring. Dark patterns are deliberate, they run according to a plan, for instance, an airline wants to fool their ticket buyers and they do so. Unconscious influencing, on the other hand, means that sometimes



The very basis of a sustainable urban environment is people who think sustainably. It is an unconventional answer as a common answer would be clever equipment, reactive systems, accountability and feedback. Indeed, all that forms part of sustainable urban environment, but unfortunately, or should I say fortunately, the central element will always be people. Our behaviour dictates how we behave within these smart urban environments, how we use the technologies available to us.

AGNIS STIBE

PROFESSOR OF ESLSCA BUSINESS SCHOOL PARIS AND SOCIAL ENGINEER

a person may have good intentions, but they are misunderstood and something goes wrong. Considering that there are going to be more and more technologies developed in order to influence the public, both situations when the developers have dark intentions and when bad things happen unintentionally will arise. Therefore, it is especially important to educate on these subjects.

How interested are your students in this new scientific discipline?

My teaching style includes students working on projects. Each student picks a topic and I give them a sample with which they can define the main issue of the project. It is usually something to do with a change in people's behaviour that they would like to achieve. They work with their project, they understand which people they would like to help change, we look at the methodology, seven forms of social influence, transforming models — and they use it all for their projects, thinking about innovations, technological solutions that would help this target audience achieve change.

There are many innovations that have been specifically built to change people's behaviour and, unfortunately, often they can be targeted at a group of people who are not ready to change and do not want to. There are many people who want to change therefore we need to work with those people first. As soon as we help them, they will be the ones showing the example and inspiring to see that many have managed to change. For instance, if you would like to become sustainably minded, to start recycling, then seeing an example that somebody has managed to do that and how they have achieved that can be very inspirational. One of the main things that I encounter working with students is that they, just like all of us do, look at and see what is around them. I am trying to widen this line of vision. Of course, I have to battle stereotypes that have been put in place by consumer society. I am particularly pleased to see students changing during the course.

Zero-waste living and other green initiatives are very topical at the moment. How do they resonate with thinking long-term?

I have not looked into these activities in depth, but I do understand that there are many people who care about ecology and sustainability. I believe that as much as they can, they make decisions and take actions taking into account the long-term measure. But at the same time, I assume that also these organisations might need a more organised and better managed view on what long-term actually means. An organisation may be focusing on waste recycling, carrying out various activities in order to implement processes and systems, to help people adapt, but maybe at some point, when you are so focused, you do not look at the whole picture, what is the common measure, why is it done and what will be the long-term impact.

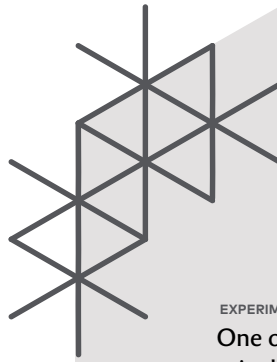
USA comes to mind here. They are being blamed for promoting the consumerism cult. Is the consumer culture really that much more significant there or are we just trying to flatter ourselves thinking that we are not so consumer minded?

Since the beginning of the age of internet all the tendencies have globalised. Consumer culture was created very purposefully and, unfortunately, it is being actively maintained and promoted in many ways, because the supporters of this culture are gaining from this way of thinking and promotion of it. I have lived in Latvia, USA and Finland, now I am living in France, I have also travelled and seen many countries. I have to say that consumer culture is spreading very quickly. I think that it is driven by the human nature, basic instincts and necessity. Fear factor is also very important — people are afraid of not being accepted, not being a part of the society.

You started your career working for technology companies. Which technologies do you see as having the most potential to transform the world in a positive way?

At the moment the world is full of all sorts of technologies and tendencies. The most recent examples are blockchain, artificial intelligence and machine learning. These are techniques and technological processes that have a potential of becoming better and more productive. Sometimes I ask myself — ok, we will develop a solution that will imitate human thinking. How is that going to contribute to the society? That is the most fundamental question. Engineers are doing everything right, but social engineers or welfare ambassadors are needed to look at the role of technologies linked to welfare.

My first degree in computer science and also my workplaces have been closely linked to this area. I am certain that technologies will become even better and more effective. We need to focus more on having people who position these technologies within the bigger picture of welfare, this is an area that in many countries is not organized even at government level. Of course, there are people who are responsible for related areas, but people who are sustainably minded, with technological education and social psychology in order to effectively achieve a great change, that is the most important issues that all of us on this planet need to immediately take care of. ●



ANDRIS JANKEVICS

EXPERIMENTAL OFFICER AT PHENOME CENTRE BIRMINGHAM, UNIVERSITY OF BIRMINGHAM

One of the greatest challenges in many areas of natural sciences is the ever increasing volume of information available, both in the form of scientific publications, as well as through various data banks. Using effective, user-friendly information technology tools to separate «grains» from «chaff» is one of the main conditions for future development of natural sciences.



INA DRUVIETE

PROFESSOR OF THE UNIVERSITY OF LATVIA,

VICE-RECTOR FOR HUMANITIES AND EDUCATION SCIENCES

Nowadays, besides solving problems that are common for the whole of mankind, the preservation of the identity of each country and every ethnic identity is becoming increasingly more important, so that the world would not move towards homogeneity, but towards enrichment of each other. Topics of public interest, such as ethical and legal issues, cultural identity, religious thought, changes in culture, language, understanding of due to technologies and social mobility, distribution of resources and wealth cannot be addressed without the participation of humanities experts and direct communication between researchers and social partners. The scientific capacity of the individuals employed in the field of humanities makes it possible to grasp the various areas of the science of humanities interdisciplinary linked, by identifying the most recent theories and using the opportunities presented by new technologies. It strengthens the identity of our country and cultural and historical knowledge, as well as increases understanding of the processes in the society, because Latvia is the only place in the world where full research of the Latvian language, literature and culture can take place.



TĀLIS JUHNA

PROFESSOR AND VICE-RECTOR OF SCIENCES, RIGA TECHNICAL UNIVERSITY

With the development of competitive technologies, data will be increasingly used in the future and new sensors will be developed to obtain it. Developing data processing techniques, such as machine learning, will boost robotics and automation, making equipment smarter. That will in turn increase the need for ensuring data safety. Climate technologies will become economically more viable and will compete against the more traditional energy producing technologies. Smart technologies will be used even more in medicine and agriculture, thus strengthening the health and welfare of the society. Is the society ready for such rapid onset of technologies in our lives - a question that is becoming even more topical.



On the edge of bacteria abyss

The world is increasingly talking about an antimicrobial resistance, or an antibiotic insusceptible bacterial crisis: cases of people getting infected with germs and finding no medicine to fight it are becoming more frequent

There are countries where such a risk exists on a general domestic level; in the meantime the situation in Latvia is comparatively good: here we still do not have any bacteria spreading that would be resistant to all existing antibiotics, and the problem of resistance is mainly contained within reanimation units in hospitals. There is work to be done in order to remain in this position for a while longer — consumption of antibiotics should be limited and hospitals with individual wards should be built, evaluates Uga Dumpis, Chief Epidemiologist in Latvia, Professor of the University of Latvia, Head of the Infection Monitoring Service at the Pauls Stradiņš Clinical University Hospital. «We have been studying hospital-acquired infection and antibiotic resistance issues for about twenty years now in Latvia. They are usually interconnected because infections in the hospital are often caused by micro-organisms that are resistant to antibiotics,» U. Dumpis explains.

Bacterial resistance to antibiotics is mainly due to the inadvertent use of antibiotics in both humans and livestock: in the process of natural selection bacterial strains develop that are not susceptible to antibiotics, which should be killing these microbes. The spread of such micro-organisms is enhanced by poor infection control in medical institutions, when resistance bacteria have the opportunity to be transmitted from patient to patient, or there is a risk of infection during surgical procedures or operations. Infection does not occur every time; the risk of infection also depends on the type of operation or manipulation. «If it is an ordinary bacteria, the patient will take antibiotics and will get better. If an infection is caused by a bacteria that cannot be treated with antibiotics, then we have a problem,» says U. Dumpis. «In that case it would be

treated like in pre-antibiotics era, removing the pus and infection surgically. The damage is much wider, recovery is longer and may not be as successful.»

On the global scale, antibiotic resistance outside hospitals in Latvia is relatively rare. The doctor explains that according to a not yet published research data in the Baltic States, it has transpired that Latvia has had the least cases of antibiotic resistant gastrointestinal bacteria in people not connected to health care. The reason: we do not use a lot of antibiotics and the health care availability is not of the highest level. Another positive factor in this context is that Latvia is not overcrowded. Also livestock farming, in which antibiotics are widely used in other countries, creating a huge «contribution» to the problem of antimicrobial resistance, is not that well developed here. However,

the research highlights an unwelcome trend — use of antibiotics is excessive in treating children, whereas, in treating elderly people who are suffering from an infectious disease, antibiotics are used comparatively less. «In fact, children very rarely suffer from bacterial infections that should be treated with antibiotics; but with the elderly it is the other way round — situations where antibiotics should be taken may be more common» he stresses.

Threat to human development

There are no bacteria in the world that are not resistant to antibiotics that have been invented to eliminate them. They are still not spreading in Latvia, and there are also 1 — 2 types of antibiotics that are used to treat microbial infections that are non-susceptible to other medicines. «For instance, there is a bacteria in our hospitals that can only be fought with one type of antibiotics. They have been manufactured since the fifties and were used mainly in veterinary medicine at that time. Then they were forgotten about for a while, but now they have proved to be effective in treating people,» says U. Dumpis, while emphasizing that similar cases of resistance in Latvia are relatively rare. There are countries, for instance Greece and Turkey, where this has already created a crisis, and being admitted to the Reanimation Unit of a hospital carries a high risk of dangerous infections. Circumstances in, for example, India and China, are even more critical; over there the issue



At the global level, antimicrobial resistance is seen as a potential catastrophe that threatens human development, admits Uga Dumpis, Chief Epidemiologist in Latvia, Professor of the University of Latvia, Head of the Infection Monitoring Service at the Pauls Stradiņš Clinical University Hospital.

of resistance is no longer restricted only to hospitals — it exists outside the hospitals as well. In these countries, antibiotics are being both manufactured and widely used; soil and water has been contaminated with antibiotics, there is overcrowding, so bacterial resistance is a huge problem that involves the whole society. «It is possible in a domestic context, for example, whilst swimming, to contract a urinary tract infection that can not be treated with medication,» the doctor illustrates, adding that such cases are described in the medical literature. At the global level, antimicrobial resistance is seen as a potential catastrophe that threatens human development. Two years ago the UN General Assembly was summoned to discuss antimicrobial resistance. It was only the fourth time in the history of the UN that the Assembly was held on a health topic; previously only the risks of HIV/AIDS, Ebola virus and non-communicable diseases have been discussed at this level.

«Therefore there is talk about post-antibiotic era — what are we going to do when antibiotics stop working. The worry is that liver transplants, dental implants or other surgeries will no longer be possible, because these patients will be at very high risk of dying from complications brought about by incurable infections,» U. Dumpis describes a situation that has not yet occurred in Latvia, but is not far off either — in his opinion it could be a matter of about five years. According to him, the situation is getting progressively worse

and there is no reason to hope that it will be possible to stop it; only ten years ago all infections could be treated and there were a whole range of effective medicines.

It has to be said though, that during this period there has been some success in limiting antibiotic resistance in Latvia, for example, a system has been put in place that allows to observe and eliminate the spread of antibiotic-resistant golden staphylococcus in hospitals: in 2003, out of all the cases of infections with golden staphylococcus 40 % were resistant, currently — only 3 %. Due to a successful program the situation with resistant tuberculosis has also improved.

Single use hospital rooms

«Now there are other problems — gram-negative intestinal bacteria, which is even more resistant than golden staphylococci and causes serious complications,» says the epidemiologist. «Therefore, it should be researched which measures best limit this bacteria. We have been doing this for years, therefore, we know that in the case of golden staphylococcus, hand disinfection is most effective. That would not be enough for gram-negative bacteria, it is difficult to restrict their spread, especially since our hospitals have multi-patient hospital rooms with a shared toilet.» With a view to limiting the transmission of resistant bacteria from one patient to another, Sweden and the Netherlands, for example, are building new hospitals with single

patient hospital rooms only. They have estimated that it is more cost-effective to do this, rather than fighting the consequences of the spread of resistant bacteria in a medical facility. There is great hope for creating new antibiotics, but people keep forgetting that innovative medicines are extremely expensive. «People are used to antibiotics being cheap — one course costs around EUR 5 — 10,» estimates U. Dumpis. «But now, also in Latvia, a treatment course with the new generation of antibiotics costs EUR 6000 — 8000 per patient. If there are more instances of only this medicine being effective, then the cost of medication for two patients is going to exceed the cost of building one single patient hospital room, comparing to this the cost will seem ridiculously low.» Currently every third patient in the hospital is prescribed antibiotics. If we are going to be requiring the same amount of the new, expensive medication, the health care system will soon go bankrupt, therefore the main task is to keep the effectiveness of the «old» antibiotics for as long as possible. This may be achieved by drastic reductions in the consumption of these medicines (records show unjustified use of antibiotics in hospitals in about every third case, outpatients — in every other case). It is also necessary to increase the control of antimicrobial resistance in medical treatment units by transforming the infrastructure according to the new circumstances. Use of antibiotics in livestock farming also needs to be reduced. ●



Māris Kūlis, Researcher at Institute of Philosophy and Sociology of University of Latvia points out important aspect – internal threats that Latvia creates itself, by not being able to formulate what it's national identity is going to be in the 21st century.

text / Dita Arāja
photo / Ieva Leiniša, LETA

THERE CAN NEVER BE TOO MUCH SECURITY

Europe is currently weak as it is surrounded by uncertainty - the old ideas are no longer viable, but new ones have not been born yet

«Even when it feels safe, one should never rely on that,» says Māris Kūlis, Researcher at Institute of Philosophy and Sociology of University of Latvia. He explores intercultural relations and contemporary Islam, jihadism and terrorism and has collated his findings in the book «In the Cross-Fire of Terrorism. Islamic State». However, M. Kūlis believes that at present Latvia needs to be aware of not only external but also internal threats we create for ourselves, because we have not figured out and defined what the identity of Latvia is going to be in the 21st century.



Fight against Western Invasion

Although we would like to believe that after the two devastating world wars of the 20th century the world has changed and become wiser, however, we cannot feel completely safe in this time and age. We are reminded of this by various indicators — security threats relating to our neighbouring countries, the Near East and more distant countries. «The generations that have lived during the wars of the 20th century, are going, new ones are taking their place, and the enthusiasm to make noise with guns is increasing,» says M. Kūlis. Since September 11, 2001, when *Al Qaeda*, run by Osama bin Laden, announced itself internationally with an act of terrorism of an unprecedented scale, the world has suffered a series of smaller-scale terrorist attacks that have recently taken place in Europe. «One of the flags for radical Islamists is a fight against the invasion of Western culture and the willingness to turn Islam into a hobby. For them it is so unacceptable that they have to take guns in their hands and destroy,» says M. Kūlis. He explains that one of the most influential 20th century Egyptian Islam philosophers and one of the radical Islam and Jihadist spiritual fathers, *Sayyid Qutb* (1906-1966), after visiting the United States of America (USA) declared the West to be crippled and everything possible needed to be done to prevent the Western society influencing Islamic countries. Namely, he believed that the Western democratic countries suffer from «schizophrenic secularism» — religion being separated from the state, and Sayyid Qutb was of the view that this must not happen in the Eastern countries, since Islam and power, politics is an one. «The war against the West is a long-term defence,» M. Kūlis sums up, and reminding of the war in Iraq, he adds — it is not entirely true that the governments of the liberal and democratic Western countries have no influence in the Middle East.

If *Al Qaeda* once declared the United States its enemy, then Islamic State directs its attacks at Europe, where from time to time bombs go off and innocent pedestrians get targeted by vehicles. M. Kūlis says that the Islamist strategist Abu Musab al-Suri is calling for «Torah Bora mentality» to be given up, or Bin Laden's way of thinking, which is built on a pyramid-type structured organisation and large-scale attacks on imaginary enemy countries, mainly the USA. Abu Musab al-Suri is of the opinion that such a structure no longer works and there needs to

FOR INFORMATION

— Studies and innovations focusing on the creation of a Latvian language corpus deserve a special support, since they would ensure a transfer to create language products that have a demand for nationally and internationally (amongst others - speech technology development, machine translation, training materials, etc.).

— In the future, the regions and countries that will strengthen and develop their unique identity will gain an important comparative advantage in the global race.

SOURCE: STUDY ON THE CURRENT ISSUES DEVELOPING
LATVIAN SOCIETY, ECONOMY AND SCIENCE, FUTURE
TRENDS AND OPPORTUNITIES

be a new one — a «franchise type» consisting of small «cells», which from time to time at various places and times, organise minor attacks, slowly terrorizing the imaginary enemy. «It looks like the terrorist movement is currently headed this way. I am concerned that the small attacks might continue or even become more frequent,» says M. Kūlis.

Shooting alone is not enough

Even though the Islamic State has lost its territory and does not exist as a «country» any more, it has not disappeared as a terrorist organisation and has moved from the material world into the digital, where it is easy to express oneself. Māris tells us of an incident that he learned about from *New York Times*. A Western girl wanted to convert to Islam and needed two witnesses for this ceremony, which she did not have in real life. Nevertheless, they found a solution — witnesses were found on *Twitter* and the young lady converted to Islam through virtual reality. This story brings it home that Western countries need to be thinking about cyber security more and more, and

that will most probably come with certain restrictions to the societies of these countries, who are used to freedom of speech and various self-expressions. However, Internet is only one of the options that terrorist organisations use. M. Kūlis specifically points out the role of media in the spread of terrorism: «There is a type of demonic marriage going on between media and terrorists» — media needs as scandalous as possible news, to be able to attract the largest audience possible and with it — advertisers, and terrorists have, unfortunately caught on to this weakness of the Western society. If you want to «get past» «the very important» news on the size of Kim Kardashian's bottom, then you cannot kill just one person, you need to kill at least ten. And you cannot just shoot them — you have to cut their head off, because that is the kind of stuff that the Western media will accept. It is absurd, but that's how it is, unfortunately.»

European countries do emphasise that terrorist attacks do not frighten Europeans, but still, researcher says — the Western society is shocked about the suicidal aspect, because here death is viewed as something alienated, but, if people are prepared to sacrifice their life in the name of an idea, then we don't know what to say to them. If you blow yourself up, we are going to shoot you? But that does not work. And the West do not know what to do with the suicide. «We live in our bubble of abundance, and then suddenly somebody destroys our way of life — it is very traumatic and makes terrorism a scary threat,» says M. Kūlis. But he also points out that Islamic State propaganda only has about 1 — 2 % depiction of extreme violence, that is taken over and reproduced by Western media. The greatest part of propaganda is aimed internally, at followers of Islam themselves.

Uncertain road for Latvia

As far as can be seen from the propaganda materials of the *Islam State*, Latvia still is not on the radar for the terrorists. On the map, where the *Islam State* had graphically placed little flags next to the countries that they consider their enemies, Latvian flag was not there, M. Kūlis says. In his view, Latvian citizens can live in peace for another 10-20 years, since terrorists might aim their attacks at the big European countries. However, the researcher points out another, in his view, important aspect — internal threats that Latvia creates itself, by not being able to formulate what its national identity is go-

ing to be in the 21st century. «European Union is at an interesting stage at the moment, when the old ideas are no longer viable, but new ones have not been born yet. Sociologist Zygmunt Bauman describes this issue using the term *interregnum*, comparing it to the emergence of Roman Empire, when the old power — Rem and Romulus — were dead, but the new one was not born yet. What do we do? During this time of uncertainty Europe and Latvia are weak - the countries do not know what they want themselves, and are replacing it with buying new handbags, shoes and *gadgets*, thinking — if we buy new things, we will contribute to the economy and it will be ok. But I am convinced that no society is able to exist without the big ideas, especially if they are located next to the big countries, who have ideas, ideologies, which make these societies want to act,» M. Kūlis considers.

To his mind, since the European Union (ES) is primarily all about economic cooperation, the notion of «all different, all equal» is not yet rooted in the minds of the citizens of those countries. The recent decision of Great Britain to leave the EU, as well as the heated expressions of nationalism in the member states, for example, in France and Poland, illustrate this.

The scientist believes that Latvia has to define and decide what model of development it is headed for. For example, do we support blending with the EU and aim to become a federal European country, or do we wish to keep Latvia as a culturally authentic county within Europe. «The illusion that we will become a bridge between the EU and Russia is a naive one — neither the EU, nor Russia will allow it,» M. Kūlis is convinced and believes that when defining the vision for the road of development, state institutions should ask for help from Latvian thinkers, artists, writers — that would be the humanities contribution to the future of our country. So far he has not noticed that politicians would be willing to define the great ideas for our future, because Latvian politics are pragmatic. What road should be chosen for Latvia? It is not that easy to say. M. Kūlis has observed that Eastern European countries, probably because of their painful historic experiences, wish to preserve their culture, however, the desire to preserve their country is fading, as the world is becoming more interconnected, globalised. «If a society wishes to preserve their language and culture, while that is still possible, then that should be done, but I would not wish to support militant isola-



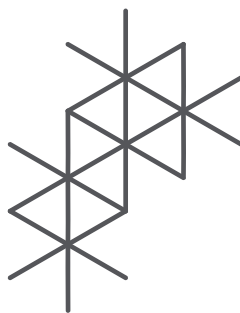
JĀNIS GRABIS

Professor at the Faculty of Computer Science and Information Technology, Riga Technical University

The society's attitude is superficial

Despite the fact that the issue of cyber-security has been widely discussed, people still have not truly experienced cyber-security risks, and the society's attitude towards these issues is superficial. A perfect example here is the recent incident with the stolen passwords — people are still using primitive passwords, that are easy to guess. Such an attitude is probably due to the fact that at present the losses related to cyber-crimes are relatively small for people. Attitudes would change if, for example, a certain amount of money disappeared from the bank account every month. Then people would start thinking about cyber-security.

Another aspect — a democratic society has no idea where to draw a line and when crimes in the digital realm need to be met with a real force. Should it be at the point when cyber-criminals damage data centres, infrastructure? At the moment we do not know where this line is to be drawn, however, we can reach it really quickly. The good news is that in this day and age focus is on developing a persistent system. These are systems that are able to diagnose and prevent cyber-threats and counteract them. In an ideal scenario those who wish to spread fake news, to hack servers, would hit the barrier of the persistent system and would even receive a return punch. Persistence properties should be built in during the development stages of an information technology solution, since adding them to an existing system is complicated and inefficient. Firstly, of course, these types of systems are introduced for critical systems and the military, and after that it is possible that they will be widely used by businesses and private persons. The only thing we have to bear in mind is that these systems are secure and, as such, the price will be significantly higher.



tionism as that can lead to evil consequences,» says M. Kūlis. His opinion is that we need to find a way to preserve our culture, and in the meantime accepting and respecting other people. But never should we underestimate international events. «In the 20-30s of the previous century people were taking out loans, building houses, thinking — there is going to be a future, but the most devastating war of the 20th century started,» says researcher, reminding that there can never be too much security. ●



VAS Latvijas Dzelzceļš has an interest in the development of hydrogen technologies, says Aigars Laizāns, Vice-Rector of Studies at Latvian University of Agriculture and a Member of the Council of Latvijas Dzelzceļš.

teksts / Lāsma Vaivare
foto / Elīna Karaseva

DIVERSIFYING

It is envisaged that during this year, the first hydrogen fueling station will be starting to serve customers in Riga, as well as an innovative trolleybus will start operating passenger routes; active use of hydrogen in energy and transportation would increase Latvia's energy independence and security



FOR INFORMATION

Within the concept of national security, energy security has been recognized as one of the most important issues of national security, which is particularly significant under the so called Hybrid hazard conditions. As such, studies on energy independence and new approaches to diversifying energy resources can also contribute to strengthening Latvia's national security.

SOURCE: STUDY ON THE CURRENT ISSUES DEVELOPING LATVIAN SOCIETY, ECONOMY AND SCIENCE, FUTURE TRENDS AND OPPORTUNITIES

Hydrogen manufacturing, fueling and storage station on Vienības Gatve in Riga has already been built, trolleybuses have been delivered, however tests are still being run and the project is delayed slightly, admits Baiba Bartaševiča-Feldmane, *Rīgas Satiksme* representative. Due to the considerable costs — around 16 million Euro, part of which has been co-funded by EU funding — the company has received a lot of criticism.

The plan is that there will be ten *Hytrolleys* operating throughout the streets of Riga — trolleybuses, that have their traction power diesel generators replaced

with modules of hydrogen fuel elements. As such, the vehicle is more energy-efficient, generates less noise pollution and operates in no-emissions mode, informs *Rīgas Satiksme* (Riga Traffic). A trolleybus without an overhead line will be able to cover up to a 100 km with a single fueling up; using it will allow the replacement of diesel buses with partial overhead line coverage. In addition, the hydrogen fueling station will be available to the public. These initiatives form part of an international project aimed at construction of hydrogen fuel stations along the North Sea-Baltic Sea Trans-European Transport



Network (TEN-T) — in Riga, Pärnu and the Dutch city of Arnhem — and promotion of the demand and use of hydrogen vehicles in the European Union (EU).

VAS *Latvijas Dzelzceļš* (SJSC Latvian Railways) have also shown an interest in the development of hydrogen technologies and they have demonstrated their seriousness with an international gesture. Namely, last year at the *EXPO 2017* exhibition in Kazakhstan's capital, Astana, it demonstrated the prototype of the world's first hydrogen maneuver-locomotive. «A maneuver-locomotive loads cargos, it spends more time at standstill, while waiting for carriages to be hooked on or off, than moving. It works for short periods of time and very ineffectively - speeding up is quickly followed by breaking. It creates a high level of pollution. There are researches in Europe showing that port areas, customs warehouse zones are very polluted territories,» says Aigars Laizāns, Vice-Rector of Studies at Latvian University of Agriculture (LUA), Professor. He is also member of the council of *Latvijas Dzelzceļš*, therefore, he is able to tell that the locomotive will be powered by an accumulator battery and elements of hydrogen fuel. If the prototype turns out to be a success, there could be a maneuver-locomotive transition plant in Latvia.

Both these projects are mentioned by A. Laizāns as an example to describe how topical research on sourcing, storing and utilising hydrogen in Latvia and in the world is. Europe has research programs on transitioning indoors transport to hydrogen, transitioning cars to hydrogen, for hybrid solutions, there is also electric cars being gradually developed. «It is mostly about hybrid solutions, not about putting hydrogen in the internal combustion engine and burning just that,» he says. A. Laizāns does not rate hydrogen to be the only energy solution in the future: «If we, as a clever country, were able to develop hydrogen technologies along with lithium-ion batteries, we would diversify our risks and live more securely.»

Research in Latvia takes place both at the University of Latvia and Riga Technical University, as well as Institute of Solid State Physics at the University of Latvia.

Double security

«Half of the world's hydrogen production is achieved by breaking down methane in the steam reforming process. This industrially approved method can also be used to break down other hydrocarbons by using, for example, biogas (biomethane)

FOR INFORMATION

Smart energy in Latvia is defined as another smart specialisation area, which gives its specific contribution in the context of European Energy Community. This contribution can be brought by a number of smart specialisation niches: the development of smart networks (development of demand-supply systems, smart buildings, devices and home automation systems); development of next-generation technologies for sourcing energy from renewable sources; increasing energy efficiency (energy efficiency of building structures, energy efficiency of residential area infrastructure elements); sustainable energy for transport (new technologies, accelerating introduction of these, electric mobility).

SOURCE: STUDY ON THE CURRENT ISSUES DEVELOPING
LATVIAN SOCIETY, ECONOMY AND SCIENCE, FUTURE
TRENDS AND OPPORTUNITIES

or) or petroleum gas (a mixture of propane-butane),» states the Alternative Fuel Development Plan for years 2017 — 2020, when looking at the alternative fuel sourcing methods. Water electrolysis process using only electricity and water, is mentioned as a second industrial method that is being used to manufacture hydrogen. This world-tested and industrially approved technology allows hydrogen to be manufactured anywhere where there is the necessary power connection to the electricity transmission grid and the required amount of water available.

Also, A. Laizāns, while enlisting all the pros of using hydrogen, points out that its use in energy is more environmentally friendly compared to fossil fuels, besides the process is reversible. «It is double security. Latvia has a lot of water, sometimes it seems that there is too much water. If we make smart use of resources around us, we can source hydrogen from water, this way reducing our energy dependency on oil products and import. Every country that has water and electricity, can source fuel — hydrogen. Since we can source electricity from the sun, wind, water, we can be completely independent from oil products. Another gain is the sense of security about the fact that we are not polluting the environment. When hydrogen burns, it turns back into water, water

returns to nature. Through hydrogen oxygen cycle we obtain freshwater. Around 95% of the world's water supply is salt water, the volume of freshwater is tiny. When sourcing energy we are creating water mist in the atmosphere, which eventually rains down somewhere. This way, indirectly, through energy activities, water and the environment get purified, where we base ourselves, for example, in urban areas, near ports where there is busy traffic of cargos and people,» says A. Laizāns.

The fact that it is an effective technology also is crucial. «More than a hundred years ago, a fuel cell was discovered within which a reaction between oxygen and hydrogen takes place, resulting in electricity. Technologies are so advanced that hydrogen oxygen reaction within a fuel cell is very effective. 70 and more percent of energy is used for electricity, a maximum of 30 percent - for heating,» A. Laizāns says, adding that this is twice as effective as internal combustion engine generator system.

Hydrogen is a carrier of energy, therefore its technologies could be used to stock energy, thus becoming more independent from the large energy manufacturers and the prices that they dictate, the professor goes on to explain. It would also permit a scattered energy supply. When asked — does that mean a hydrogen manufacturing plant near every body of water, A. Laizāns responds — quite possibly. We are one a strange path — everything needs to be centralised and within cities, creating problems for ecology and people's interaction. Thinking about a proper organization of transport and energy flows, we could be living outside of city and it would take us an hour to get to downtown Riga, we could build a network and spread people all across Latvia,» says the Professor of LUA.

Critics exist

Nevertheless, there is also plenty of critics, who point out the high cost, complex and energy-intensive distribution, accumulation, safety risks. One of the critics is, for example, Elon Musk, entrepreneur, inventor and millionaire. A. Laizāns rejects the criticism, saying that there is research underway currently on use of hard substances for storage of hydrogen. At the same time he also admits that there are still unresolved issues, for example, creating a hydrogen sourcing, storage and supply network is problematic. He is informed that there is reasearch on at-

FOR INFORMATION

__According to the European Union, promoting alternative fuels is one of the key measures to reduce the negative impact that transport sector has on the environment.

__There already are vehicles in operation that use hydrogen as fuel: passenger cars, city buses and minibuses, lorries and ships that run on inland waterways. The performance of such non-emission vehicles, the mileage between each re-fueling and the frequency of re-fueling, is comparable to the relevant parameters for vehicles that run on gasoline and diesel. Compared to a battery operated electric vehicle, hydrogen electric vehicles cover more mileage with one refill and have shorter re-fueling times.

__The prevalence of hydrogen electric vehicles is directly linked to the available infrastructure - if it was promoted, there would also be a noticeable increase in the number of these vehicles. Hydrogen infrastructure is at an early stage of development, in 2015, there were only around 200 hydrogen fuelling stations around the world, around a 100 of them in Europe. Hydrogen fuelling station network is rapidly developing in Europe, especially in Germany and Scandinavian countries.

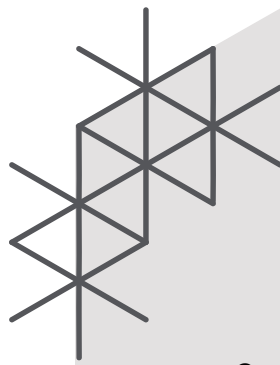
__The projection is that by 2050, the number of vehicles fuelled by hydrogen sourced by hydrogen oxidation within the hydrogen fuel cell, will be around 1%.

SOURCE: ALTERNATIVE FUEL DEVELOPMENT PLAN 2017

— 2020

tempts to use existing natural gas supply networks. There is also the question of what elements need to be used for the membrane to last longer. All in all, though, maintenance of transport running on hydrogen is easier and cheaper, as the fuel elements are much simpler — «there are no moving parts, there is just the membrane, which takes oxygen on one side and hydrogen on the other, finds electrons through reactions and creates power,» A. Laizāns explains.

In the development of hydrogen technologies it is not just contributions to the environment that need to be considered. Scientists need to prove that business will also benefit. ●



UĞIS GRUNTMANIS

PROFESSOR AT UNIVERSITY OF TEXAS

One of the hot topics in the field of medicine and health is the fact that the USA have approved using T CAR - (*chimeric antigen receptor*) for lymphomas, where other treatments no longer work. This is a highly personalised therapy, where each patient's T lymphocytes or thymus cells are specifically activated, by placing T CAR on them, which locates and destroys lymphoma cells. Using this method 57% of patients, who would otherwise have died, are completely cured. We are expecting the greatest surprises from using the CRISPR (*Clustered Regularly Interspaced Short Palindromic Repeats*) genome editing technologies. It will let scientists for the first time in the world history feel like they are gods, they will be able to change our genetic code, eliminating, for example, chances to develop an inherited disease or, for example, to normalize cholesterol levels. With the help of this technology the gender on malaria carrying female mosquitoes can be altered, thus ending their reproduction and eliminating these species entirely.



JULIA ELLEN MELKERS

ASSOCIATE PROFESSOR OF PUBLIC POLICY AT THE GEORGIA INSTITUTE OF TECHNOLOGY

One of the most pressing global issues for the social science research community to address is the development and support of the human and social capital of the scientific community. With an increasingly global and mobile workforce and the presence of innovation and economic disparities, attention to the factors that matter in the attraction, retention and productivity of the scientific community is relevant to social well-being. This is an issue relevant to the strengthening of the higher education system, but also relevant across sectoral and country boundaries.



IEVIŅA STŪRĪTE

RESEARCHER AT NORWEGIAN INSTITUTE OF BIOECONOMY RESEARCH

Area of land that can be used for agriculture is shrinking, whilst biological diversity is also decreasing. In order to be able to supply the world population with food, maintaining and increasing the fruitfulness of soil is crucial.



Taking part in the discussion about quantum physics and the opportunities Latvia has in this area, are Vjačeslavs Kaščejevs, Associate Professor of the Faculty of Physics and Mathematics, University of Latvia, and Andris Ambainis, Professor of Faculty of Computing, University of Latvia.

text / Elīna Sprūde-Nesenberga
photo / Sintija Zandersone, LETA

What does quantum physics, Internet of Things and security have in common?

In science there is no borders between countries, but informal communication and as few obstacles as possible for approbation of new ideas and forming a team is very important



That is the view of Andris Ambainis, Professor of Faculty of Computing, University of Latvia, and Vjačeslavs Kaščejevs, Associate Professor of the Faculty of Physics and Mathematics, University of Latvia.

What is quantum and quantum physics?

Andris Ambainis: Quantum physics is physics that describes the laws of nature at the level of individual particles, laws that operate either for very small things (for individual atoms) or for very cold things with a temperature of about 0.01 degrees above absolute zero.

Vjačeslavs Kaščejevs: These laws have been known for about 100 years already. What makes the practical application of quantum laws current is the advanced technologies, including nanotechnologies that allow targeted manipulation of such small systems — from individual atoms, molecules and quantum elementary particles sources it is possible to purposefully create devices and equipment for both computing and measuring, and communication.

Where else, apart from quantum computing, are quantum technologies used? How would it be useful to the society?

V. Kaščejevs: The other component, which stems from the peculiarities of quantum physics and makes developing practical quantum computing so complicated, is the fact that quantum systems are very sensitive to external conditions. This disadvantage can be turned into an advantage by using the ability of a single quantum to detect very small changes in the external environment so that they could be very sensitive sensors for such ordinary physical quantities as magnetic field, electric field, temperature. Unprecedented sensitivity is what opens up a perspective for entirely different uses, which up to now have not been possible with coarser, large-scale, macroscopic sensors.

A. Ambainis: It is possible to get a more accurate measurement than with ordinary sensors, or to measure in situations where ordinary sensors cannot be used. Quantum sensors are the thing that is closest to reality at the moment, because the quantum physics that is needed there is relatively simple. The quantum computer needs to have, say, a thousand particles working in harmony, much less particles are necessary for the quantum sensor.

V. Kaščejevs: Another area where quantum sensitivity is used and the inevitable traces that are left behind by intervention

FOR INFORMATION

— There are significant advantages for the competition in the following [ICT] research and innovation niches: innovative knowledge management, system modeling and software development methods and tools; innovative ICT hardware and software applications for industries; cyber-physics systems, language technologies and the semantic web; bulk data and knowledge infrastructure; information security and quantum computers; computer system testing methods. Alongside these niches of specialization, the Latvian scientific institutions highlight a need to explore the possibilities of integrating system technologies for cyber-physics and high-speed optical transmission, high-performance signal processing and fast modifications, as well as developing the next-generation radio frequency and microwave communications system.

SOURCE: STUDY ON THE CURRENT ISSUES DEVELOPING LATVIAN SOCIETY, ECONOMY AND SCIENCE, FUTURE TRENDS AND OPPORTUNITIES

in the quantum system, is safe communication.

Are quantum technologies relevant in the context of Big Data and Internet of Things?

A. Ambainis: I would call it the big dream that *Google* and many other big players in this area have — we have quantum computers that could offer much more computing abilities in the future, and we have big data from which we would like to compute something that we are unable to compute on an ordinary computer. The big challenge is — how to connect them. Solutions are still being sought, but it is a very topical subject, and there is a lot of quantum machine-learning related activities happening in the world right now. It is interesting to note that at one of the companies that work in this area, there is a Latvian employed in a managerial role.

Does that mean that Latvian scientists are at the global level?

V. Kaščejevs: Of course! Developing quantum technologies is a challenge of a global scale. There are opportunities to specialize and find exactly the niche where

we can be the best and cooperate with the best in the world, because only then can one get to where nobody has ever been. This is also one of the major challenges that gets talked about a lot in relation to quantum technologies — we need not only quantum physicists, mathematicians, programmers, but also engineers and business people, as well a specialization called quantum engineering, which requires an overall knowledge of the principles of how these devices work, but having an engineer's thinking, the ability to perfect the product.

How could quantum computers influence public safety?

A. Ambainis: Quantum computers quite directly influence encryption and safe data transmission. If we build a complete quantum computer, then it will be able to hack many of the existing encryption systems. We would need to change our whole encryption infrastructure to methods that are safe. The positive thing is that quantum mechanics can be used to build safer encryption systems. The fact that quantum particles are very fragile and can not be measured without taking them apart, can be used to construct an absolutely secure encryption, where any attempt of listening in is noticed.

What is the potential for development of quantum technologies?

A. Ambainis: An important issue at the moment is how to use a quantum computer to model physics. In the nineteenth century in order to create a new battery all the possible designs had to be tested in laboratories, nowadays modelling is carried out on ordinary computers. Modelling would be much more precise on a regular computer. Actually this is the closest purpose of quantum computers, since quantum physics is the natural environment of quantum computers, this is the case where a quantum computer would have the greatest advantage over a regular computer.

V. Kaščejevs: Considering where the industry is investing and what products it is working on, one niche would be magnetic field sensors that operate at room temperature, are compact and stable, but at the same time extremely sensitive. The goal is to create easy to use and practical magnetocardiography and magnetoencephalography equipment. Everyone is probably familiar with heart cardiograms and encephalograms that measure the electric signals transmitted by the heart and the brain.



From the perspective of Internet of Things, quantum sensors would provide a way to affordably and accurately collate a large amount of information, which could be processed with the large data methods, and discover possibilities and relationships that would otherwise be invisible.

VJAČESLAVS KAŠČEJEVS

ASSOCIATE PROFESSOR OF THE FACULTY OF PHYSICS AND MATHEMATICS, UNIVERSITY OF LATVIA

But the heart and the brain also transmit a magnetic field, a very weak one, and it requires very sensitive sensors to measure it.

One of the specific quantum systems that is being actively explored and used, including at the University of Latvia's Laser Centre, are specially processed diamond crystals which contain separate molecular type quantum systems that retain «quantum» also at room temperature and change colour depending on the magnetic field. With the help of laser physics methods, this slight change of colour can be turned into a signal, which is detected on a computer.

From the perspective of *Internet of Things*, quantum sensors would provide a way to affordably and accurately collate a large amount of information, which could be processed with the large data methods, and discover possibilities and relationships that would otherwise be invisible.

You already mentioned that Latvian scientists are at the global level. How would you rate the current situation in science in Latvia?

V. Kaščejevs: Our advantage is that, in order to get into the TOP circles in fields that are connected with programming, with theory, less prior investment is needed, in comparison to the «metal» build-

FOR INFORMATION

ICT as a branch of economics has the best potential to collaborate with Latvian scientific institutions, ensuring knowledge co-building and sharing.

SOURCE: STUDY ON THE CURRENT ISSUES DEVELOPING
LATVIAN SOCIETY, ECONOMY AND SCIENCE, FUTURE
TRENDS AND OPPORTUNITIES

ing fields. Of course, these fields gather at the large research centres, but the modern research environment in Europe is very open. We have proof that there is enough talent in Latvia, we can prepare them, so that they could be completely competitive, working at the TOP laboratories in the world and using this experience and developing further, including within Latvia. Eventually we will find our roots in the global circles — through our young generation.

Investments that Latvia receives both through the structural funds and Excellence projects that Latvian scientists win by participating in equal competition with Western Europe, have the highest direct returns in people. And human capital is the resource that can be accumulated also in Latvia. And then it is achievable that the range of subjects to be studied,



One of the great challenges in science in Latvia is to bring to Latvia the new that has surfaced in the world in the recent decades.

ANDRIS AMBAINIS

PROFESSOR OF FACULTY OF COMPUTING, UNIVERSITY OF LATVIA



the areas of excellence is no longer work and contribution of just one or two people. In a way it is our goal and vision — for there to be enough critical mass with enthusiastically minded young scientists, who do not look at the borderline in a traditional way, am I an academic scientist who is only interested in science, or, if I am an entrepreneur, then it is entrepreneurship with a little technological added value.

A. Ambainis: One of the great challenges in science in Latvia is to bring to Latvia the new that has surfaced in the world in the recent decades. In my view, both computer science and quantum technologies are positive success stories, as they are areas where things can be achieved with a relatively small team. In computer sciences almost everything happens in relatively small teams. If we were to talk about quantum technologies, then quantum computer building is a challenge that requires 50—100 or even 500 people, but quantum computing theory is something that can be done with a small group of scientists and that way it is also the most productive.

V. Kaščejevs: The niche, that we have successfully proved ourselves in, is modelling and supporting theory when creating new devices, which experimentally takes place in laboratories, where there is infrastructure that has been accumulated



for decades of years and *know-how* in precisely this area; but often these laboratories lack specific knowledge with regards to manipulation of quantum systems. It is a challenge for the conventional electronics, which has been nanoelectronics for a while already, as certain sizes of elements have been shrunk down to the absolute minimum, which follows the laws of physics, and they are the laws of quantum physics. Therefore there is a demand for nanoelectronic's theorists who know the laws of quantum physics like the back of their hand, and at the same time have a thorough understanding of how they manifest in practical, actual devices. This is a very fruitful area for collaborations, which is very easy to do within Europe, and that is so mainly for research projects that my team are working on at the University of Latvia. The theoretical part is done in collaborating closely with the experimental — one step is taken in experimenting, the next — in theory. Theory and the practical part drive each other to understand what new things can be created on the same electronically technological basis, which will have already out-served its classical purpose.

What is your opinion on the collaboration between disciplines among Latvian scientists and information exchange?

A. Ambainis: As with many things, we

have success stories here, and not as successful stories. On one hand there is plenty of these success stories, on the other hand, it would be better if there were even more of them. On a positive note, aside from quantum technologies — it is also worth mentioning what is happening in cognitive sciences — Jurgis Šķilters and his team, who have a very successful collaboration between computer sciences on one part, psychology on another part and Latvian programming industry on the third part.

V. Kaščejevs: In professional scientific communication borders between countries do not exist, exchange of scientific results happens very effectively, irrespective of where the scientists are located. But a level of informal communication and as few obstacles as possible for approbation of new ideas and forming a team is very important. Therefore I am very pleased to see that both the University of Latvia and Riga Technical University are trying to place their faculties close by also geographically, since often interdisciplinary collaboration starts with an informal chat at the coffee machine. A challenge and necessity is to place people who think likewise also close by geographically, because only then this critical mass can be achieved that we already spoke about.

A. Ambainis: We both represent areas where there are quite a few Latvians who

have successfully gained their education here and are now working outside of Latvia. Besides us, also Laura Mančinska will be speaking at the congress. She started her scientific work on quantum computing here, at the University of Latvia, but 10 years ago she went to do her PhD abroad and now is a professor at the University of Copenhagen. I believe these kind of people are very important as they help to build a bridge between Latvia and science outside of Latvia.

V. Kaščejevs: The most crucial element that helps us build our national competitiveness, is our agents in the most active, intellectually and technologically richest areas. They enable us to grow and achieve what we would not be able to achieve otherwise.

A. Ambainis: Science, knowledge are being transmitted through the social network, built up of contacts between people, built up of science magazines that they read. It is important for Latvia to be a part of this network. If we look at the inventions that came out in 1920 —1930 in Latvia, they were very strongly based on being part of the German speaking scientifically technical network. The great challenge for Latvia since 1990 has been to get back there. In the Western world science network. And that is something that is still a process, and we are taking another step towards it. ●



The main culture of selection of the Institute of Horticulture is apple trees, they are the most demanded by growers, says Edīte Kaufmane, the leading researcher of the Institute of Horticulture.

text / Lāsma Vaivare
photo / Gundega Preiss

Local, innovative, valuable

Peas and beans, that have turned into protein-rich breakfast cereals, future food from earthworms, innovative products from manufacturing leftovers — Latvian scientists offer solutions for production of high quality food using locally sourced raw materials

At the packing plant of the Faculty of Food Technology, Latvia University of Agriculture (LUA), products that are currently being industrially manufactured, and that have been developed in the recent years with the involvement of university's scientists, are all lined up on the table. There is baby food, drinks, packaged ready to eat vegetables, porridges, cereal flakes, various snacks, bee bread, etc. Very soon extruded legume snacks will be added to the list as well. These snacks can be used to supplement the traditional breakfast cereals or as an additive for salads and soups. Investors have already shown interest in manufacturing these, says Sandra Muižniece-Brasava, Professor at the Department of Food Technology of LUA and Head of Technology and Knowledge Transfer Office.

Protein and fibre-rich peas and beans have old cultivating traditions in Latvia, but nutrition experts admit that their consumption in food could be higher. It would be worth consuming both animal and plant protein, S. Muižniece-Brasava also agrees. Scientists from the LUA in an international project (16 partners from 10 countries participated in the EU 7th Research Framework Programme EURO-LEGUME) have created innovative products from grey peas, broad beans and field beans: legume pâtés, extruded legume snacks and legume bars. Two doctoral theses have also been written on this subject, their authors were Asnate Ķirse and Liene Strauta. «Protein intake with food is important for all of us, but even more so — for growing children, although not everyone likes to eat meat. What are children more likely going to eat? Breakfast cereals. Why not make them out of legumes? They are rich in protein and fibre, besides legumes do not contain gluten, which is often found in grains,» S. Muižniece-Brasava explains the reason for creating the extruded legume snack products. It is true that it took more than a year to give peas and beans cereal-like texture. «They do not puff up as easily as it was hoped they would. We had to find optimal technological parameters and adapt them to ensure a continuous manufacturing process,» the professor goes on to explain. The snacks have also been enriched with different flavours, therefore, children and young people who would not normally eat legumes, are happy to eat these as they cannot tell what they are actually made of. Legume bars contain more protein and less sugar. The pâtés that have been created, have been given an extended best before term without adding any preservatives. This is possible using high-pressure technology, which allows the destruction of microorganisms, significantly extending the shelf-life of products without the use of thermal treatment. This is very important if the product is to be exported, but at the same time it needs to retain valuable components, therefore, high temperature would be damaging. The work of LUA scientists S. Muižniece-Brasava, A. Ķirse, L. Strauta, Ruta Galoburda and Daina Kārklīņa has been appraised by the Latvian Academy of Sciences, naming it as one of the achievements of Latvian science in 2017.

Fish and earthworms

Another project has been nearly completed on the creation of innovative pro-

FOR INFORMATION

The issue of security is often emphasised in various science policy development documents, but public opinion points to other set of issues that are more important. Namely, in the opinion of the Latvian people, support should be focused on research into problems that are empirically closer to us, such as health and food quality.

SOURCE: STUDY ON THE CURRENT ISSUES DEVELOPING
LATVIAN SOCIETY, ECONOMY AND SCIENCE, FUTURE
TRENDS AND OPPORTUNITIES

ducts from Baltic herring and European sprat caught in the Baltic Sea, which in Latvia are traditionally tinned or processed into fish meal. LUA scientists have developed a wide range of structured fish mass products, for example, fish sausages, bread rolls with fish filling, semi-finished fish products. The new products have not only been developed in the laboratory, but also have been approved for manufacturing. Using herring and sprat expands the local fish processing as well as, by using imported raw materials, we have gained a cheaper product, S. Muižniece-Brasava emphasises.

There is a number of other projects still in the early stages; one of the most exotic of those is a study of use of earthworms in food. Leading researcher Ilga Gedrovica, Faculty of Food Technology, LUA analyses the use of protein-rich non-traditional raw materials in food. She explains that by using earthworms, it is possible to reduce ecological and economic problems in food manufacturing. Namely, the current world food consumption is not sustainable, the economic activity of people, including the acquisition of food, causes climate change, reduces the availability of fresh water, impairs the quality of air and water, degrades ecosystems, etc.

The role of packaging

Research shows that about one third of the world's food is thrown away; the main reasons — packaging is too big, shelf life is too short and insatiability when buying products on sale, says S. Muižniece-Brasava. Finding technologies to be able to

extend the shelf-life while maintaining the nutritional value of the product without adding e-numbers, is on the agenda for both researchers and entrepreneurs. Everyone wants organic and eco products with a long shelf-life, she smiles. Emphasising the importance of packaging, the professor tells us about a packaging solution for perishable products, for instance, Olivier salad. It keeps the salad fresh for nearly two months without the need to add preservatives. Even more importantly, tests have shown a better microbiological quality than of a salad that has been freshly made. This study has coincided with the doctoral theses of Vita Levkāne.

Development of functional products, innovative packaging technologies, the use of high-pressure and other advanced technologies are important areas that scientists of the Faculty of Food Technology of LUA are working on by evaluating both microbiological parameters and sensory parameters as well as parameters such as microstructure, amount of vitamins, adds associate professor Jeļena Zagorska. «Extending the shelf-life is one thing; we also need to ensure that the product quality does not suffer during this time,» she points out. As part of the national research program *Agricultural Resources for the Sustainable Production of Quality and Healthy Food in Latvia* a research has also been carried out on substituting food additives used in manufacturing with natural compounds, such as extracts from lovage, celery, parsley. Although not equally effective, they do prolong the shelf life of the product. Researchers at the Faculty of Food Technology of LUA have also evaluated various fermentation starters to obtain the best possible consistency of yoghurt and other sour milk products without the use of stabilisers. At the moment there is a clear demand for more natural products in the market. Besides, by not using stabilisers we are able to reduce the cost price, the associate professor goes on. Similarly, researchers are looking into ways of replacing sugar in bakery products with natural sweeteners such as agave syrup, using biologically active compounds extracted from cranberries, viburnums and chokeberries in confectionery. As part of the national research program scientists have expanded the range of gluten-free products and introduced a new kind of gluten-free pasta, using Jerusalem artichoke, cabbage core and pumpkin marc to improve the nutritional value and taste. The use of by-products in manufacturing



Scientists from the Latvia University of Agriculture (LUA) have created innovative products from grey peas, broad beans and field beans, which are all grown in Latvia, for example, extruded legume snacks, says Sandra Muižniece-Brasava, Professor at the Department of Food Technology of LUA and Head of Technology and Knowledge Transfer Office.

of new products is very topical, says J. Zagorska and lists some examples that have been worked on in the national research program. For example, phenols derived from potato processing products could be used in pharmaceuticals, whey-derived lactulose — as a probiotic to increase the nutritional value of milk and other products, etc.

Use everything

The creation of new synbiotic products from fruit and berry marc and cereal bran, using biocatalysts — enzymes — is currently being explored by the Institute of Horticulture (LUA Scientific Institute — a derived public person) as part of PostDoc project leading by Vitalijs Radenkovs. The Institute of Horticulture plays a major role in the development of fruit processing and waste-free technologies, as evidenced by this fact. «A very popular product at the moment is candied fruit — it was created here. There are many manufacturers for these now and, for instance, *Rāmkalni* even export them to Japan,» the institute lead researcher Edīte Kaufmane acknowledges. The institute have

patented the manufacturing technology for candied cranberry and quince.

The Institute has developed a successful co-operation in the development of products and technologies with various processing companies, for example, SIA *Lat food LP* developed dry cereal manufacturing technology for baby food, but SIA *Mežrozītes LV* — a product based on rose hip mass. There are also companies that the institute has approached with their initiatives, for example, at the moment it is interested in waste-free technologies. «Manufacturing candied quince, their cores are left behind. A chutney or a meat additive has been developed; it has chopped quince seeds as a base to which fruits are added. There are very valuable substances in, for example, apple stalks. Why not use them? There are also many good substances to be found in raspberry and black-currant marc. There is a company that uses black currant marc to add to their meat additive, which is good for gastrointestinal tract,» E. Kaufmane informs. Waste-free technologies can also be used to manufacture animal food. «Sea buckthorn leaves and shoots are used as

an additive for feeding young calves who have abdominal and problems. Adding sea buckthorn leaves and shoots to their food stabilizes their abdominal function and increases their resistance to diarrhea. Sea buckthorn can only be picked along with all the shoots, but afterwards the berries get separated from the stalks and leaves. Why not use the sea buckthorn leaves as well? They can also be used to manufacture horse food, to give them a better shine,» she goes on to explain.

Eating your own apple

Fruit processing is just one of the branches of the Institute of Horticulture. Its specialist work provides the full spectrum (selective breeding, growing and storage technology development, pathology and genetic research) to promote the development of the fruit growing sector and the provision of local buyers and processing companies with fruit, winning the competition against the Polish rivals, whose produce dominates the stores. «At the end of the nineties commercial orchard planting began, most of them are currently producing and provi-



The new building of the Faculty of Food Technology, which hosts the laboratories and a pilot manufacturing plant, creates ample opportunities for developing innovative products and technologies from an idea to a finished product.

ding the market with local fruits. A lot of the harvest is being used for the school fruit program at educational institutions. Grocery stores have our own apples, blueberries, cranberries, also strawberries. Theoretically we can grow raspberries, pears, plums, cherries and many others; the question is — how to guarantee a price. The whole world is wondering how Poland can offer such low prices on fruits — they have mass produce, cooperation, and at one point they had great support from the state,» E. Kaufmane explains. At the same time she admits that consumer demand for local apples is growing, therefore everything possible needs to be done to improve the quality and to reduce the price. Work is now under way on a project aimed at wider mechanization of the fruit industry, where there is still a great deal of manual work, both in terms of crowning and thinning of fruit buds. Nevertheless, it is very unlikely that there are only going to be local fruits at stores, but their dominance can be achieved.

Changing along with the customers' tastes and demand, new cultures and varieties are being developed. «We used to grow such varieties as *Antonovka*, *Rudens svītrains*, *Sīpoliņš*, *Trebū*... At the moment only *Antonovka* still does not have a suitable replacement, but everything else has. We lack varieties that can easily be stored long term. We have registered a new variety *Monta* — one that can be eaten nearly until the next harvest comes in. It takes a long time to «tame» a new variety,» E. Kaufmane says. Talking about new cultures — highbush blueberry, buckthorn, flowering quince are still considered new cultures. The latter have

been registered as a plant of fruit in Latvia. The Latvian Academy of Sciences acknowledged selecting the quince variety *Rasa* by the Institute of Horticulture to bear fruit as one of the most significant achievements in science in 2012. Also elderberry, viburnum, edible mountain-ash and honeysuckle are becoming fashionable now. «Candied strawberries are currently being manufactured, although only a few varieties are suitable. Candied plums turn out well also, but only one variety out of the 30 currently grown in Latvia can be used for this purpose. Cider production is developing in Latvia and the little «paradise apples» are good for this,» some of the examples mentioned by the leading researcher.

Select, grow, preserve

The Institute of Horticulture has registered more than 50 varieties in Latvia, there are also varieties registered abroad. Work is ongoing all the time, mainly on the selection of apples, raspberries and quinces, in an effort to create new varieties suitable for our climate conditions, high fruit quality, productive and resistant to diseases. This is very important in the context of the shift towards environmentally friendly and integrated farming, which means plant spraying against pests and diseases only when absolutely necessary. «We have great success in the selection of disease-resistant apple varieties, we have created varieties resistant to apple scab, but new diseases continue to emerge,» says the leading researcher. The development of cultivation technologies is also important for industry. In the mid-1990s modern breeding methods were

being developed that were very different from those used during the Soviet era. At that time fruit cultivated mainly for processing, not for fresh consumption, so quality was not essential. Learning from the European experience, work on lower-growth rootstocks began, planting them closer together, introducing planter edges. The next steps were watering, fertilisation program, crowning. Work with risk reducing technologies has also begun, for example, covers for sweet cherries, raspberries, strawberries. «In fruit cultivation scientists face many risks, for example, if a PhD student has four years to write their doctoral theses, but on two of these years the entire harvest suffers from frost? It is critical also for cultivators — investments in fruit cultivation are huge, and if the harvest suffers from frost, then losses are huge,» E. Kaufmane explains.

Technologies for storing fruit are also developing. The institute has studied storage, both by increasing carbon dioxide, but lowering the oxygen content of the storage facility, as well as by treatment with methylcyclopropene (MCP). E. Kaufmane explains that the latter method stops the ripening process in the fruit, therefore it does not spoil, therefore, if a fruit has been placed in storage while still green, it will remain exactly the same months later. Determining the stage of ripeness, again, is a science in itself, she says, and admits that she is an optimist and sees a perspective for fruit cultivation. «We have local market with low supply as well as exporting opportunities. There are also the small businesses, who are trying out something new and who need raw material,» the scientist adds. ●



We are not going to become a manufacturing state. If there is something simple to be manufactured, like a leather wallet or a plastic cup, it is not worthwhile doing it here, but if we are considering a complex and smart product with a high added value, then it can be done quickly in Latvia, says Kristaps Rikāns, Regional Managing Director of Ubiquiti Networks.

BRAIN CENTRE

text / Lāsma Vaivare
photo / Zane Bitere, LETA

Not advertising themselves loudly, for the fifth year running, talented engineers in Riga have been creating innovative solutions for communication and internet of things for the global market; creating research and development centres could be a success story in Latvia

Around 250 million dollars — quarterly turnaround that is being calculated in the financial year of 2018 for the former *Apple* employee Roberts Pera's information technology company *Ubiquiti Networks*. Part of this turnover is made up of products developed in Latvia, at the company's research and development (R&D) centre *U-Labs*. «We are a research and development cell, a small group of talented people who generate ideas, hear out the ideas of our parent company and sees them to finished products and manufacturing,» says Kristaps Rikāns, Regional Managing Director of *Ubiquiti Networks*, head of *U-Labs*. Although they modestly call themselves a «small group of talented people», the team consists of around 60 engineers of various specialties, programmers, testers and mobile application developers.

Teleporting

The number of employees since the beginning of *U-Labs* has grown significantly. The product basket offered by *U-Labs* is also increasing. A small *social camera* — video camera that can take photos, film and stream videos on-line, has joined *AmpliFi*, a home *Wi-Fi* router that has become a multi-million dollar business, with signal amplifier that can expand home wireless network. «There is also *AmpliFi Teleport* — a device that you put in your hand-bag and get teleported,» jokes K. Rikāns. «Being anywhere in the world, the device allows you to connect to your home *Wi-Fi* network, making your phone or computer think you are at home. What is the use? You can read your local news portals, watch your local TV channels, control your smart devices at home,» he explains seriously now. Besides, a smart home air purifier that measures air quality, — pollution, amount of dust, odours, gases, humidity, temperature, and cleanses it, is the first product that we can say has been developed in Latvia from A to Z. Previously, the products were developed and prototyped here, but manufactured in China. The air purifier is produced in cooperation with the Latvian electronics company *Hansa-Matrix*. «We are not going to become a manufacturing state. If there is something simple to be manufactured, like a leather wallet or a plastic cup, it is not worthwhile doing it here, but if we are considering a complex and smart product with a high added value, then it can be done quickly in Latvia, manufacturers are flexible in relation to amendments, reconciliations. We can run into problems if there is a need for some specific materials that can not be manufactured in Latvia, or if there is a need to produce a large volume,» says the head of *U-Labs*. Manufacturing in China, if you do not need a million simple plastic cups, but, for example, a thousand complex machines, is definitely not cheaper than what Latvian manufacturers would charge. Besides, Chinese manufacturers are not interested in such small volumes.

Being able to step away from an idea

R&D centre in Riga is continuously working on new internet of things, some are in their development stage, others — prototyping stage. However, the head of *U-Labs* emphasizes that all ideas do not need not be developed into a product. Sometimes people believe in their idea so strongly that they cannot objectively evaluate the possible risks.



MĀRCIS JANSONS

ASSOCIATE PROFESSOR AT WAYNE STATE UNIVERSITY,
DIRECTOR OF EARLY ENGINEERING PROGRAMS

Globally, tremendous engineering resources are being devoted to advance autonomous vehicles, electrification, and vehicle-to-vehicle communication. These developments are occurring simultaneously. They will impact the way we live and work, our health and our environment.



AIVARS LEJNĪEKŠ

HEAD OF THE DEPARTMENT OF INTERNAL MEDICINE AT RIGA STRADIŅŠ UNIVERSITY

Currently integrating the findings of various branches of science into development of technologies and medicines and the demonstrating their efficacy in order to reduce mortality and to stop or prevent the development of pathology is topical. Studies on stem cells and their use in the treatment of various pathologies are under-way, development of regenerative medicine (tissue and organ replacement) and studies on gene therapy and “repair” of damaged (defective) genes is also taking place. With the help of new technologies, when working out and implementing an individualised approach to each patient’s treatment, it is essential to maintain humane attitude towards the patient.



ZINTA GAILE

PROFESSOR AT LATVIAN UNIVERSITY OF AGRICULTURE, DEAN OF THE FACULTY OF AGRICULTURE

The main challenges that global agriculture is facing are supplying the rapidly growing world population with food, at the same time protecting the environment, as well as global climate change and water scarcity. Agricultural scientists are working in all possible directions in order to resolve these issues innovatively. The most significant trend in forestry can be described with the phrase “climate-smart forestry”, namely, planning such activity in the forest landscape, rather than at the level of a single habitation, which would ensure the contribution of this ecosystem to reducing climate change and, at the same time, the resilience to withstand the negative impacts of the ongoing changes.



We will continue developing ideas and will try to manufacture more in Latvia. I see a great potential for Latvia in this area, especially if those currently still at school will see it. I think they will see it. If we look at robotics extra-curriculum activities in schools — there are so many interested and active students there!

KRISTAPS RIKĀNS

REGIONAL MANAGING DIRECTOR OF UBIQUITI NETWORKS

«We spent two years on a fantastic idea — a spherical drone. The idea was slightly crazy, but we really believed in it. We developed a prototype — an actual flying ball just like in *Star Wars*. A ball was flying around the office. There was a huge interest in the prototype, nobody had ever created anything like it before, and apparently there was a reason why nobody had. Only afterwards did we start to realise what the problem was. Manufacturing such a drone would be very complicated and expensive, there would be potential quality problems, we would not even be able to consider manufacturing in Latvia. Often turning an idea into a prototype is only 10% of the work, the rest is taking it to mass manufacturing and on the shop shelves. We had to discontinue the project,» K. Rikāns is sharing the lesson they learned.

Country of opportunities

In our conversation he repeatedly emphasizes that despite the criticism we have about our country (and he himself also has some, as he calls them, «red flags»), Latvia has all the preconditions to be the country of future *iPhone*, *Tesla*, *AmpliFi*, etc. «The business environment, tax policies, investment environment is overall not bad. In many ways we are a safe country with convenient logistics, there are simple customs, import, export procedures, so that it is easy to operate an R&D or a logistics centre here. Our location geographically and the political orientation to the West, as well as talented and clever engineers, we have plenty of opportunities to prototype and ma-

nufacture. There are companies such as *HansaMatrix*, *Volburg*, a 3D print company of European level *Baltic 3D*, world-class testers *TesDevLab*, and many small workshops where anything can be molded out of metal,» K. Rikāns points out all the pros. There is, however, also a drop of tar — quality packaging. He shows us the packaging for the smart air purifier and the solution offered in Latvia. They are not comparable. «You can find a nice cardboard box to put a cake in or a baby rattle. The amount of things we produce in Latvia — medicines, chemicals, lasers, optics — but it is hard to produce a simple thing. That is absurd — we manufacture the goods in Latvia, but have to order the packaging from China,» he says.

Americans do not need to be convinced

The skills and achievements of the Latvian engineers were the key words to convince R. Pera to set up *Ubiquiti Networks* R&D Centre in Latvia. At the time, K. Rikāns was the head representative in North America for the Latvian manufacturer of microwave data transmission equipment *SAF Tehnika*. Once he decided to return to Latvia he was looking for new challenges. At a technology conference he approached R. Pera, told him about Latvia, technologies that have been developed here, talented engineers, and he believe him. «I had lived in America for a while, I was well known in my industry, I had a large network of clients and partners, *SAF Tehnika* also had become known in North America. I had a credit of trustworthiness.

For the next person who is going to do it, it is going to be even easier — they will be able to say that not only *SAF Tehnika*, *Catch Box*, but also *U-Labs* and others are from Latvia,» he smiles.

When asked whether R&D centre and the development of manufacturing is not being slowed down by the lack of work-force, he admits that the circle of good specialists is limited; he has been in situations where students are expecting an unreasonably high salary. There are engineers whose qualifications do not add up, who change employers often. And there are those who do not really want to work. «I started working when I was 14 — I was sawing wooden planks at a sawmill. At the age of 16 I was putting together computers,» K. Rikāns shares his experience.

Due to the limited number of specialists, *U-Labs* and other R&D centres are unlikely to become large corporations in the future. Is that necessary? «I think it is wiser and more efficient to form R&D cells with 50–60 engineers in each, possibly even fewer specialists. There were 10 people in the *AmpliFi* team. 10 people developed products which are now a business worth millions!» emphasises the Regional Managing Director of *Ubiquiti Networks*. He would not really want to work for a giant company with lots of project managers, general managers and directors, prescribed working procedures, reports, where employees are just little screws in the mechanism. He would like to continue developing ideas with his team and try to manufacture more in Latvia. ●



iNOVUSS
INNOVATION FESTIVAL

Idea. Excellence.
Inspiration. Engagement.

Riga, Lucavsala
August 31 – September 2
www.inovuss.lv



Izglītības un zinātnes
ministrija

Latvija 100 
ES ESMU LATVIJA



1862
RĪGAS TEHNISKĀ
UNIVERSITĀTE

NACIONĀLAIS
ATTĪSTĪBAS
PLĀNS 2020



EIROPAS SAVIENĪBA
Eiropas Reģionālās
attīstības fonds

IEGULDĪJUMS TAVĀ NĀKOTNĒ