

NEWS AT BUT

2021/2022



Entoway

Martin Masár's project targets insect food



MILAN HOUSER / LACQUER STORIES

Catalogue of works by Milan Houser who uses lacquer as a specific painting material. In the competition The Most Beautiful Czech Book of the Year 2020 the publication came third in the Books on Fine Arts category.



NEWS AT BUT

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NOT FOR SALE!

EDITORIAL



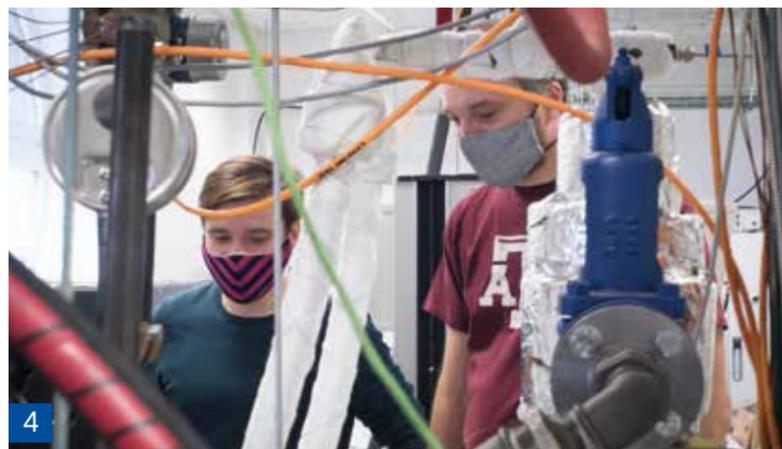
Dear readers,

This year marks the 30th anniversary of the first issue of the Brno University of Technology magazine, which provides regular information about important events in the life of the university and its alumni. Since January 1996, the magazine has been called Události na VUT (News at BUT). In 2016 it received a contemporary graphic makeover and changed from a monthly to a quarterly magazine. The English version of News at BUT has so far published 5 issues, which take the form of a yearbook presenting a selection of articles with international significance so that information about events at the university reaches a foreign audience.

The magazine News at BUT has been published for many years under the editorial care of the university's publishing house VUTIAM, which this year also celebrates its anniversary – for 25 years it has provided publishing services, a significant part of which consists of high-profile translated literature, especially university textbooks. However, we also publish publications in Czech-English or books whose primary language is English. It is obvious that the University's publishing activity is an excellent and effective tool for building international cooperation, not only with scientific and educational, but also cultural institutions. We are proud to participate in this two-way transfer of knowledge.

I hope that you will find our yearbook an inspiring read this year as well and I wish you a successful and, if possible, healthy academic year of 2021/2022.

Jana Kořínková
Director of the VUTIAM Publishing House



4 Karel Katovsky from the Department of Electrical Power Engineering of the Faculty of Electrical Engineering and Communication presents an experimental loop that allows simulation of the reaction to a sharp temperature rise in a nuclear reactor.



8 The Magneto-Optical and THz Spectroscopy Laboratory at CEITEC BUT has an international team led by Peter Neugebauer.



16 Zdeněk Fránek, a graduate of the Faculty of Architecture of BUT, holds the title of Architect of the Year 2020.



40 Petr Baxant, a lighting engineer and promoter of energy savings, was at the birth of the luminance analyser, which gained international renown at the Frankfurt trade fair.

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NEWS

AWARD



HR EXCELLENCE IN RESEARCH

BUT received the prestigious HR Award

In February 2021, BUT received the international HR Award in the field of human resources management. The European Commission thus confirmed the position of Brno University of Technology among European scientific research institutions. Among Brno universities, Mendel University and one of the faculties of Masaryk University, together with CEITEC MU, already have the HR Award. BUT applied for this international assessment for the entire university at the end of 2019 and succeeded in the certification process after more than a year, with no reservations and no comments.

As stated in the letter from the European Commission addressed to BUT, the award confirms the University's commitment to strengthen its care for the development and improvement of conditions in the field of human resources management in accordance with the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers and, in particular, its commitment to achieve fair and transparent procedures in the recruitment and evaluation of scientific researchers.

From the moment of the award, there is an implementation phase for BUT, which will last for two years, when an internal evaluation will be sent to the European Commission for the purposes of reassessing the award.

(ed)

GOLD MEDAL



Students from Brno won gold in the iGEM competition

A team of Brno students from Masaryk University (MU) and University of Technology (BUT), known as Generation Mendel, won a gold medal and a nomination for Best Environmental Project at the global International Genetically Engineered Machine (iGEM) competition. Their solution for cleaning water of cyanobacteria using synthetic biology tools was successful in an international competition of nearly 250 teams from 36 countries. Students from the Faculty of Information Technology and the Faculty of Business and Management joined the team.

To effectively remove cyanobacteria from water, it is necessary to remove not only the cells of cyanobacteria but also the toxins that the cyanobacteria produce. Therefore, the students set about developing a system based on cells of the soil bacterium *Bacillus subtilis*. For these bacteria to serve their purpose, the students had to modify them so that they have a protein scaffold on their surface that traps enzymes that destroy both the cyanobacteria cells and their toxins. In addition to solving the problem itself, the team had to prepare a scientific poster, a web page called a "wiki", a short 2-minute video, a 20-minute video replacing the presentation to the jury in Boston, and also design the future implementation of the research.

(ed)

COMPETITION



Award for a PhD student of the Faculty of Chemistry

PhD student Aneta Pospíšilová from the Institute of Materials Science of the Faculty of Chemistry at BUT won the 3rd place in the competition for the Make Our Planet Great Again prize, organized by the Embassy of France in the Czech Republic together with BNP Paribas. The competition seeks to reward the research work of Czech students in the field of climate change, environment and sustainable development. The jury was impressed by Aneta Pospíšilová's dissertation on poly-3-hydroxybutyrate, its isolation from bacteria and its use as a substitute for conventional plastics. The PhD student is working on her dissertation in the bioplastics laboratory under the supervision of Radek Příklad.

There is a large team working on PHB bioplastics research at the BUT Faculty of Chemistry. Aneta Pospíšilová is mainly interested in the isolation of polymers from biomass and in the search for possibilities of their use in industry. These could be implemented by the company Nafigate, with which the Institute has long been cooperating. This could include, for example, decorative cosmetics, which are literally full of microplastics and replacing them with degradable alternatives is desirable here. Participation in the competition involved a detailed written presentation of the dissertation and then a presentation in English to the jury followed by a lively discussion that this topical issue provokes.

(ed)

Experiments from FEEC can contribute to increased nuclear safety

Heat and unpleasant noise, these are the main feelings during a visit to one of the laboratories of the Department of Electrical Power Engineering of the Faculty of Electrical Engineering and Communication of Brno University of Technology, where an experiment on a new experimental loop is being carried out. It gives the scientists around Karel Katovský the opportunity to simulate situations that can occur in a nuclear reactor when the temperature of the metal cladding of the nuclear fuel rises sharply, threatening to burn through the fuel rod and expose the fuel. Their device, abbreviated as M.R.C.H.A., was developed in the FEEC and FME laboratories over seven years.

Radana Koudelová
Photo Lenka Gumulec

The result is the Mobile Research Critical Heat-flux Apparatus – a device that is unique in the breadth of its configuration options. The loop also opens up possibilities for experimental collaboration, as similar experimental facilities can be found in Germany, Sweden and South Korea, for example, and the devices can complement each other. On the device, the scientists are investigating the so-called boiling crisis, a condition in which the temperature of a heated surface, in this case the fuel rod of a nuclear fuel, jumps up dramatically. By studying and understanding this phenomenon in detail, researchers can design nuclear reactor safety systems to prevent damage to the nuclear fuel blanket and the release of radioactive substances into the plant's primary circuit. This would mean economic losses, risk of radiation exposure to personnel and other negative impacts.

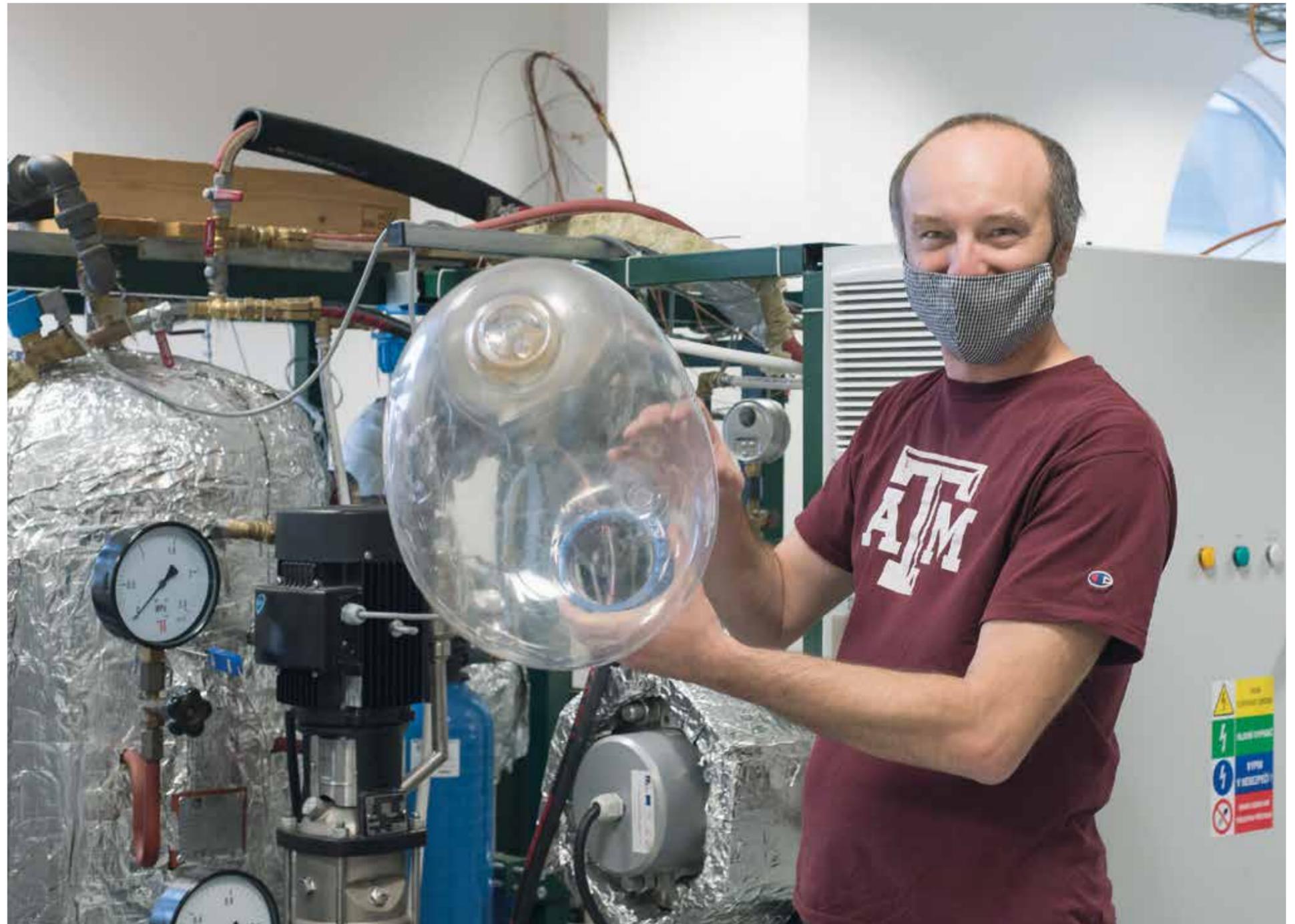
"A single nuclear reactor contains tens of thousands of fuel rods, inside which are

fuel matrices made of uranium oxides or a mixture of uranium and plutonium oxides. The fuel undergoes a fission reaction that causes the rod to heat up strongly. These are stacked in hundreds close together in

individual fuel assemblies, with only millimetre gaps between them through which water flows to cool them. The rods must be intensively cooled, because if they are not cooled sufficiently they can overheat

or even the above-mentioned boiling crisis could result. This does not normally happen, but it is part of the safety assessment of a nuclear reactor. Such a situation could theoretically occur, for example,

if a control rod is ejected, the coolant flow is blocked or the cooling system otherwise fails. Therefore, we need to know when such a situation can occur and how the rod coverage behaves in



Karel Katovský

such a moment," said Karel Katovský from the Faculty of Electrical Engineering and Communication of Brno University of Technology, explaining the need for the experimental loops.

During the experiments, the experts gradually heat the loop to the boiling point of water at a given pressure and further increase the electrical power input to the dummy rod. "The moment the critical heat flux is reached, the temperature of the rod rises sharply and the device automatically shuts down to prevent its destruction. Occasionally, the heated spot on the rod will light up," explained PhD student Kamil Števíanka, who has helped test and calibrate the device since April 2020, describing how the device works. From the academic year 2020/2021, it has already been in use by scientists for experiments.

"While we bring the coolant to a boil in our primary circuit, we definitely don't want boiling coolant in a real nuclear power plant. That would already be an emergency situation," pointed out Katovský, adding that the safety data and thermohydraulic calculations must be verified experimentally to show that the calculation programme is working correctly. Test loops, such as the one at FEEC BUT, are used to verify these programmes. It will make the programmes used, for example, in research institutes for designing new types of fuel even more accurate.

In addition, scientists from Brno University of Technology can now investigate various

materials for the production of fuel rods. "There are now 444 nuclear reactors in operation worldwide, most of which use zirconium alloys for covering fuel rods. This has generally good properties, but in an emergency, zirconium reacts with superheated water vapour to produce hydrogen. Unfortunately, people may remember the spectacular explosions of the reactor halls at Fukushima ten years ago, which were caused by accumulated hydrogen," said Karel Katovský, pointing to another area of research. As a result, many researchers are now looking for new ways to prevent this reaction of zirconium and are screening various new materials or surface treatments that need to be tested in different situations. This is also where the M.R.C.H.A. device can help.

"In the first set of experiments we studied critical heat flows on an inconel nickel superalloy, a very expensive and stable material applicable to various extreme environments. Our experiments with this material and on the parameters we studied were the first of their kind in the world," added Števíanka. However, it was not only scientists from the Department of Electrical Power Engineering at FEEC who worked on the new experimental loop; Ladislav Suk from FME was the main designer and engineer of the device. Scientists from other institutes of the Faculty of Electrical Engineering and Communication and the Faculty of Mechanical Engineering also helped in finalising the loop. "For example, colleagues

from the Department of Power Electrical Engineering and Electronics created for us a power supply operating with a current of 1,500 A and a voltage of 70 V, which is an excellent device in itself. Moreover, it is a multifunctional source, so it can also be used for plasma research," said Števíanka pointing out the interdisciplinary cooperation.

The first students have already tried out measurements on the experimental

circuit, but their selection is very strict. Any unsuccessful experiment can damage the entire loop. Two PhD students are now working on the device and Karel Katovský has already announced the first two topics for final theses: one for a bachelor's thesis and one for a master's thesis. The collaboration with Texas A&M University, the largest nuclear university in the United States, serves as an inspiration for the students' active involvement in experiments and testing; since

2012, not only researchers but also students have been going there for exchange visits and internships.

"We are now working on a joint scientific project called ADAR – Advanced Accelerator Controlled Nuclear Reactor. In addition to the University of Texas, the University of California Berkeley and the University of Wisconsin-Madison are also involved. It is researching liquid-salt reactors, a reactor concept that

has a number of advantages, such as liquid fuel with the ability to continuously remove neutron poisons or other radioactive particles. These are so-called fourth-generation reactors, which means that this is also the direction that nuclear power could take in the future. However, this type of reactor has many opponents because of some unresolved issues in the technology," commented Katovský on the joint research. The project also involves several partners

from the Czech Republic: for example, the Czech Technical University, the University of Chemistry and Technology, the University of Defence and the Institute of Nuclear Physics of the Academy of Sciences in Řež.

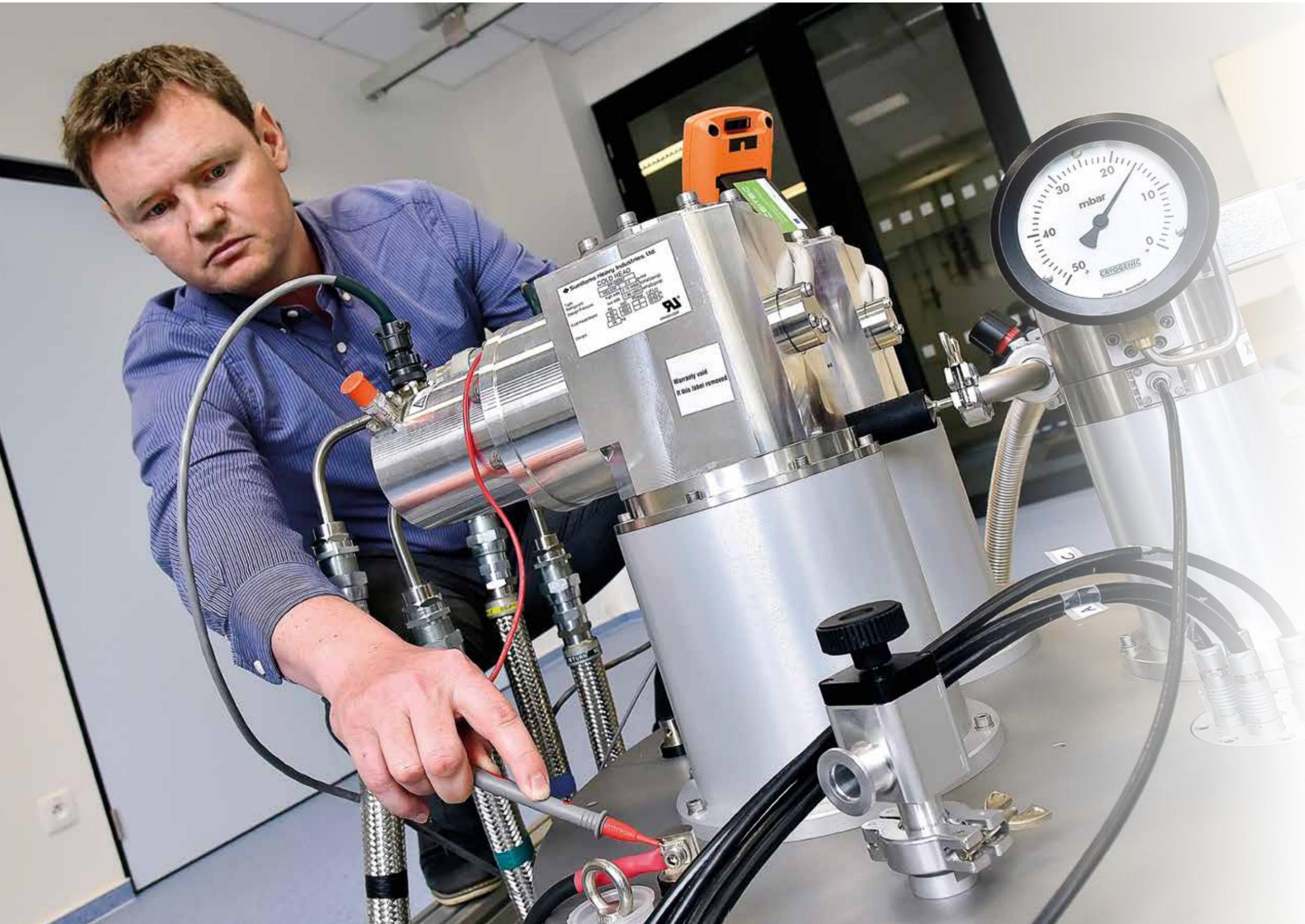
And how has the international project been affected by the global coronavirus pandemic? "We are proud that we managed to get the project, however, covid interfered a little bit. Nevertheless, we hope

that in 2021 our PhD students will be able to travel to Texas again. On the other hand, this unusual situation has helped us in some ways. For example, thanks to solidarity between scientists, we were able to make measurements easily at the Institute of Nuclear Physics in Řež, we were able to use detectors from the University of Defence, etc. Thus, thanks to all this, a strong Czech team has been created, focused on advanced methods of measuring neutrons in new reactor systems," said Katovský who hinted at some of the positives of year 2020.

Although Texas A&M University is regularly ranked among the TOP 5 nuclear universities in the USA and has by far the largest number of students in the United States studying nuclear physics, it is not the only international partner of Karel Katovský's team. For years, his students have also been going on internships to the Joint Institute for Nuclear Research in Dubna, Russia, to KINGS University in Korea and have also worked with India's Maharaja Sayajirao University of Baroda and Rajiv Gandhi University of Arunachal Pradesh. It is this international collaboration that has also brought four able PhD students from Armenia and Ukraine into his team. ■



Doctoral students (from left) Kamil Števíanka and Taron Petrosyan, a graduate of the Faculty of Physics at Yerevan State University



Research on paramagnetic resonance at CEITEC BUT is led by Petr Neugebauer

A new paramagnetic resonance spectrometer is the basis of the emerging Laboratory of Magneto-optical Spectroscopy at CEITEC BUT. It is being assembled by Petr Neugebauer, a graduate in Physical Engineering at BUT, with his international team. He has received a prestigious grant from the European Research Council for the unique instrument, which changes the previously established measurement principle. In addition to medicine, it may also find applications in industry or chip development.

Jana Franchi
Photo Igor Šefr

Doctor, you have proposed a new method that makes magnetic resonance measurements faster, more comprehensive and more accurate. What principle does it work on?

In contrast to the classical electron magnetic resonance, which so far mainly works on the principle of a variable magnetic field at a non-variable frequency, it operates in a non-variable magnetic field with a rapid change of frequency. Thanks to the spectrometer we are developing, we will also be able to observe the dynamics of the processes, which opens up new possibilities in the study of new materials.

Most of us encounter magnetic resonance most often in the hospital. But the examination is quite lengthy. Could your method make it faster and less uncomfortable for patients in the future?

My idea is that people would only go through the door frame. But that's really a long-term vision that you have to take with a grain of salt. But it's certainly not unrealistic, I personally think it's a matter of time before something like this comes along, and I really hope we can make a significant contribution to that.

Your research is supported by an ERC research grant. Was it difficult to obtain?

I had the grant project in my head for about two years before I wrote and submitted it. There is no space in the application to describe the idea in detail, so every word needs to be weighed. You also have to come up with something very bold, even revolutionary. It's not enough to propose

improvements to something that's already there. Probably the hardest thing for me was to explain briefly and simply what I was trying to do and to get those present excited about my idea. I only had ten minutes to do this during my final presentation in Brussels.

You are currently building special laboratories at CEITEC BUT. How will they be equipped?

The crucial apparatus, the spectrometer, is now operational, and we have even managed to break our previous "world record" for measuring electron spin relaxation, but it is not yet to my liking. It takes time to tune everything. We also need quasi-optical instruments, radiation sources and detectors. Everything will be interconnected and automated. The computers will ensure the proper operation of the equipment. However, I would still like to acquire benchtop magnetic resonance spectrometers not only for scientific purposes but also for training students. The purchase of a commercial pulsed EPR spectrometer and a SQUID magnetometer would also be very helpful, as we currently have to perform these experiments outside Brno.

Your team is made up of researchers from all over the world. How did you recruit them for your project?

Most of them are Czechs and Slovaks, then Ukrainians and people from Poland, France, India, Columbia, China and Egypt. Some of them are key personnel that I have known for a long time and managed to entice away. Others contacted me themselves. Most of them knew my work or had attended

my lectures. Students then applied within the topics announced. It is the involvement of the students that is important to me; thanks to this collaboration they often work on their final thesis with us. However, we also try to attract younger secondary school students for science in the framework of the Secondary School Research Activity scheme.

Did the international composition of the team bring any complications? I don't just mean administrative, what about covid-19?

It certainly wasn't easy. In 2018, many of us came from abroad, so we had to "find our bearings". Especially the visa system of the Czech Republic taught us a lot. When a foreigner applies to stay here, he or she must, among other things, provide proof of impunity from all the countries in which he or she has worked for a long time. For a person who has travelled the world this can be a challenge. And that's not taking into account that in the UK, for example, this certificate will be issued to you by a person who knows you and who will honestly declare that you are of good character. Furthermore, all these documents must be no more than three months old. In one case, this took almost a year, but it proves that this colleague really wanted to join our team, of which I am duly proud. Otherwise, during the spring of 2020, we were mainly concerned that one of us might fall ill, which could mean a drawback in the running of the laboratory. Fortunately, that didn't happen. I must say,

however, that the limitations of the covid-19 pandemic have brought us some positives, especially in terms of streamlining our work.

You mentioned that you returned to the Czech Republic from abroad. Where did you work specifically and what made you return home?

As a PhD student, I worked in Grenoble in a strong magnetic fields laboratory, which was largely funded directly by the French government and the European Union. Naturally, that was a slightly different world. In Germany I had the opportunity to look behind the scenes and I can say that the local system of managing public money is certainly the best I have ever personally experienced. It is all based on proper investment in the future of society as a whole. In both Germany and France, there is clearly a great deal of institutional support for scientific teams. Here, we certainly have room for improvement in this area. Nevertheless, I wanted to return home from Stuttgart, being a bit of a patriot. One of the reasons I applied for the ERC was the possibility to move the grant anywhere in Europe. I wouldn't get money in the Czech Republic, but there is no shortage of smart people here. Unfortunately, some structures are so fossilised that they do not allow young people to develop further. ■

More information on this topic can be found on the Magneto-optical and THz Spectroscopy Laboratory website:

<http://spectroscopy.ceitec.cz/>



Adam Hajtmar singing in the middle

The stumbling block of Czech baseball is that we are in the Czech Republic and it's baseball, says Adam Hajtmar

Adam Hajtmar, a player of the national baseball team, is finishing his studies at the Faculty of Business and Management at BUT this year, and although he is still "a young baseballer", he is thinking about ending his sports career. And because he doesn't spoil any fun, as a renowned showman he contributed to the creation of a documentary about Czech baseball by becoming the main prize of a crowdfunding campaign to support it.

Jana Novotná
Photo archive of Adam Hajtmar



You have just finished your master's degree. What brought you to BUT?

My classmates from secondary school and I wanted to start a law firm, but none of us got into law school, so we went en masse to Newton College to study economics. I then went to Masaryk University for my master's degree, but after a year I went to the Faculty of Business and Management at BUT on the recommendation of my friends and I have no regrets. The fact that I graduated is a great credit to the school, which respected the fact that I play sports all the time and

accepted my individual study plan. Especially the last year was demanding both academically and athletically. Despite lockdown, we trained with the national team, we had a training camp in Tenerife, so even though seemingly nothing was happening, it was quite action-packed. Just as I was about to leave for three weeks, exams started, but luckily a number of teachers took note of it.

Since when have you been playing baseball?

I grew up in it. My older brother plays baseball, and when I was three, my brother's coach told me I was going to play too.

That meant I didn't have the freedom to choose my sport, I just fell into it, but I have to admit I've always been good at it. I went through all the national teams, and when my brother was one of the first players to sign a contract in the Magellanic baseball system at the age of 18 and went to America for three years, it became a question of whether I should follow him. Then when I was selected as one of the top 40 players in Europe at 15 and went to America for a training programme, after a week it was clear I could never do it.

Why?

That horrible drill is not for me, and I am not really attuned to the American mentality where everything is great and everyone is happy. My brother is different, he would breathe for the team, whereas I kind of don't care; for me it's still the same game and I make fun of everything. I was very talented, that's why they always took me without me having to try. That's why I've been in the national team's starting line-up to this day.

What competition is played in the Czech Republic?

The Czech Baseball Extra League is our top league. My team in Brno is the Dragons, we have been in the league for the last 27 years and have won it 22 times. So, the Dragons are the clear hegemon, we are the most successful club in the Czech Republic and Europe. In the last few years it's changing, the league is getting a lot more equalised, so in the future that dominance will

probably end. When I started playing for the A team when I was seventeen, there was no thought of anyone other than the Dragons winning, it was a game of who would be second, who would be in the final with the Dragons.

Is it possible to make a living playing baseball here?

Even though we're a professional league, I don't know anyone who can make a living out of it, the league doesn't have enough money for that. The stumbling block is that we're in the Czech Republic and it's baseball. Who's gonna go watch baseball? Most people don't understand it at all, it's not a sport that once you watch it you know. My friends want to come and see a game, and I tell them not to come because it's boring. I've gotten to the point where I've done everything there is to do in baseball and there's nowhere to take it any further.

So, you're gonna do a "regular job" for a living?

Now a lot of things have changed in the national team. For the eight years I've been there, we've had an American as a coach, he's world-renowned and he has his own academy. He could have better paying jobs, but somehow, we hit it off and he takes it as his mission. But the Czech Baseball Association has decided to call it quits this year. So even though I'm still young in baseball, I'll probably only play one more year after college and I'm done. Also, the generation of players I've played with so far is changing. Guys are going to slowly quit because they've moved on and

their priorities are changing, and I'm at the point where I want to work rather than play baseball.

When one searches for you on the Internet, the most prominent link is "Behind the song with Áda Hajtmar". What's that about?

It came about because the Ondráček brothers, who both played for the national team, had the idea of making a film about the Czech team and the whole unique paradox that most people in this country know nothing about baseball, and yet at one time we were thirteenth in the world, and now we are fifteenth. Jakub Ondráček was with us in Mexico, where we were playing for qualification for the World Baseball Classic, which is a professional world championship where national teams with the best players come. We have never experienced such an atmosphere, we played with the best players in the world with the highest incomes. And our team has a lawyer in centre, a secondary school teacher in left field, a gynaecologist throwing, a fireman at first base... With this line-up we lost 2-1 and suddenly the world started to respect us. And that's what the guys decided to make a movie about. It's called Inbetween and it's based on the story of the three main players of the national team, being a fireman, a gynaecologist and a lawyer. The main part was originally supposed to be filmed at the WBC last year, but that didn't happen, so it's being filmed here. The guys set a goal of raising at least 600,000 Czech crowns

by crowdfunding for the film and started a Hithit page where every financial contribution was matched in some way. They called players to see if they would be able to offer a prize, a signed jersey, a ball, etc. And because I play guitar and sing, they filmed a clip of me in my jersey playing guitar and singing in our field, and posted it as a 50,000 crowns appeal, pledging to come and play for the donor wherever they wanted. Two weeks after posting, the guys texted me to say that someone had already bought it, and in between I got a call from Peter Moylan, an Australian who played for us for a year at the end of his career in America's top league, saying that he and his wife were going to renew their marriage vows in Hawaii and wanted me to come and play for them.

Your preferred style is the music of the 60s and 70s. What are you going to play for them?

I've been riding in the car with my dad since I was a kid, listening to his favourite CDs. And that's what stuck with me. I don't like contemporary styles at all, I prefer the 50s, 60s, 70s, even older stuff I know from my grandmother. That's my favourite repertoire, so you can't hear anything else from me. When I can, I'm going to play the Beatles for Peter Moylan. ■

Mexican Scientist Develops Scaffolds at CEITEC

Edgar B. Montufar works at CEITEC BUT on materials that enable faster regeneration of damaged tissues and organs, like fractures and bone injuries. Although originally from Mexico, he came to the Czech Republic from the Technical University of Catalonia. He considers CEITEC to be a top scientific workplace and enjoys living in Czechia with his family. However, he admits that not being fluent in Czech language is sometimes an obstacle that he is now trying to overcome. Especially due to possible cooperation with local hospitals and companies.

Zuzana Hübnerová
Photo archive of Edgar Montufar

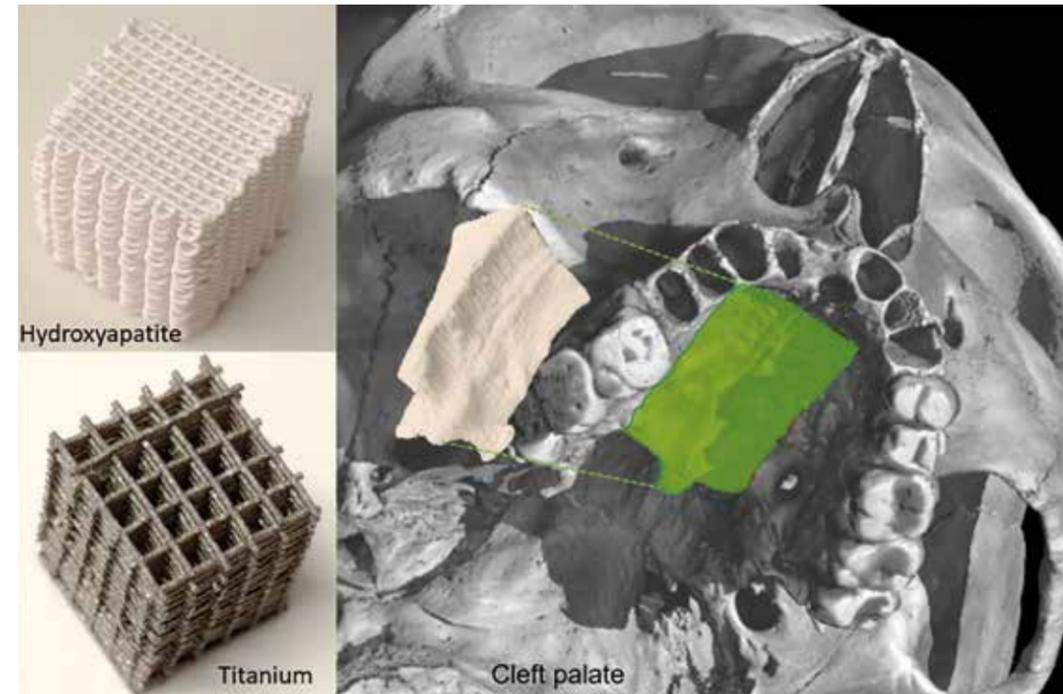


Edgar B. Montufar focuses on the development of so-called scaffolds for tissue engineering at CEITEC BUT. Scaffolds support cells during tissue and organ regeneration. "We

We are looking for materials that will help the body regenerate damaged tissues and organs instead of replacing them with implants or prosthetics.

explore the advantages of additive manufacturing to create more complex scaffolds faster than we would achieve with conventional methods," explains Montufar, adding that additive manufacturing is a computer controlled process in which they create three-dimensional objects by adding layer-upon-layer of material without the need of molds and tools.

Together with colleagues, Montufar, a member of the Advanced Coatings research



group, is looking for suitable combinations of materials and structures that allow faster, safer and less invasive treatment. "We are looking for materials that will help the body regenerate damaged tissues and organs instead of replacing them with implants or prosthetics," confirmed Montufar. For example, they currently work with titanium, which is mechanically strong. "But we combine it with calcium phosphates, which promote bone growth, but are very fragile and break easily. The composite material created by us is thus sufficiently strong to provide mechanical support, but at the same time triggers bone healing," described Edgar Montufar.

In addition, in his work he experiments, for example, with hydrogels and the printing of living cells. He tries to circumvent the need to populate the

scaffold with cells after it has been fabricated. As many of the projects Edgar Montufar is working on have an overlap with medicine, he would like to work with Czech doctors more extensively. But not being fluent in Czech is often an obstacle. "It is one of the challenges now. How to establish

There are many top experts in the Czech Republic, but communication in English is sometimes difficult and requires more effort before we can reach an agreement.

contacts with Czech doctors and entrepreneurs. There are many top experts in the Czech Republic, but communication in English is sometimes difficult and requires more

effort before we can reach an agreement," admitted Montufar. Nevertheless, several collaborations have already been established. For example, on a project that should address materials that prevent the development of bacterial infection during the placement of scaffolds or implants.

Edgar Montufar, who moved to the Czech Republic from his residency at the Technical University of Catalonia in 2015, is also learning Czech with his family. "We cannot expect the Czechs to adapt to us. We live here, so we have to learn the language. This is especially important in professional life," he said. Other than that, he praises life in Brno. "As a scientific workplace, CEITEC is very well equipped. I have good relations with my colleagues and all the collaborations I have

had so far with other research groups have been successful. We also have a number of very good friends in the Czech Republic today," added Montufar.

He sees the main difference in work pace. "In Spain, we hoped for every free minute in the laboratory. Here, some laboratories are sometimes even empty, which is in fact an advantage," he said. And he added a second difference. "The time between an agreed experiment and the actual implementation is sometimes very long. But the results, on the other hand, are very professional," described Montufar. According to him, this experience was initially a challenge. "Today, however, I have built a network of contacts, colleagues and friends, with whom it is easy and pleasant to work," he concludes. ■

Zdeněk Fránek: People should stop waging war on nature



We met architect Zdeněk Fránek, winner of the Architect of the Year 2020 award, at the headquarters of Fránek Architects in Brno, where he spends three days a week. The travel itinerary of the 1985 graduate of the Faculty of Architecture at BUT has calmed down considerably during the pandemic, and he relishes getting a lot more work done. This includes teaching environmental design at the art faculty in Pilsen. Finding the harmony between man and nature, the ability to adapt the intended building to the site and to exploit even the apparent handicap of a place for its strong potential are among the strengths of the award-winning architect.

Jana Novotná
Photo Igor Šefr

Compare a fresh engineering graduate with today's successful architect. Has anything fundamental changed?

I guess man does not change in that fundamental way, but he evolves. I've never worked in a famous architectural firm, so to this day I'm still figuring out things to advise young architects on how to get started. But I think the evolution has always been smooth, without fluctuations, extremes or upgrades – it's a gradual internal growth. Sometimes it was necessary to make a decision – when I didn't want to move with the studio anymore, I built this house, or when we didn't have anywhere to put the models, I bought a baroque granary in Miroslav, which in the future could function as a kind of depositary of models for friends.

What is most important for the success of the project? Where can it fail of all things?

Anywhere. Architecture is an artistic discipline, so if I am forced to compromise, I prefer to walk away from a project. But the technical aspect is equally important – negotiations with the investor – there is a high level of responsibility. Offices with more senior architects can handle a larger number of commissions, but it is difficult to maintain artistic quality. I'm alone, so it's even more difficult to keep everything under control, but the work that comes out of us is an original. An architect should create original architecture as an artist. I have never looked for work, the commissions came to me on their own and

we worked more or less as necessary, but I have never offered myself... It comes in waves – my reference is the work itself. For example, when I did green houses for LIKO-Noe in Slavkov, a company that promotes energy from natural resources, there was a flurry of interest, so now we have a number of similar jobs. That was one of those waves. Or after we did the churches in Černošice and Litomyšl, we are getting orders for others. Plus, my houses are photogenic, so they get published a lot.

It is known that the setting of the house in a particular place is very important to you.

I always deal with the house and its surroundings, including the planting of greenery. The important thing is the setting of the house. It's good to look not only at the horizon, the silhouette, but also the edge of the house, which sits on the ground, and I think that's what we've done well – to set the house so that it has a nice figure from the ground. I'm convinced that you can make a quality house on any site.

Why do the houses of ancient builders, who built intuitively, look so natural, so harmonious with nature that they are pleasing to our eyes?

Because they're sort of archetypes. They arise slowly, over hundreds of years, they change subtly, and they always repeat what has worked. That's folk architecture, a special category that is only architecture in the sense that it repeats a certain element in a certain region... We've got used to these little houses with small windows that are

built with local materials, and we like them because they've been tested over the centuries, and they look wonderful in the landscape.

Do you think about the length of time you're doing the house for?

I do because my buildings can be finished and remodelled in various ways thanks to their natural and environmental concept. That's a given, but I always think about how the house can be extended in the future. As a teenager I studied the houses of Frank Lloyd Wright and other famous architects and was inspired by their spatial design. Many of them have now been abandoned by their original occupants and house various foundations, but they continue to function perfectly. So, I think about how the house should work in the future, that maybe a new resident will come in and turn to me to do a revamp, which does happen.

Can you say that one of your buildings is your favourite?

I love each of my buildings – it's like with children, they are the fruits of my labour. There are a lot of them, so I don't even remember some of them. But when a new request comes and I have to name the ten best buildings, it's usually the same ones. Some of them are ordinary, but people have been living in them for 20 years and they write to me and tell me they are happy. But I usually give the most glaring examples. For example, the Sky Walk in Dolní Morava has been in use for some time, and because it is controversial, it has attracted attention from

foreign media and a lot of other contracts. Then there are churches that stand by the roadside so they can be seen. And then there are the foreign projects. For example, we did a gallery in Beijing, a villa in Croatia, and now there are more in the line. We have projects underway for a museum in Calcutta, a presidential palace in Cape Verde, a primate rescue station in Cameroon.

You are not only an architect, but also an educator. Does it fulfil you?

Yes, right now the most, because I am at a fantastic school, the Ladislav Sutnar Faculty of Design and Art at the University of West Bohemia. It's a very distinctive decorative art school, I'm very excited about it. I teach environmental design there, which is a separate discipline completed with a diploma. We

have already dealt with water with the students, specifically how to touch the surface of the ground so as not to disturb the water supply, now we will be addressing the theme of a caravan or a house on wheels that can be easily moved again with minimal disturbance to the ground. We recall important principles of folk architecture, the use of natural materials, but on the other hand we do projects for

the 22nd century, which are philosophical assignments. A graduate in the field will know a lot about nature and will have a feeling for nature, so he or she shouldn't do anything brutal...

What do you enjoy about teaching?

When I tell students something, I am clarifying some principles for myself. I teach from memory, I'm not forced

to write textbooks, although I do publish. I have my own theories, but I don't impose them on anyone, I just suggest and advise what literature they can study. I point them in a direction and they either catch it or they don't.

What do you live for at the moment?

I have a small child, which is fantastic! Workwise, it's a church for Neratovice and the entrance building to the Botanical Gardens in Prague – those are the two main projects, in addition to many others that keep popping up. The school was in online mode all last year and I have to say I enjoyed it to the max. The whole time felt like a bolt from the blue: the planes stopped flying, the bugs started flying, it started raining and nature blossomed. I had the happiest months at home, my beard grew, everything was managed from home and we did a hundred times more work. I think our planet knows what it's going to put in man's way and when. People need to get a grip and stop waging war on nature. ■

<http://www.franeckarchitects.cz/en/>



It was a coincidence in the beginning, Fabian Khateb recalls

Jana Franchi
Photo archive of Fabian Khateb

From the originally foreign student from Syria, fascinated by everything connected with electricity, there was an associate professor working at the Department of Microelectronics within FEEC BUT over time. He settled permanently in the Czech Republic. Fabian Khateb is one of the three BUT academics appointed by the President of the Republic last year.

How did it all start, Professor? How did you get from Damascus to Brno?

It was in Damascus shortly after graduation when one evening a classmate who had a Czech mother called me to say goodbye to me, because he was going to fly to the Czech Republic to study at university. I asked him to send me information about the possibilities of studying in the Czech Republic. And so began my story. When I was a child, my parents gave me a bicycle that was made in Czechoslovakia. Sometimes we watched Czech fairy tales (with subtitles) on TV. However, it never occurred to me that the Czech Republic

would become my second home. Soon after arriving in the Czech Republic, I celebrated my eighteenth birthday and began attending a one-year intensive Czech language course in Mariánské Lázně. Since I was interested in microelectronics and everything connected with electricity, studying at BUT was an ideal choice for me.

But microelectronics was not your only concern. What other field did you choose?

I successfully completed the study of Electronic Production and Management at the Faculty of Electrical Engineering and Communication at the same time I also studied Management and Business Economics at the Faculty of Business and Management. Subsequently, I successfully completed my doctoral studies at both faculties.

What do you like to remember about your studies most of all? On the contrary, what was the most difficult thing for you?

Studying two fields in Czech at the same time at two different faculties was often exhausting, especially in the beginning, when it was necessary to learn the basic terminology and phrases of each of the fields. It often took long hours.

In addition, it was problematic to coordinate the schedule so that I could attend all lectures and trainings. I did a lot of running around at that time. Nevertheless, I have nice memories of my studies, especially friends not only from the Czech Republic, but also from abroad, with whom I spent my free time and shared common hobbies.

You mentioned taking an intensive language course. Have you ever encountered a language barrier?

Not today. The most demanding were the aforementioned beginnings of university studies. The Czech language is complicated, especially its system of grammar rules. Their observance is relatively difficult in communication practice.

What advice would you give to future international students?

My advice is no different from the one I would give to Czech students, and that is above all a responsible approach to study. BUT is a prominent university that provides young people with a beautiful opportunity to apply both at home and abroad.

After graduation, you also became a university

ambassador. What was your task?

After completing my doctoral studies, I was employed at FEEC and at FBM BUT. Out of love for my mother country, Syria, I had a great vision for building cooperation between BUT and especially the leading Syrian universities. The BUT management very much welcomed this cooperation and subsequently the memoranda of cooperation were signed with the most important universities in Syria, Lebanon and Jordan. As part of this six-year collaboration, of which I was the coordinator, several mutual visits and workshops took place and dozens of Syrian assistants completed their doctoral studies at BUT. Unfortunately, it was stopped in 2012 due to the turbulent situation there.

When did you decide to stay in the Czech Republic permanently? What led you to this and how did the Czech Republic gain you?

For twenty-five years I lived far from my homeland in a country that became my home. A professional career was the main motive to settle here. I have been married for eight years to a Czech wife and we are raising two children together.



In the Czech Republic, I prefer the Christmas atmosphere and nature. Endless greenery is rare in my home country.

How did your professional life develop further?

Ten years ago, I became an associate professor in the field of Electrical and Electronic Technology and began to build international cooperation with important experts from, for example, Greece, Poland, Thailand and Brazil. Thanks to this cooperation, several new techniques and concepts have been implemented for the design of integrated circuits with extremely low supply voltage, which can be used in biomedical applications. The results of the cooperation were published in international prestigious journals. For several years I have been the editor of the editorial board of four impact journals. These activities are time consuming, but at the same time interesting and motivating.

So the path to a professorship was not easy... What is your recipe for becoming a successful scientist?

The path to professorship required intensive work, patience and confidence. Fortunately, I was accompanied all the time by the support of my family and colleagues from BUT, who wished me success with all their heart and whom I would like to thank again on this occasion. However, gaining a professorship does not end the story. I want to continue to strive to contribute new knowledge in the field at the international level and to continue to strengthen and expand foreign cooperation. ■



One ride in the formula was enough for me, says commentator Tomáš Richtr

In 2020 he completed his 13th season as a Formula 1 race commentator. Yet Tomáš Richtr still does not consider himself a sports journalist. In addition to F1, which he still counts among his hobbies years later, the graduate of the Faculty of Mechanical Engineering at BUT works on the development of air traffic control systems. The recipe for success, he says, is this: you have to devote yourself to what you can be passionate about. And Tomáš Richtr undoubtedly has a passion for the queen of motorsports.

Iveta Hovorková
Photo archive of Tomáš Richtř

What was your path to Formula 1?

Formula 1 has always been my hobby. I don't even see it as a sport, for me it's more of a technological show business. I was so intensely involved in it and from different angles that professional sports journalists noticed me and started asking me for advice. First, I got the opportunity to comment on lesser-known circuit series and in 2008 came the chance to comment on the queen of motorsport F1 for TV Nova, which I still do today.

What do you consider to be the key to success in this industry?

I've been thinking about this a lot lately, because sometimes

young fans, mostly teenagers, approach me and ask how they can become sports commentators. Looking back, I never had the ambition to become a TV commentator; on the contrary, I suffered from stage fright for a long time. I think the main factor in success is not doing it for the money, to satisfy your parents or for fame. It has to be that you get so caught up in it and you give it 100 per cent, in short, you become engrossed. I think that's the common denominator for all honestly successful people. I did Formula 1 for myself, and the turning point came when I suddenly felt the desire to share the knowledge I had gained with others.

How did you come to the attention of sports journalists when there were no social

networks and you couldn't make a break as an influencer or popular YouTuber?

At that time there was no Facebook or anything like that, internet discussions in the sense of comments under articles were just beginning and thanks to them and the web journalists noticed me. I was putting Formula 1 into perspective like no one else in the Czech Republic and very few in the world. That is, not only from the perspective of what was happening on the racetrack, but also from the perspective of sporting and technical rules and business context. When established motoring journalists started to approach me, I took it very humbly.

The 2020 season was your thirteenth as a commentator. What keeps you there?

I love the uniqueness of the whole setting. Spectators often expect wheel-to-wheel battles with a similar intensity to an ice-hockey game. But Formula 1 has never been like that. In Formula 1, the tactics are done remotely, the engineers on the pit wall watching how one driver fares against another... watching the story is incredibly fascinating. And what I enjoy even more is the extreme style of Formula 1. It's an amalgamation of all disciplines: technology, HR, marketing, but also human weaknesses such as the male ego. All in that wonderful formulaic extreme. McLaren boss Ron Dennis once called it "the piranha club" and it's really not far from reality. It's a world that inspires me on the one hand and always surprises me with a quirk on the other. And I enjoy the

adrenaline rush of live broadcasting, it's the magnet that keeps me going.

What are you experiencing during the live broadcast? Is it a flow state, i.e. total concentration?

I find there a comparison with top sport, because before the race I already feel nervousness, or rather a subconscious impression of concentration. But the moment the red light comes on and the microphone is switched on, one goes into a kind of trance, a state of intellectual concentration. I'm dedicated to keeping all my senses on edge and missing as little as possible, but also to selling it to people in the best possible way, because Formula 1 and sport in general is all about emotion. Then when the broadcast is over, it takes me a day or two to get back to normal from that emotional-intellectual overdrive.

You did not experience Formula Student at BUT, but do you follow our student team and their achievements?

I know the projects very well, not only the student formula, but also F1 in schools. We even meet the student team sometimes at events. I'm pleased to see strong brands and institutions like F1 trying to engage with students at university. They know very well that once young people start to see how things work there, they can also more quickly figure out not only what they want to do in the future, but how to contribute to it. I am a big fan of these projects and I hope the students keep going and keep developing and learning.

Your dream of driving an F1 car already came true in 2012 at the Abu Dhabi circuit. Do you have any other dreams related to Formula 1?

It wasn't actually my dream, because I didn't even think I would ever succeed, the chance came completely unexpectedly. And that experience deepened my respect for F1 drivers. Today on TV the effect is a bit lost, and driving a Formula 1 car may look easy, but when a driver goes into a corner at 300 km/h and turns, there are enormous forces acting upon him, the lateral overload is greater than 5G. I experienced that for a little while and by the end of the second lap I was thinking, "Thank you, that's enough, we can stop now." It's an unimaginable strain on the body, you feel like a giant paw is trying to pull you out of the car. The drivers have this for almost two hours straight, they have to concentrate as much as possible, not to make the slightest mistake, to communicate, to set the modes. Since then I have had huge respect for them and I don't really want to go back to that formula. But thanks to Formula 1 I have travelled halfway around the world and my dream is to continue travelling for the rest of my life, to meet more interesting and inspiring people, and other nations. I can't express enough how enriching that is. ■



NEWS

ACKNOWLEDGMENT



Photo: Miloslav Druckmüller

A photograph from FME becomes NASA's astronomy picture of the day

The image of comet Neowise taken by Professor Miloslav Druckmüller from the Institute of Mathematics at the Faculty of Mechanical Engineering BUT was chosen by NASA as the Astronomy Picture of the Day (APOD). The awarded photograph captures the brightest comet that can be observed in the Czech Republic in these years and can be seen with the naked eye. This is the 14th image taken from the Czech Republic and the 10th image taken by Professor Druckmüller.

NASA's Astronomy Picture of the Day (APOD) is an award for the most interesting photograph from space, selected and captioned daily by NASA astronomers Jerry Bonnell and Robert Nemiroff. The motto of the event is "Discover the Universe" and since 1995, when the first image was selected, it has become one of the most recognised of its kind worldwide. APOD is followed by millions of visitors on social media and the original texts about space objects are now translated into twenty-three languages, including Czech.

(ed)

FIT student calculates how to land on the Moon



More than 48 years have passed since a man last walked on the surface of the Moon. Talk of breaking that hiatus and returning to the Moon has become more and more frequent recently. Jakub Karpíšek from the Faculty of Information Technology (FIT) addressed this topic in his bachelor's thesis. His landing simulation impressed the jury of the competition '8 from BUT' so much that he won second place.

—
Hana Nečasová
Photo archive of Jakub Karpíšek

When the Beresheet spacecraft launched a landing attempt in the Sea of Brightness in April 2019, everything looked good – it was to be the first landing by a private company on the Moon. However, during the braking manoeuvre the gyroscope failed, the spacecraft was unable to slow down sufficiently and crashed into the lunar surface. Jakub Karpíšek followed the fate of the probe of the Israeli company SpaceIL as well. When he was choosing a topic for his bachelor's thesis, he was immediately interested in the topic "Simulating a Lunar Landing" and decided to try to "calculate" the Beresheet mission.

"In my thesis I was concerned with calculating the optimal descent trajectory, which can be used, for example, for comparison with other calculations. Part of my work was also to create a 3D visualisation environment. This allows you to visualise a landing along this optimal trajectory, or upload your own and play back an animation of a lunar landing along this trajectory," describes Jakub Karpíšek. The documentation of his work, which was led by Peter Chudý, can then help other researchers.

Jakub Karpíšek managed to find the optimal landing trajectory including fuel reserve in his thesis and his presentation also impressed in the traditional competitive showcase of presentations of the best bachelor theses of all faculties of BUT for the academic year 2019/2020, which took

I would love to be involved in something that helps a lot of people every day - maps, journey or task planners, banking apps, calendars...

place in the form of online presentations due to the pandemic. "I take away a pleasant experience and being enriched by the presentations of the other competitors. I am glad to have tried my hand at bringing a complex technical topic to a wider audience and presenting my work. I learned that I had to be more flexible because I had prepared for presenting in front of the screen standing up, but in the end it was done sitting at a table without the possibility of making gestures towards my presentation, which made me a bit uncomfortable," recalls

Jakub Karpíšek with a smile. The jury, made up of representatives of Brno University of Technology, evaluated especially the ability to present the topic in a clear and engaging way. That is why the students took a virtual course in presentation skills before the defence. But as Jakub Karpíšek says, the hardest part of the entire bachelor's thesis, which he completed during a national lockdown, was maintaining his work ethic – while studying remotely and without the opportunity to do sports and see friends. "The hardest part of the thesis itself was understanding how to calculate such a trajectory for a lunar landing in the first place and describing the mathematical tools used and deriving the equations of motion," he adds.

He has been interested and fascinated by the universe since he was very young.

Now Jakub Karpíšek is in the second year of his Master's degree and he is thinking of continuing his studies on the topic of space flight, perhaps in his diploma thesis. "In that case, we would probably go

Jakub Karpíšek decided to try to "count" the Beresheet mission after its unsuccessful landing in Sea of Serenity.

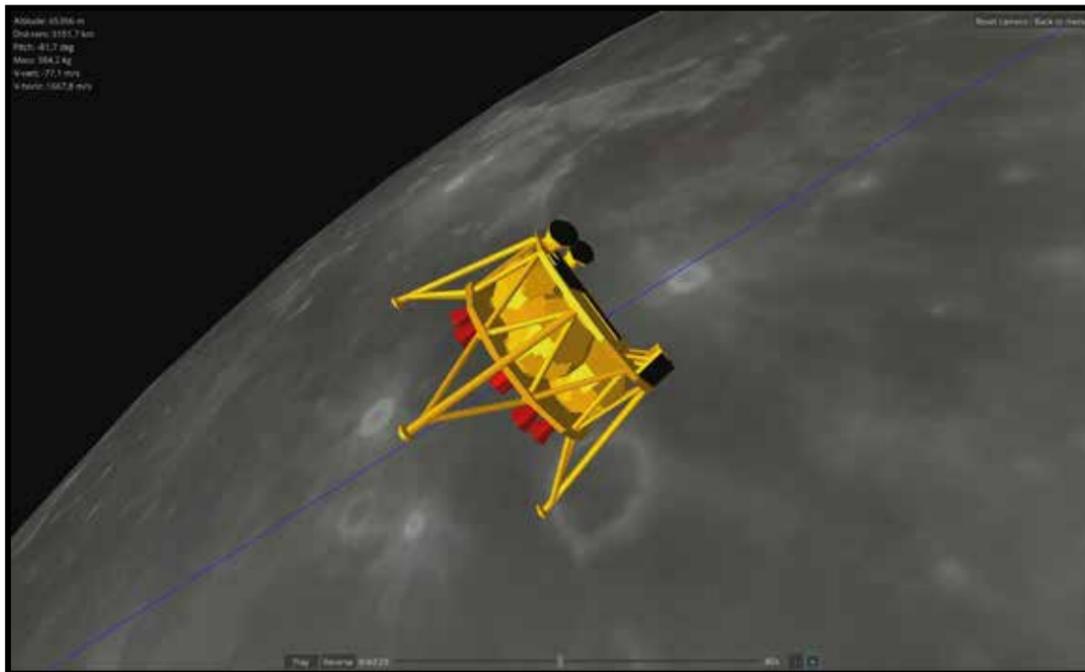
further than the Moon this time," he says. But he is not yet clear whether he wants to pursue space exploration professionally. "It would be very interesting, but for now I have the idea that I will settle down in my homeland in the Giant Mountains. But with today's possibilities to work from home, I guess those opportunities are open as well. In that case, however, I

would prefer to focus only on software development and leave trajectory calculations to someone more mathematically proficient," he says with a smile.

Software development is a path that attracts him more and more. "I would love to be involved in something that helps a lot of people every day – maps, journey or task planners, banking apps, calendars, in short, apps that people like because they simplify their work and save time," he explains. And how does Jakub see the future of spaceflight itself? "The reusability of rockets will play a big role now. The vast majority of them are now only disposable.

Jakub wants to pursue spaceflight in his diploma thesis, but this time going further than the Moon.

But SpaceX – and I think others will soon follow – can reuse their rockets and a repeat launch costs a fraction of the price. This opens up a whole new range of possibilities and all we have to do is plan where we want to go," says the successful student.



AWARD

PeaLock electronic lock protects sports equipment



Zuzana Hübnerová
Photo Lucie Šiprová and the archive of PeaLock Co.

The theft of expensive ski equipment led Marek Vala, a graduate of the Institute of Forensic Engineering at BUT, to found his own start-up and create the world's first portable electronic lock, PeaLock. In a crowdfunding campaign on Kickstarter he managed to raise more than he planned for its production. In addition, the expert jury of the prestigious Red Dot Award 2020 gave him a prize for the almost unbreakable lock in the Design Concept category.

His own unpleasant experience was at the birth of an electronic lock that has captivated the design community and customers around the world. Marek Vala, a graduate of the Faculty of Business and Management and the Institute of Forensic Engineering at BUT, went to the Austrian

slopes a few years ago and someone stole his new ski equipment worth tens of thousands CZK. But the theft gave him an idea for a product that could protect the skis. Three years later, after a series of setbacks, he set about making the electronic PeaLock and he hopes that smart protection for skis, bikes or buggies will become widely available in the future. PeaLock may be now the only product of its kind in the world.

The PeaLock security lock weighs just 140 grams and is equipped with a motion sensor and alarm. "The moment someone moves the locked item, a 110 decibel alarm is triggered and the owner either receives a notification or a phone call. Naturally, a time delay can also be set in the mobile app. So, if someone just moves the skis in the rack, the alarm doesn't have to go off," described Marek Vala.

During its design stage Vala also thought about possible

damage to the lock and as a result had it made of highly durable materials. The box is filled with Kevlar used, for example, in bullet-proof vests. The strap is made of thermoplastic elastomer. Inside, it has steel cables and wires connected to the alarm. It wasn't easy to find a manufacturer, but they finally did it. Just as Marek managed to find the money he needed. A campaign on the crowd-funding platform Kickstarter raised eight thousand dollars more than the original set amount. Vala adds that the work was a shared effort with several people from BUT. "For example, Vladimir Haltof from the Faculty of Mechanical Engineering was behind the design," he explained. ■

Currently, the multi-functional lock is on sale and its price is about 160 euros <https://pealock.com/>.



START-UP



It's not just hoes and shears – you can also garden using your mobile phone, computer or tablet. The smart greenhouse, invented by FIT students David Bažout and Daniel Kolínek, can be controlled remotely, extending the harvest until Christmas and saving water along the way. This may be one of the reasons why their Sensorie project was among the best SDGs Award 2020 project, a unique award for the implementation of the United Nations's Sustainable Development Goals.

Hana Nečasová
Photo archive of David Bažout and Daniel Kolínek

The smart greenhouse project of two FIT classmates can currently control the opening of a greenhouse window, control rainwater irrigation or detect one of more than thirty diseases on leaves. The faculty's "incubator" Star(t)up@FIT is also helping them to get their company Sensorie off the ground. "The idea was conceived in the summer of 2019, actually completely spontaneously on a park bench. We got started right away and hardly slept for two weeks," laughs David Bažout. Soon afterwards, a website and a questionnaire were created, which the students sent out to several gardening groups. "It was nice to see the support from others and it encouraged us to actually build the smart greenhouse," recalls Daniel Kolínek.

The old greenhouse of David's parents became the site of the first experiments. "Most of the parts of the greenhouse were very old and lying discarded in the attic. We applied a disused electric heater for heating and the fan was older than the two of us put together. It wasn't perfect, but within a few weeks the first smart

It is based on a control unit, which includes air and soil temperature and humidity sensors, a camera with night vision and an electric window opener.

greenhouse was up and running," says David Bažout.

The control unit can be connected to a Wi-Fi network and controlled via mobile phone, computer or tablet from anywhere in the world.

Today they have their own electronics supplier and you can see their project in practice at the Open Garden on Údolní Street in Brno. "Initially, we offered our solution to just a few people at a cost. It was basically a trial run where we

needed to get feedback and to finalize the product so that we could get certification. We are already taking pre-orders for 2021," explains David Bažout.

And how does it all work? The basic element is the control unit into which all other components are connected. There are air and soil temperature and humidity devices, such as a night vision camera or an electric window opener. The control unit can be connected to a Wi-Fi network and controlled via mobile phone, computer or tablet from anywhere in the world.

"With simple settings you can determine what conditions you want to maintain in the greenhouse. If the user has no experience with growing or is unsure, there is help available in the user interface to advise on typical plants such as tomatoes, cucumbers or peppers. There is a choice between economic or turbo growing modes, but there is also a manual control option if you want to adjust the conditions to suit you," says Daniel Kolínek. The grower chooses or selects temperature and humidity ranges and the controller creates the conditions by controlling the window opening, fan, electric heating and irrigation

system. In addition, the system can identify more than three dozen diseases that can affect plants based on a photo of the plant.

"We focused on the most commonly grown vegetables in Czech greenhouses. After carefully studying the diseases and their symptoms, we started downloading a huge number of photos from the Internet. All the photos had to be carefully cropped, sorted and then processed by a neural network. We now want to improve this and expand the number of detectable diseases based on the photos that users send us," plans

Daniel Kolínek. People can also watch the ripening harvest on a camera, which also guards the greenhouse against thieves or other pests.

The project of the Sensoria founders is aimed especially at enthusiastic gardeners who can stretch their harvests until winter, but also at those who are not able to devote themselves to cultivation on a daily basis. "One of our clients, for example, is a cottager who lives in Prague and cannot devote himself to his greenhouse on a regular basis. This way,

We believe that the future lies in green technologies and investment in sustainable solutions.

programme are also helping them develop their business. "The greatest benefit for me was mainly at the beginning – in the realisation that I could work on something of my own, but also in the basic information on what it takes to start your own business. I had never really thought about it. Now the programme's advisors help us with specific things, such as how to negotiate with business partners, and they have also arranged consultations with a neural network expert from FIT," says David Bažout.

In 2020, Sensorie's founders concentrated on sales. In the future, they plan to improve the neural network for plant disease detection and automation and offer solutions to large-scale growers, for example. ■

he can keep an eye on what's going on in his greenhouse and the harvest is taken care of even when the frosts start," says David Bažout.

Based on their own experiments, he adds, they found that the controlled conditions in the smart greenhouse extended the growing season by three months and increased the plants' resistance to various diseases. In addition, the smart greenhouse saves water – thanks to soil moisture sensors it irrigates only when necessary and makes do with rainwater.

"We believe that the future lies in green technology and investment in sustainable solutions," says David Bažout. Advisors in the Star(t)up@FIT



Don't Panic – the application and counselling service spreads the message: not being ok is ok!

In March 2019, Veronika Kamenská, a student of biomedical engineering at the Faculty of Electrical Engineering and Communication at BUT, created a mobile application for people suffering from mental disorders, which she aptly called Don't Panic. In the meantime, the app has saved more than a hundred lives and justifiably won the Gratias Tibi 2020 award, which is given annually to young people for civic activity that positively influences life in society. In October 2020, an online counselling service of the same name was launched and is gaining momentum with an ever-increasing number of volunteers and users worldwide.

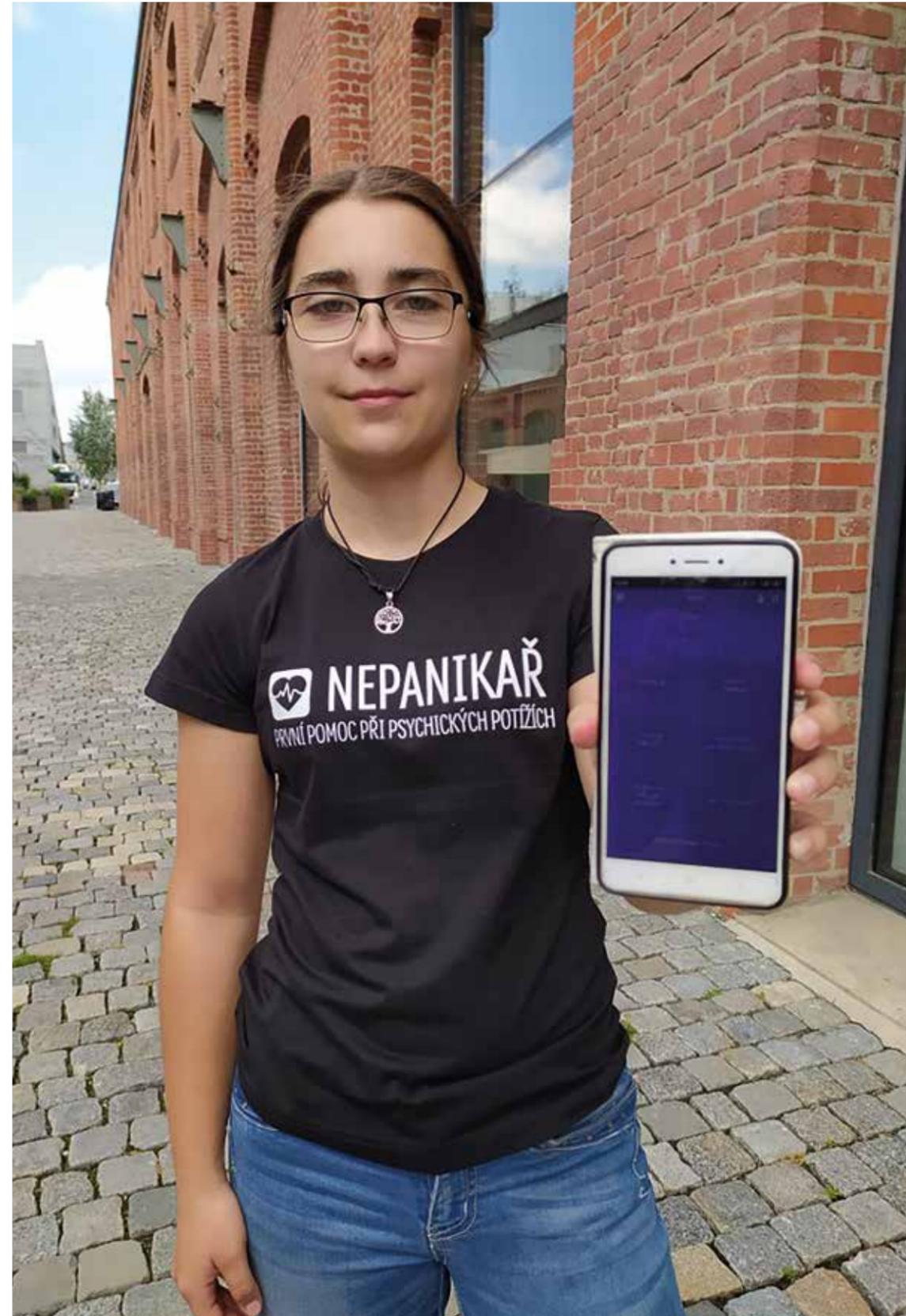
Jana Novotná
Photo Oto Janoušek and Jana Kopecká

Since Veronika Kamenská had experienced a psychological disorder firsthand, she knew how important it was to have help at hand from the first symptoms. She started to look into the issue and created the first Czech app focused on this problem. The application offers a quick solution for people suffering from a panic attack, depression, anxiety, self-mutilation or suicidal thoughts. Just specify the nature of the problem on the mobile phone and the app will guide the user on what to do. In the case of anxiety, breathing exercises bring relief, in case of a panic attack, counting simple arithmetical problems, in case of depression, the system prompts the user to plan and perform activities. It is also a useful recommendation to create a rescue plan in a stabilised state, which reminds the user to contact a loved one or a crisis centre when suicidal thoughts erupt. In developing the app, the electrical engineering student worked not only with psychologists and psychiatrists, but also with people suffering

from mental health problems. The programming was done by Tomas Chlubna, a student of the Faculty of Information Technology at BUT, and he takes credit for the fact that the app now works both on the Android operating system and on iOS.

Exactly one year after the application's launch in March 2019, the covid-19 pandemic arrived. "Covid definitely increased the number of downloads. In the beginning it was around 30 percent, today we are at about double that, which could be both covid and the fact that the app is more talked about," reflects Veronika. "Covid indirectly forced us to expand Don't Panic, so today it's not just an application anymore, but we've created a non-profit organisation and have started other activities. The main one that we're doing full time now is the chat and e-mail counselling service, Don't Panic."

The counselling centre offers help mainly to young people between the ages of 14 and 24



who are experiencing a crisis, dealing with various problems in their relationships, at school or struggling with mental health problems or illness and do not know where to turn for help. The counselling service offers support, information, orientation counselling in crisis situations and contacts to other specialised services. However, it does not itself provide psychotherapy or other specialist services. It

The application offers a quick solution for people suffering from a panic attack, depression, anxiety, self-mutilation or suicidal thoughts.

only tries to increase the availability of first psychological help in the online environment and to raise awareness of the possibilities of dealing with the situations experienced.

The entire team is based on volunteers. Veronika

The current main activity of Veronika Kamenská's team is the chat and e-mail counselling service Nepanic (Don't Panic).

Kamenská is the coordinator and chairwoman of the association, Tomáš Chlubna works as a support developer. "The team also includes Veronika Radilová, a student of psychology and addictionology, Romana Švecová, a graphic

designer, and Lucie Slámová, the coordinator of the e-mail counselling service. In addition, we have 11 volunteers from among psychology and sociology students who have training in complex crisis intervention on chat, six psychology students on e-mail and eight volunteers for other activities," enumerates Veronika.

The question arises whether help is also available to older people who do not go on social networks. "Absolutely. We have reports that even older people who have smart phones use the app in case

of panic attacks. The app is simple to use, so even my grandmother can handle it," assures the project coordinator. However, the primary target of the help is the younger generation, who are at home on social networks. Just type words like depression, anxiety, self-mutilation, help with mental health problems into Google Play and the first thing that comes up is Don't Panic. There are also various campaigns running on social media. "In general, we talk about how it's ok not to be ok and that mental health is just as important as physical health," says Veronika,

reminding us of the fact that in addition to helping those in need they also aim to destigmatise mental illness.

User feedback is important. "On platforms where you can download Don't Panic, users can write a classic review under a nickname. But we get a lot of experience from users who have been helped by the app. The longest messages are usually from people whose lives the app has saved – they open up because they want to say thank you," says the project's author. By the end of 2020, over a hundred lives had been saved in the Czech

Republic alone. But the app has already been translated into nine languages, making it operational in 151 countries.

We want to focus on destigmatising mental disorders on social media and we plan to focus on prevention.

"In the future, we want to expand the capacity of the counselling centre, so we are continuously recruiting more student volunteers who would be interested in doing an internship with us. We also want to focus on destigmatising mental disorders on social media and we plan to focus on prevention – looking at what we can do to prevent health deterioration," adds Veronika elaborating on her future plans. Among the new developments is a so-called Help Map. "We have mapped out all the psychologists, psychiatrists, educational-psychological counselling centres, and university centres in the country, and we provide them clearly and free of charge on the web, so that you just click and a list of all the psychologists in town comes up," explains the coordinator.

She knows from personal experience that one-off depressive episodes can be resolved, as can most anxiety conditions. "There's always that little voice in your head that says, but what if? But even with more enduring problems, with systematic psychotherapy, it is possible to lead a full life without

major limitations. Then, of course, there are diagnoses, such as schizophrenia, that are lifelong," points out the student who has always been attracted by helping people. She had already considered studying medicine at grammar school, but she also enjoyed mathematics and physics, so she was delighted when she discovered a course at BUT that bridges the worlds of medicine and technology. "Moreover, it was partly related to my post-traumatic disorder. And then my dad had a heart attack, so I was quite interested in cardiac problems and related things," explains Veronika.

She has remained faithful to her plan to this day. "I have a dream goal that I would like to work part-time at the Bohunice Faculty Hospital in the interventional cardiology ward, and the other half would be my own psychotherapy practice," concludes the student who already commands respect now. ■

NEWS

SUCCESS



Female students from the Faculty of Business and Management win the Euroweek competition

The international student competition Euroweek 2020 took an online form. Despite obstacles caused by the coronavirus, students from the Faculty of Business and Management at BUT succeeded in the strong international competition. Among the 13 final projects from university students from 15 countries, FBM students Petra Klimánková and Tereza Kelnarová shone and won first place for the best project under the guidance of Lenka Smolíková.

The Euroweek competition, which was held for the 26th time, is designed to better prepare students for practice and give them the opportunity to experience cooperation in an international team. This year's theme was sustainability and, in view of the situation, the participants had to make a video presenting the most important results. The winning team from BUT convinced the jury with their work on business models in the circular economy.

The next edition of the competition will be held in France. The Faculty of Business and Management at BUT has hosted the competition twice before, in 2016 and 2019.

(ed)

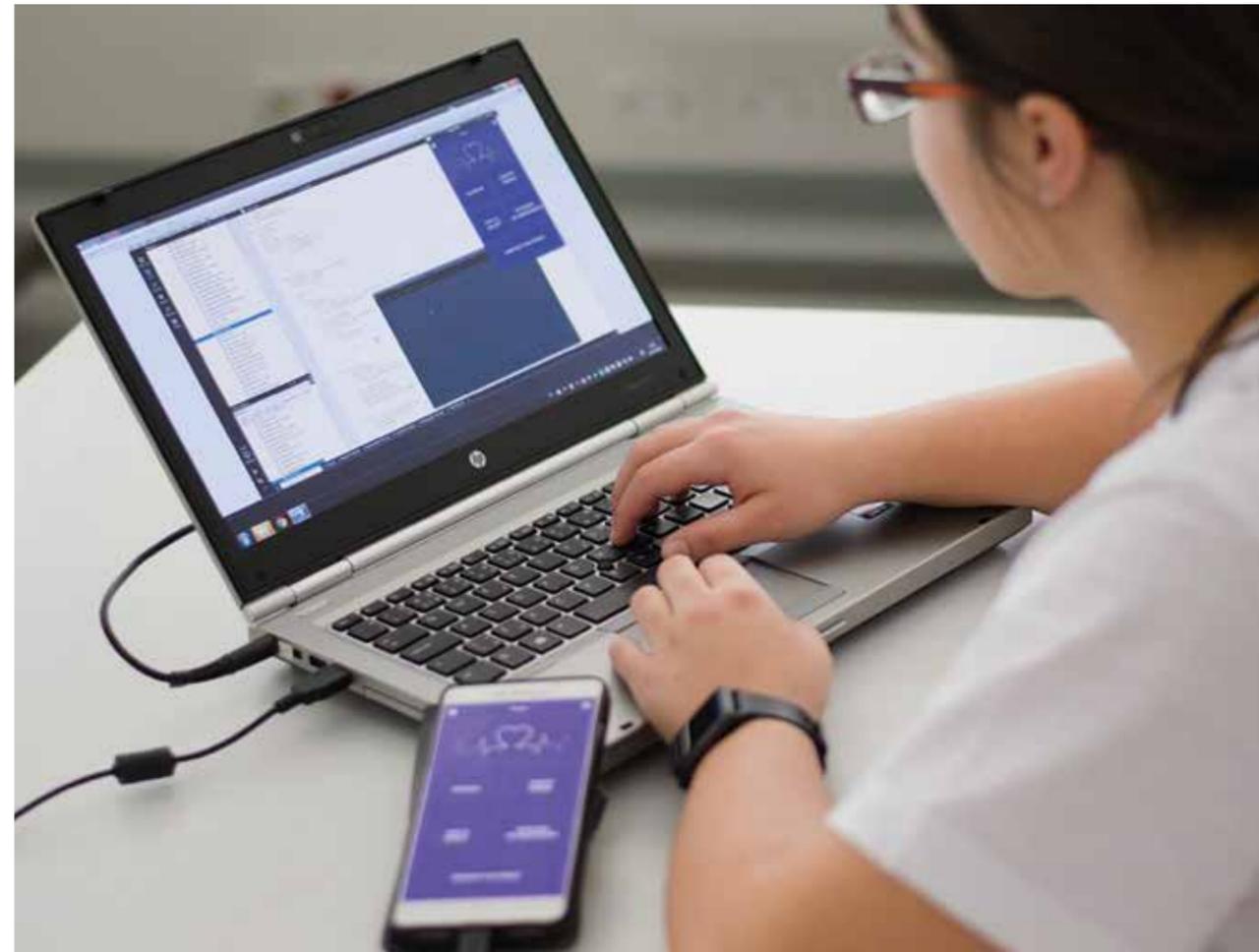


PHOTO REPORT

Terralóna and Lunalón

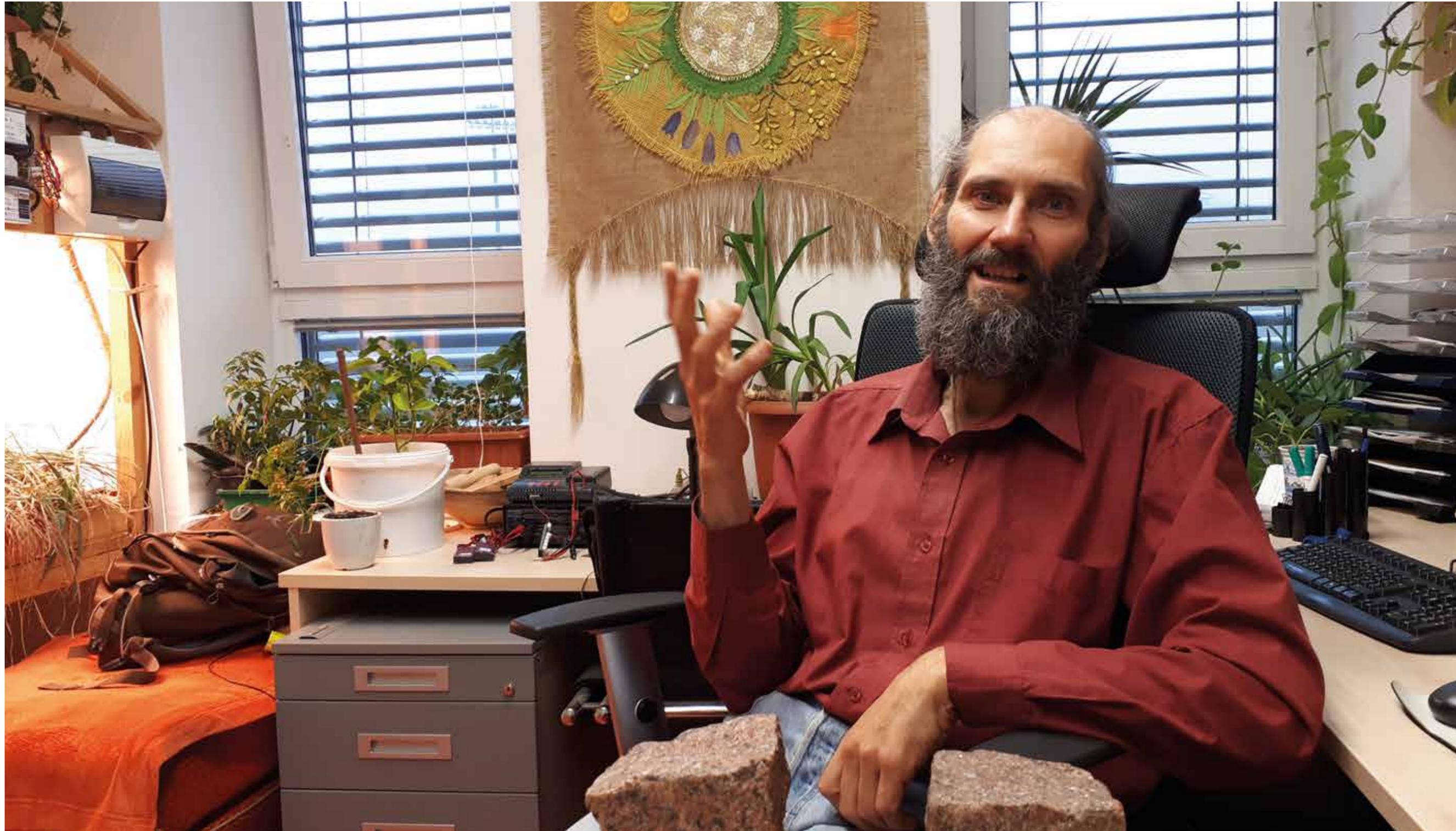
Giant models of the Earth and the Moon – an unusual theatre staged by members of VISUALOVE in cooperation with the Brno Observatory and Planetarium in the summer of 2020 at Kraví hora in Brno. They created photorealistic models that they blew up into a sphere with a ten-metre diameter. Terralón and Lunalón were exposed to the admiring gaze of Brno residents during one week in August.

"It was more challenging to create the model of the Earth because we had to edit the print data for longer, tune up the colour scheme and even add a layer of clouds to make the result as realistic as possible," said Jan Machát, a PhD student at the Faculty of Civil Engineering of BUT who together with his classmate Michal Okleštěk forms the VISUALOVE creative group. ■

(ed)
Photo Lucie Šiprová Mojžíšová and Michal Bernátek



Let's use illumination in a way that respects nature, urges lighting engineer from FEEC



Petr Baxant graduated from the Faculty of Electrical Engineering and Communication of BUT and after his postgraduate studies at the Department of Electrical Power Engineering he has never left the school. He is behind the development of the luminance analyser with which the team from BUT won international recognition and as an expert in lighting technology he raises awareness of light pollution. He promotes environmental protection and a return to nature. He proves that he is serious by living outside the city surrounded by his natural garden.

Jana Novotná
Photo Jana Novotná and the archive of
Petr Baxant

He still sees the world as a technician, so he explores the possibilities of using renewable or alternative energy sources in his garden and invents original technical improvements to make life in nature easier. Although he often meets with scepticism from those around him for his attitudes to life, he remains first and foremost a scientist. So when he is intrigued by an alternative phenomenon, he is angry that it is primarily rejected by mainstream society. "As a research scientist, I believe, and that's why we have PhDs, that science is a discipline that should bring philosophies and condense them into reality by conducting tests and looking for evidence. Thus, even if one comes across a hypothesis unacceptable to our civilisation, its validity should be confirmed or refuted by a study that has a solid foundation, and not by simply declaring it nonsense," says Peter Baxant.

The luminance analyser is actually an artificial human eye, which has the required standards and allows the use of software image processing and algorithms to calculate the brightness and from it the glare.

He has spent more than half of his life at BUT up to the present day, including his studies, and as he says he is now nostalgically connected with BUT. Since his doctoral studies he has been working

on problems of luminance analysis and glare assessment using digital photography. "Back then, in the early age of imaging and sensing devices, I bent my PhD thesis into this topic. I defended my thesis and my boss offered me a position as an assistant lecturer here," Baxant recalls. And because he felt he wasn't fully stretched, he set up a software development business. "If it wasn't for that company, there wouldn't be a luminance analyser - it was absolutely intertwined. I needed a programmer in the company, which I found in a handy PhD student at the Faculty of Information Technology, and together we formed a tandem in which we complemented each other so well that we started collaborating on school projects," explains the FEEC scientist.

The luminance analyser allows area measurement and subsequent analysis of luminance distribution on illuminated surfaces or light sources. "We have actually created an artificial, computerised human eye, which has the required standards and allows us to calculate the brightness and then the glare from it using image processing software and algorithms. Glare cannot be measured with conventional instruments; it is a psychological phenomenon in a way," explains Baxant, describing the nature of the device which was used by the team from the Department of Electrical Power Engineering to great acclaim at the Light&Building trade fair in Frankfurt two years ago. Since then, the analyser has been in continuous demand, so they have not been able to keep up.

"The instrument is continuously being improved and we are already preparing the next series with new technology. Nowadays, it's basically my students working on it, and I'm doing support management for them. They enjoy it and I know I can trust them," adds Baxant, highlighting the fact that he has already dedicated a second generation to it.

In practice the analyser helps determine the quality of lighting in a variety of outdoor and indoor applications. It is most often used to measure the illumination of roads, pedestrian crossings, workplace lighting, large-scale advertising, architectural lighting. The

customer can thus verify that what he or she has designed in the computer, he or she has also received from the supplier or whether it meets requirements and complies with the standards of the International Commission on Illumination. Outdoor lighting is related to another phenomenon that occupies Peter Baxant – light pollution.

"I'm trying to deal with environmental issues, so I started measuring how much light we have in the lab, in the office and on the streets. I realised how much light we produce, and I started to think about whether we really need it," says the lighting engineer.

If we were to get above the atmosphere, we would measure 133,800 lux. At the surface of the earth in our latitudes, however, it will not be more than 80,000 lux, and a little more in the tropics.

His simple recommendation is: "Let's illuminate in a way that respects nature and its needs. The sun shines naturally during the day, but at night it should be completely dark. Once a month, the light intensity rises to just 0.25 lux on the night of the full moon, unless it is cloudy." Petr

Baxant also deals with light on his website. The visitor learns, among other things, that "daylight has an intensity from zero to tens of thousands of lux. If we were to get above the atmosphere, we would measure 133,800 lux. At the surface of the Earth in our latitudes, however, it will not be more than 80,000 lux, and a little more in the tropics. This, too, is an enormous value, for in our houses we generally achieve something between 200 and 1 000 lux by artificial lighting, depending on the type of activity."

In his opinion, Peter Baxant began to be regarded by the general public as an expert on

light when he became chairman of the Czech Society for Illumination. "That was in 2015 at the Light-Světlo conference. I became chairman, and even though I am no longer there, the public started to notice me and various people started to come to me when they wanted to measure, for example, how the advertisements shine at night in their place of residence. You measure it and find out that the values are absolutely crazy, that the glare could cause you a stressful situation," says Petr Baxant, who gets invited to various debates as a light pollution awareness promoter. In the 21st Senate public hearing on Light – a Good Servant, he explained to senators how light pollution levels are determined. During the autumn lockdown associated with the 9 pm curfew, he used the situation to experiment with nighttime non-lighting. "I figured that given the ban we had a rare opportunity to try it without the risk of anyone getting hurt and I posted a challenge on Facebook. Pavel Suchan from the Astronomical Institute took it up in a practical way and expanded it to a call for outdoor lighting operators to turn off or dim their lights and the results were then presented."

Petr Baxant admits that the current situation with coronavirus is playing into his hands. "I really wish humanity could slow down and realise what it has already devastated on the Earth, and stop expanding technology to absurd proportions." He welcomes, for example, the suspension of air traffic. "The jetstream that planes create is incredible.

Someone calculated that there are about one million people in the air all the time, that's a steel city, and this flying monster is still flying on very primitive propulsion, fueled by fossil fuels. And then it stops flying, it starts raining, and even scientists can't agree on weather patterns and why that is so. I'd be happy if we could each say to ourselves what we can give up what we can do without. It would be a way of paying off or reducing the debt that we keep creating on our planet."

In cooperation with the management of the faculty and the administration of the Technická Campus, Petr Baxant initiated the installation of biodynamic roadway lighting between Technická Buildings 10 and 12. "The lighting automatically changes the spectrum and intensity of the light according to the time of night. In the evening it provides comfortable vision with a chromaticity temperature of 3,000 K and at night it operates in a saving mode of reduced intensity and chromaticity temperature, where the light does not contain radiation in the blue region and thus does not disturb the circadian rhythms of humans and many animals. It is thus more environmentally friendly and, thanks to the regulation, saves energy," explains the expert from FEEC enlisting the advantages of the pilot project, which – if the assumptions are confirmed – will be gradually expanded. ■



Student of the Faculty of Chemistry sees a future in insect food

Huge consumption of water, feed and taking up farmland are just some of the demands of livestock farming today. According to Martin Masár, a student of the Faculty of Chemistry, such production is not sustainable in the long term. That is why he became interested in edible insects and with his project Entoway he eventually won 3rd place in the BUT Student Entrepreneurship Award competition, which Brno University of Technology organises together with the South Moravian Innovation Centre.



Radana Koudelová
Photo Jan Prokopius

"I have been exercising regularly since I was young, I do powerlifting and I am also interested in a healthy lifestyle. I am involved in nutrition education, so I am close to food supplements," says Slovak student Martin Masár describing his journey to insect food. Although he first applied to the BUT's Start a Business! programme with an idea for healthy fast food, in the end he realised that he wanted to offer a specific product rather than a service and during the seminars he hatched the idea for a food supplement in the form of a protein powder for making a drink combining plant and insect proteins.

"Our product has the potential to become an alternative to all the food products that are a significant source of protein, especially in sports nutrition. We are targeting people who are trying to reduce their environmental footprint but at the same time do not want to compromise on the quality of their diet. In my opinion, we can also appeal to unorthodox vegans – most plant-based alternatives do not cover the full amino acid spectrum, so there are not full-fledged proteins. Therefore, food with added insects is a nutritionally better solution. In addition, edible insects also provide some vitamins and minerals," says the Food Chemistry and Biotechnology student.

Today, Martin is also working on the Entoway project with a student from the Faculty of

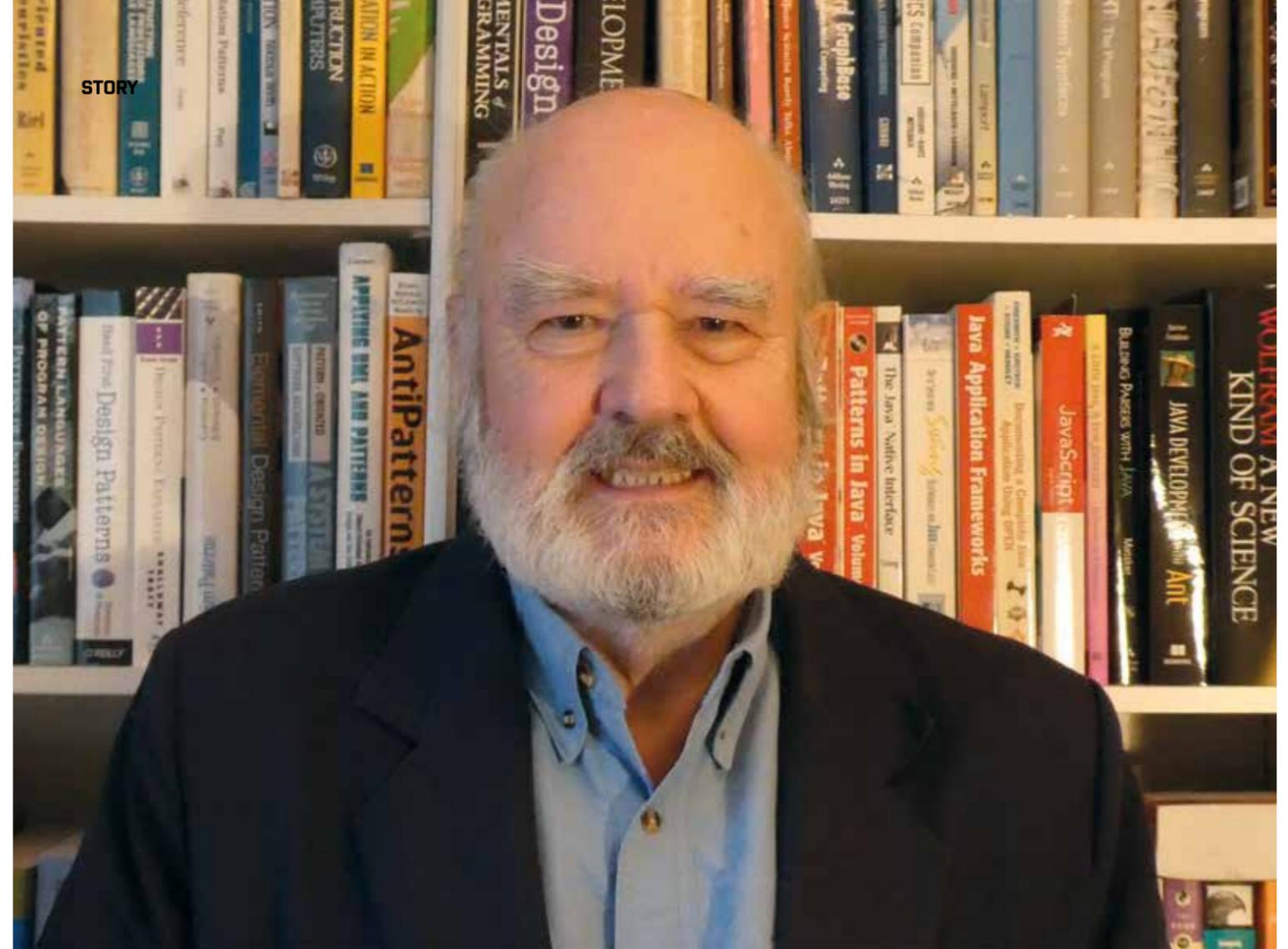
Business and Management, who is helping him with market research, and a PhD student from the University of Veterinary Sciences, who wants to write articles for a blog. "There are still customers who have no experience with insects as food, it's unusual for them and so they may find it disgusting. For me, that's one way we can go in the future. I'm not saying that we should completely switch to an insect diet, but edible insects can certainly diversify and enrich it. In the beginning, people try it more for fun, but I believe that in time it will become a regular part of our diet," says the chemistry student outlining his vision.

In addition to producing a food supplement, Entoway wants to bring education and information about entomophagy, the consumption of edible insects, to its website. Masár pointed

out that while in Europe or North America there is an aversion to edible insects among people, worldwide insects are considered a normal part of the diet of up to two billion people. Insects can be found on plates in China, Thailand, Mexico, Nigeria and Zambia. Moreover, if the Earth's population does pass the 10 billion mark in 2050, it will not be possible to increase livestock production adequately so that everyone can regularly indulge in meat. Yet insects account for up to 80 per cent of all animal species on the planet and are probably one of the most sustainable sources of animal protein.

Martin Masár has been studying the nutritional profile of insect foods for two years now, and insect processing technology was the topic of his diploma thesis, which he developed under the

supervision of Tomáš Svěrák. He is currently undergoing product development tests, adjusting the taste and texture of the protein powder to appeal to as many customers as possible. "There is still relatively little competition on the Czech market. Insect foods are doing slightly better in Germany, but there are also countries where it is still impossible to market insect foods. In my opinion, however, the whole segment has a great potential for growth and in the future will be one of the leaders in the field of alternative proteins," thinks Masár, according to whom their chocolate-cinnamon protein powder has a better taste than classic vegetable substitutes and also provides the body with a complete amino acid spectrum. ■



Potato picking was my last project at BUT, says Czech-Canadian from BUT

Antonín Zimmer (1943) studied civil engineering at Brno University of Technology, yet he can be described as one of the first "IT guys" from BUT. His promising career at the school was interrupted by the arrival of Warsaw Pact troops in 1968 and the young engineer decided to emigrate. He spent his professional life as Tony Zimmer, mostly in Canada, where he settled permanently. He still remembers his alma mater fondly.

Jana Novotná
Photo archive of Tony Zimmer

He joined the Faculty of Civil Engineering at Brno University of Technology in the autumn of 1960. As a result of the restructuring of the faculties that had just taken place, classrooms were scattered all over the city, which led to a considerable loss of time for students and teachers. "One of our first lectures, however, was in the historic building of the Faculty of Civil Engineering on Veveří Street, at that time occupied by the military academy, where Professor Bezdiček lectured us on Introduction to Civil Engineering. He intrigued us with his experiences from the 1930s in New York, where he watched the construction of the Empire State Building with a stopwatch in his hand and admired the perfect organisation," recalls the BUT graduate for whom the main place of instruction was the building on Barvičova Street.

In the first two years, descriptive geometry was the bane of students' lives. "The drawings had to be perfect. They had to be done in Indian ink on chalk paper, points were drawn with a bow compass and the text had to be perfectly handwritten. The dormitories where we did them were wooden barracks built by the Germans as a concentration camp and in winter the snow blew through the cracks. Some of the boys slept in closed cupboards laid on the floor so that they wouldn't get frostbite," recalls the eyewitness of the shady side of the study. In his first year he still experienced the rag

day parade. "A procession of students in various disguises and with humorous banners marched through the town. In my second year, I did not attend and that was my good fortune, as the communist authorities disliked anti-regime slogans and the classmates who carried them were banned from school for a year and had to atone for their sins on construction sites."

From his second year Antonín Zimmer started working as a research assistant at the Department of Structural Mechanics and it was then, while working endless hours on a mechanical calculator, that he realised that the future was in computers. He enrolled in the LGP30 computer programming course taught by Zbyněk Drahoňovský and completed it with an ever-increasing interest in computer technology. "My job was a bit of everything – programmes for calculating special functions, watching the computer calculate the statics of frames or solving systems of linear equations. Up to six linear equations I was cheaper than the then pinnacle of computing, the LGP30. It took me about five hours to solve those six equations using a calculator. The computer was faster, but considerably more expensive per hour."

Working endless hours on a mechanical calculator, he realised that the future belonged to computers.



Tony Zimmer in 1961 with his classmates on Koblížná Street in Brno

In the third year, the students were divided into three study streams and only the "elite", including Antonín Zimmer, got into the Construction and Transportation Engineering stream. The students' duties then included training at the military department, which was held once a week at Kraví Hora. "After rollcall, we practised building a bridge – either Bailey or wooden – then we listened to information about war issues, and after lunch we dismantled the bridge again and put it into storage. The only advantage of all this was that it reduced compulsory military service to one year as against the normal two years."

At the beginning of his fourth year, the talented student received an unofficial offer from Vladimír Kolář to stay at the Department of Structural Mechanics as a researcher in the field of the synthesis of computers and structural

mechanics. "I was one of the first to complete an individual study with a focus on computer-aided structural engineering. I had less specialised civil engineering courses and added more theoretical courses in structural mechanics, mechanics of materials and selected topics in numerical mathematics and computer programming, which I enjoyed very much." This gave Zimmer easy access to professors and study materials and even his own office. He recalls the final lecture in Concrete Structures given by Jindřich Cigánek as a great experience. "It was, I think, the most attended lecture of the whole study. Professor Cigánek showed slides and films of catastrophic failures of concrete structures. The highlight was a 1940 film showing the self-destruction of Gallopin' Gertie, a bridge over the Tacoma Narrows in the USA."

In the fifth year Zimmer continued his individual studies,

while at the same time doing programming jobs on the side and, under the guidance of Vladimír Kolář, working on his diploma thesis on partial differential equations of deflections of orthotropic bridge plates and programming the result on the computer. "I didn't receive machine time for debugging, so it was decided that a programme in the publication version of the ALGOL-60 language and the assembler for Minsk-2 must suffice. After a successful defence and subsequent graduation, I became a graduate civil engineer and my passport had the title Ing. in front of my name," says the graduate of Engineering Structures and Transportation Construction with the "red diploma".

In the autumn of 1965 he joined the department in the position he had been promised. In February 1966, he had to join the army, but during his military service he took a course in programming the Swedish SAAB D-21 computer, which was installed at that time in the Computing Machinery Laboratory at BUT. "After the army I continued what I had started – applications of the finite element method, source cable construction and many other assignments on computers. In autumn 1967, I was assigned as an assistant to Professor Lederer, the designer of the legendary Pavilion Z, in the Department of Steel Construction. At the end of the spring I was invited to do a postgraduate course at the University of Zagreb, but this did not happen because of the 'fraternal help' of the Warsaw

Pact countries," recalls the witness of the dramatic events of August 1968. Meanwhile, Antonín Zimmer had arranged his passport and visa for Austria and was waiting for the right moment. "I still had time to go as a supervising teacher for the students' voluntary potato picking drive and that was my last project at BUT. As he admits today, the decision to emigrate was not difficult for him. He had been trying to find employment abroad from the autumn of 1967, and the events of August 1968 only helped.

On his way across the ocean, the young emigree tore out an advertisement from a Toronto newspaper in which a start-up computer company, Computel, was looking for system programmers. "The next day I handed in the ad at the Toronto employment office, was interviewed and started work in Ottawa a fortnight later. I could roughly eat and drink in English and read a little, but I was good with a computer. My colleagues took turns standing at my desk, inviting me to their homes and teaching me English, so within a few months I had no further problems with the language," says Tony Zimmer recalling his time at Canada's first company that rented computer time. He enjoyed the work, but he wanted to get into engineering, so he applied for membership in an organisation that awards engineering degrees in the province of Ontario. "I took the exam, got a diploma on the wall, a stamp on my drawings and a P.Eng. degree put behind my name. It was illegal to do engineering work without membership in that

When I compared the quality of my education with my colleagues in Canada, Brno University of Technology came out very well.

organisation. After three years with Computel, I went on a vacation to Europe, which proved fatal, because I met my future wife there and after a week's acquaintance, we entered into a marriage that has endured to this day."

After returning to Canada and two years with the Department of Public Works, Tony Zimmer and several friends founded Group Five, an engineering computer systems firm. "It was definitely the most exciting time in my career. I was my own boss, young, full of energy, and during those twelve years I gained confidence in my own abilities. The downside was working from morning till night. Burnout syndrome does exist, but fortunately it didn't happen to me." With Group Five, he went to Australia, the Middle East, all over Canada. In the meantime, his two sons were born, they started playing hockey and he had to look after them. He didn't want to work 70 hours a week anymore, so in 1985 he sold the company to a partner and took a job with Canada Post. "I started working in artificial intelligence, making decisions about computer purchases. It was risky because it was big money, but I never made a mistake. I was with the Post Office for eighteen years, and when I was about to retire, a big Canadian company,

CGI, offered me a job where I continued 'capacity planning' for their clients for the next ten years. Meanwhile, my sons have graduated and embarked on a computing career where they are doing very well." Tony Zimmer didn't really settle down, as he puts it, until he was 69.

He never regretted his decision to choose Canada as his new homeland. Thanks to the internet, the world is much smaller today than it was fifty years ago, so it's easy to keep in touch with old friends and Czech culture. When he reflects on his alma mater, he emphasises that it truly gave him the essentials in life. "Mostly I learned to use my own mind and in addition I got the theoretical foundations that are absolutely essential for engineering. I am most grateful to my three teachers. They were the assistant lecturer Svatopluk Šmířák, who employed me as an auxiliary researcher at the Department of Structural Mechanics, Zbyněk Drahoňovský, from whom I learned not only the craft of programming, but mainly that man is a creature that makes mistakes and must look for them first in himself and then in his surroundings and, of course, Vladimír Kolář, to whom I owe my unfortunately short career in structural mechanics. Moreover, my engineering diploma from BUT helped me obtain the degree of P.Eng. When I compared the quality of my education with my colleagues in Canada, Brno University of Technology came out very well," concludes Antonín "Tony" Zimmer. ■

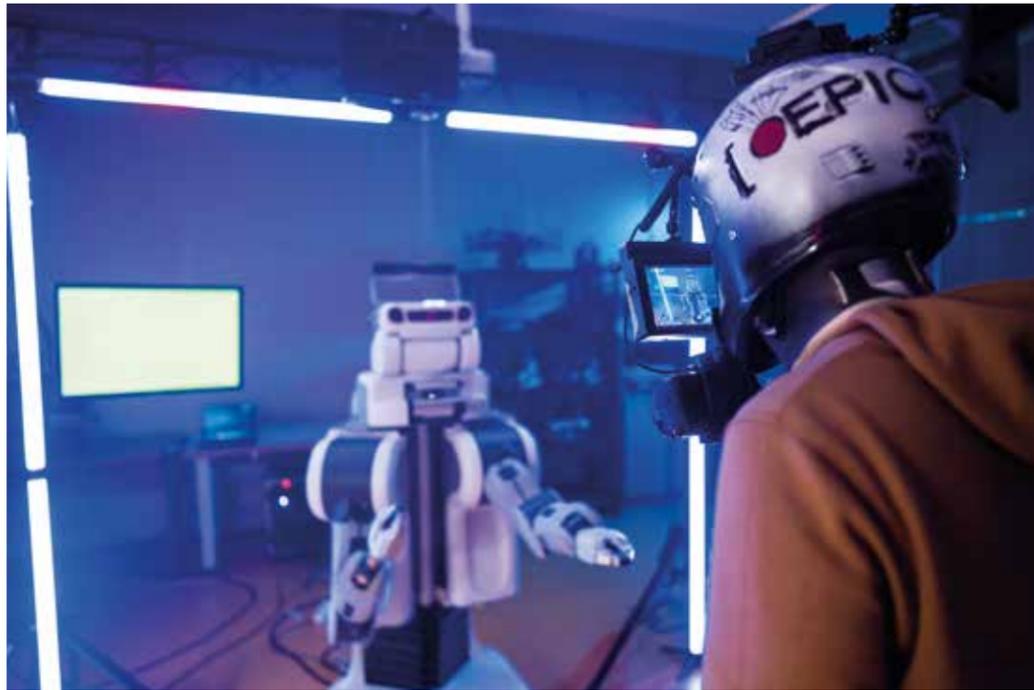
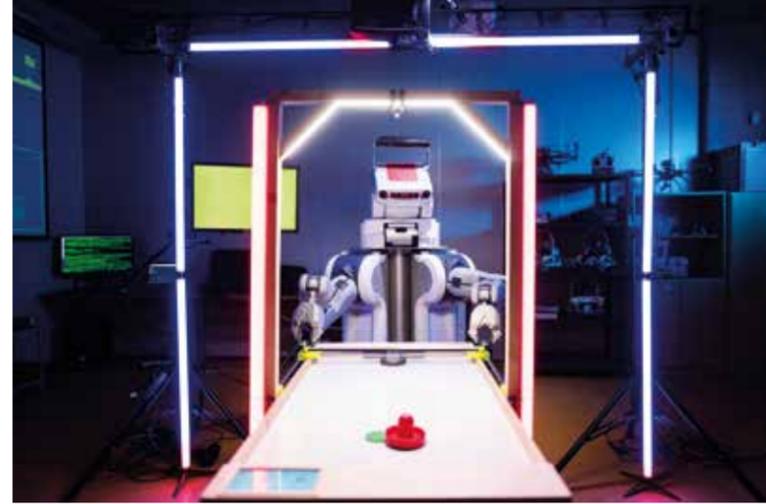
BUT campaign is about saving the world

Together with the hero of the latest BUT campaign, we find ourselves in a post-apocalyptic world and observe how he manages to improve the world thanks to knowledge and skills acquired at Brno University of Technology. The campaign is also a reaction to the current pandemic – it points to the difficult study conditions, but at the same time it proves that the necessary knowledge and skills can be transferred to students by BUT, albeit remotely.

The lessons take place in virtual reality and the hero only meets robots. Gradually, he arrives at the Faculty of Mechanical Engineering, the Faculty of Information Technology and CEITEC BUT and uses modern equipment to help repair broken machines or eliminate black holes. ■

You can watch it on www.youtube.com/user/vutvbrne.

(ed)
Photo Jan Prokopius



Advanced research topics, equipment, and development opportunities brought Italian scientific couple to CEITEC

Graphene and chicken poop started off an adventure and new scientific career for Mario Urso and Martina Ussia. They read this famous article by Martin Pumera and decided to apply for positions at CEITEC BUT. Luckily they both got into Martin Pumera's research group, moved to the Czech Republic during lockdown and on the way here managed to get married. Over the year they have participated in many successful projects and they consider applying to CEITEC to be a good decision they haven't regretted.



Zuzana Hübnerová
Photo archive of Martiny Ussii a Maria Urso

Martina Ussia is a chemist and chemical engineer, Mario Urso is a physicist. And they both managed to secure a place in Martin Pumera's group Future Energy and Innovation. "We work on micro and nanorobots. They are tiny machines able

to autonomously move in liquid media under specific stimuli. We apply these nano and microrobots in different areas ranging from biomedical applications to environmental ones," describes Martina Ussia.

She mostly focuses on preparation and modification of these materials to induce motion under light irradiation and also to optimize their properties depending on type of application, such as bacterial biofilm eradication

from surfaces. On the other hand Mario Urso designs these robots so that their motion is controlled by light and magnetic fields, and perform specific tasks such as the degradation of plastic waste in water. "Although

we come from different backgrounds, we have a complimentary knowledge and we mix our competencies to achieve better results. We

After reading Professor Pumera's famous publication on graphene and chicken poop, I wanted to become part of his research group.

even worked together on the two most recent projects," says Mario Urso.

When asked what brought this Italian couple to CEITEC BUT, they laugh because it is not a very traditional story. "Last year in February I read this famous paper by professor Pumera about graphene and chicken poop. After I read it I thought to myself that I would like to join his exciting group. I reached out and Martin Pumera introduced me to CEITEC. I realized there are many expert garants, great machines and development possibilities. Based on that I decided to apply and was hired," describes his journey to CEITEC Mario Urso.

Martina Ussia admits that seeing what Future Energy and Innovation Lab and

CEITEC Nano offer she got a bit jealous. "I told Mario that I also want to work with Martin Pumera and have this fantastic equipment and facilities. So, I started thinking about applying myself and finally decided to apply too. I got accepted and in less than one month we were moving to the Czech Republic," says Martina Ussia.

However, their journey turned out to be an adventurous one as they arrived in Brno in June 2020 with all different coronavirus restrictions going on and all flights cancelled. "We travelled by car and it was a very long ride going through the different countries," recalls the couple. Since they were allowed to travel and be accommodated only with a family member,

When we were moving to the Czech Republic, we were only allowed to travel in the car with family members, so we decided to get married on the way.

the couple decided to get married and arrived here already as newlyweds. "We

were planning to get married at the end of 2020 anyway and to make the travel and administration easier we decided to do a civil ceremony and celebrate in the church with our families later when the situation allows us to do so," agree both.

They now celebrate one year being at CEITEC and both agreed that they don't regret making that decision. They also plan to stay for longer which is possible thanks to Mario receiving the Marie Curie grant. "It means that I can stay at least two more years which I am really happy about," claims Mario Urso. As his wife Martina has a contract at least for another two years, they can both carry on with their work here.

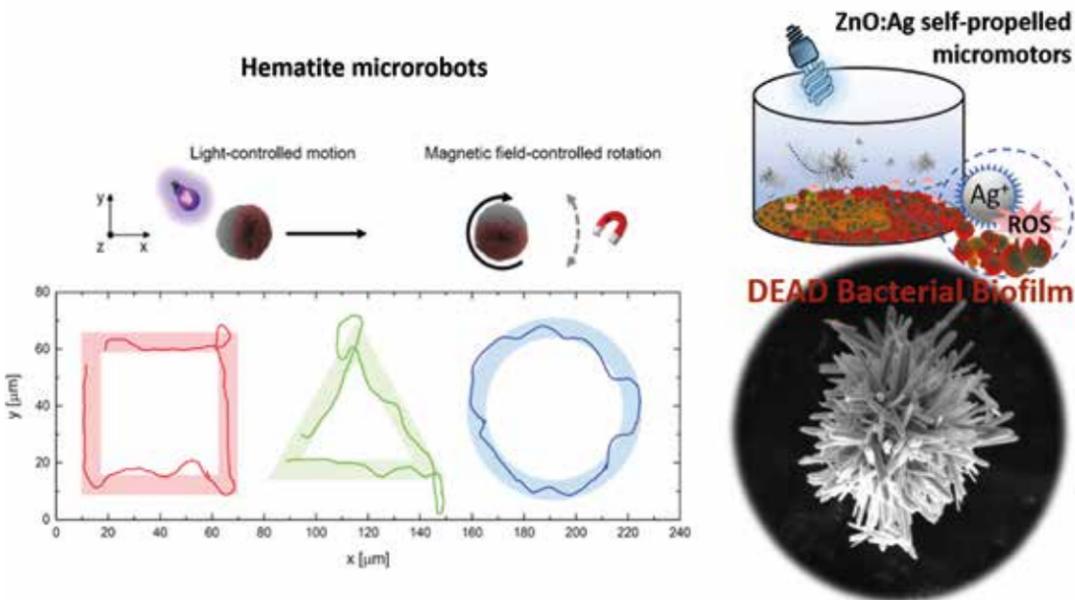
What they like about Martin Pumera's group at CEITEC and why they would like to continue in projects here, besides the equipment, is also its tight cooperation with universities and companies. "Here it works faster compared to Italy.

What we miss in Italy are facilities where everyone meets and collaborates together from PhD students and senior researchers to external users.

To translate an idea into something more complex and to complete it takes less time. Also, we just had

a collaboration with Mendel University and we are now starting a collaboration with Masaryk University," explains Mario Urso and Martina Ussia adds that they also enjoy the openness of CEITEC facilities. "What we miss in Italy are facilities where everyone meets and collaborates together from PhD students and senior researchers to external users," agree the scientists who also enjoy the international group they work in and already look forward to all the ambitious projects and collaborations planned for this year. ■

Light-driven self-propelled microrobots for environmental applications



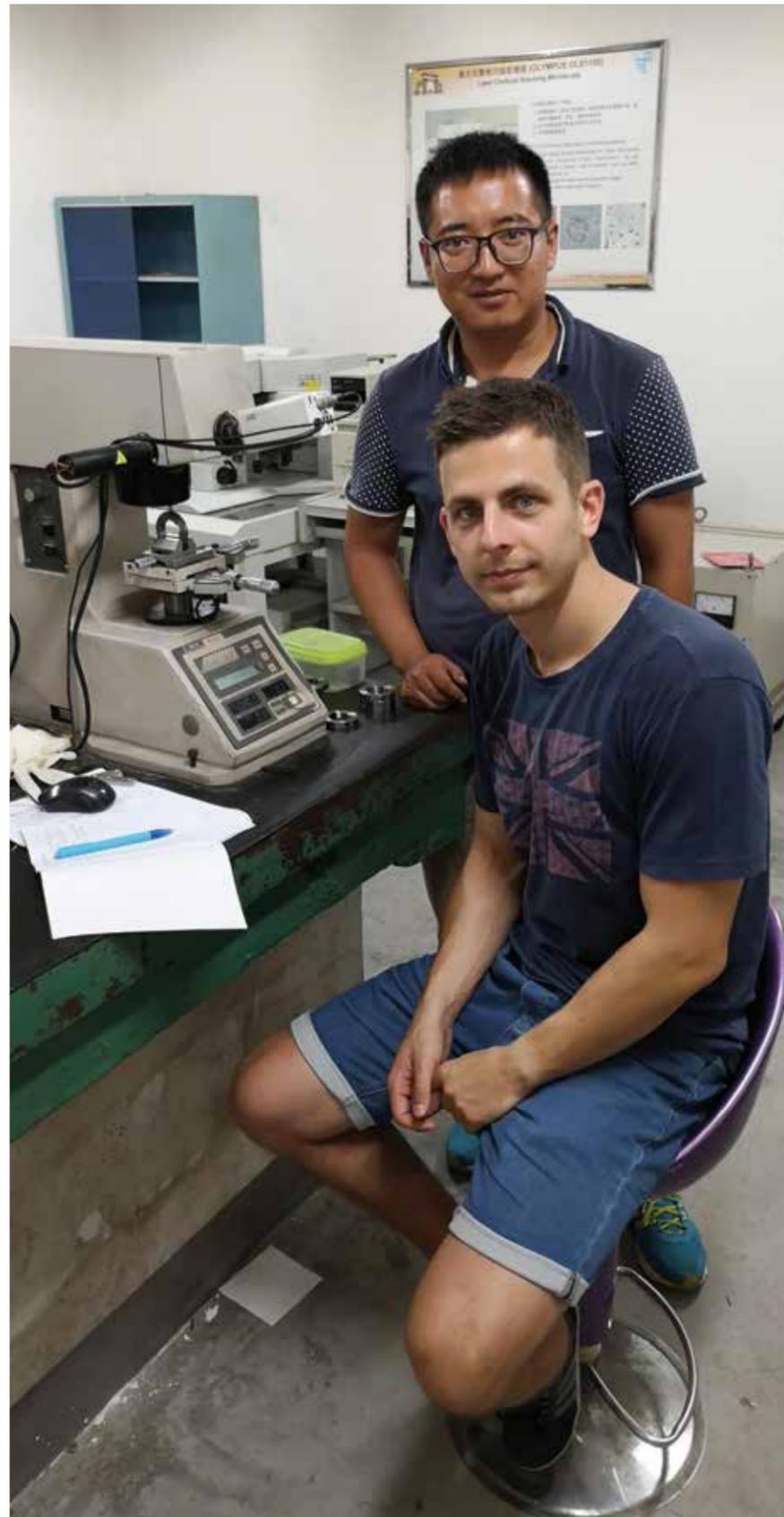
Increasing railway resilience explored by FME experts in Asia

How do you make rail infrastructure more resilient to weather changes, extreme natural events and even terrorist attacks? This was one of the main questions of the RISEN project, thanks to which researchers from the Tribology Group at the Institute of Machine and Industrial Design of the Faculty of Mechanical Engineering (FME) at BUT were able to travel to Japan and China and exchange the latest knowledge and experience in this area with both private institutions and other universities. Although the project was interrupted by the pandemic, it was possible to take advantage of the established cooperation and turn it into further joint research projects.

Zuzana Hübnerová
Photo archive of Tribology Group FME
BUT

"Our project is being carried out under the MSCA-RISE scheme, a network of collaborating institutions between which research and development staff exchange visits take place. It takes two forms. Either it is an inter-sectoral exchange, that is, between a university and a private company, or it is an international exchange. This means within academia, but usually outside the continent. In our case, it is exchange with universities outside the European Union, specifically in Asia," says Milan Omasta, who coordinated the project for FME.

Although the project is quite broad and is more about knowledge exchange and new experiences for employees than a specific research task or product development, it has a central theme, according to Omasta. In this case, it is research and development in the field of rail infrastructure



to make it more resilient to change. "These include climate change as well as various natural disasters and extreme human interventions such as terrorist attacks," adds Milan Omasta. The second research topic is advanced monitoring methods. "Advanced methods for monitoring the condition and various variables related to rolling stock and infrastructure. This involves the implementation of various sensors and evaluation methods," explains Omasta. The outputs of the joint research and development activities are mainly impacted articles and two technical books.

The project involved departments from both mechanical and civil engineering. In addition to BUT and other European universities, there are also MIT and Berkeley University in California as partners, prestigious private research institutes and industrial partners from all over the world. "We specifically targeted two sites, namely the Transport Engineering University in Chengdu, China, and RTRI in Japan. Japan's Railway Technical Research Institute is a research institution dedicated specifically to railways. As it is a private institute, it is very difficult to get in, unlike academia. And we were one of the few who managed to do so within the project," points out Milan Omasta. According to him, the greatest role was played by the close proximity of the topics and publications. "It was crucial that we were able to get directly involved in their research activities and

also be an asset. Moreover, this is experimental research, which is what we are primarily involved in," explains Omasta, adding that the main credit for the very successful work in Japan goes to colleagues Radovan Galas and Daniel Kvarda.

Czech experts from BUT spent six months in Japan and nine months in China. However, the project was then interrupted by the global pandemic and further work in Asia is now uncertain. But if all goes well, the project should restart in autumn 2021, so that the remaining exchanges can be completed. At the same time, however, it has already been possible to build on the programme. "We are now working most closely with the Tribology Research Institute at Chengdu University, where we have already submitted and received two projects that we are now working on," confirms Omasta. The internships with the Japanese RTRI should continue again, this time beyond the RISEN project. ■

NEWS

AWARD



Photo archive of FME BUT

A'Design Award for designers from BUT

The international A'Design Award 2020 in the category of production and processing machines has been awarded to a team of researchers from the Faculty of Mechanical Engineering. They succeeded in the competition with the design of the Big Trimmer for hemp harvesting.

"We won what is known as the Iron A'Design Award, which is given to about one-fifth of the best designs submitted to the competition. For us, it's the first award for a project we've done for an industry partner, so we're very happy about that. Even more so because we designed a very technical, sober product. In our case, it was not about a strong stylistic expression, it is an industrial product, and as such it is relatively modest and practical," explains chief designer David Škaroupka from the Institute of Machine and Industrial Design at the Faculty of Mechanical Engineering, who participated in the development with two other colleagues.

The school received an order from Sunflower Trimmer, a young Czech company that focuses on foreign markets. "The cooperation between our company and BUT helped us set the product identity of our machines. During the development process, we worked on many construction and design details, and I firmly believe that we have found a high quality and innovative solution, underlined by a great design," says Petr Mertlík, founder of the company.

(ed)

Bioinformatician helps archaeogeneticists search for primordial organisms

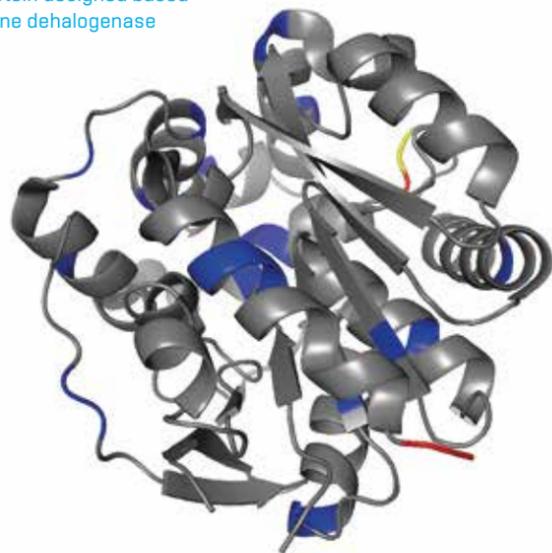


Miloš Musil from the Department of Information Systems at FIT created a new web application that helps scientists with ancestral reconstruction. He developed the unique tool in collaboration with scientists from the International Clinical Research Centre of St. Anne's University Hospital and researchers from the Loschmidt Laboratories at Masaryk University. There, they use the application to study molecular evolution and search for ancient proteins that no longer exist today. These can help, for example, in pharmacology, medicine or biotechnology.

Hana Nečasová
Photo Jan Prokopius and archive of Miloš Musil

Archaeogenetics. This is sometimes called ancestral reconstruction – a technique through which scientists investigate traces of the past, much like archaeologists. However, biologists do not look for them at excavation sites, but in computers. They are examining gene sequences and looking for organisms that no longer exist today. The new unique FireProt-ASR tool, developed

Ancestral protein designed based on a haloalkane dehalogenase sequence



by Miloš Musil from the Faculty of Information Technology of BUT, will fundamentally help researchers with finding millions-of-years-old proteins from which the current ones have evolved.

"Finding out what the evolution looked like is important not only from a scientific point of view. It is also of great importance in industry today. The further back we follow the evolutionary tree, the closer we get to primordial organisms. And these, as it seems, are often much more

stable than the current ones," explains Miloš Musil.

There are several theories as to why is this so. One of them is that in order to survive the inhospitable conditions that prevailed on Earth millions of years ago, organisms simply had to be more resilient. Another theory suggests that proteins had to be more stable in the past in order to survive the large number of mutations to which they were exposed during evolution. "Either way, it really seems that most organisms that currently exist have evolved to function in relatively mild conditions. This is enough for them to survive in nature, but if we want to use them in industry, for example, they need to withstand higher temperatures or perhaps an unfavourable pH level. And in that regard, ancestral proteins are truly more resistant," he adds.

Such findings are then used, for example, in pharmacology, medicine or biotechnology. "A washing powder is a typical example of this. It uses active enzymes to help remove dirt. But the proteins that occur in nature today cannot withstand the temperatures normally used to wash clothes. It is therefore necessary to increase their resilience, and this is precisely what ancestral reconstruction is meant to do. It will lead us to a common ancestor, who is likely to be more stable," describes Miloš Musil.

The web application he has developed will make this much easier for scientists. "In the past, a great deal of expertise was needed in order to put it all

The further back we follow the evolutionary tree, the closer we get to primordial organisms.

together. First, it was necessary to know the biological system, i.e. study the protein in depth and know the family from which the protein comes and how it works. And then it was also necessary to be able to use bioinformatics tools that would help aligning sequences or building a phylogenetic tree, which is crucial for ancestral reconstruction, because it shows which organisms, or proteins, evolved from which," says the PhD student from FIT.

His program, as the only one in the entire world, needs just a single protein sequence as a starting point for the calculation. The rest can be handled by FireProt-ASR, as is the tool made by Brno scientists called. It can save hours or days of work for experienced researchers, or even months of work for those just starting out with the system. "The program is fully automated, so it is suitable for beginners. Users can also use their own data and start the calculation from different parts of the computing environment," Miloš Musil says about the advantages of the tool. The tool is currently used by institutions all over the world. "It has already analysed nearly 1,300 proteins. It is freely available at the Loschmidt Laboratories website and is accessible for any use. About two-thirds of its user base are academic users, the rest are businesses," he adds.

By default, the program works with approximately 150 sequences, so the calculation of a phylogenetic tree often takes several hours to complete. Although the theoretical foundations of ancestral reconstruction are over fifty years old, the true potential of this method did not develop until the last decade, which saw the advent of powerful computers. The further development of this technique will probably also depend on computing power.

"We also tried a 620-sequence reconstruction, but the calculation took about two weeks on a fairly powerful computer. And that is still only talking about proteins, which are the product of just a small piece of genetic information. In terms of how the method itself works, however, there is theoretically nothing to prevent us from reconstructing the whole DNA, even DNA of the entire animal kingdom. This would require a huge amount of computing power, which we do not have at our disposal yet," explains Miloš Musil.

Many people may wonder how far this method can go. "It is similar to all other areas of science – it can be used both for good and evil. You can split an atom in a reactor as well as in a nuclear weapon," he says. So could the Jurassic Park become real? "It could.

FireProt-ASR has already analysed nearly 1,300 proteins. It is freely available at the Loschmidt Laboratories website and is accessible for any use.

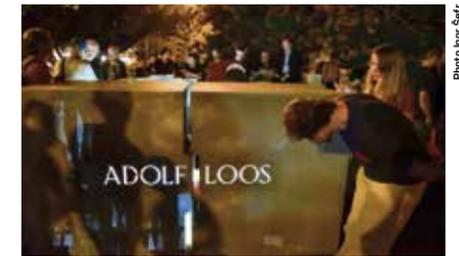
Although I imagine it would be easier and, above all, more accurate to sequence something from a piece of amber, like in the film. It is also possible that this could awaken prehistoric bacteria or viruses which our immune system would not be prepared to handle. But if I wanted to bring about the end of the world, I can imagine an easier way than analysing the teeth of a dinosaur," he says with a smile.

Miloš Musil has been working on ancestral reconstruction and protein stability in the Loschmidt laboratories for six years. He was particularly drawn here by his interest in the natural sciences. "Bioinformatics is at the intersection of two fields, and I find that fascinating. I am glad that I can use IT as a research tool in this area as well," he says. FireProt-ASR, which he has been developing for the last three years, is the central topic of his doctoral thesis, which he will defend at the Faculty of Information Technology.

He plans to stay in the laboratories in the future. He and his team of colleagues want to add some additional tools to the program to give experienced users more options for data processing. They also plan to improve other members of the FireProt family – a website used to design stable multiple-point mutants and a database collecting protein stability data. In the future, scientists would like to use this data for machine learning and create a new, more sophisticated system that would help them select mutations for even more stable proteins. ■

NEWS

ADOLF LOOS YEAR



Adolf Loos commemorated by a new memorial

On the occasion of the celebration of the 150th anniversary of the birth of Brno native and world-famous architect Adolf Loos, a memorial designed by Jaroslav Sedláč from the Faculty of Architecture and a graduate of the Faculty of Fine Arts, Oldřich Morys, was created. The unveiling ceremony took place on 20 August 2020 in the park on Janáček Square in Brno, not far from the site of the Brno architect's birthplace.

The new minimalist monument is conceived as a concrete sculptural form of the tombstone of Adolf Loos, situated in the Central Cemetery in Vienna. On a symbolic level, it is a reinterpretation of the tombstone itself, using classical sculptural techniques. The main idea behind the design was to create a negative as an imprint of Loos' final resting place for the location where he was born and raised, and an imaginary connection between the two places.

(ed)

I consider threats to be a form of feedback, says an activist from the Faculty of Business and Management



When Marek Mach was still in his first year at the Faculty of Business and Management at BUT, he could lecture his classmates about his experience in the non-profit sector. Thanks to his projects, which reached the Slovak public and earned him tens of thousands of followers on social networks, he was selected for the Forbes Top 30 under 30 in 2020. In addition, he received the Pontis Foundation Awards for sustainable development, becoming a Leader Under 30. He gained public recognition primarily for his commitment to fighting extremism and spreading the ideas of freedom and equality.

Radana Koudelová
Photo archive of Marek Mach

How does it happen that such a young person becomes engaged in social events?

The idea of founding the Youth Against Fascism initiative was born when I was in the 9th grade in elementary school. Since I was about 12 years old, I have been interested in communist regimes around the world, for example, North Korea. In March 2016, an extremist political party succeeded in the parliamentary elections in Slovakia, and that's when I decided that I didn't just want to grumble about the fact that young first-time voters had decided to support a party that openly referred to the fascist Slovak state during World War II, but that I wanted to do something about it. And that is how the Youth Against Fascism project came into being.

What was the reaction of your classmates?

Personally, I try to separate my non-profit activities from my private life. I don't bring it up unnecessarily in conversations with friends or classmates. But, of course, I got some reactions, especially from people I don't know

personally. But I was very encouraged that there were enough people who wanted to help and support me precisely because I was so young.

But this is not your only activity ...

On the anniversary of the Velvet Revolution in 2016 I launched a website called Youth Against Fascism where I summed up information about the development of fascism, its possible effects on society, etc. Along with the website, I also started a Facebook page where I published articles. In 2019 I received a grant from a Slovak bank and started to focus more on offering short, simple information about what is happening in society to young people who spend most of their time on social networks. This format really caught on and from that point on the interest started to grow incredibly.

In the summer of 2020, I decided to launch the Youth for Climate project, where we focus on environmental issues and climate change, and the politically independent activity of the Youth Report, where we offer news and current events in a simplified form. Based on the stories of people who wrote to me in Youth Against Fascism, I also launched Dúhy (Rainbows) with Ondřej Vrábek,

which is a social network for the LGBT community in Slovakia, because these people don't have it easy and are often afraid to confide even in those closest to them. Dúhy gives them the opportunity to communicate anonymously. Everything has grown so much that I am, understandably, no longer working on the projects alone and together with other colleagues we founded the Youth civic association as an umbrella for all these activities.

Why didn't you go into political science but instead chose to study business?

In addition to all of the above, I am also involved in audio-visual production. For a long time I could not decide which university to go to. I wanted to study in Scandinavia because I like their school system and I don't want to study something where, during the examination period, I have to spend dozens of hours memorising a text I know I won't need. At the Faculty of Business and Management I was attracted by the Entrepreneurship and Small Business Development programme, which I joined, and where they take a different approach to teaching than is usual in our country. And that was exactly what I was looking for.

What was the first year of distance learning like for you?

I don't know how many people will agree with me on this, but I like distance learning better than full-time. I have plenty of other activities outside of school, and being able to "walk to school" while being at home suits me very well.

What should I do if I see a hateful post on a social network?

Here we need to assess, for example, the potential impact of the contribution. If it's posted by a small site where it's viewed by dozens of people, then by commenting on it the post would be unnecessarily spread to a larger number. But if it's a post from a site with a large reach, for example, if it's fake news, I would recommend reporting it and commenting on it or trying to argue the facts.

Have you encountered any threats or attacks on yourself?

Yes, and there were quite a few. Anyway, for me, threats are a form of positive feedback, because it means I'm doing a good job when the people I'm targeting start getting upset and calling me names.

Do you think Slovak society is becoming more radicalised?

I think this is most pronounced in the online environment where we see an increase in misinformation and hate in the comments. In the past, people who we know to be fascists and who are now in parliament were more radical at first sight. They wore fascist uniforms in the streets, etc. But then they obviously realised that to appeal to the wider public they needed to step back slightly from that visible radicalisation and look more reasonable.

Are young people interested in participating in political and civic affairs?

It is individual, but I personally think it is important to try to communicate information to young people in a way that is interesting to them. There are criticisms that young people spend too much time on social media and do not read, but that does not have to be a disadvantage. We can get interesting information to them on social media, which is a concept that has worked very well for us. We try to "distil" important information from the media for them so that young people don't have to read long and extensive articles to get the most important information. We assume that a well-informed society is much less likely to resort to extremist views.

You made the Slovak Forbes 30 under 30 list in 2020. Do you feel you have high expectations of yourself now?

First of all, I must say that I appreciate the award very much and it means a lot to me. I see it as a signal that what I am doing is meaningful and it is a kind of appreciation of the results of my work in these projects. But I'm still trying to push the platforms somewhere. We want to explain to young people in a long-term and systematic way why it is important to be interested in these topics, and thus improve awareness and the whole situation in Slovakia.

Do you harbour political ambitions?

I don't know what the situation will be like in a few years, but for now I want to develop my existing projects. I'm certainly

not doing it now with the intention of entering politics.

Slovak society is more conservative than Czech society – how do you assess the situation of minorities there?

The most serious problem in Slovak society is the fact that we have stopped talking to each other. People are divided into camps that do not discuss with each other. When it comes to certain topics, some people simply stop listening and do not want to discuss it. The most important thing is to find common ground, understanding and not to divide society. If we can help someone to improve their situation in society without limiting anyone else, we should do so. ■



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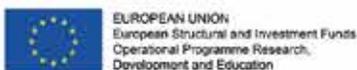
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