

NEWS AT BUT

2018/2019



Klára Částková

Nano sizes shift the properties of ceramics to previously unknown limits



EBEC 2017

The final of the largest student engineering competition in Europe was held on 3 August at BUT



NEWS AT BUT

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Editor

Jana Novotná
tel.: +420 541 145 345
novotna@ro.vutbr.cz

Translation

Kateřina Danielová, Miloš Bartoň

Editor-in-chief

Radana Kolčavová
tel.: +420 541 145 146
kolcavova@ro.vutbr.cz

Editorial board

Mária Režňáková (Vice-rector), Karel
Blažek (Director, VUTIAM Press),
Miroslav Doupovec (Vice-rector),
Renata Herrmannová (Head, Marketing
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(President, Student Chamber, BUT
Academic Senate), Eva Münsterová
(Quality Department), Milada Vávrová
(Vice-chair, BUT Academic Senate)

Editorial Office

Brno University of Technology
Antonínská 1, CZ-601 90 Brno
redakce@ro.vutbr.cz, www.vutbr.cz

Graphic Design

Vojtěch Lunga

Typesetting by Jan Janák (VUTIAM)

Cover photo by Igor Šefr
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Please, address your
comments, suggestions and remarks
to redakce@ro.vutbr.cz

NOT FOR SALE!

EDITORIAL



Foto Igor Šefr

Dear Readers,

Welcome to the third English edition of the magazine "News at the Brno University of Technology". Another year has passed and we would like to share with you some of the events and successes of the 2017/2018 academic year at the largest technical university in the Czech Republic.

In this issue you can read about Dragon 8, the successful student formula race car, the first BUT Junior – the technical university for children, the success of the research group CPhoto@FIT, and much more.

The Brno University of Technology has also taken part in the recent celebration of the 100th anniversary of the establishment of the Czech Republic. During this celebration, a very interesting exhibition on the history of the Brno University of Technology was installed in the vestibule of the Rectorate.

I hope that all this information about projects and activities will give you useful insights into BUT. If you would like to know more about the current developments at BUT, please visit the Facebook page of the Brno University of Technology or the official website of the university: www.vutbr.cz/en.

I wish you pleasant reading,

Hana Philippi
Head of Foreign Relations Department

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Michal Veselý of the Faculty of Chemistry heads the research team that received the Technology Agency of the Czech Republic 2017 Award in the Originality of Solution category for the Color Clock project.



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The Cash Reader application, designed by graduates of the Faculty of Information Technology Tomáš Jelínek and Martin Douděra, helps the blind to recognize banknotes.



4

In this year's racing season, the student formula racer designers from the Faculty of Mechanical Engineering have proven that they are among the best in the world.

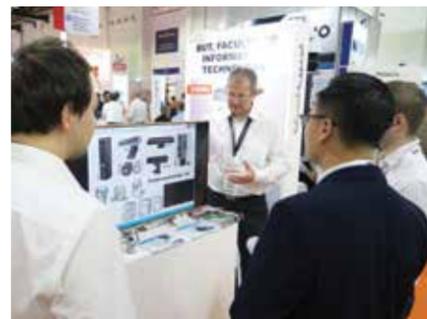


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The unique High Voltage Laboratory at the Faculty of Electrical Engineering and Communication operates in the so-called open access regime and is open to both students and experts from around the world.

NEWS

TRADE FAIR



The STRaDe group at the INTERSEC 2018 trade fair

In January 2018 Martin Drahanský and Ondřej Kanich from the Faculty of Information Technology took part in the INTERSEC trade fair in Dubai. As members of the STRaDe research group, which is part of the Department of Intelligent Systems at the Faculty of Information Technology and co-operates with Siemens, they presented the group on the stand of the Ministry of Trade and Industry of the Czech Republic. "We primarily showcased a retina scanner device, the RUDA robot and liveness detection vs. production of counterfeits," said Martin Drahanský who hopes that the established contacts will come to fruition.

The group concentrates on research and development of technologies in the security field. The research focuses for the most part on biometrics. Another research area of the group is sensory systems and their application, mainly in robotics, which is in itself part of the research. "In relation to robotics and biometrics we examine intelligent systems and particularly their applications which are closely related to the last area of our interest – the processing of image and video including the research and development of algorithms and their application to hardware," concluded the researcher.

(eds)

BUT RECTOR



Petr Štěpánek to continue as head of Brno University of Technology

On its meeting in October 2017 the Academic Senate of the Brno University of Technology elected the existing rector Petr Štěpánek a candidate for the position of the rector for the 2018–2022 term of office whose previous four-year term will thus be prolonged after his appointment to the office.

During Petr Štěpánek's term of office work was completed and operation started in the laboratory complex of the CEITEC BUT in the vicinity of the Technological Park and the reconstruction of the A1 hi-rise building of the Faculty of Mechanical Engineering was also successfully brought to an end. Yet, Petr Štěpánek notes: "Although I am head of the Institute of Concrete and Masonry Structures I continue to maintain that money should be invested in people rather than concrete. It is the talented employees and students who push the country's largest technical university further."

In the forthcoming four-year term of office the rector of the Brno University of Technology would like to concentrate on making the school more international, providing support to project management and making the rector's office more open and welcoming towards the faculties and institutes.

(eds)

SUCCESS



Pneumobiles from the Brno University of Technology beat European elite

Not just one but two vehicles propelled by compressed air and made by students at the Faculty of Mechanical Engineering of the Brno University of Technology scored points in the international races of students' teams in Hungary. From five competition disciplines they won three, and came third and fourth in two others. In a competition of 36 university teams they achieved the best result in their history and reached a top position in Europe. The Pneumobil Racing Team Brno is the only representative of the Czech Republic in pneumobile races.

Around 90 students collaborated in the development and building of the new model of the pneumobile. For their work the students have a completely equipped workshop at their disposal and they can also use selected laboratories at the Faculty of Mechanical Engineering or the strojLAB, a university 3D printing workshop. The project is also beneficial from the research point of view. While compressed air may not be considered an alternative to traditional combustion engines or electric motors, it can represent complementary fuel that will bring lower consumption and emissions.

(eds)

The Dragon from Brno Shines in European Races



No pain, no gain – but if you work hard, the results will soon arrive. This applies 100% to the TU Brno Racing students' team which in 2018 scored points in the European Formula Student races with their Dragon 8 formula car. In the local Formula Student Czech Republic 2018 race the young designers defended their victory in 2017 and in the next three races they confirmed that with their knowledge and skills they belong at the absolute top. What happened along the way to this year's success?



Radka Štávková
Photo archive of the TU Brno Racing team

50 thousand working hours – such is the rough estimate of the time the students of the Faculty of Mechanical Engineering of the Brno University of Technology spent developing, building and testing the new model Dragon 8 formula car. The result? The carbon monocoque can handle acceleration from nought to a hundred in 3.2 seconds and given its power-weight ratio it could be compared to the Bugatti Veyron hypersports car. The students of the Brno University of Technology also collected valuable trophies at four European races in Italy, Hungary, Germany and the Czech Republic.

In international competitions the designers have already scored points with the previous model Dragon 7, but they decided to make its successor even better in order to be able to fight for the top positions in the races. “Although the car construction was very light we wanted to make it even lighter and at the same time increase the torsional rigidity of the car’s frame. We managed to achieve this by employing, for the first time ever, technology using pre-saturated carbon fibres hardened in the autoclave for building the carbon monocoque. If I should make a comparison, the carbon monocoque of the Dragon 7 is like the monocoques in Formula 1 in the 1970s, while the Dragon 8 is a compact monocoque made following

the latest trends in the industry, it is basically identical with the cars in Formula 1 or the Le Mans specials,” explained Lukáš Gregor, a student at the Faculty of Mechanical Engineering and head of the Chassis section of the TU Brno Racing team, describing one of the most profound changes introduced before the start of the racing season.

The design of the aerodynamic packet was no less important, the designers wanted to take maximum advantage of aerodynamic thrust. The Dragon 8 has three shock absorbers on both axles which gives the chassis the desired rigidity in every situation on the race course. The team has a competitive edge with the power unit in the form of

a turbocharged single-cylinder engine. The car styling has also undergone a significant change, looking very fierce – after all, like the students themselves who build the car in their free time.

With the eighth model of the Dragon the students completed two training camps and four regular races. In Italy on the Ricardo Paletti race track in Varano de Melegari they came fourth in Autocross and claimed the incredible second place in Endurance. Another stop was Hungary and the Formula Student East race. “The feedback on the presentation of the engineering design of the car contained a praise for the best presentation of the dynamic behaviour and the chassis and the

car also received a prize from the Hungarian Ministry for Innovations and Technologies as the most innovative car in the competition,” informed the team leader for the 2017/2018 season, Josef Jelínek, and added that the team also did well in the dynamic disciplines.

At the home race in Most the team successfully defended last year’s victory in its category – so in the 2018/2019 season the TU Brno Racing team will compete for a hat-trick. The team ended the series of races in Germany on the Hockenheimring race track which is usually considered the unofficial world championship in students’ formula cars. In the past season 115 teams from around the world took part in the race. “The technical commissioners appraised our car as one of the best prepared. We excelled again in the dynamic behaviour area and the team went to the start of the dynamic disciplines

with great expectations,” said Jelínek. In the end the team brought back an overall 11th position from Germany.

“The results clearly demonstrate that all the changes to the car were for the better. This has been the second season in which each of the disciplines in Endurance that we took part in we also successfully completed. This alone is terrific and a tremendous effort is always exerted for this. But it cannot be taken for granted, a little bit of luck is always needed,” continued Jelínek and added that the team has already been hard at work on improvements for the next season.

The students consider the trophies they won in the past season to be insignificant compared to the experience they gained in building their Dragon. Every year the team is made up of approximately 40 students who work on the project outside of their school

curriculum. “The whole competition is conceived in such a way that students of technical courses acquire practical experience in building a car from the first idea via building prototypes to the final formula car, the design and qualities of which they have to defend in front of representatives of the best car manufacturing companies. This is invaluable experience which they could never gather by just studying,” ended the team leader Josef Jelínek.

In addition to designing a car the future graduates from technical disciplines also receive some practise in negotiating with sponsors, planning and budgeting. New team members are always recruited at the beginning of each academic year and the selected students work on designing a new model of the Dragon formula car. In the 2018/2019 season the students will unveil the ninth model in the series, the Dragon 9. ■

TU Brno Racing

This students’ team was founded at the Brno University of Technology in 2010. The aim of the students is to design and build a race car within one academic year. With the car they later compete with more than 500 university teams from around the world in the Formula Student races. The aspects evaluated in the competition include the engineering approach, thoughts given to production costs, marketing abilities, reliability, ease of control, performance, and car safety. A complementary aspect is the car styling. TU Brno Racing is the largest students’ team at the Brno University of Technology. Every year about 40 bachelor and master students co-operate in developing and building the race car.



An awarded project of the Faculty of Chemistry will protect sensitive skin or rare prints

A small flat packet with the inscription Color Clock contains inconspicuous colour strips that function as a dosimeter. The invention, which raised the interest of the public several years ago during the Night of the Scientists at the Faculty of Chemistry of the Brno University of Technology, received the Award of the Technology Agency of the Czech Republic 2017 in the Originality of Solution category. One of the researchers in the project entitled "Research and Development of Advanced Thin-layer Elements for Direct Monitoring of the Time Variable Using Precisely Calibrated Colour Changes" was the team from the Faculty of Chemistry of the Brno University of Technology led by Michal Veselý.

Jana Novotná
Photo archive of Michal Veselý
and Igor Šefr

"If you perceive the world around you, you are bound to notice that colours fade as a consequence of a particular dose of radiation. If we quantify the radiation dose and the colour response, we receive a dependence between the radiation dose and colour or something that we call a chemical clock," explains Michal Veselý from the Institute of Physical and Applied Chemistry the principle of his work. "Using this instrument we can estimate the radiation dose which caused the colour change. Or vice versa, when we know what constant

dose of radiation we are dealing with, we are able to measure the time after which the change will happen with this response," details the team leader. "When you stick a colour photo on the fridge, it will fade after some time. And our strip basically does the same. We have a thin layer of a composition on the strip which is sensitive to light or ultraviolet radiation and fades in a reproducible way, so that we can use it as a measure for establishing the dose of light or UV radiation that falls on the strip," adds Petr Dzik, another member of the research team, his explanation.

We understand the term light to be the visible light while UV radiation is part of the electromagnetic radiation. And this gives rise to two basic outcomes of the successful project which are just now in the phase of pre-production samples. "The first of the two, strips for safer sunbathing are sensitive to UV radiation and should serve in monitoring the amount of sunshine that falls on a person. And the second version, sensitive to visible light, is primarily intended for archives and galleries and serves to control the conditions of exposing artefacts which might be damaged by visible light," explains Petr Dzik and adds: "There is quite a number of regional museums which may have medieval artefacts or photographs in their collection, generally quite sensitive to damage by light, and it is these institutions that the relatively inexpensive strip is intended for." Every collection item is classified in a particular light sensitivity category and has a permitted yearly dose of light specified for it. "This permitted dose depends on

the type of material and it is a value which does not cause a discernible change," continues his explanation Veselý and introduces two types of colour clock.

The set for galleries is described as "a disposable dosimeter of light exposure", while the sunbathing set is inscribed as "a warning strip for staying in the sun". "The public usually connects the word dosimeter with negative associations, so we call it a warning strip instead," says the head of the team and from the sunbathing set takes out one by one a UV card for colour checking, a paper leaflet with a table of sunbathing

periods and the strips which are essentially a dosimeter for measuring the UV radiation

When you stick a colour photo on the fridge, it will fade after some time. And our strip basically does the same.

dose. "There are two types of application. Either you stick the strip anywhere on your clothes and keep an eye on it until it changes to the colour of the first warning, after which one should no longer expose him/herself to the sun. After the second warning the skin will turn red. Alternatively, if you

want to sunbathe, you stick the strip on the deckchair, apply sun lotion and watch how long it will take for the strip to change colour to the first warning degree. Then the table will show you how long the sun lotion is going to protect you," says Veselý.

The whole project was born from an idea which the researchers from the Brno University of Technology initially aimed just at galleries. They started by submitting the idea to an industrial partner to see whether the endeavour would be worth the effort and gradually other scientific institutions joined the project with their know-how. Along

the way it became clear that it need not be limited to galleries only, as there were many other potentially interesting areas. "To take an example, dermatologists would welcome a simple means of monitoring the dose their patients receive during phototherapy, and from there it was just a short step to a requirement for the indication of a dose for safe sunbathing of the general public. It was followed by a demand for an indicator for veterinary needs, as some cattle breeding facilities require disinfection using UVC radiation, or in the

Petr Dzik, Andrea Třešňáková,
Michal Veselý





area of construction materials, where some materials are exposed to solar radiation for the whole day during storage and over time turn yellow. Another field of application is monitoring foodstuffs which are not served well by light," enumerates the team leader and adds: "It is well-known that potatoes turn green after being exposed to light, but people are less interested in the fact that poisonous solanine forms in the tubers of potatoes due to visible light." As a result the project developed a whole set of disposable, cheap, and what is important, printed dosimeters which respond to the received dose of radiation or light by a colour change.

The idea itself is not original, just as one of the standards for evaluating light fastness which uses a similar system.

"The contribution by the awarded project consists in the optimisation of the process, that is ensuring that it can be made quickly, cheaply and using printing techniques," states Michal Veselý and adds that in their work they used both printing techniques to apply thin layers and nanoparticles of semiconductors for controlling the colour change. "This is also a well-known thing but in connection with

It is well-known that potatoes turn green after being exposed to light, but people are less interested in the fact that poisonous solanine forms in the tubers of potatoes due to visible light.

dosimeters for this purpose it is new. If I sum it up, the originality of the solution rests in the combination of a user-friendly form, a sophisticated reaction layer with nanoparticles of semiconductors and inexpensive production by printing. These are the three pillars of our work."

The main addressee of the award is the INVOS company specialising in the production of packaging materials, including highly sophisticated packaging, and they also initiated the first impulse for co-operation. "They wanted to make packaging with a higher added value and they turned to us asking if we had an idea of how to enrich the technology of printed foils with new functionality," explains Petr Dzik and the team leader adds the information that the

company is capable of printing the dosimeters directly on the packaging materials for the purposes of packing and transporting light-sensitive materials.

Along with the Brno University of Technology the project was a collaboration with several other research institutions. "INVOS was responsible for co-ordination and material support, the Centre of Organic Chemistry prepared the nanoparticles and led research into raw materials. The Institute of Chemical Processes of the Czech Academy of Science, together with us, did the photochemical and photocatalytic tests, the dermatologists from Hradec Králové were most beneficial in determining the radiation doses," recounts Michal Veselý and expands: "The most difficult thing was to establish the radiation dose to which it was necessary to calibrate the warning strip so that it would be dermatologically sensible. So that it would be a real warning and not just a children's toy."

The query of how far the project has got along the way to its user is answered by the team members in unison saying that it is no longer up to them and the question should be directed to the main researcher - the INVOS company. "Production is ready, now it all depends on proper marketing. It has ended for us and we are facing new challenges." ■

BUT WOMEN

Klára Částková: I have always been inclined toward a more lively science

Although Klára Částková is one of the graduates from the Faculty of Chemistry, today she teaches at the Faculty of Mechanical Engineering. It is, however, science and advanced ceramic materials that have become her destiny. Presently she is the deputy head of the Central European Institute of Technology (CEITEC) BUT research group concentrating on advanced ceramic materials with the aim of improving their properties and finding suitable applications.

Jana Novotná
Photo Pavel Nesvadba and Igor Šeř



Did your parents support your idea to go on to the University of Technology?

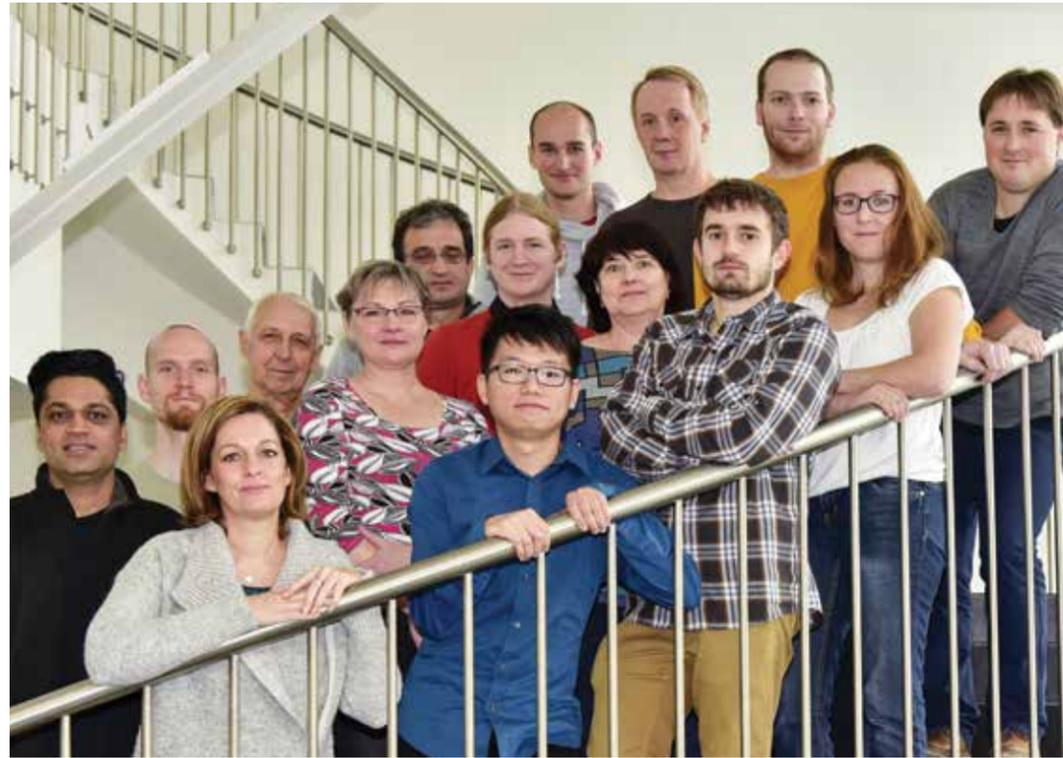
Frankly, I come from a family of doctors, so from the beginning the parents tended to guide me in this direction. Even I imagined it to be that way and today I sometimes feel sorry for not being a doctor. At that time the entrance exams to all schools took place on the same day and that year, for the first time, the exams to medicine included physics. I felt I was not prepared enough so instead I applied to the Faculty of Science of Masaryk University for environmental studies, but as I fell outside the limit for the number accepted I was offered a place at the Faculty of Chemistry which was just opening. I thought to myself I would go there and after a year return to the Faculty of Science but I never did return.

So it was really a coincidence...

It was a little random but I was satisfied there. In the first year the faculty did not have enough teachers and most of the lectures were given at the Faculty of Science so I basically finished the first year with students of natural sciences.

You graduated in food technology and biotechnology from the Faculty of Chemistry but you received a higher doctoral degree from the Faculty of Mechanical Engineering. How did that happen?

The transfer to the Faculty of Mechanical Engineering started earlier. In the fifth year, when we were to choose the theme of the diploma



CEITEC BUT research group for advanced ceramic materials

thesis, Jaroslav Cihlář, who is like my second father, was an external teacher at BUT. At that time he was at the Faculty of Mechanical Engineering where he was pushing for courses in chemistry and he also proposed one theme for the diploma thesis at the Faculty of Chemistry. So I worked on the diploma thesis under his tutorship and he then offered me a chance to stay for the doctoral study, although officially I was a doctoral student in chemistry of materials. Later I studied for the higher doctoral degree at the Faculty of Mechanical Engineering, where I have had a job as a teacher to this day.

Why did you begin to be interested in advanced materials?

I have always been inclined

toward a more lively science, in fact food biotechnology is something like that – yeast, beer production, etc. The subject of my diploma thesis, as proposed by Professor Cihlář, concentrated on bio-ceramic materials, i.e. materials which can be applied in replacing human tissues by hydroxyapatite. Today it is a traditional material for bio-applications. At that time I worked on the synthesis of hydroxyapatite as part of the diploma thesis and the preparation of different materials for a broad spectrum of applications marked the start of the way to materials engineering. Then it was just biomaterials, but as soon as I began to work at the department of ceramics, and later also polymers, with the wide application of advanced ceramic materials the portfolio

of materials we would prepare and synthesise expanded and included other groups as well.

What does the word advanced imply?

We can basically classify ceramics as traditional and advanced, where traditional is the utility material and advanced is the hi-tech. Using traditional materials is limited by their properties, while advanced materials can go further with their enhanced properties so that they are better suited for applications under extreme stress by high temperatures, high loads, etc. These applications include replacement parts for the human body. In other words, they are hi-tech materials which find application in new technologies or new visions and that is also the reason

for our research – we aspire to prepare more and more new materials as they are in ever greater demand by new technologies.

How long is the path from your research to applications?

This may be the dark side of basic research that one does not have feedback as we are at the base level of research. But within the CEITEC framework there has been some convergence between living and non-living sciences going on so that practical collaboration is happening, such as when a particular material can be tested by, let's say, doctors in their applications. As an example I can mention ceramic scaffolds which replace solid tissues. Colleagues from Masaryk University use our ceramic scaffolds as supports for cells which they implant in mice and they may test, for example, leukaemia research. Or synthesised nanoparticles which possess certain catalytic activity and are applied to spots where a tumour may be present and they are capable of initiating a reaction whose result is a toxic substance which kills the tumour. They have specific practical targets or visions and we provide the material for them so that is some motivation.

How does your ceramic differ from the standard one?

It is a polycrystalline material so that its structure is made up of grains. The crystalline structure may have an effect on optical properties and then the size of the grains, which is the trend of the day where everything goes to nano sizes. So, we try to use the smallest

possible grains of ceramics, which shift the properties to limits so far unknown. In order to obtain a ceramic which has the smallest grain, I need to prepare a powder from particles smaller than before. The preparation of particles for nanoceramics is my primary task – a synthesis of the characteristics of particles, at best nanoparticles of advanced materials. What influences the properties most is the structure and, naturally, the chemical composition, but this can be modelled or tuned based on the characteristics of the material.

How did you discover that ceramics are so unique and irreplaceable?

The basic materials that material engineering works with are plastic, metals, ceramics, maybe glass and sometimes glass-ceramics. Each of them has its advantages and disadvantages for a particular application. Ceramics excel in their mechanical properties, especially hardness and toughness, but are very brittle. It's not that I would think that other materials are not suitable for hi-tech applications, but it depends on the specific situation. Ceramics also have excellent resistance to high temperatures and good energetic properties so that they are functional materials. Certain properties predetermine the ceramic for certain applications and we try to control its structure and chemical phase composition in order to reinforce these properties.

Using ceramics in medicine may be surprising for the non-expert.

As far as replacement parts for the human body are concerned, the brittleness of ceramics is a great disadvantage in biomedicine. On the other hand, it is inert to the human body and can also be bioactive. It can initiate a response in the body which leads to the union of the new material with the body and the body considers it to be of its own, which does not work for metals in this way.

Are you guiding your son into the technical sciences?

He is nine and so far he knows what H₂O is. Everyone has a predilection for something

but I think that the role of the parents in directing the child somewhere is important. At Masaryk University they organise minilabs for first and second grade children - my son used to go there and he was enthusiastic. He even went through a period when he wanted to go to the lab with me, to cook various potions, but now he is more interested in football. So it's not targeted at all. But by talking about my work when he is interested in what I do I do direct him in some way to technical science. He will not be a philosopher. ■

Who is Assoc. Prof. Klára Částková, PhD?

Klára Částková was born in Brno.

She completed her studies at the Faculty of Chemistry of the Brno University of Technology in 1997. She started her doctoral study in Material Engineering in 1997 at the Institute of Materials Chemistry of the Faculty of Chemistry of the Brno University of Technology working at the Department of Ceramics and Polymers of the Institute of Materials Science and Engineering of the Brno University of Technology. She defended her higher doctoral degree on the subject of Chemical and Biological Properties of Biochemical Materials in 2002. In 2016 she became an associate professor in the field of Materials Science and Engineering at the Faculty of Mechanical Engineering of the Brno University of Technology.

Since 1998 she has been employed by the Department of Ceramics and Polymers of the Institute of Materials Science and Engineering at the Faculty of Mechanical Engineering in Brno as a researcher and since 2005 concurrently as a teacher. Since 2012 she has also worked as a scientist-researcher in the Central European Institute of Technology BUT.

In the field of scientific research she concentrates on preparing and characterising advanced ceramic materials. She has developed her scientific activities by working as the main researcher or co-researcher on more than 20 research projects.

Ivan Ruller:
I would like to
reinvigorate
something from
the cultural
climate of the
first republic
in Brno



Jana Novotná
Photo Igor Šefr and the archive of the editorial office

An interview took place with the architect Ivan Ruller, a graduate from the Brno University of Technology and the first post-revolutionary dean at the Faculty of Architecture, in August 2017, six months before his death. In spite of his 90 years of age he radiated incredible enthusiasm and optimism. He never left Brno and the bond with his native city was felt most intensely in the house where we talked. Built by his father, the renowned Brno contractor Čeněk Ruller, the doyen of Brno architecture spent nearly all of his life there. Ivan Ruller worked until his last moments – in spring 2017 his team won an architectural competition for the revitalisation of the embankment of the Svratka river but he did not live to see the project's completion. He left us on 25 March 2018.

Is your study bound for implementation?

Together with the teams that took second and third place in the competition we were invited to the Council of the City of Brno which initiated the competition. We will all receive an invitation to bid and after that the one that is most suitable will be selected. If we do come through, we must consider everything very carefully, as it is a project worth almost 300 million crowns. At any rate, there is a serious interest on the part of the city to build the project and I think it is only good as until now Brno did not show much concern about its waters.

Yes, Brno has actually two rivers, and they are sort of hidden ...

Along with the Svratka and the Svitava there is a mill-race which led from Jundrov via Mendlovo square, the Ponávka and a number of small streams and rivulets. I used to walk across Mendlovo square to the elementary school at Poříčí; the old town hall stood there and it was a very charming place. And we used to go to the fish hatcheries there to buy carp for Christmas. There were three swimming pools on the mill-race to which Bohuslav Fuchs added a beautiful building of the changing rooms, and as students we were regular visitors there. Towards the end of the war the swimming pools were hit by a bomb, and instead of repairing them, the bathing facility was closed down and the square was rebuilt to what it is today.

What was it that the jury appreciated in your design?

We did two things. First, we cultivated the river and then we differentiated the left and the right banks. The largest improvements are proposed between the bridge to Vídeňská St and the bridge to Renneská St. On the left side we created a colonnade with small cafes and pubs, where for safety reasons we separated foot traffic from cyclists and skateboarders, while the right bank has more natural features. Today a four-way road which is part of the city ring road runs around it but there is a study according to which traffic could be led at the back around the Brno Exhibition Centre and via a new tunnel through the Červený kopec

massif. The road to Poříčí could consequently be reduced to a two-way with more space left for the improvements of the embankment. However, a decision concerning this ring road will not be made until 2035, while the completion of the embankment is planned for 2022.

Does it give you an edge in such a competition when you have been part of the place for all your life?

I think that nobody has an a priori advantage in the competition. You either manage to meet what is required by the competition or not and this time we probably succeeded in doing that as people in general and experts like the project.

How did the behaviour of architects change during your professional career? Do they feel more freedom today and a need to come forward with their ideas?

Every period has its positive and negative side. Until the 1990s everything was inhibited by the atmosphere of totalitarianism which made life uncomfortable and deformed relationships in architecture. And today, in my opinion, the situation in this area is strongly influenced by monetary relationships. There is a group of developers who take a construction project only as a means to make profit, rather than to satisfy the needs of the people and to cultivate the environment.

Your Rondo sports hall respected the Brno silhouette, while today hi-rise buildings are being erected in the south and nobody cares ...

You are right about those hi-rises. There is a study in Brno which stipulates where hi-rises could stand and where not. But they need not be only tower houses. When you walk up Pekařská St, the terraces at Anenská St obscure the view of the Brno dome and this is wrong in my opinion. I think that architects who represent the essence of the productive generation in Brno today have the qualities but sometimes the pressure by the developers is too strong. When the communists seized power after 1948 they completely upturned the whole economic system and now it has to be reinstated.

What do you think about the role of the city architect?

In Brno the Office of the Chief Architect was established in the 1960s and it was led by Zdeněk Chlup, a true expert and a wonderful man. The political pressures exerted on him were often pretty strong but he managed to refuse to accept some of the projects. I think this function is very important and I am glad that it has been re-established; it is a great success of this generation in the city's management. The other side of the matter is that we have divided the republic into 14 regions, and I don't think that you can find 14 qualified regional governors (hejtman) in this generation. In the past there was only one building office in Brno which guaranteed the building of the whole city. Now you have 29 city districts and each has its own building office with competences which, I am afraid, cannot be always manned by qualified people.



Like Zdeněk Chlup mentioned above, you never bowed to the system, yet you were able to work on quite exceptional projects ...

I was just lucky sometimes. When in 1959 Bedřich Rozehnal, Miloslav Kopřiva and Bohuslav Fuchs were forced to leave the Faculty of Architecture, being their assistants we had to go as well and I had a hard time finding a job. At that time the architect Chlup was deputy director of the Stavoprojekt company and the project for the building of the Janáček theatre was just in the making. Although I did not have official positive

references he invited me to work on the project and thanks to that I could experience rather wonderful creative years. It was in a period when only prefab hi-rises were built and all of a sudden we were working on a building where everything was atypical. We had to design every chair, every construction detail and sometimes we had to persuade the manufacturers to accept our order. I have fond memories of that. And then there were other built projects, mostly thanks to the atmosphere of the Prague Spring – the Ingstav building, Rondo sports hall, Karat and the funeral parlour in Židenice,

which may not be taken down in the end. I have always liked designing family homes when somebody asks me.

But you later returned to the Faculty of Architecture ...

Yes, after the revolution I was approached by students proposing me to consider the position of dean. It was not an easy decision – at last I would be able to dedicate myself to designing full scale, or to join the school and occasionally design something. But it was hard to turn them down. The students were living to the full the changes in society – they were enthusiastic and dedicated. I like to recollect that period.

You also took part in international projects, which was kind of a miracle in the communist period ...

The credit for this goes to Jan Jelínek, then the director of the Moravian Museum and the Anthropos Pavilion and an internationally-recognized anthropologist. At that time he was president of the International Council of Museums at the UNESCO (ICOM) and as such he was assigned with leading the project of building a museum in Tripoli in Libya. He was to choose an architect and somebody recommended me, which for me marked a start of a very pleasant period. Between 1976 and 1981, every year, sometimes twice a year, we spent a month in Tripoli, which was nicely framed by Paris where we had to drop in to the residence of the UNESCO to collect flight tickets, expense allowances, etc. We also designed the

interior and the complete permanent exhibitions for the museum. We surveyed some buildings in the field, in the Sahara desert, and with the anthropologist Jelínek as a guide this was an unforgettable experience.

You have lived in Brno for all your life. What do you think the city needs most today?

I think that Brno would benefit from reinvigorating the cultural climate that prevailed in the interwar period. Just imagine, ten years after the establishment of the republic they were able to build the premises of the Exhibition Centre and hold the excellent Exhibition of Czechoslovakia's Contemporary Culture there. I would be pleased to see if contemporary Brno had something from that past atmosphere. We have two world-renowned prominent figures in Brno, Janáček and Mendel, and so far we have not dedicated a dignified expression of their greatness to either of them. I appreciate that the present City Council has resuscitated the plans for building the Janáček Cultural Centre, and I hope they will succeed in making it happen. Now the important thing is that the building also has some architectural value.

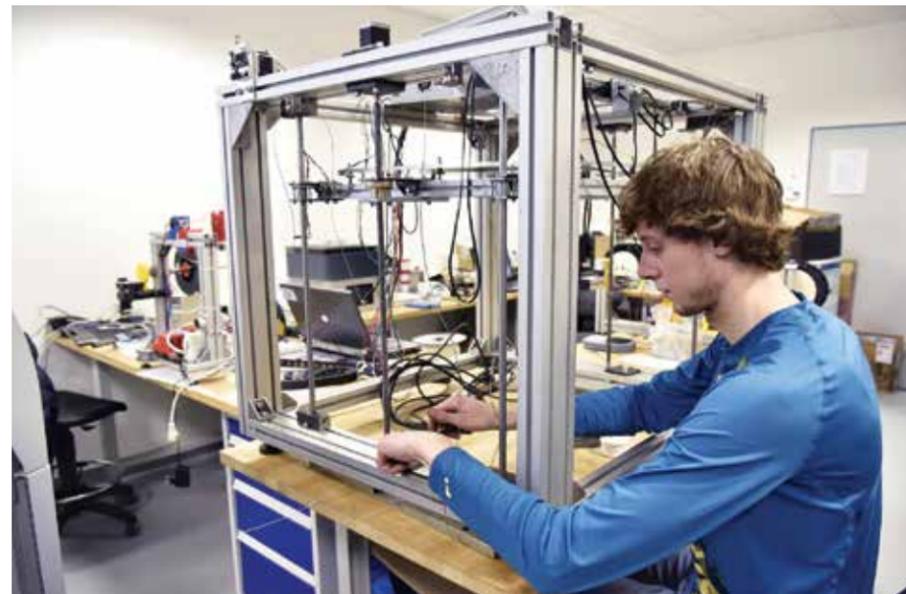
You never gave a thought to emigration or at least moving to Prague?

Naturally I gave it a thought, but dad was ill, mum was taking care of him and I simply could not run away. There were some offers to go to Prague, but I am a Brno patriot. I was born in Brno and I am glad to be here. ■

StrojLAB may pave the way to a career in science

In May 2017 the first university workshop specialising in 3D printing and related technologies started operation at the Faculty of Mechanical Engineering. This gives students at the Brno University of Technology an exceptional opportunity to take advantage, free of charge, of top-class equipment which is not generally available and to elaborate on their ideas for prototypes. The workshop called strojLAB is part of the all-European FabLabNet network of shared hi-tech workshops and its operation is partly funded with money from the European Regional Development Fund. The aim of the project is to develop and support students' projects which may lead to innovations in the machine industry in the Czech Republic.

Radka Štávková and Jana Novotná
Photo Igor Šefr



The workshop is equipped with several types of 3D printers designed for the building of prototypes from plastic and metal materials, heat and laser cutters, equipment for vacuum forming of plastic and a scanner for converting a produced part into a virtual form. The operation of the whole laboratory is supervised by the "engine driver" Josef Březina, who takes care of the maintenance of the equipment and the whole workplace, while at the same time providing expert assistance with on-going projects and training new students in operating the individual pieces of equipment. "StrojLab is exceptional in that it is a university workplace,

so that we have professional equipment available for our projects, which in general is not so common in FabLabs," says the engine-driver and alongside the possibility of vacuum forming of plastic slabs he also underlines full-colour 3D printing. "Selected users have access to a 3D scanner, which is used for research and development and cooperation with industry," adds Březina.

"Students can come here to consult and improve on their ideas, develop and test designs of their products on top-class equipment. The FabLabs abroad gave birth to a number of prototypes which were so innovative



that after some enhancements they made it to serial production," says the head of the Department of Reverse Engineering and Additive Technologies at the Institute of Machine and Industrial Design of the Faculty of Mechanical Engineering, David Paloušek, who sees strojLAB as a chance for the students to blend theoretical knowledge and practical experience. "A successful project might pave the way to a successful career."

StrojLAB is even open to complete beginners in 3D printing. Each of the interested students is first required to register at the www.strojlab.cz website and pass entry-level training. "There are four training levels according to the skills and knowledge of the student. At the first level the student acquires practical

skills for working on a desktop 3D printer, manipulating the hand-held scanner and working in the locksmith workshop. In the following free courses he will learn the basics of vacuum forming, machining and how to use the electric workshops. The most dexterous students may acquire the know-how for working on a 3D printer specialising in metal printing, which is the most difficult job, or for machining and large-format 3D printing on the Kuka robot," elucidated the strojLAB methodologist from the Institute of Machine and Industrial Design of the Faculty of Mechanical Engineering, David Škaroupka.

Initially, strojLAB had over 50 registered users. "With the beginning of the academic year we expect increased interest not only on the part of students," explains

the enginedriver and adds: "Regular training will include working on the equipment for the strojLAB level as well as on professional 3D printers and the robotic machining centre."

Since the beginning of its operation the workshop has seen several remarkable projects completed there. "They included, for example, making a model of a five-axis robot which serves as a teaching aid in the robotic circle, or printing students' designs of air-frames. An interesting project is a large-size 3D printer for producing parts sized 0.5 × 0.5 × 0.5 m," enumerates Josef Březina. As the engine driver he is quite busy at work, but he dedicates his free time in the laboratory to the development of his own printer or modifications of road bicycles.

The opening of strojLAB was made possible by the engagement of the Faculty of Mechanical Engineering in the European FabLabNet project. Since 2016 the project has brought together nine FabLabs from around the whole of Europe with the aim of supporting the sharing of know-how in this dynamically developing field. The Brno University of Technology is the only representative of the Czech Republic and the only university in Europe involved in the project. The other partners are workshops which are targeted at hi-tech hobbyists and designers and are found in Germany, Austria, Italy, Slovenia, Croatia, Poland, Hungary and Slovakia. ■

BUT Junior



(eds)
Photo Igor Šefr



The Brno University of Technology launched an edutainment project for pupils of the 6th – 9th grades of elementary schools, called BUT Junior. The University of Technology for Juniors aims to promote the technical education of children aged 12–16 years. During the academic year 2017/2018 the small scientists had the initial opportunity to submerge themselves into the mysteries of architecture, civil engineering, electrical engineering, chemistry or IT under guidance from the staff of BUT. The first to open its doors to the future technicians in October 2017 was the Faculty of Electrical Engineering and Communication. The project entered another year and its capacity for the academic year 2018/2019 has already been filled.

Marek Štěpán strives to make his buildings true to life

Same brief, same architect and two designs separated by a quarter of the century. Yet, in the ongoing construction of a church at the Lesná housing estate in Brno Marek Štěpán has used some identical elements to the project with which he graduated from the Faculty of Architecture at the Brno University of Technology. In his work the architect, who in the meantime has become a renowned creator of sacred buildings, excels as a designer of original wooden structures, although he has also left his imprint on Prague Castle, while he strives to make the buildings as close to the truth as possible. By studying the archetypes and the signs of the times, finding relationships between the old and the new, the external and the hidden he attempts to find the inner truth that he infuses into his projects and he also tries to pass it on to his students.

Drápal, his decision was greatly influenced by his personal preferences. "I knew him from his previous work at the faculty so I wanted to continue under his tutorship," remembers Štěpán as the course itself was probably a product of the period. "The contemporary structure did not mean the omnipresent prefab hi-rises, it was about searching for something new." Another favourable circumstance was the arrival of Ivan Koleček who joined the staff after the Velvet Revolution. He had a studio in Switzerland and thanks to him students were able to take part in projects abroad.

"All of a sudden, after the rigid regime ended, everything was massively free and I hardly

remember anything from the first half-year after the revolution. It was like a permanent party when everything was happening with hopeful expectations of something new, beautiful, optimistic," recalls Štěpán. In the first gust of freedom a competition was announced for the spiritual and pastoral centre at Brno Lesná which he took part in together with two other classmates as part of his graduation work. "I had been interested in churches before, but I thought about them only marginally, how they might look if they would be built," explains the architect whose design received first prize alongside the work by Zdeněk Bureš. František Zounek, who was together with Viktor Rudiš



St. Wenceslas Church in Sazovice

the whole world I think that in terms of spirituality it resonates with today." There might be something in it – the church in Sazovice was selected as one of The 10 Best Buildings of 2017 in Azure Magazine. Štěpán raises the subject of sacred buildings even during his teaching at the Brno University of Technology. "The majority of churches originated together with the settlement, but it could have been the site of a grave of a martyr or where a miracle happened, this is where pilgrim churches were erected," explains Štěpán. With his undergraduate students from the Faculty of Civil Engineering he carries out analyses and syntheses of spiritual places and they find various relationships, most often topographical ones.

Churches could be built near a ford on a river such as the church at Staré Brno, or on top of a hill such as Petrov in Brno. "Today we romantically see some geometry in it, but I am not so sure about that. In most cases the site where you can build is from as early as the settlement period," reiterates Štěpán and returns to the model case of the Lesná housing estate. "The architects

Jana Novotná
Photo the archive of Ateliér Štěpán

When, as a student of the Faculty of Architecture at the Brno University of Technology, he chose the specialised courses of Contemporary Structure in a Historical Environment and Theory of Architecture under Jaroslav



the chief designer of the Lesná housing estate, then proposed to both of them to team up, but it did not work and the project was abandoned. In the end Zdeněk Bureš built a community centre at Lesná several years ago and a little later a competition was also announced for a church, the

construction of which started last summer to the design of Marek Štěpán. "It's strange. Although the contemporary project has new features it still retains some common elements which I have kept in my head all the time," says the author of the project. Marek Štěpán has a number

of built churches behind him, of which he feels himself probably to be most closely affiliated with the Church of St Wenceslas in Sazovice. "I don't know whether it's because it is the latest one or whether it feels to be the most personal one. But judging from the response both at home and

Zounek and Rudiš were talking about a community centre, but somewhere deep inside they must have thought that it could be a church and knew from the beginning where the right place was.”

A church was also a subject of the so-far most complicated reconstruction work that

Ateliér Štěpán has undertaken – the Piarist church in Litomyšl. The building, which was extremely damaged after many years of dilapidation, is today a place for community and spiritual meetings and a tourist attraction. “The project entailed many complications in terms of paperwork – it took seven years as a whole. The

Beatified Restituta Church for the Lesná housing estate



Conceptual ETFE foil cloud for the terrace of the Museum of Applied Arts in Brno



Freedomek house No. 001

most difficult task was to find new content for the church,” says Štěpán, who finally returned the original sacred characteristics to the space but enriched it with cultural and tourist functions. “I introduced new elements and operations there generating minor tension between them and thanks to them I got life in there,” describes the architect. The favourite material of Marek Štěpán is wood, which he incorporates with striking effect in family homes and public buildings, such as the awarded Café Fara pension in Klentnice. After all, his extraordinary Freedomky project was also conceived as a wooden structure. “The idea came about 10 years ago and materialised in 2010, when the director of Architecture Week was looking for something original for his festival. During three months we had to build

the first freedomek house and transport it to Václavské náměstí in Prague. It met with a lively response,” remembers the originator of the brilliant idea which gave rise to a company manufacturing modular wooden houses. So far over 80 were made, apart from the Czech Republic in Germany, Austria, Switzerland, there are even variants for a pontoon, and with the first floor. “The individual modules can be connected, recently a sauna was built, it continues to develop in a natural way. But most

The church in Sazovice was selected as one of The 10 Best Buildings of 2017 in Azure Magazine.

importantly we introduced new technology – cross-laminated timber panels, which is at the

moment probably the peak in wooden structures, emphasises Štěpán.

The technology of cross-laminated timber panels that he applied for the first time in the pension in Klentnice seems to interest the awarded architect more than ever before. “It is the same revolution as when glued laminated timber appeared, but it’s one level up, as it involves gluing in space,” enthuses the architect about the technology which he recently used for a concrete family home. “I like to combine concrete and wood, as concrete belongs in the ground and wood above the ground.” On the concrete mantle of the detached house the architect applied the principles of his “decor of structuralism”, which for him simultaneously represents a way to make the building true to life. “The basis of my theory consists in the fact that every building has



more precisely the spiritual brownfield, or even better what is absent in this area today. For example, that buildings are on sites where people are absent, or they are missing in places where people need them,” recounts the architect-teacher and mentions the success of one of his undergraduate students who received the Kaplický Internship.

An interesting episode in the career of Marek Štěpán is his engagement at Prague Castle where he was advisor to the Office of the President of the Republic on architectural matters between 2006 and 2012. It began with a phone call from the presidential office, which the architect initially took for a practical joke by his friends. But in the end he assented to the question of whether he had time to have dinner with Mrs Klaus. As the entrance examination he prepared an arrangement for the meeting of the presidents of the Visegrad Four at Prague Castle and stayed for six years. The most visible result of Štěpán’s Castle period is a plateau with a pylon bearing the lion by Vincent Makovský on the Prašný bridge at the northern entrance to Prague Castle close to Plečnick’s footbridge. Nice company, isn’t it? ■

some structure, and if we take the original meaning of the Latin word it is essence. And this structure should be visible on the building even from the outside and should not be wrapped in additional layers. And when this inner structure is decorated, again in the original meaning of the antique decor, when it has nothing to do with embellishment but rather with highlighting and clarifying the essence of the thing, the building is right and true to life,” says Štěpán, elucidating the theory he also adopted for the above-mentioned church in Sazovice.

The décor of structuralism is also one of the things he tries to teach his undergraduate students at the Institute of Architecture at the Faculty of Civil Engineering where he established a specialised studio last year. “I started to call it the Laboratory of Sacred Space. We study sacred buildings, or

They have retrained a neuron network to recognise banknotes – and Cash Reader was born

Tomáš Jelínek and Martin Douděra, both graduates from the Faculty of Information Technology of the Brno University of Technology who got together for the first time during collaboration on the Cool Ticket application, are well matched – Tomáš specialises in iOS, Martin in Android. They invited me for a meeting where we were to talk about Cash Reader, their latest application for the blind, capable of recognising banknotes, to Impact Hub from where they both work now. The place itself is definitely worthy of mention.

Impact Hub is tailored for people who are self-employed or freelancers, as the buzz word is today. "It is a place where people with most varied specialisations associate so we can meet different professions here and we can help one another," explains Tomáš Jelínek, the elder of the creative duo. In the meantime we are moving to the centrally located bar where allegedly many friendships and business deals have been made. "When we conceive of a new application and the others are interested, we can give a talk about it here. And when we are looking for a copywriter, for example, the organisation will send me the necessary contacts," adds Tomáš praising the advantages of the centre, which is a global franchise so that its members can work from anywhere they reside. "We wanted to go to Athens with my wife and we spent two months there in the local Impact Hub, where it looks just

like here," says Tomáš. Today, developers from the Brno University of Technology have a table of their own in Brno's Impact Hub, although another option is to hire a place in the open space for a fixed number of hours.

Rather surprisingly, the two graduates did not meet at school, but in their hometown of Prostějov, so the first collaboration started, as sometimes happens, in a pub. Martin began to concentrate on Android quite early, in his bachelor's thesis, and he has stuck with that. "During the master's studies I worked in a research group where I was responsible for – Android. We did practical things, a smart household, which later became the subject of my diploma thesis," remembers Martin who finished school three years ago. His more experienced collaborator studied in the very first year of the Faculty of Information Technology and

was one of the first graduates. During his master's studies he focused on graphics. "I started working on projects and I would say that image processing, which I learnt at the Faculty of Information Technology, is one of the essential things in the Cash Reader application and maybe even more so in NowYouSee," adds Tomáš mentioning his earlier mobile application which can compensate for the user's colour-blindness.

After school he worked several years for large corporations and along the way began to develop small applications for mobiles. "When the first iPhones emerged I became totally hooked, so from time to time I produced something and put it in the American app-store. I was excited that someone without a distributor and a large team was capable of making something good and it would get to people around the world," remembers Tomáš of

Jana Novotná
Photo Igor Šefr

the moments when he said to himself that he did not want to be in a corporation and started

working as a freelancer. The beginnings of Martin's business go as far back as

his bachelor's thesis that he did on Google Play. "Since that time I cannot imagine

that I would join a corporation, although today corporate culture is totally different from





before,” says the younger of the two programmers.

The Cash Reader project was sparked off by a random question. “My friend’s blind brother asked me whether it would be possible to think of something which might help the blind distinguish between banknotes. So we started to work on that with Tom,” explains Martin. At first they were surprised that something like that had not existed before. “This is what I like about programming – that at the beginning we don’t know if something like that can be done at all. We experimented with different technologies for image recognition, but it was slow, unreliable, extremely sensitive to changes in light. Then we moved to a different technology, neuron networks, which is a little bit of magic,” mentions Tomáš of a technology which is studied in a special course at the Faculty of Information Technology. “There is a huge number of neuron networks and we chose one which is perfect for use on mobiles. It was created by Google and they

made it available to developers for making applications. The network has been trained to recognise thousands of objects from our world, but it can be retrained, which is what we did,” describes the programmer. They created a large number of shots of banknotes and retrained the network in a way that it would recognise paper with pictures, in this case banknotes. “You need a very expensive computer for these things, but instead of buying one we hire machine time in a computing farm, we upload everything that we need, we carry out all the necessary procedures and let’s say in five to six hours we have a trained neuron network that we subsequently insert in a mobile application. We do all kinds of debugging and gradually verify whether it can be used for reading Czech banknotes and be released to people,” explains Tomáš.

The Cash Reader application has to be adapted to the abilities of the blind and iOS and Android have a special user environment for that. “The mobile’s reader moves along the display, selects the individual elements on the screen and pronounces them aloud. When the user switches the reader on, the mobile will read the first header on top of the display, in this case: ‘recognising Czech crowns’. Then the user moves his finger on the mobile phone’s display and when he hears ‘setting’ he taps twice and enters the application,” says Tomáš describing the behaviour of the application, whose advantages are that it is very simple and when the blind person switches it

on, it immediately works. “The blind person only has to aim the mobile at the banknote and regardless of the angle or whether the banknote is turned upside down, back side up or damaged, the application will announce the value of the banknote,” says Tomáš. There are hundreds of situations that may happen during banknote imaging and which the application must be able to cope with. The developers from the Brno University of Technology added a function to the existing version, which enables the blind to help improve it. If they reach a stalemate when the application freezes, they activate the corresponding button and send off the photo which the programmers can later add to the current version.

There is a huge number of neuron networks and we chose one which is perfect for use on mobiles. It was created by Google.

From the first responses the users are satisfied with the application. But the work of the developer duo is not at an end. “One thing is to conceive something and do it, which is our daily bread, but then it is necessary to see that Cash Reader reaches people and we are not so experienced in that,” explains Tomáš. One of the ways to build awareness of the application was a talk given by Tomáš Jelínek at the Dark Blue Festival. The question is at hand, whether one could make a living from helping the handicapped. “Being

freelancers we do a lot of business applications, that’s what feeds us. But over time it might certainly be possible to start a firm that will only produce compensation aids, there is a huge gap in the market and what is available is not up to much,” admits Tomáš.

I am interested in the dependence of both developers on IT technologies in their personal life. Are they not afraid that overuse may degrade certain abilities and skills of the user? The programmers are not afraid. “I have the feeling that there are these stages in life. Many of us would sit fixed to the PC and play games, and today they spend their free time outdoors or go in for sports. In short, they play it to the full and in the next life stage they pursue something else,” ponders Tomáš. But immediately adds, laughing: “Although Martin will probably not be able to do the cleaning in the future, as he got himself a robot.”

“Yes, I bought a robot for our home. We have an agreement with my wife that I will vacuum clean so I solved it like this. I am convinced that smart devices and applications will help us save a lot of time which can be used in a different, more pleasant way,” says Martin closing the conversation.

You can test the new application at: <http://cashreader.cz> ■

PERSONAGE

Petr Spielmann: The Faculty of Fine Arts is not just the icing on the cake of the Brno University of Technology

It might seem like a paradox – the art historian Petr Spielmann (1932) has devoted his whole life to art but towards the end of his life journey he was awarded with a gold medal by the rector of the Brno University of Technology. He has always been attracted to various crossovers and inter-disciplinary relationships and found deep meaning in the co-existence of art and science. It may have been a reason why, in his old age and after some hesitation, he decided to accept the position of dean at the Faculty of Fine Arts of the Brno University of Technology.

Jana Novotná
Photo archive Petr Spielmann

Petr Spielmann as the new collaborator of the Museum Bochum, 1969



Petr Spielmann's fate was influenced by the unfortunate consequences of his father's Jewish origins and the strong social feelings of his mother. Among the number of forefathers of both parents with artistic leanings he was affected most by his architect father, who loved music and literature. The young Spielmann grew up in a family which worshipped T. G. Masaryk and spoke two languages. "I say that German is my father tongue and Czech is my mother tongue," jokes Spielmann. Even as a student he was committed which, in his own words, was the source of many troubles. "I must bow to all my teachers from the elementary school to Masaryk University who would always speak up for me," appreciates the art historian today. When he organised an evening in memory of T. G. Masaryk at grammar school in Prague, he faced the possibility of being expelled from all the schools in the republic. As a result after the final exams he chose to send an application to study art history and ethnography in Brno.

At Masaryk University he happened to find himself amidst the unseemly period of Stalinism, yet he considers the seminars in art history in communist Czechoslovakia to be an extraordinary institution. "It was the only institute where the head and his closest collaborators were not in the party, except for one female assistant to whom we alluded as a fig leaf," remembers Spielmann. "The period was a horror, but we did things which were not officially approved. Very soon I became

friends with Zdeněk Kudělka, the teacher who sat in during my interview at the faculty, and together we were there when the first Brno creative group called Brno 57 was founded." Its members were the artists Bohumír Matal, Jánuš Kubíček, Vladislav Vaculka, Vladimír Vašíček and Pavel Navrátil, as well as the architect Ivan Ruller and the composer Jan Novák. The art theorists, apart from Kudělka and Spielmann, also included Jaromír Zemina. At the same time Spielmann established contact with the director of the Brno House of Arts Adolf Kroupa and his assistant Gerta Pospíšilová, who can take credit for helping him later to work in Germany.

After the completion of his studies in 1957 Spielmann began to work for the Brno City Museum, he married in the same year, and in 1959 his son Marek was born. After some time he worked as a member of a coordination commission with responsibility for sorting out the furniture at state-owned castles and chateaux. "Everybody had heritage monuments assigned to them, myself, for example, Pernštejn, Buchlov and Buchlovice, where we evaluated each item of the furniture and classified them into three categories – there were thousands of items," explains Spielmann. The work was supervised by the director of the National Gallery in Prague Vladimír Novotný, who afterwards took a few people from the commission with him to Prague, Spielmann worked in the print collection from where he was later relocated to the modern art collection. During the Prague Spring he was



With AICA members (from left): Peter Feist, Petr Spielmann, President Wladyslawa Jaworska, Peter Sager

The former minister of Nordrhein-Westfalen for science, Johannes Rau, in conversation with P. Spielmann and the Bochum artist Fritz Gratzki

elected chairman of the trade union committee in the National Gallery and after August 1968 he was allowed to go to West Germany to work there.

Spielmann's German contract materialised following an invitation by the director of the museum in Bochum, Peter Leo, who was then probably the only one who collected and exhibited European art from both sides of the Iron Curtain. He travelled round Europe with an exhibition of his collection and during one stop in the Brno House of Arts he met the director Kroupa and his assistant. "He asked them whether they knew someone who would join him as an assistant as nobody cared about a job in the Ruhrgebiet and they told him about me," remembers Spielmann. He negotiated collaboration directly with Leo in 1968 when he visited the museum in Bochum during a trip to Germany. The contract was originally closed for one year and was to be extended as had been promised by the then director of the National Gallery Jiří Kotalík, but when a year

had passed it was rejected. Spielmann cancelled his job contract with the National Gallery and applied to the Ministry of Culture for extension of his stay. There was no response to his application and the human resources department of the National Gallery informed him that he was an emigrant.

It is difficult to say what feelings prevailed in Peter Spielmann as an involuntary emigrant – loss or victory. "It was both. I did not have complete freedom. My boss was an exquisite expert but his wife hated me because of my Jewish origins," explains Spielmann. When Leo died in 1972, Spielmann was entrusted with directing the museum. Before a proper vote for director took place, he managed to build such a reputation that in a competition of the City Council he was unanimously elected from among 17 candidates. For as long as 25 years he found himself at the helm of the museum and continued the work of his predecessor. Thanks to his father who went

to German schools, Spielmann did not have to apply for asylum. He was recognised as a so-called Spätheimkehrer, thanks to which he obtained a passport and the rights of German citizens, but he lost Czechoslovak citizenship at the moment of receiving the German one. Petr Spielmann introduced an open gallery concept in Bochum. His exhibitions were a meeting point for highly varied exhibits independent of the time and place of their origin accompanied by expressions of a musical, literary and social-scientific nature... "I felt an affinity for this even during my studies in Brno, so I came to Germany with a concept similar to Leo's. But it was only there that I had the freedom to make it happen and although I had opponents I was my own master and was supported by important public figures in Germany," remembers the former museum director.

His memoirs of working in the management of the Bochum gallery were collected by Petr Spielmann in the book *Museum als Ort der Begegnung*,

Museum Bochum 1972–1997 (The Museum as a Place of Meeting), published by the Publishing House VUTIUM. During his term of office he opened the museum to the students of the Bochum University where he lectured, he organised meetings of ethnic minorities, events for children, social meetings on topical political issues – such as in 1980 an event to express solidarity called Freedom for Václav Havel. He founded Kemnade International, a successful folk festival of ethnic minorities which he organised from 1973 until his departure. "I even took the liberty of inviting friends from Uherské Hradiště, the cimbalom ensemble of Jaroslav Čech, which became a huge draw at the festival," recalls Spielmann of the festival where he presented, for example, Karel Kryl.

By the irony of fate, in Bochum Spielmann could exhibit works by Czechoslovak artists (and other "prohibited" prominent figures from East European countries), who he would have never officially met at home.

He managed to build a rare collection amounting to around 1,200 exhibits of Czech and Slovak art, including works by Jan Preisler, Vojtěch Preissig, Toyen, Josef Šíma, František Kupka, Otto Gutfreund, as well as Jan Koblasa, Mikuláš Medek, Vladimír Preclík, Bohumír Matal, Jánuš Kubíček and others. He succeeded in inviting Aleš Veselý to a sculpture symposium in Bochum, where the chairman of the committee was the Austrian sculptor Karl Prantl, and Veselý was then able to win several large contracts. Spielmann parted with Bochum in 1997 with a large exhibition of Josef Čapek.

After his departure from the position of director at 65 years of age he returned to Brno and in 2004 was elected dean of the Faculty of Fine Arts of the Brno University of Technology. He was interested in this post as he felt himself to be tied with Brno by the whole of his fate, and because he liked to be in contact with young people. Throughout his life he tried to interpret art in all of its contexts and all of its types and underline the need for it in the life of the people. But there was one more reason – Spielmann's life-long passion for Pablo Picasso and cubism. "Picasso's oeuvre is a seamless fusion of two aspects, on the one hand the aesthetic, poetic one, and on the other hand his depiction of space undoubtedly exhibiting the influence of the thoughts of Albert Einstein – the time and space problem, so we get an amalgamation of art and science," explains Spielmann, who found it natural that the working of the Faculty of Fine Arts at the University of

Technology may initiate shared solutions to some problems.

As dean he attempted to implement his ideas of a school between science and art. On acceding to the post he appointed his predecessor Jan Sedlák head of the Department of Art Theory and History and J. H. Kocman his statutory successor. At the faculty he founded the Aula gallery which was inaugurated with an exhibition of Woody Vašulka, he took credit for receiving accreditation for doctoral studies and introduced regular meetings with students' representatives. Although as dean he did not have to lecture it was a pleasure for him to share his experience with students of the Faculty of Fine Arts and together with Jan Sedlák the students at the University of the Third Age. When after the first term he left the post of dean he continued to teach art history and tutored doctoral students.

It was not a coincidence that for his last rector's collegium Petr Spielmann translated a lecture by Yehudi Menuhin On Art and Science and dedicated it to his colleagues. He revisited the words of the violin virtuoso when he received the gold medal of the Brno University of Technology at the Academic Convention in November 2017: "Menuhin says that one of the main differences between art and science is that science is predictable and art is unpredictable. A living moment is unpredictable and that is one of the principal confusions of our time: we would like to apply a meter to the immeasurable." ■

Lukáš Matěna: Children in the Himalayas are not aliens

School in Mulbekh, IT lesson

Although the graduate from the Faculty of Electrical Engineering and Communication of the Brno University of Technology, Lukáš Matěna, works for Siemens, he spends a great part of his life with his family journeying around the world. Out of necessity he has learnt to make a living in all possible ways. In case you would be surprised by the variety of these activities, it is exactly what Lukáš considers to be a good means of prevention of burnout at work. One of his latest engagements was in Mulbekh in the Himalayas, where he taught children IT.

Jana Novotná
Photo Martina Tlachová and Klára Matěnová

Was electrical engineering a clear choice for you? And did you have any family role models for your decision?

I have been attracted to the technical disciplines since elementary school. Dad was a software developer in Metra Blansko, while mum worked on calculations of water turbines in ČKD Blansko, so after punch cards and tapes she began to bring home large diskettes. It was at her workplace that I saw a computer for the first time. I started to address the question of which particular university to enrol in during my final year at the Lycée Carnot in Dijon, where I had received a scholarship. I made choices according to the course syllabuses advertised by the schools. In the end I decided in favour of the Faculty of Electrical Engineering at the Brno University of Technology, which seemed to me to be closer to practical life, and the

Faculty of Informatics of Masaryk University where I was tempted by theoretical things.

So you studied at two schools simultaneously?

Yes. At the lycée in France I learnt how to work really hard and I had a feeling that it would be a shame to stop. I managed to get a credit for a few subjects recognised by both schools but it was still quite demanding. If I were to make the decision again, I would opt for one school only and went to a greater depth and devoted myself more to life outside school. But thanks to not being specialised in one discipline only, it was then easier to find an interesting job crossing over from IT to telecommunications.

Did you already travel during your studies? Maybe taking advantage of the Erasmus programme?

I began to travel independently at secondary school in France – by hitchhiking. Via the University of Technology

I spent a year as an Erasmus Socrates exchange student at INSA Lyon in France. Since then I have frequently been on the road.

Today you are a “freelancer” and travel with a numerous family. How difficult was it to find a woman who would take that on with you?

A good question. I’ve only found one.

How did you arrive at your present untraditional way of life, compared to the usual circumstances?

It was definitely as early as during my stay at secondary school in France which opened up my horizons quite a lot. And later, the bigger the family became, the more sense it made to go for an extended period. From the originally planned three months in South America it was a year and a half. My employers were not yet procedurally ready for the era of digital nomads so I learnt to support my family even when we were on the road.

What did it consist of?

During my study at the secondary school I made an additional income by working in vineyards during the harvest and by translations. Later I had a lot of activities outside of my standard work in IT for multinational companies which enabled me to continue travelling: translations and interpreting, teaching snowboarding and skiing in Austria, Argentina and Japan, safety kayaking as an accompaniment to commercial rafting, assistance to the manufacturer of electric mopeds and electric bicycles in Taiwan during entry in the European market, baking and selling desserts, programming for the university in Lausanne, auxiliary work in restaurants, street performances and concerts on a private yacht, internship in a human-computer interaction research centre in Switzerland ... I intentionally list the activities randomly to underline their diversity which I consider the best prevention of burnout in a job. I recollect one of the autobiographical books by Jack London where he remembered that he was able to iron a shirt in seconds as he had worked in a laundry for some time.

Some of your activities include voluntary work for not-for-profit organisations. What





Ladakh, trip to a temple

came first – the desire to travel and discover the world or to help the needy?

The important thing for not-for-profit organisations is fundraising, getting the projects into the media. But the overwhelming majority of my travels were private, with family, or I might travel for work. Only thanks to travelling was I able to experience how even the poorest people are willing to offer a helping hand. What I knew from home in theory and as part of my upbringing or faith became everyday practice. I learnt to take and you naturally reach a point when you also want to give.

What was your first work for a not-for-profit organisation?

I probably started by putting up low fences to protect frogs in the Moravian Karst, but it's three weeks in the Adaševci and Principovač refugee camps in Serbia to where I transported a trampoline for children that are really worthy

of mention. It met with great success. At night I used to speak with the refugees which worked for me as prevention of unnecessary short circuited actions. I made many friends there and most importantly formed a more independent opinion of the migration "crisis" which for the time being I do not consider a crisis in the context of the Czech Republic.

Recently you returned from Mulbekh in the Himalayas, where the Brontosaurus Movement helped build a school and now they are out there to teach local children to play hockey.

I have been in touch with the Brontosaurus Movement for some time, in 2017 I helped at their stand at the Colours of Ostrava festival. This time I have taught children in the Himalayas IT. But next time, instead of teaching I would prefer helping outside. I spend enough time sitting at the computer during the year and the exteriors there are breathtaking.

What are the local children like and what you were able to teach them over such a short time?

The children are no extraterrestrials, they enjoy themselves, play, are fixed onto their mobiles. But they have much more humbleness, respect and I would say joy as well. They have wonderful relationships between each other so, for example, they also helped one another during the IT classes. As it was an extra-curricular class during holidays we wanted to make IT fun. We modified photos, edited videos, mixed music and created a poster. And we added a little office software for older children. But the most important thing was to make them understand how they can intuitively teach themselves to work with new programmes, how to save and organise unfinished files and similar basics.

In Brno you work externally for Smarteon. What is the company's business?

Smarteon is a very young and dynamic firm which offers complete solutions for smart homes. Our advantage compared to competition is maximum flexibility, an accent on safety and an ability to solve non-standard requirements. This means that up till now I have collaborated in many different activities from the development of components via negotiations with clients to supervising the laying of cables. But the focus of my work is designing the behaviour of smart homes. In the future we plan to model their behaviour to suit the

personal needs of individual household members based on artificial intelligence.

Has the firm been involved in the Smart City Brno project?

The Smart City Brno project covers multiple areas (Smart Governance, Smart Resources and Smart Living) and is the city's view to the inhabitants to whom it should provide better life in the city. Smarteon is currently focusing on private households, which means that the project overlaps with our activities only partly. At this phase of the project there is no demand for our services but when it arrives we will definitely be a partner to the city. At the moment our clients are individual people who want to live today in a comfortable smart household that will become standard in ten to twenty years. Naturally, we keep an eye on the activities in this sphere and future interaction between a household and the city infrastructure is highly probable.

Do you plan your activities a long time ahead or does it depend to a certain extent on what life will bring?

It mostly depends on what life will bring. I may have a vague idea, but I also had a vague idea ten years ago and in the end everything turned out differently and it was good like that. I believe that if you capture new opportunities that life offers in a humble manner you can live a rich life without great planning. I am slowly beginning to understand that it's not important how much one manages to do, but rather whether what he does fulfils him. ■

AWARD

We were the first to merge several independently researched methods into a single whole, says Jiří Matyáš



At the end of 2017 the media published the news that as part of his diploma thesis a student of the Brno University of Technology, Jiří Matyáš, had solved the problem of extending battery life in mobile phones. Unfortunately, it's not as simple as that, but there is no doubting that with his diploma thesis he won the IT SPY competition. He succeeded in a competition of 1,800 diploma theses and in February 2018 he was also awarded in the Brno Ph.D. Talent competition. We asked the author of the successful work, who continues as a doctoral student at the Faculty of Information Technology and with his research group has resumed activity on the promising project, what is the main contribution of his work.

Can you describe your work in a manner comprehensible even to a non-expert?

In general we are dealing with the problem of approximate counting. Approximate systems are built from basic hardware components – so-called approximate circuits. And it's quite difficult to design the components so that they are efficient – to strike a compromise between how precisely the component counts and how much it can save compared to the original, precise version. Our approach made it possible to approximate or develop these approximate components which are larger by an order of magnitude than

had been previously possible. As a result the parts which can be developed are bigger, more complex and the approximate systems built from them may have better properties than systems built from smaller parts.

What effect can this have for the general user?

Approximate systems typically have lower energy consumption. This means we are not concerned with trying to make the battery last longer, but with the equipment consuming less energy so that in consequence the battery has the same capacity but lasts longer. Approximate counting is based mainly on the fact that human perception is generally limited. For example, in a mobile where the colours on the display are counted or the sound is filtered it does not matter whether you have small imperfections caused by these parts which occasionally make a mistake. People can't tell and the components work but require less energy. Another possible application is using these parts in large computer centres which provide scientific calculations or cloud services, such as Google, Amazon, Facebook, etc. They are giant halls with thousands of computers and their greatest cost item is currently energy consumption. The acquisition cost of equipment is not so high today and the total cost is more and more tilting on the side of energy consumption. Most energy is consumed by components which carry out calculations and it is there that you could save a lot of money by including approximate components.

The same problems have been researched on a long-term basis by a number of foreign research groups. What makes your solution so revolutionary that you got ahead of them?

We merged several methods that had initially been researched independently, which makes us the first. It is a collaboration of the group of Lukáš Sekanina, which develops hardware and evolutionary algorithms, with our group concentrating on formal verification methods, and these two methods together managed to provide much better results than previous approaches. And to make a step forward, we modified the evolutionary algorithm in such a way as to prefer components whose quality can be evaluated faster. This step brought an additional enormous improvement.

To explain it in greater detail, evolutionary algorithms belong to computing techniques inspired by nature – there is a population of individuals (in our case approximate components), which crossbreed and mutate. In the course of the generations only the best will survive which are again modified and the quality of the population gradually improves. The success of evolutionary algorithms depends on the number of completed generations, or the more time is available for the evolution, the better the result. And when we manage to evaluate the individual circuits faster than others, we get along further with the evolution and have better results.

We keep talking about the group but it was your diploma

thesis. Where did you get the idea for the subject?

The subject had been researched over a longer period. Our hardware specialists had already gained experience and the tutors Milan Češka and Tomáš Vojnar came with the idea of introducing formal verification methods into the evolution and trying out how it would run. I was attracted by this idea so I signed up for this subject. We started to work on it, found new procedures and tools worthy of testing and it showed they worked.

What is the chance of implementation for your invention?

With hardware it is generally more difficult than with programmes which can be easily downloaded and installed on your PC. It takes a long time before a component physically reaches its user. The deployment would depend on whether the big firms were interested in applying them in their equipment, this is not something an individual or a small group or academy could do. It really depends on the few biggest firms which might profit from making approximate components because the initial costs are enormous, totally unacceptable for the academic sphere. The hardware domain is experiencing a problem in that it is hard to achieve any improvement. Take a notebook four years ago and today – they are quite similar and the same goes for mobiles – Apple used to be the best for a while, now all have caught up with Apple and it does not have much space to move forward. Approximate counting might be one of the approaches to

bring about a further enhancement. But the problem with the implementation is determined by the fact that the initial costs for the manufacture of a chip reach millions of dollars, so that implementing our results in production would mean a huge initial investment.

You also took advantage of the supercomputer at the faculty which considerably speeded up your experiments. How did it come along?

Yes, we call it the cluster, a group of many computing units together. We used it so that we would be able to statistically evaluate our research and provide statistical guarantees for it. There is a problem with evolution in that randomness plays a role in it. As a result of random crossbreeding and mutations of the individual generations one evolutionary run may end very well, while others may get stuck in a blind evolution alley and stop moving further. There are many settings for

the different types of circuit that we approximated and if you want to provide a statistical result for your research you need to perform the evolutionary process several times for each setting. One evolutionary run may last two hours and will develop one final approximate component. If you want to provide statistically founded information on the success of the approximation process, you need to run it at least fifty times for each setting. And given that you can have hundreds of alternate settings, we'll get to tens of thousands of hours of computer time. On the cluster you can run it in parallel on thousands of cores at the same time, so that the total time can be shortened to a single afternoon.

You use the word randomness, but one would think that randomness does not comply with scientific work.

On the contrary. In many problems which are difficult to solve exactly we use methods

collectively termed softcomputing, and that means taking into account the fact that we partly work with random values or indeterminacy. There are problems which have very high computing complexity, such as the so-called travelling salesman problem. You have a list of cities and a little man who has to visit all the cities one by one. The aim is to find the shortest way that would take him to all the cities. The more cities we have, the more possible combinations are available for the travelling salesman to follow and the total number of combinations increases rapidly. When someone says that randomness does not belong in IT, they can try to gradually list all the possible routes, calculate their length and select the shortest path. This can work for a small number of cities, but if there are one hundred of them, we will receive an astronomical count of the possible routes (100! – approximately 10,157, i.e. a number which has 157 digits). The computer does not have a chance to evaluate such a great number of combinations. As a result, we do not even try and instead introduce randomness into the calculations. We decide that we will test some paths, make the statistics which connections between the places are good and which are bad, and on the basis of probability or randomness we will select the good ones and combine them between themselves.

IT SPY competition winners announcement; Jiří Matyáš is second from the left

The resulting solution may not be optimal, as we have not evaluated all the possibilities, but it will come very close to the optimum. In evolution it works in a similar way. So in general, softcomputing, neuron networks and evolutionary algorithms work with indeterminacy and are very successful in solving the problems.

Back to the competition. The jury also acknowledged your communication potential ...

It was probably the communication potential of my research subject rather than my own that was acknowledged. Frankly, I think that we as IT specialists are generally lacking in presentation skills and something should be done about that. We have one course in the humanities and a couple of presentations or defences in specialised courses, but that does not suffice.

Does nervousness play a role?

Definitely. Short presentations are worse as you don't have time to really start talking. At IT SPY it was fifteen minutes so I warmed up a little and managed to calm myself. I suppose the doctoral study may be beneficial in this respect as I even have to lecture from time to time. On the other hand, I quite enjoy teaching exercises, it's one of the most positive things here because I teach the complete basics and when I see that the students can grasp that and are able to use it further it's a pure joy. Lectures are more difficult, but I think that you need to surpass yourself and continue to work on improving yourself. ■



The High Voltage Laboratory is open to experts from around the world

By its equipment and specialisation the High Voltage Laboratory at the Centre for Research and Utilisation of Renewable Energy, which is a research unit within the Faculty of Electrical Engineering and Communication of the Brno University of Technology, has no competition in the Czech Republic. Apart from companies which may test the resistance of electrical equipment to voltage or the electric strength of high voltage cables there, the laboratory opens its doors to students and researchers from the whole world. It operates in the so-called open access regime and would like to continue promoting research in the future.

Zuzana Pospíšilová
Photo Igor Šefr

Since 2013 the High Voltage Laboratory has resided in an inconspicuous single-storey house near the Faculty of Electrical Engineering and Communication of the Brno University of Technology. In the specially adapted spaces it is possible to generate voltages of up to one megavolt during testing.

"The whole laboratory was built as part of the Construction of the Professor List Science and Technology Park project and has been in full operation since 2014," explained the head of the laboratory, Jaroslava Orságová. In her words, over the four years of operation they have worked mainly on projects in collaboration with commercial enterprises based on contracts for research. "At the same time we have been listed as so-called research infrastructure working in an open access regime. This means that if people from the university or other research organisations want to do their research or some experiments here nothing stands in their way. Our service consists in providing technical support to these researchers," added Orságová.

The open access regime is not restricted to interested parties from the Czech Republic only. Researchers from around the world may apply for using the lab. "The aim is to establish contacts in the high voltage technology field," says Jaroslava Orságová. In the open access regime the Brno unit is one of the few high voltage laboratories. "We are part of the DERlab consortium associating this type of laboratory.

And there we are the only ones who have a high voltage laboratory and simultaneously a research infrastructure," continued Orságová.

According to Michal Krbal, who supervises testing and experiments, the equipment they offer is also unique. "We have very good screening. And we also have exceptional diagnostics for cable testing. In this respect hardly anybody in the large infrastructures can compete with us," pointed out Krbal.

In 2017 they succeeded in acquiring new equipment thanks to winning a competition for investment money. "We received about nine million crowns to extend our equipment with expensive and rare instrumentation. As a result our importance as research infrastructure has increased again," noted Jaroslava Orságová adding that in the future they would like to dedicate themselves to research as much as possible. "It is not our goal to become a traditional commercial testing laboratory. Unlike other laboratories of this type we try to have researchers in mind even during collaboration with companies and we do not offer the whole capacity to commercial businesses only. When somebody sends a request to carry out a test within the open access we usually oblige very quickly," added Orságová reminding us that each research application is subject to approval.

The types of testing requested most frequently in the High Voltage Laboratory are the testing of resistance to voltage and



high-voltage cables. "We carry out complete measurement and testing of electrical parameters. We can also provide insulation diagnostics by measuring partial discharges. To put it quite simply, we know how to assess the quality of a given insulation," described Michal Krbal and further explained that it is usually development testing when companies come to test a particular piece of equipment after each development change. "This means that at the moment when something is changed in the product, they arrive and test whether its properties have improved or deteriorated in order to know where they are moving. It is a preliminary stage before they head to an expensive accredited testing laboratory to get a certificate," added Krbal. Within its own research the laboratory explores a range of fields from diagnostics of the dielectric via endurance tests to testing the dielectric properties of materials.

"Testing takes place in specially adapted halls. Apart from several stages of protection to ensure that none of the present staff is hurt even during equipment failure, the space interior is furnished in

such a way that no external impacts can interrupt the testing. For example, a visitor will probably not succeed when searching for a mobile phone signal. One of the main pieces of equipment that we have here is a surge generator. It simulates excessive voltage such as during a lightning strike. The excessive voltage hits the individual components and we examine whether they can withstand the impact or not. We also have here an alternating source which can give as much as 300 kilovolts on the output, or high-frequency sources such as the well-known Tesla coils," said Michal Krbal describing some pieces from the laboratory inventory.

Although he is happy to show different types of discharge, Michal Krbal simultaneously points out that they are phenomena they generally do not like to see during testing. "Most of the tests that we carry out here are silent. The customer hopes all the time that no blow will resound. It would indicate that the tested component failed to withstand the load. So often there is greater tension on the side of the researchers than on the equipment itself," joked Krbal. ■

Crash Day ÚSI 2017

(eds)
Photo Igor Šefr

Another in a series of traditional events organised by the Institute of Forensic Engineering at the Brno University of Technology with presence of the public was held on 13 and 14 October on the premises of the Kovosteel Recycling company in Staré Město near Uherské Hradiště. By means of crash tests Crash Day ÚSI 2017 checked the behaviour of vehicles in extreme situations and in particular their ability to protect the people in the car during impact. The test results serve experts in analysing actions during a real life traffic accident. The Institute of Forensic Engineering thanks Škoda Auto for providing three new cars. ■



Technical and scientific progress is driven by universities - that was Armin Delong's credo

Alžběta Blatná, Archive of BUT
Photo Igor Šefr and Archive of BUT

Armin Delong, a scientist respected around the world and one of the pioneers of electron microscopy in Czechoslovakia, died in October 2017 at the venerable age of 92 years.

He was born on 29 January 1925 in Bartovice, during World War II he completed the technical secondary school in Hranice. After the war he enrolled in Dr Edvard Beneš Technical University in Brno as a student at the department of electrical engineering. In the autumn of 2013 in an interview for the Archive of the Brno University of Technology he remembered his professional beginnings: "And how did it all begin for me? Professor Bláha had an institute of electrical engineering – it was called the Institute of

When I saw the phages devouring the bacteria I said to myself that we needed to do something like that as well. It was quite something!

Theoretical and Experimental Electrical Engineering. And he established laboratories in which they started to do research work. Once during an examination he asked me whether I would not like to join him in the laboratories. That was quite something for me! But I did not start working on microscopes. It was something to do with electrical engineering. Later Professor Bláha said that we might try out some microscopes as the field was still at its beginning and there was room for us to do something. So that was the first product that we made there. At the same time it was my graduation work."

Professor Delong passed the second state examination in 1950 with honours and continued research work as an assistant to Professor Aleš Bláha. At the end of the 1940s there was an American

RCA electron microscope with Professor Herčík at the Faculty of Medicine of Masaryk University in Brno. "That is also quite unforgettable for me. Herčík was very nice – later I became his friend. He showed us everything and when I saw

the phages devouring the bacteria I said to myself that we needed to do something like that as well. It was quite something! So we were able to take a look at it. Naturally, we could not get deep inside the microscope. In addition, I found a book by Manfred

von Ardenne, a German, which was set to be dumped. When the rooms underwent cleaning after the Germans, the book was there. And there was quite a lot written in it, so we had some information. Professor Bláha was also close to microscopy so he

would occasionally check or correct the things we did." Further development was affected by a political decision concerning the establishment of the Military Technical Academy in Brno, the basis of which was constituted by the

Armin Delong receiving the Doctor Honoris Causa title at the BUT in 2014



Armin Delong (sitting) at the prototype of the microscope called the White Lady



equipment, buildings and staff of Dr Edvard Beneš Technical University in Brno which was closed down in the autumn of 1951. Professor Bláha had to leave for Slovakia and his students were transferred to the Military Technical Academy. In 1953, Delong and his colleagues, Vladimír Drahoš and Ladislav Zobač, as "The Collective of Designers of the Military Technical Academy" received the Order of Labour medal for their design of the electron microscope. In 1954 Delong left to work for the Czechoslovak Academy of Science. In the interview Professor Delong described the whole matter very briefly: "Afterwards we left. They did not want to let us go, as we had received the Order of Labour, sort of a decoration for the Academy."

At the EXPO 1958 world exhibition the team of Professor Delong was awarded with a gold medal for the design of the microscope TESLA BS 242.

In 1954 the first desktop electron microscope was presented in Smolenec. The idea for its design was born before the closing down of Dr Edvard Beneš Technical University in Brno but it was built

elsewhere. Under the TESLA BS 242 brand it was manufactured from 1956 and several hundred units were sold. At the EXPO 1958 world exhibition the team of Professor Delong was awarded with a gold medal for the design of this type of microscope. Armin Delong particularly highlighted its practical applicability and ease of assembly/disassembly: "Professor David Cockayne once told me at a conference: 'We have that microscope of yours and we always disassemble it so that students could see what

is inside the microscope. And then we put it together again and it still works.' I was pleased to hear that."

Although in the following decades he worked for the Czechoslovak Academy of Science (first in the Electron Optics Laboratory and later in the Institute of Scientific Instruments, which he led for almost thirty years), he found time to impart his knowledge to students, both at the University of Technology and, for example, at the Faculty of Science of Masaryk University.

Personally, he considered and promoted combining individual scientific research and teaching as being of crucial importance, which he underlined several times in the interview of autumn 2013. "A professor at a university is not a teacher; he is first and foremost a researcher. He needs to know who he is working with instead of using a thirty-year-old textbooks and making students memorise their word by word and take exams. Technical and scientific progress happens at universities and technical



Desktop electron microscope Tesla BS 242

to Austria or Germany, where science is given some direction. And he said, no nothing like that, the way it would be was to dissolve everything, establish banks and buy licenses. Obviously a foolish idea, isn't it? So I said, I won't have this, I quit, I have nothing to do here. I felt a little sorry though. They also said I ran away – they expected I would do more for it."

Professor Delong was active into old age. In the last years he worked in a firm of his former students bearing his name – Delong Instruments. In 2005 he received a prestigious scientific award – The Czech Brain. In 2014 the Technical University awarded him with a title of Doctor Honoris Causa and in 2015 he was decorated with the state Medal of Merit. In the same year he received the Silver Memory Medal of the Senate.

colleges. If it's not done there it's wrong."

In 1978 Armin Delong was appointed professor in electrical engineering. He slightly reduced his teaching activities at the University of Technology only in the 1990s following his being appointed vice-premier. "When they asked me which party I would join, I said, come on, this is not for me. Things came to a head when I talked to the later president-to-be, then minister of finance. I asked him whether there would be a body, similar

With the demise of Professor Delong we lost a top-class scientist and a noble man with great wisdom and pleasant manners. In his work he stuck to the motto: "When you want to do something, you cannot frown." And he was very glad that he instilled the same manner of work in his followers. ■

COOPERATION



Photo archive of CEITEC VUT

Scientists from the CEITEC BUT for the first time as coordinators of FET Open

The Central European Institute of Technology team of the Brno University of Technology have succeeded in the category of basic research projects – Future Emerging Technology (FET). In addition to being assessed as the best in this prestigious category they have also become its coordinators for the first time in Czech history. They will focus on a unique innovation of electron paramagnetic resonance.

The project aims to enhance the existing methods of electron paramagnetic resonance. The scientists believe that if they place such an antenna on the tip of a probe microscope it will be possible to perform the method of electron paramagnetic resonance with previously impossible resolution of less than 1 micrometer. This would open up the way to research into the microscopic functional areas responsible for the properties of materials and in general to a further development of the method and its application.

(eds)

An expert from the Faculty of Civil Engineering designs unique building structures



of double curvature which ideally spreads the load,” explained Jan Podroužek from the Faculty of Civil Engineering of the Brno University of Technology, who has been working on research into building structures for 3D printing in construction for two years.

His work consists of the mathematical design and 3D printing of spatial materials, including experimental and numerical verification of their properties. So far the team of Jan Podroužek has used biodegradable thermoplastic

materials for 3D printing which are made from maize or potato starch. Even so, he was able to print a porous cylinder 20 centimetres high and wide and weighing 1.2 kilogrammes that carried a load of five tonnes, and only afterwards began to collapse into itself by gradual folding. The results of research by Jan Podroužek can also be applied in printing from cement composites or an environmentally-friendly mixture of mud and plant fibres.

“Some traditional building structures can unexpectedly

and quickly collapse. By modifying the inner structure of the construction elements the threat of a sudden collapse can be avoided and in addition we gain an opportunity to monitor the history of excessive loading. If we talk about a column, the shape of the resulting element might resemble part of a tree with the inner structure similar to a bone. To find the optimal, organic looking external shape is relatively commonplace today – there are many software tools available that can do that. But searching

for the optimal parameters of the inner structure still represents an open, multidimensional problem, if we take into consideration the many requirements concerning the static, dynamic and insulation-related properties of the whole,” added Jan Podroužek, who works in the Institute of Structural Mechanics, the Institute of Computer Aided Engineering and Computer Science and in the AdMaS research centre.

Research into smart building structures is a relatively

unique phenomenon in the world – to this extent it’s only worked on by specialists in America’s MIT. According to Podroužek 3D printing in the construction industry is the next big thing and can be applied even in space. The construction of bases on Mars or the Moon will probably not be possible without 3D printing from local sources. ■

They look like porous membranes from a natural history lesson. Smart building structures, whose static, dynamic and insulation properties can be tailored to suit the application, may have better properties than traditional construction elements. Airy organic shapes designed by the team of Jan Podroužek from the Faculty of Civil Engineering of the Brno University of Technology, make it possible to resist high loads with low weight without the threat of a sudden collapse. During tests a roughly one-kilogramme cylinder from maize starch resisted a load of five tonnes and only afterwards deformed.

Radana Kolčavová
Photo Igor Šefr

“We all know traditional building procedures, where mostly simple rectangular shapes are created by pouring concrete into prepared formwork. With the gradual introduction of 3D printing into the construction industry we now have the incredible possibility of influencing the external shape and the inner structure of a construction element and thus building exceptionally safe and economic buildings. Smart building structures are reminiscent of organic porous material and, among other things, use the principle



A student of the Brno University of Technology presents BIKEDOO to the world

Make wheelchair users' mobility easier and provide them with a fast means of transport without having to leave their wheelchair. This was the principle idea which gave rise to BIKEDOO. A frame which can be fixed to any type of wheelchair within a few seconds will transform it into a sports type three-wheeler powered by an electric motor. One of the company founders, Adam Dolinský from the Faculty of Business and Management of the Brno University of Technology, is now travelling around the world presenting the prototypes and collecting feedback from wheelchair users. Over the course of this year the first orders for the final product should be on their way to customers.

Zuzana Pospíšilová
Photo bikedoo.cz



A couple of years ago the father of Adam Dolinský and his friend noticed a man in a wheelchair who had a problem going uphill. This experience became fixed in their memory and they started to think of how the wheelchair could be technically improved so that its users were able to handle any standard type of terrain without help by other people. "Our family friend has extensive experience in electrical engineering and my father studied aerospace engineering with a specialisation in electrical engineering. Step by step, they began to put together a possible solution. Originally, it should have been only a drive for the wheels. By gradual development they finally got as far as BIKEDOO," described Dolinský, who subsequently elaborated on the idea and tested it within the Enterprising course. "I was greatly helped by being able to clearly specify the target group and test whether the idea was feasible at all," added Adam Dolinský, who studies the master's programme Corporate Management and Economics at the Faculty of Business and Management of the Brno University of Technology.

What is the most important about the unique solution is the fact that the users are not required to move or change over from their chair. "During a survey we found out that most of the scooters and similar vehicles designed for wheelchair users are independent and you need to change the seat. This can be a problem for people with a handicap, particularly if they plan to go somewhere where they will again need their traditional mechanical wheelchair. And to do this you often need assistance from another person. You may have climbed a hill, but then you might have a problem to get into an office or shop if you don't have your own wheelchair with you," pointed out Dolinský.

The advantage of their invention is its compatibility with standard mechanical wheelchairs. It is simply attached to the wheelchair without any modification to its construction and you get a third wheel, electric drive and a handlebar including control elements. A wheelchair with this type of drive is transformed into a transport vehicle capable of

going up to 50 kilometres per hour and it has a range of 70 kilometres for one charge cycle. "Most of the wheelchair users have their chair custom-built and adjusted to their needs and health condition. We wanted to let them sit in the wheelchair they have become accustomed to and allow them to move over a greater distance," explained Adam Dolinský and added that the vehicle will be additionally fitted with a lock.

Currently, BIKEDOO is undergoing testing. "We invite interested people to test the vehicle and give us feedback. All people who are interested in having a ride with BIKEDOO can get in touch via our website. At the same time, we are trying to find a solution that would be so universal that BIKEDOO could be used by people with different types of needs," said Dolinský and informed that so far they have not found an active wheelchair in the market to which BIKEDOO could not be attached. It is also possible to modify the brake and gas controls. "Not all wheelchair users have such a good sense of touch in their hands so as to be able to use the traditional lever brake on the handlebar or to add gas by twisting the grip like on a motorcycle. We are now trying to modify the controls so that they could be used even by the handicapped," remarked Dolinský.

Adam Dolinský has presented BIKEDOO all over the world. Most recently, he has been in Australia, New Zealand and Dubai. "In Australia and New Zealand I attended a summer school with the theme of young people with a handicap.

We worked in mixed teams together with handicapped people from the whole world. I had an opportunity to show them our invention, talk about what we do and receive valuable feedback. A few weeks ago we also went along with a party of Czech para-athletes to the Grand Prix contest in Dubai. We were helping there as personal assistants and as an accompaniment during the races. We took BIKEDOO with us and the sportsmen could try it out," added Dolinský. According to him, the response was by and large very positive. "People like that it is so easy to attach, they can reach higher speed and move without problem even in more difficult terrain configurations," enumerated Dolinský.

Acquiring the frame costs roughly one hundred and fifty thousand crowns excluding VAT. "Unfortunately, for the time being it is not affordable for everyone. It may seem a lot but one should realise that a customised wheelchair may cost over one hundred thousand crowns. But we have been continually working on reducing the production costs. Launching production of multiple units could slash the final market price," added Adam Dolinský. After almost year-long testing, the construction is undergoing further development and necessary modifications, but its designer also concentrates on marketing. In the T-Mobile startup competition his project came second. At the beginning of 2019 BIKEDOO should go on sale to customers in the Czech Republic and abroad. ■



The Brno University of Technology enabled me to make a free choice, says Tomáš Tomeček

When we meet in an old factory hall on the precinct of Tatra Kopřivnice, I don't even need to ask: Are you today at the place that you dreamed of as a boy? Shining eyes and a smile confirm that. Tomáš Tomeček, who graduated from the Institute of Automotive Engineering at the Faculty of Mechanical Engineering of the Brno University of Technology, comes to his Tatra trucks covered in promotion logotypes in racing gear. He has won the Paris–Dakar Rally and the Africa Eco Race, and in addition holds the Desert Master title. He has been racing in long-distance events since 1995, and today he is the only one who drives a 100% mechanical Tatra with a Tatra engine.

Jana Novotná
Photo Igor Šefr and the archive of Tom Racing



As a boy, did you want to be a dustman and truck driver?

Definitely! I made drawings of trucks even as a young boy. They say I learnt well, so my parents sent me to a grammar school, to be able to choose later, but as early as that I already made plans to race in the Dakar Rally on a motorbike. In 1988 I enrolled in the Faculty of Mechanical Engineering of the Brno University of Technology.

Did the school give you what you had imagined?

I began to understand that school is important in particular to allow you to make a free choice of what you want to do. And today I keep saying that to our children as well. If I hadn't studied at the university, the director of Tatra would not have approached me that he needed me for the racing department. It was also one of the reasons

why I learnt English, Russian and French at that time. The University of Technology provided me with knowledge of vectors and differentials. But, above all, the university degree and title. I studied with the idea that I would become a designer but I am glad that I am not one, as I do not have to sit at a table and I am a freelancer. I might work as a designer when I have had enough of racing. So the University of Technology mainly enabled me to make a choice.

You were offered a position in Tatra while you were still at school?

The director knew that when I was still a student at the University of Technology I was building my first racing truck in grandma's garden and that I was looking for partners and sponsors. It was a Tatra 805 called the Duck from the year 1955 and I drove it on my first

trip abroad to Belgium to a race. If it wasn't for that offer from the racing department I would probably have not joined Tatra.

What did the work in the racing department consist of?

I did all the administration related to races – registration of racers, communication with organisers, medical inspections, equipment for racers, everything that is important but is hidden to the eye. It paid that I knew languages. I did not work directly on the trucks, but I made attempts to improve them technically, make them lighter – I was surprised to see all the things that the Tatra team had to take with them to Africa. It was amazing that at work I was able to see the trucks and all of my icons, about whom I had only read, that I was a part of it all.

When did you race in the Dakar Rally for the first time?

When I told Karel Loprais, six-time winner of the Dakar Rallye, that I would like to go, he answered that it was impossible because I had no money and experience. Then I was very lucky when the Tatra management decided to break up an established crew - it was in 1994. I was writing down the usual line-up for the Dakar Rally: Karel Loprais, Radomír Stachura, Josef Kalina, when the director general called and told me that I was going instead of Kalina. And so, as a 24-year-old boy, I took part in the Dakar Rally for the first time as navigator. I still didn't fully realise what happened, but I was happy. And we won! In addition, there was a competition in navigation of the long navigation-marathon stages, and we won that too. I was learning navigation during the journey to Spain, I had borrowed my first GPS, I learnt to work with it over maps at night. As a result of my hard work I was able to make some progress and a proof of that was the Bedouin for victory, which I received as a rookie navigator. A year later I went again, we were second, then I did compulsory service in the army and immediately afterwards Tatra hired me again and I raced in Dakar 1998. It was the year when we were ambushed and our racing truck was stolen, we were held at gunpoint by masked terrorists with Kalashnikovs. Luckily nobody was hurt.

How did you get behind the driving wheel?

I was a graduate from the Brno University of Technology, I had

a Bedouin, but otherwise I was a zero. I wanted to drive, but I didn't have money. I was able to acquire one of the Tatra trucks which raced in the 1996 Dakar Rally for the Poldi Kladno team, I transported it home to Přebor, took it to pieces and all on my own started to make it ready for the race. I recollected how I did that as a student at the University of Technology, and from white-collar I became blue-collar again. I got unpaid leave from Tatra, it was a year of real crisis ... I had a truck, and my old Duck along with that which I used to haul parts for repairs, but how to get behind the wheel? I began to offer places in the cabin, and so I met André de Azevedo, the first Brazilian who raced in the Dakar Rally on a motorbike. His sponsor was Petrobras, and in order to be able to represent it further he was looking around the world for a truck. We hit it off, drew up an agreement, I received money to complete the truck and without accompaniment and spare parts I set off for the 1999 Dakar Rally in Granada where I met André again for the second time, two days before the start. He brought with him a Brazilian female reporter, who went with us, so I was the only Tatra man ever to experience a woman in the cabin, and there I came to understand that a woman can endure an awful lot...

And you were at last a driver in the Dakar Rally.

But not officially. Although I was driving, the condition by Petrobras was that it would be registered under Azevedo's name – that was my price for not having money. That's the law: you have money, you are

a racer, you don't have money, you are not a racer, that's the first thing that the race organiser checks. We came third and I immediately had a meeting with the director general of Tatra to officially make my way into the factory. Since that time I have been in the company renting space under a crane as an external legal person. I raced with André until 2004 and we parted. He also wanted to drive, but the problem was I did it all just because of driving – it was stupid but that's how it goes! In the meantime I was able to put some money together for building another car, I founded Tom Racing and in 2005 I drove under my name for the first time. Sometimes I finished, sometimes I smashed it up.

You have raced 15 times in the Dakar Rally and 8 times in the Africa Eco Race. In the Africa Eco Race 2018 you came second, but you were all alone in the cabin. How did you discover that you could do without a navigator?

That has been coming along

over many years. For a long time I had needed a partner to sell him a place in the cabin, but once the situation improved, I could have it my way, although everybody said it was dangerous. I said to myself: motorcyclists are also alone and nobody cares. The most important thing was not to damage the truck or myself and reach the finish. It clicked and I enjoyed it a lot, I don't want anybody sitting next to me any longer. Nobody meddled with the driving, I was as happy as a bee!

What are the specific features of a racing Tatra modified for desert conditions?

It has a central backbone tube with independent swinging half-axes, it has a mechanical Tatra engine – air-cooled 12-cylinder, which is the most powerful engine ever to be made in Tatra, it has over 700 horsepower, 19 litres. This year Tatra celebrates 122 years and few people know that after Mercedes and Peugeot it is the third oldest car manufacturer in the world. I have this written on the bonnet and I am happy that

I can drive it, that I can play like a little boy and I am making my dreams reality. Racing in Africa is a classic, a little bit retro, maybe I am also retro. For me the real Dakar is still in Africa ...

Is it possible to apply the experience gained from Tatra racing trucks to the production of standard models?

Yes, sometimes Tatra sends me as a specialist driver on a mission or to participate in a tender where the chassis is tested in extreme conditions and experience from the desert certainly pays dividends there.

How long do you want to race?

I let things take their course. When it is no longer possible due to health or financial reasons, I'll give up. Our thirteen-year-old son comes to help me, I don't push him, at present he is just breathing in the flavour of the trucks, but he has to work hard. And if things work well, my wife and I will be happy when he completes university, to have a good starting position ... like myself. ■



Experts from the Faculty of Information Technology can determine the location on earth where a photo was taken



Radana Kolčárová
Photo archive of Martin Čadík

Martin Čadík from the Faculty of Information Technology of the Brno University of Technology has been working for almost twenty years on research into computational photography and the geolocation of photos and videos taken outdoors. His research group CPhoto@FIT is able to determine the exact location and orientation of the photo or video camera. Geolocation may help, for example, in the search for missing persons or the presentation and editing of photos taken during a holiday.

Most recently the IT specialists from Brno have been collaborating with Adobe Research, a branch of Adobe from San Jose, California, which changes the world of digital experience. Čadík says that within this collaborative framework the doctoral students have a unique opportunity to gain practical experience in one of the global software giants. As an example, a doctoral student at the Faculty of Information and Technology from his team, Jan Břejcha, just recently completed an internship in Adobe.

"A digital photo contains encoded approximate GPS

coordinates of the location where the photo was taken. We need to precisely fix this location and find the exact orientation of the video or photo camera. We can achieve that taking advantage of digital landscape models from which we will retrieve elevation data of the topography. These 3D models are available for free for the whole planet. We can easily identify where a forest, a mountain or an iceberg is situated. Using silhouettes we align the photo with the 3D model of the terrain, and we are then able to determine the exact location and orientation of the photo or video camera at the time of shooting the image," explained Martin Čadík, describing the principle of visual geolocation of photos and videos. By their specialisation in images captured outdoors his team is the only in the country and their research puts them in a very small circle of experts in Europe.

Geolocation of photos is also set to find application in the security field. Thanks to precise identification of the location a photo from a missing person may be of help in a search campaign. Experts are capable of determining where a particular photo was taken from the surrounding terrain. This information can also be helpful during a forensic

analysis when it is necessary to verify whether the photo captures what its author says or, for example, whether it was really taken on top of Mt Everest as the photographer maintains.

Apart from investigators, geolocation of photos and videos may be used by ordinary users who may want to enhance photos from holidays. Computational photography offers a whole range of features for editing captured photos. "You can simulate another camera or re-focus an existing photo. When we have information on how far each mountain top is we can artificially refocus on it, which our field equipment would not allow us to do on location. Suddenly we see how a photo would look if it was captured using a giant telescope," explains Čadík who has been a post-doc at the Max

The IT specialists from Brno have been collaborating with Adobe Research, a branch of Adobe from San Jose, California, which changes the world of digital experience.

Planck Institute in Germany. "When I have a photo fogged by atmospheric haze I can

easily automatically defog it and make the sky clear. Or vice versa, if I want an arty picture I can easily make it foggy. Today people do it manually and use a complicated process, we can do it automatically," added Čadík, who maintains that computational photography introduces a brand new way of editing photos. In retrospect you can change the photograph lighting, add artificial shadows cast by the topography and modify the photo exactly in the way it would look on the given location during sunrise or sunset. "Today it is increasingly difficult to tell whether a photo was edited, meaning

In the future geolocation of photos might be used by the Swiss mountain rescue which currently monitors snow cover with an extensive camera network.

additionally modified. But it can be done. And it is something that we examine as part of the forensic analysis of photographs," said the IT expert from Brno.

Merging information from a captured photo and 3D models of the topography helps users obtain additional data

on the surrounding landscape, for example, the name of the pictured mountain, how remote its top is, what its elevation is, etc. In the future geolocation of photos might be used by the Swiss mountain rescue which currently monitors snow cover with an extensive camera network. Extension by data from 3D digital models would provide the rescuers with additional valuable information on the surrounding terrain.

Reading the topography may also help in the navigation of self-driving cars and drones. The team around Martin Čadík focuses on the geolocation of photos and videos from nature,

but IT specialists can analyse images and videos made in cities. In this case they compare the visual image with an existing database of pictures similar to Google Street View. In nature specialists refer to digital 3D models enriched with data from the public geographical database Open Street Map. Regarding geolocation there is also talk about its use in the navigation of autonomous space vehicles on Mars which orient themselves by the surrounding landscape.

More on the work of Martin Čadík's team at <http://cphoto.fit.vutbr.cz/>. ■



BUT WOMEN

You can find a performance on every corner, says Jennifer Helia DeFelice

Invisible woman and disappearing man, Jennifer Helia deFelice and Tomáš Ruller



American artist Jennifer Helia DeFelice came to the Studio of Performance at the Faculty of Fine Arts of the Brno University of Technology in 1993, and she basically hasn't left it since. It has been an incredible 25 years since she first arrived in Europe as an art student with an interest in the countries of the former Eastern Bloc. She intended to cross from west to east, going all the way to Russia. But she took a break in Brno on her journey, and she didn't continue farther. She has been working as an assistant in the Studio of Performance ever since.

Jana Novotná
Photo archive of Jennifer Helia DeFelice

DeFelice was interested in art even as a child. She is grateful that although she came from a working-class family, her parents noticed her interest. "When I was only eight years old, they sent me to a local artist for a Sunday painting school, which other than me was attended solely by retired women," laughs

DeFelice. The United States does not have a standardized system of vocationally oriented secondary schools, so she was only able to formally study art after high school. After a year at the private Parsons School of Design, she continued at the more affordable Empire State College, which is part of a state university in New York. "The school is exceptional in being based on experiential learning, so that you can even earn credit for life experiences. For example, I received a credit for Czech. And, as the school made distance study possible, I completed my last two years at the Brno University of Technology," explains the American artist.

The link between New York and Brno was unintentionally established by Tomáš Ruller, who was then head of the newly formed video-multimedia-performance studio at the Faculty of Fine Arts and was presenting his performance art in New York. At that time, DeFelice, who was an art student, worked as an assistant to the conceptual

Burning New York; after a score by Vladimír Havlík



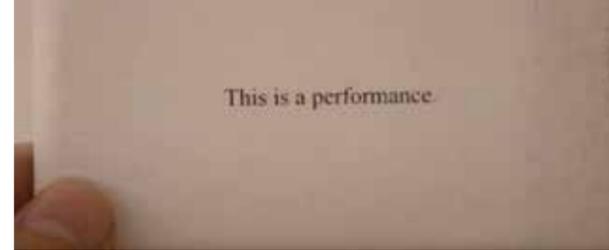
artist Douglas Davis. "Douglas was interested in communication media and had contacts with the former Eastern Bloc, which was quite exceptional then. At the beginning of the 1990s, there was a great boom of interest in Eastern Europe in New York – before that, the Soviet Union had been our archenemy – and I also found it quite compelling," remembers DeFelice. When Davis learned that a performance artist from Eastern Europe would be showing his work in New York, he sent DeFelice to meet him and invite him to Davis's studio. "Tomáš's performance was presented without words, which was really unusual in the performance art milieu in New York at that time, and for me it was such alchemy that I was unable to speak to him," recalls DeFelice. She was hungry for art and regularly visited numerous galleries. At an exhibition at the Thread Waxing Space Gallery on Broadway, she met Ruller again. This time she approached him.

When Ruller visited Davis's studio, he mentioned the new school of fine arts in Brno, but later the contact was lost.

DeFelice left New York and travelled around Europe, stopping off in Paris for some time. She wanted to find a job. The idea occurred to her to get in touch with Ruller and ask whether he was interested in having an assistant. "I wrote a letter to the Ronald Feldman Gallery in New York with another letter for Tomáš attached, asking whether they could forward it to him in Brno. I gave my telephone number in Paris. Then some friends invited me to Vienna, where I stayed in a student hostel. In the meantime, Tomáš received the letter and made a phone call to Paris, and they gave him my number in Vienna. I was in my room when one of the students knocked on the door and said that Jennifer had a phone call in the corridor. It was Tomáš calling to say he was interested. And at that moment, I wasn't 1,400 miles away from Brno, but just an hour's trip," says DeFelice. Naturally, she did not have any idea that artists in the Czech Republic did not usually have personal assistants, but Ruller proposed that she could study in his studio and work there at the same time to make money for her studies.

"There I was, at the Faculty of Fine Arts in the second semester of the school's existence, not as a regular student, but rather as a tolerated intern. The Studio of Performance was in a villa on Květná Street, so there was a family ambience," says the American art student who became a performance artist in Brno. "When I came to Brno, I had the dream that I would be a painter, and initially I did only painting and drawing. But there was an editing room on Květná. We also had all kinds of PC programs for 3D modelling there and with all the studio activities focusing on new media, I became hooked. Probably most of all on editing," remembers DeFelice.

In that period, she was essentially influenced by two things. She met Miloš Vojtěchovský, who organized a multidisciplinary festival in Plasy focusing on improvisation, which gradually led to her being completely immersed in improvised music and improvisation in general. Here it should be mentioned that DeFelice plays the double bass. "When I was editing a video recording at the Faculty of Fine Arts for Ivan Palacký's music ensemble, he discovered that I played the double bass and we then played together in a band for several years. Later I even played with other musicians, but it was mostly improvised music, which I occasionally still do today." The second thing that had a powerful influence on DeFelice in those years was the Skleněná louka (Glass Meadow) venue and its program. "I learned an awful lot there – I often made recordings in the club and afterwards I edited them and



This is a performance

via these technologies I began to delve into documentary activities. Suddenly I became interested in working in real time without having a script prepared in advance or knowing what would come next. I suppose that my experiential journey to the East was something similar. The open-ended quality was exciting and at the same time terrifying – kind of an adventure," says DeFelice.

The medium of performance, which was initially intended to defy institutions, has become a standard part of the art business, and a very compelling one according to DeFelice. In large contemporary galleries, performance is a fixed component of the exhibition program. "I would compare a performance to an experience in the sense that it is a delimited period of time that has a beginning, progresses, and comes to an end. We all have one experience or another that we are able to make into an object or story, and performance art works in a similar way. You have to be inside the action and at the same be an observer," explains DeFelice. She likes to look for performances in everyday life; as part of the practical exercises at the Faculty of Fine Arts, students take a walk in the city and, upon encountering various situations, they turn over a card with the inscription "This is a performance" on one side or "This

is not a performance" on the other side. "When we take an event from everyday life and insert it into a performative context, it becomes a subject to contemplate. You can find a theme on every corner – you only need to know that it exists and then you'll begin to see it. The important thing is to understand the timeframe, which could be less than a few minutes or could take several days," explains DeFelice.

A performer takes risks, which requires some courage. "It is a natural filter with students – they have to jump in and try it out. They may find they are not cut out for this and they can do without or, conversely, that they're good at it and they can do solo performances," says DeFelice. When she sees outstanding performers, she is always pleased that they are doing something like that because then she need not do it herself. She does not like to show off in her art. "I am more of an unostentatious person in what I do, and I tend to apply a performative approach to things rather than try to envelop people in the performance and astonish them." She usually does her performances alone and then later creates an installation using photos, video, or text. As an example, she mentions last year's exhibition by the Projektplus Gallery at Holešovice railway station in Prague. "I adore wandering and also the attitude to nature that

you have here, and that brings the quality of life to a higher level," explains DeFelice, who is impressed by the Forest Act that has been in force since the times of Maria Theresé. She likes that people have free access to the woods where they can pick mushrooms and berries, and she compares it with the laws in the United States. "I made a series of photographs where I was moving about in a forest, and I created an installation from the photos on the rotating cylinders the result being like hide-and-seek. Visitors could rotate the cylinders and the figure in the woods would appear and then disappear again," she says, describing the performance.

Currently, DeFelice is busy building the Vašulka Kitchen Brno Center for New Media Art at the Brno House of Arts, which is being created in collaboration with the Studio of Performance of the Faculty of Fine Arts. "Woody and Steina Vašulka are a great inspiration; Woody contributed to merging intermedia and performance at the Faculty of Fine Arts, where he was also a visiting lecturer. The Vasulka Chamber in Reykjavik is a partner and a model for the upcoming center," states DeFelice, describing the project which is set to start operation in October 2018.

Today the American artist feels she will stay in Brno for good, but it has not always been so clear. For a long time, she thought that her time in Brno was only temporary, saying to herself: "I don't want to die here." When this changed

into "I will probably die here," she came to believe that she would not leave, although she continued to have doubts. "I thought that when I had learned the language it would feel like home, but it did not work that way. I tried my best to adapt as much as possible, to learn and become part of society. I suppose this is the reason why I don't do things so aggressively. I am here as a visitor, kind of, so I cannot be very critical, as people would say 'why is that outsider preaching to us?'"

Czech society has been inching its way towards freedom over the 25 years that she has lived here, and DeFelice can see this in her children's generation. "I can see it in my two sons. They are very much aware with regard to human rights; they have resources from abroad, so they think more globally. When I arrived in Brno, I was fascinated by how much people who I came into contact with knew, as they were thirsty for information even though they did not have access to it. I learned an awful lot from them – they even knew American cultural references that I had missed," says DeFelice in appreciation. She is curious to know what her children's generation will be like when they grow up. "Many things float to the surface through performance art. It's good that things resurface in this way, through art, because when they emerge elsewhere, or remain suppressed, it can have enormous negative effects," concludes the Brno resident from New York. And I finally understood what performance art is good for. ■

One hundred years of women studying at the Brno University of Technology

Alžběta Blatná, Archive of BUT
Photo Archive of BUT and archive of
Tomáš Nebeský, grandson of Slávka
Vuletič-Donátová

In 2018 it was one hundred years since the time when women were allowed to enrol in the Czech Technical University in Brno as regular students. However, we could have met a limited number of them as guest students there from the school's foundation.

Slávka Vuletič-Donátová and Ludmila Hromádková with their colleagues on an excursion to the Na Strži power plant in Kroměříž; summer 1921



In the very first year of the Technical University's existence we have evidence that Eliška Kozlová (b. 1866) and Ludmila Šebestová (b. 1872) signed up for drawing under Prof. Hanuš Schwaiger. Both ladies were teachers by profession and wanted to attend a single subject as extraordinary students, which was not permitted to them by the ministry, and there is a note with their names that they can visit lectures only as "guests". The guest status did not authorise them to take an examination from the subject nor to even receive a certificate confirming they attended the lectures. With the approval of the lecturer they could only visit the classes. In her short memoir "How We Lived and Worked at Vesna" Eliška Kozlová commented: "After the establishment of the Czech Technical University two women teachers were allowed to visit drawing lessons under Prof. Schwaiger as guests (!); the first students welcomed them as colleagues, but as early as in the second year first-year students made plans to oust the 'intruders'. This, however did not happen and Prof. Schwaiger had even more new lady-non-teachers."

Before 1918 women were allowed to attend the non-engineering course of State Accounting comprising five lessons a week that was taught at the Technical University. In the school year 1909/1910 several female students enrolled in this course with the status of extraordinary students. The course was taught at the Czech Technical University in Brno until the end of the 1920s, and it figured on the programme of the Czech Technical University in Brno for the last time in the school year 1929/30. In total approximately 160 women registered for the course. Some women selected languages or shorthand to be added to the main subject, but there were not many of them. In wartime we gradually begin to encounter women who studied purely technical subjects as extraordinary students.

The essential breakthrough came in the school year 1918/1919, when women could start to enrol for the study as regular students. The first to be registered were Marie Haičmanová, Miloslava Javůrková-Donátová, Marie Jůvová, Miroslava Radićová, Karla Sumcová, Štěpánka Utíkalová and Anežka Zichová. The last two on the list began their studies at the Technical University even before the year 1918 as extraordinary students. Apart from Miroslava Radićová all of the above named ladies finished their studies successfully and received a technical degree. Miroslava Radićová (b. 1901) was the daughter of the famous Croatian politician Štěpán Radić, who was assassinated in 1928. In 1921

she married Augustin Košutić in Brno, who was at that time an assistant at the Czech Technical University in Brno. In December 1921 Augustin Košutić successfully completed his studies in Brno and returned to his homeland in Croatia where he pursued a career as a politician. As might have been expected, his young wife followed him and her studies of chemical engineering remained unfinished. Nevertheless, her case illustrates a relatively frequent phenomenon. If women studying at the Technical University in Brno married, they often chose husbands from the ranks of their colleagues and classmates. Among the first female graduates this applies, for example, to Miloslava Javůrková-Donátová (after her second marriage Vuletič-Donátová) or Karla Sumcová (married name Zikanová), daughter of Professor Sumec. Anežka Zichová (married name Václavíková) also went into wedlock with a colleague from the Technical University, with whom she later ran a driving school. Unfortunately, the fate of all the female graduates is currently not known to us in greater detail.

In 1923 we have evidence of the first female graduates from the Czech Technical University in Brno with a technical degree – three in chemical engineering and two in electrical engineering. Marie Haičmanová (b. 1898) and Věra Hanáková (b. 1898) passed the second state examination at the chemical department on 8 May 1923. In June the successful graduates from the chemical disciplines were

The essential breakthrough came in the school year 1918/1919, when women could start to enrol for the study as regular students.

joined by Irena Löwy (b. 1901), who had started to study chemistry at the German Technical University. The studies of electrical engineering were successfully completed in the same year by Slávka Vuletič-Donátová and Karla Sumcová, who married shortly after the state examinations and devoted herself to family life. The most detailed information that we have concerns Slávka Vuletič-Donátová, who was a highly emancipated woman for her time. She was a passionate photographer, later also a film-maker. She owned an automobile, was friends with Eliška Junková and during the races on the Masaryk Circuit she photographed and filmed the action on the race course.

Women registered most often for the study of chemistry, while mechanical engineering was the least frequented. There we have evidence of the first, and until WWII the only, graduate from as late as 1938 – Božena Hejlová (b. 1912). Until WWII a total of 30 women received a technical degree at the Czech Technical University, which is really an insignificant number compared to the male graduates, who exceeded them more than a hundredfold. Otherwise, the studies of women followed a general trend which can be

traced in the studies of their male colleagues as well: there was a considerable number of students of other nationalities than Czech or Czechoslovak among the students; after 1921 they were mainly Russian immigrants. The same can be said of religion which was also varied. Another factor is that the study rarely lasted for the standard period during which it could be managed. Students often applied for the second state examination a long time after their attendance of lectures and passing the prescribed partial examinations. And naturally not all of those who enrolled for studies completed the school. Women often sent an application to the Technical University together with their male siblings, or they could be daughters of the local professors.

The first female graduate from doctoral studies at the Czech Technical University in Brno was Antonína Rudavská (married name Medvedeva) in 1928. In the 1930s she was followed by Marie Wasgestianová, Olga Laubová (married name Sklenářová) and Theodora Stojanová (married name Ebrová). They all studied chemistry. Two graduates, Marie Jůvová and Libuše Hruběšová (married name Kostelková), continued to work for the Technical University over an extended period, even as assistant lecturers. ■

At the Faculty of Information Technology in Brno they know how to sharpen out of focus photos and text



From time to time anyone can take a photograph which is of inferior quality, with indiscernible details. You can save a lot using computer programmes. But where the abilities of traditional software end you need more complicated operations. At the Faculty of the Information Technology at the Brno University of Technology researchers are experimenting with enhancing photographs using convolutional neural networks (ConvNets). Thanks to this technology some historical documents from the Moravian Library will be clearer and more readable.

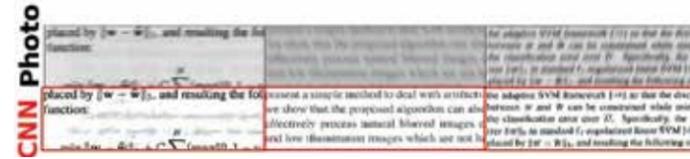
Kateřina Hrozná
Photo Michal Hradiř

Today, convolutional neural networks are mainly used in the domain of artificial intelligence. The team of Michal Hradiř decided to take advantage of them in research into the automated sharpening of photographs and corrections

of various image flaws. For two years they taught the networks to recognise which photographs are of high quality and how to correctly process the imperfect ones so that they would reflect reality. "We had available several hundred

thousand pairs of images, where one was always in good quality and one was artificially blurred. Convolution networks are able to learn from these examples to change low-quality images so that they would look as much as possible like

the quality original. When we provide them with a sufficient quantity of training samples, over time they will be able to correct even real photographs which they have not seen before," explains Michal Hradiř from the Department



of Computer Graphics and Multimedia.

The method is very successful, for example, in photographing text documents with a mobile phone, when unreadable photographs after processing come close to the quality from table scanners. The sharper documents are more readable and they can be subjected to optical character recognition (OCR) with much better results.

The researchers from the faculty also concentrated on videos, mainly from traffic cameras. They carried out experiments with the number plates of cars captured on the road by motorway cameras at the toll gates. The programme is capable of determining the number plate of a car regardless of a poorly sharpened recording. Presently, the method is not used in this field but in the future it might find

an application, for example, with the security forces.

At the moment the researchers are working on improving the method for texts. "We are about to launch a project where we will try to reconstruct old prints and manuscripts. The Moravian Library has a digital archive where they make selected old documents, such as newspapers, accessible. Some scans may be readable but only with difficulty. We use them as material for our first experiments with ConvNets," clarified Hradiř the plans for the future.

Researchers at the Faculty of Information Technology have studied convolutional neural networks for many years and they continue to find new applications for them. They concentrate particularly on areas where their further application is still the subject of research. ■



ART SHOW



NordArt 2018

Teachers, students and graduates from the Faculty of Fine Arts of the Brno University of Technology were among the three thousand artists from 105 countries who, between 9 June and 7 October 2018, exhibited their works at one of the largest European art shows called NordArt. Every year NordArt dedicates a special pavilion to a particular country and this year the Country Focus was on the Czech Republic. The curators of the exhibition entitled "On the Boundaries of the Limitless and the Futuristic / Dematerialised Sculpture and Materialised Painting" were Lucie Pangrácová and Michal Gabriel. The exhibition showed digital sculpture objects, paintings and other 2D exhibits.

The pavilion of the Czech Republic featured 12 artists – among them 7 artists from the Faculty of Fine Arts. Michal Gabriel (head of the Studio of Sculpture 1), Monika Horčicová (graduate from the Studio of Sculpture 1), Milan Houser (dean and assistant lecturer at the Studio of Painting 3), Pavel Korbička (assistant lecturer at the Studio of Sculpture 2), Tomáš Medek (assistant lecturer at the Studio of Sculpture 1), Tomáš Pavlacký (graduate from the Studio of Sculpture 1) and Dušan Váňa (doctoral student at the Studio of Sculpture 1).

<http://www.nordart.de/en/>

(eds)

EVENT



Students at the Brno University of Technology organise the largest ball in Moravia

The Ball of the University of Technology held at the Brno Exhibition Centre on 1 December 2017 was attended by more than three thousand guests making the event the biggest ballroom dance in Moravia. This time the ball organised by students themselves took place in two exhibition halls simultaneously which meant more work but also more fun as a result.

Students and graduates from the Brno University of Technology collaborated on the final installation: they designed the light effects, audiovisuals, furnishings in both pavilions, and some were even involved in the accompanying programme. The ball arrangements required a procurement of 360 candles, covers for 2 500 chairs, setting up 327 tables and building all decorations in order to transform the exhibition hall into a magic ballroom space.

The organisers would like to thank all guests of the Ball of the Brno University of Technology 2017 for the special experience and they look forward to all who will participate in the next edition which is set to take place on 7 December 2018.

(eds)

SPORTS



The Brno University of Technology came first and second at the European Universities Championship in Serbia

The University of Technology sent two athletes to the European University Championship in rowing hosted by Serbia between 13 and 16 July 2017. The European Universities Championship in the single sculls category was won by Štěpán-Adam Havlíček, a student of the Faculty of Mechanical Engineering of the Brno University of Technology. Another discipline was the double sculls where Štěpán-Adam together with Jan Hrstka from the Faculty of Information Technology came second! Congratulations to both sportsmen representing our university.

At the rowing races in Subotica, Serbia the Brno University of Technology clearly confirmed its top position on the all-European university circuit.

(eds)

CONFERENCE



Photo Pavel Zemálek's archive

The SPIL Scientific Conference 2018

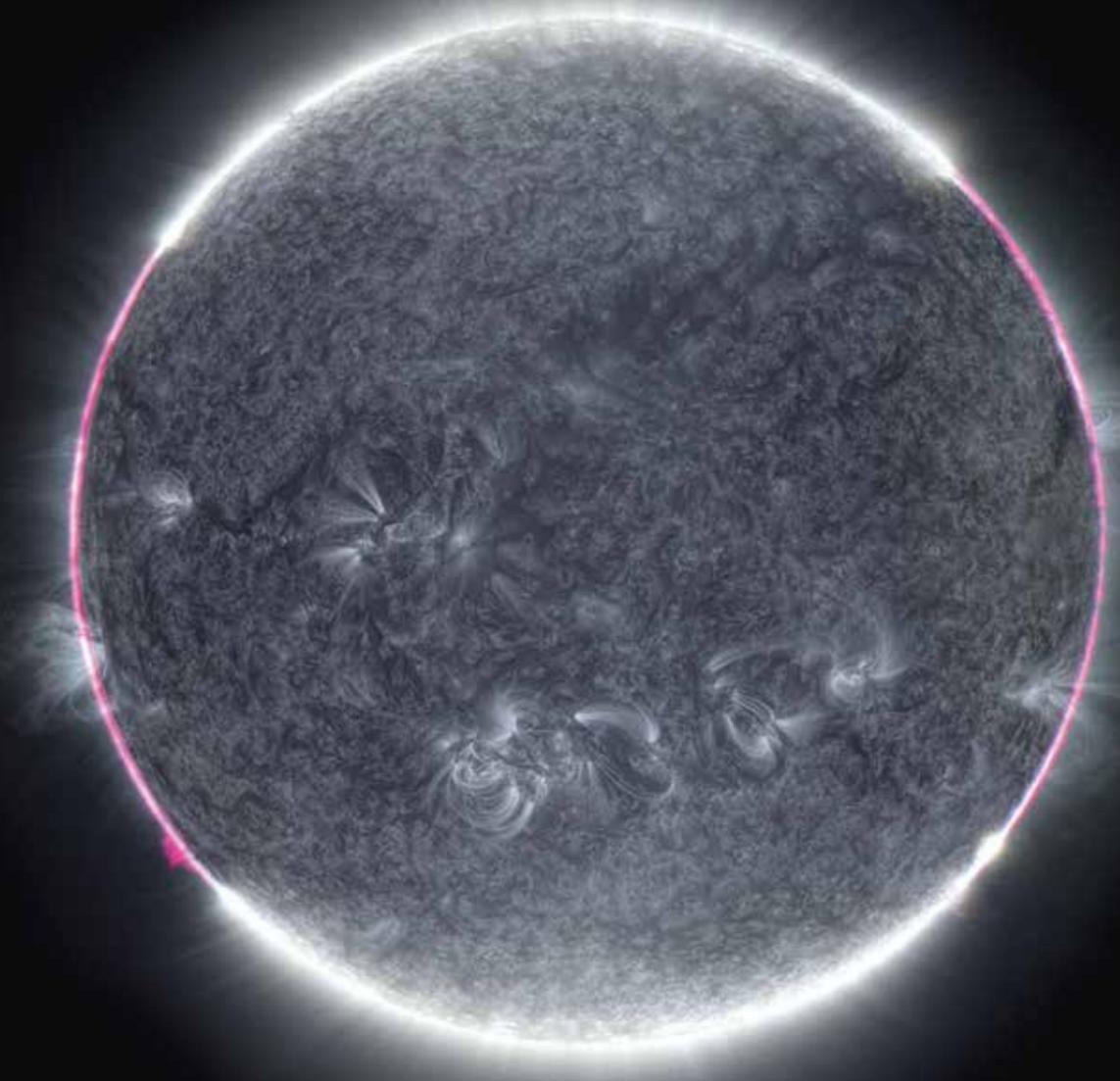
On the 30 & 31 August 2018, international researchers from 20 countries, 6 continents and 29 universities and companies gathered in Brno for the 2nd SPIL Scientific Conference on Energy, Water, Emission and Waste in Industry and Cities, at Faculty of Mechanical Engineering of Brno University of Technology (BUT).

The conference adopted an intensive two-day format with plenary lectures, supplemented by panel and group discussions and poster sessions. The conference was organised by the Sustainable Process Integration Laboratory (SPIL), which is led by Professor Jiří Klemeš.

Guest delegates joined BUT staff and student delegates to have the privilege to learn from and interact with internationally recognised authorities. The delegates represented countries including Austria, China, Germany, Hungary, India, Ireland, Italy, Malaysia, New Zealand, Philippines, Poland, Russian Federation, Slovakia, Slovenia, South Africa, Spain, Switzerland, Taiwan ROC, United Kingdom, and Ukraine. Among the delegates were Editors-in-Chief of high impact international journals – Journal of Cleaner Production and Renewable & Sustainable Energy Reviews (Elsevier).

(Radka Šťáková, NETME Centre)

Discovered Layers of the Sun
Photo by Miloslav Druckmüller, FME BUT,
and Petr Horálek



Jindřich Zeman Award
for the best Astrophotography
of 2017

Majáles
Student May
Festival
2017



The traditional student festival was held on 5 May on the Brno exhibition grounds BUT candidates were among those competing for the King and Queen of May titles