

# NEWS FROM CRH

February 2020



CENTRE OF THE REGION HANÁ  
FOR BIOTECHNOLOGICAL AND  
AGRICULTURAL RESEARCH



efb



## INTERVIEW

**We are at the beginning of a new year, which usually encourages balancing. How was 2019 for you personally and for your research group?**

In terms of accomplished tasks I think the past year was very good. We have successfully completed a project of the Grant Agency of the Czech Republic focused on Phospholipases, while using all our modern microscopic methods. We continue to keep commitments under the OP RDE Plants as a means of sustainable global development. We also maintained a relatively good publication performance in quality journals.

**Your workplace is a leading laboratory in advanced methods of microscopic examination of living plants, in the past you have inspired many foreign laboratories. Has there been any progress in this respect?**

In cooperation with a commercial company we develop a new plant illumination device, which we examine in a microscope. Commercial microscopes usually do not have such a system, but plants need it, especially during long-term experiments. We have already developed a prototype of equipment, where we can illuminate the plant in exactly the same mode as in the phytotron. We would like to turn this at least into a utility model, or in the future have it patented. We would like to develop a similar device for a new microscope for fast and gentle scanning of live plants at very high resolution, which we acquired last year for CZK 21.3 million as part of the above-mentioned project from the Excellent Research call. Last year, we also managed to make progress in capturing crops, including alfalfa and barley.

**Science cannot do without international cooperation. How are you doing in this area?**

Our bilateral project within the Humboldt Foundation, in which we work with Professor Karsten Niehaus from the University of Bielefeld, is developing very well. Professor Niehaus, our foreign co-worker within the OP RDE project, is an expert on interactions between plants and microbes and also works with legumes, especially alfalfa. We share experience, which is important in order to optimize our microscopic methods for other models, including alfalfa in addition to barley. We focus on early interactions of these crops with soil bacteria. We have recently acquired new strains of beneficial bacteria isolated directly from desert plants in Saudi Arabia from another long-time colleague of Prof. Heribert Hirt. We are also developing a long-term cooperation with the workplace of Professor Jinxing Lin in Beijing.

**How is cooperation at home turf?**

We have been intensifying cooperation with colleagues and their students from CRH and also in other laboratories at UP, namely with Martin Mistrík, David Kopečný, Ondřej Novák, Andrej Pavlovič, Saša Husičková, Lukáš Spíchal, Ondřej Plíhal, Lucie Plíhalová, David Zalabák or Aleš Pečinka. We also cooperate with other institutions in the Czech Republic

**JOZEF ŠAMAJ**

Head of Department  
of Cell Biology



and we are open to other cooperation. Our know-how is also used by other researchers in CRH as well as in the whole country.

**What challenges lay ahead of you this year?**

We started this year with a very good publication in Molecular Plant journal. It deals with the issue of heat shock in plants and HSP90 proteins that regulate it. We focused on the genetic and biochemical interaction of these proteins with the MAPK signaling pathway -YODA kinase and characterized in detail how a plant exposed to regulates the development of stomata. This research took five years. There are many other challenges ahead. The OP RDE project is very ambitious and we are trying to keep its milestones. At the same time, we are also engaged in two projects of the GA CR. We are also very pleased by students in our Biotechnology and Genetic Engineering study program. This year, a very strong class will graduate, and we would like some of the students to join us in their doctoral studies. Our graduates, however, have no problem to find work. There are quite a lot of applicants for study, and the students are highly motivated.

**Last year you became a member of the Learned Society of Slovakia. How important is this to you?**

It is quite a big honor for me. It is not very common for scientists working abroad to be nominated. As they say, no one is a prophet at home. I see it as an acknowledgement of not only my work, but the work of the whole research group. I have always built on teamwork and thanks to this we have managed to build a recognized workplace with a worldwide reputation in the field of plant molecular cell biology and modern microscopy. We can be proud of this because it is the result of the creative work and enormous effort of the whole team.

**Slovak scientists have recently called for a change in the system of science. Is this a debate you would like to join?**

The system of science has evolved somewhat differently in Slovakia than in the Czech Republic and still fewer money flows into it. So first and foremost, there is a need to address funding of science and, moreover, to support the establishment of science centers similar to CRH. Nevertheless, the investment should focus primarily on people not on buildings and equipment. It is necessary to support talented and enthusiastic people who will enhance science.

## SCIENCE AND RESEARCH

### ONDŘEJ NOVÁK ON THE HIGHLY CITED RESEARCHERS LIST FOR THE SECOND TIME

Analytical chemist and phytochemist Ondřej Novák from the Olomouc unite of Institute of Experimental Botany of the Academy of Sciences of the Czech Republic, which is part of CRH, has been included in the list of the world's most cited scientists in 2019. The list is published annually by Clarivate Analytics in the USA. The scientist from Olomouc has been included to the one percent of most cited scientists for the second consecutive year.



“I accept the fact that I belong to a group of highly cited scientists for the second time with great respect. I would like to thank all colleagues from the Laboratory of Growth Regulators and other colleagues from abroad, without

whose involvement I could not be a part of this prestigious ranking,” said Novák, who belongs to the Plant and Animal Science category. This category mentions names of 206 scientists from a variety of biological disciplines.

The Highly Cited Researchers 2019 list includes over 6,000 researcher names from approximately 60 countries, including 23 Nobel laureates. These are scientists from 21 research fields who have raised awareness by their publications and achieved considerable citation. The list was based on an analysis of publications from 2008 to 2018 according to Web of Science database. The numbers of expert on hormone analysis Ondřej Novák came to 326 publications with 6931 citations. His H-index is 44.

Two scientists listed in Highly Cited Researchers, namely chemists Radek Zbořil and Rajender Varma from RCPTM, are also connected with Palacký University. Czech science is also represented in the list by cardiologist Petr Widimský, ecologists Petr Pyšek, Jan Pergl and the late Vojtěch Jarošík, chemist Martin Pumera, microbiologist Petr Baldrian or botanist Roman Pavela. Four foreign scientists working at institutes of the Academy of Sciences of the Czech Republic have also been included in the list.

Complete results are available at <https://recognition.webofsciencegroup.com/awards/highly-cited/2019>.

### CZPPN WANTS TO ENTER A ROADMAP OF LARGE RESEARCH INFRASTRUCTURES

Incorporating Czech Plant Phenotyping Network (CzPPN) into a strategic document entitled Roadmap of Large Research, Experimental Development and Innovation Infrastructures in the Czech Republic for 2016 to 2022 was the main objective of a meeting of representatives of CRH, CEITEC and Photon Systems Instruments (PSI) with Jan Radoš, Head of the National Agency for Agricultural Research of the Ministry of Agriculture, which took place in mid-December.

“For us, the Czech Plant Phenotyping Platform is a way for greater integration with other research centers and industrial partners. If we became a supported infrastructure within the Roadmap of the Czech Republic, it would enable even greater integration within Europe. That is why we introduced our platform to the representatives of the Ministry of Agriculture and stated the reasons why we should be included in the map,” said organizer of the Olomouc meeting Lukáš Spíchal from CRH.

The Czech National Platform for Plant Phenotyping is part of the European project ESFRI-EMPHASIS, which brings together 23 European countries. The project is now in implementation and should enter the operational phase, when it is necessary to know the level of support from the participating states. A memorandum on cooperation and creation

of research infrastructure was signed by representatives of Masaryk University (CEITEC), Palacký University (CRH) of Photon Systems Instruments last February.

The Roadmap was prepared by the Ministry of Education, Youth and Sports in cooperation with six expert working groups. It provides, inter alia, a strategic model for the concept of supporting large infrastructures for research, experimental development and innovation in the upcoming multiannual framework 2016-2022.



# GRANTS

## JUNIOR GRANT SUPPORTS STUDY OF THREE GENES FROM ALDEHYDE DEHYDROGENASE FAMILY

Why have some genes disappeared from plants or been replaced by others during evolution? Since January, Martina Kopečná from CRH has been dealing with this issue together with her team within a three-year Junior Grant of UP, which she received at the end of last year in the Science, Mathematics, Informatics category.

A young scientist will mainly focus on moss *Physcomitrella patens* and three genes from the family of aldehyde dehydrogenases (ALDH). In particular, ALDH21 and ALDH23 genes specific for lower plants, i.e. mosses or algae, but cannot be found in higher plants. In contrast, ALDH22 is missing in moss. The function of ALDH22 and ALDH23 is unknown, ALDH21 contributes to resistance to desiccation in lower plants. Mosses are used as developmental models for the transition of plants from water to land, where plants have to overcome a certain drought. And these lower plants are very resistant to drying out.

“Our goal is to find out the reasons for the disappearance of ALDH21 and ALDH23 genes during plant evolution. We will study their effects on plants and test what happens if we knock out these genes in moss. If we succeed, we would like to put these genes in a higher plant and see how it will affect it,” the biochemist explained. Together with her, there will be two other women working together on a project supported by CZK 2.96 million, a colleague Radka Končítíková and a student Eva Luptáková.

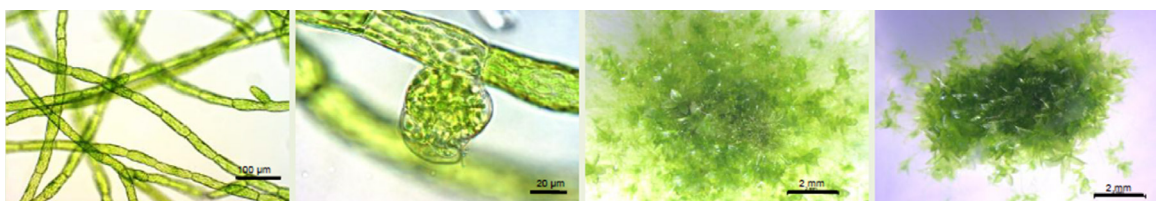
In the case of ALDH22 gene, scientists plan to insert it into the moss genome and at the same time exclude the same gene from the higher plant in which it is normally found. “We want to see what impact this will have on plants, especially their adaptation to stress, such as drought or soil salinity. We will test the presence of the gene in the monitored moss in cooperation with the laboratory of Klaus von Schwartzenberg in Hamburg, with whom our department has been working with for a long time,” added Kopečná.

In the future, research results could contribute to closer cooperation with other CRH research groups. For example, the Excellent Research project offers the idea of inserting missing genes into barley and studying their impact on this crop.

Martina Kopečná has been studying aldehyde dehydrogenases since her doctoral studies. However, her scientific career was temporarily interrupted by maternal duties three times.

“That’s why I am glad that I received the grant. It is also proof that scientific work and family life can be combined together and not often is it seen that there are only women working on one project,” added a mother of three with a smile. She and her colleagues will report on the research results within a grant “Functional characterization of aldehyde dehydrogenases putatively associated with the evolutionary transition from water to land” in professional publications or at the international Carbonyl meeting, which is held every other year and is focused on metabolism of carbonyl compounds.

Junior Grant Competition at Palacký University was opened for the first time in spring 2018.



(A) Scheme of reaction catalyzed by moss ALDH21, (B) Succinate bond in ALDH21 active site, (C) Tetrameric structure of ALDH21, (D) Coenzyme binding site

# CONGRATULATIONS

## DIRECTOR OF CRH AWARDED AUTHORS OF PUBLICATIONS AS WELL AS GRANT RECIPIENTS

Laureates received awards at the CRH Scientific board meeting in early December, where they also presented their work. PhD students were among the awardees.

A total of 20 publications were nominated and ten were awarded. In four cases, the prize was awarded for a set of two to three articles. “We took into account the quality of the journal in which the article was published. We also considered whether the author had more than one nominations. It is gratifying that in comparison with previous years we were able to appreciate more results of our PhD students. They accounted for approximately half of the awarded in the Publications category,” said CRH Director Ivo Frébort.

Grant recipients have traditionally been acknowledged. This year, six were nominated and five were awarded. The award for contracted research was given to Roman Kouřil from the Department of Biophysics. A list of all laureates and their works is available at [http://cr-hana.eu/fileadmin/userdata/PrF/CRH/oddeleni/Ceny\\_reditele\\_2019\\_final.pdf](http://cr-hana.eu/fileadmin/userdata/PrF/CRH/oddeleni/Ceny_reditele_2019_final.pdf).



### List of awarded researchers

#### Scientific publication:

1. Tomáš Takáč and Dominik Novák
2. Tereza Vavrdová
3. Zuzana Tulpová
4. Mahmoud Said
5. David Kopečný
6. Pavel Jaworek
7. Cintia F. Marchetti and Nuria De Diego
8. Jakub Hrdlička
9. Andrej Pavlovič and Jana Jakšová
10. Aditya Kumar

#### Grants:

1. Aleš Pečinka
2. Jan Bartoš
3. Eva Hřibová
4. Tomáš Takáč
5. Martina Kopečná

#### Contracted research:

1. Roman Kouřil



## BRIEFLY

On February 1, 2020, Jan Radoš - the Head of the NAZV Department, Department of Science, Research and Education of the Ministry of Agriculture of the Czech Republic, became a new member of the Council of CRH. He replaced the current representative of the Ministry of Agriculture Ladislav Jeřábek.

On December 9, 2019 a Scientific Board meeting of CRH took place. In addition to presenting CRH Director's Excellence Awards and lectures by laureates, participants also received information on progress of projects under Operational Program Research, Development and Education, namely the Plants as a Means of Sustainable Global Development project from the Excellent Research and Development of Pre-Application Research in Nano- and Biotechnologies project from the Pre-application research for ITI. The perspectives of the science center were also discussed.

Plant geneticist and scientific director of CRH Jaroslav Doležel was a guest of January edition of Václav Moravec's program Fokus on Czech Television with theme Poor Rich Planet. Along with him, the invitation was accepted

by a Protestant pastor Miloš Rejchrt, a physician Kristina Höschlová, economists Filip Matějka and Zuzana Šmídová and a polar ecologist Marie Šabacká. The whole debate is available at <https://www.ceskatelevize.cz/ivysilani/11054978064-fokus-vaclava-moravce>.

About cannabis without prejudice. Under this name the first part of an unconventional moderated discussion - a science forum Other Worlds took place in the Olomouc Fort Science at the end of November. The role of host was taken up by Petr Tarkowski from the Department of Phytochemistry, CRH. "Cannabis has been a used crop for thousands of years, and its importance to agriculture, food, construction, textile, and automotive industries and human medicine is unquestionable. Yet the abuse of a single small group of substances with a psychoactive effect that this plant has produced since the 1950s has fundamentally hampered its wider use and more dynamic research. The society is faced with the decision whether it is beneficial to adhere to strict restrictive measures in relation to handling cannabis and to spend considerable resources on these restrictions," has inter alia been heard during the debate.

## PLANNED ACTIVITIES

Academics, public research institutions and commercial partners will meet at the 19th European Congress on Biotechnology, which will take place from June 28 to July 1 in Maastricht, the Netherlands. Registration has already been launched, representatives of CRH have been involved in the preparation of the program. The meeting will be opened by a Nobel Prize winner in Chemistry Frances Arnold.

Scientists will focus on a wide range of topics in their lectures and subsequent discussions. The program is divided into five sections - Production of Biological Substances, Genome Editing, Bioengineering, Biocatalysis and Metabolic Engineering and Biotechnology for Environment and Energy. Director of CRH Ivo Frébort is involved in preparations of two program sections, and there will be two keynote speakers in genome editing section Aleš Pečinka and Goetz Hensel from CRH, who will discuss progress in increasing crop yield and agriculture (Advances in crop improvement and agriculture).

"Thanks to the complexity of the program, the Congress allows participants to look into other areas of science and to look for potential research breakthroughs. Especially our young scientists can meet leading experts and make necessary contacts with other workplaces," said Professor Frébort.

In addition to Nobel Prize winner Frances Arnold, the most important guests will include plant and marine phytoplankton biology specialist Chris Bowler, molecular geneticist professor Hans Clevers, molecular biologist John van der Oost or Sang Yup Lee, an expert in chemical and biomolecular engineering from South Korea.

The European Congress on Biotechnology is held every two years. Two years ago, it was hosted by Geneva, Switzerland, with 700 delegates attending the scientific forum. In the past, the congress took place, for example, in Krakow, Poland or Edinburgh, Scotland. In 2022, the congress will be held in Toulouse, France.

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## EUROPEAN FEDERATION OF BIOTECHNOLOGY WILL BE HEADED BY A MEMBER OF CRH'S SCIENTIFIC BOARD JEFF COLE

Starting in January next year, Jeff A. Cole, longtime Vice-President and member of the Scientific Board of the Centre of the Region Haná for Biotechnological and Agricultural Research (CRH), will take the leadership of the European Federation of Biotechnology (EFB). This was decided at the Executive Board meeting, which was held in Barcelona at the end of January, attended by CRH Director Ivo Frébort.

Professor Emeritus of Microbiology at University of Birmingham, Jeff A. Cole was elected unanimously to become the EFB President. He will replace the Swedish microbiologist Mathias Uhlén, who has led the non-profit organization since 2015.

"I believe that the in Olomouc well-known Jeff Cole will be a great president and will continue to develop EFB's activities. One of the priorities is to engage in a professional debate on the update of European legislation on new genomic techniques. Existing regulations do not reflect current rapid technological advances, restrain research, and can significantly harm European society, agriculture and the environment," said Frébort, who will represent EFB in Brussels at the European Commission meeting in February and further participate in the elaboration of the expert opinion within a survey commissioned by [Directorate-General for Health and Food Safety - DG SANTE](#).

In addition to the election of the President, a change in the organizational structure was on the agenda of the Executive Board meeting. From 2021, the current five departments will be replaced by six, perhaps seven



divisions, from which the Executive Board expects more effective management and better coordination of activities. "One of the new features is the creation of a plant, food and agricultural biotechnology division and the possible establishment of a medical biotechnology division. Members of the Executive Board Meeting elected nomination committees to suggest suitable candidates for heads of divisions. The first meeting of the new divisions will take place at the occasion of the European Congress on Biotechnology in Maastricht in June," said Michaela Holecová from the Czech Regional Branch Office, which is based in CRH.

Executive Board of the EFB with a representative of CRH's International Advisory Panel Roland Wohlgemuth among its members, also approved EFB's last year's budget report and 2020 budget. Another important task was the preparation of scientific program of the Maastricht congress and deciding that the 2022 congress will take place in Toulouse, France.

The European Federation of Biotechnology is a non-profit organization that brings together national biotechnology associations, learned societies, scientific institutes, universities, biotechnology companies and individual biotechnologists. It has 80 institutional members from across Europe and over 30,000 personal members. Its main purpose is to promote and support the development of biotechnology in Europe.





## Centre of the Region Haná for Biotechnological and Agricultural Research

CRH brings together research groups from Palacký University and Olomouc worksites of Institute of Experimental Botany, AS CR, and Crop Research Institute. CRH is a Regional Branch Office of EFB.

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