



Palacký University
Olomouc

FACULTY
OF SCIENCE



Palacký University in Olomouc

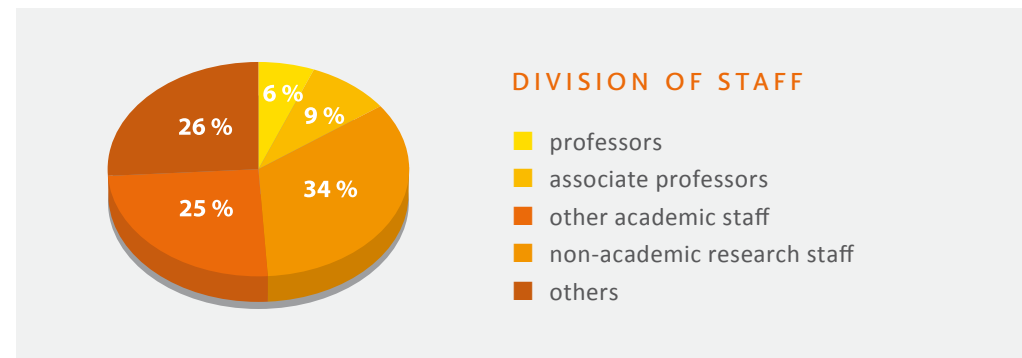
Palacký University is an inalienable part of Olomouc, which has been listed as one of Europe's hidden treasures by the Lonely Planet guide. Olomouc with approximately 100,000 inhabitants deserves the label "university city", since there are more than 24,000 students living here during the academic year. The tradition of the second oldest University in the Czech Republic dates back to 1573. Nowadays it represents a modern educational and research institution offering a wide range of study fields at eight faculties.

Faculty of Science

Faculty of Science, Palacký University in Olomouc is a research-oriented faculty. It offers Bachelor, Follow-up Master, and Doctoral studies in various fields of Mathematics and Computer Science, Physics, Chemistry, Biology and Ecology, and Earth Sciences, including programs preparing future teachers of natural sciences. Currently there are approximately 4,000 students and 900 employees at the Faculty.

Faculty

Most Faculty facilities including the dormitories and university cafeteria are located in a complex of buildings not far from the city center. Biology study fields and research centers—Regional Center of Advanced Materials and Technologies and Centre of the Region Haná for Biotechnological and Agricultural Research, are situated in Olomouc-Holice. Thanks to European funding and success in national grant competitions the Faculty managed to build modern facilities with state-of-the-art equipment. An interactive museum Stronghold of Knowledge opened in 2015 and a Botanical garden are essential parts of the Faculty.



Education

Faculty offers 33 study programs with 113 majors. A detailed course catalogue may be found at <https://edis.upol.cz/cc>.

There are 21 departments at the Faculty guaranteeing study programs, plus Department of Foreign Languages, and Department of Educational Preparation.

A brief overview of areas students
in each study field may focus on.



Mathematics and Computer Science

- Mathematic Analysis
- Numerical methods, Optimization
- Applied Statistics, Fuzzy sets, Multiple-criteria evaluation methods and decision-making
- Algebraic and Quantum structures
- Data aggregation
- Didactics of Mathematics and Computer Science
- Differential Geometry
- Theoretical Computer Science, Logic
- Computer Science
- Computer networks, Operational systems, Databases, Informational systems, web



Earth Sciences

- Landscape mapping
- Research of spatial organization of urban systems
- Climate study
- Research of map reading using technology of eye-tracking
- Contactless landscape monitoring
- Spatial models of geographic phenomena in GIS
- Development studies
- Genetic mineralogy
- Study of anthropogenic pollutants in environment and sedimentary archives of historic contamination
- Arsenic mobilization in geological environment and its impact on water accessibility in developing countries



Physics

- Quantum transfer and information processing
- Modern measuring systems in Applied Physics
- Didactics of Physics
- Experimental quantum and nonlinear optics
- Large international projects in particle physics
- Study of the human voice
- Interaction of biologically active substances and bio-macromolecules
- Study of reactive forms of oxygen in biological systems



Chemistry

- Nanomaterials in Physical Chemistry
- Bio-macromolecules in Computational Chemistry
- Modern Analytical Chemistry
- Development of biologically active compounds with antitumor effect
- Preparation and study of new materials with interesting magnetic properties
- Immobilization of bioactive substances—use of magnetic nanoparticles
- Study of defense mechanisms of plants
- Study of plant hormones
- Protein Biochemistry



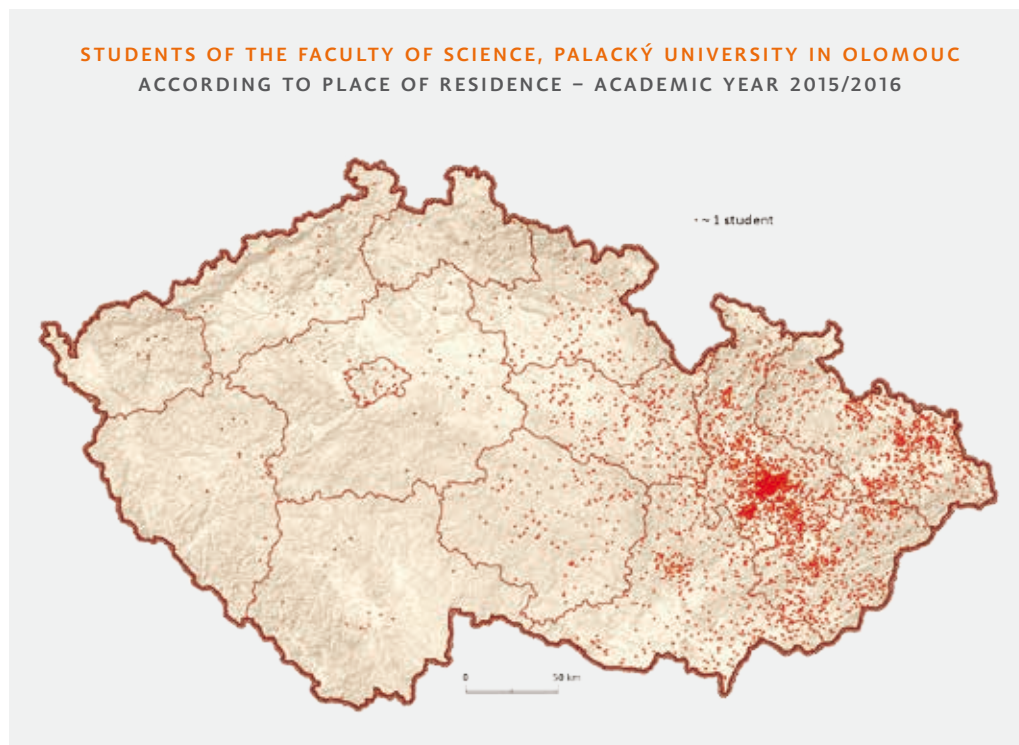
Biology and Ecology

- Biosystematics and Ecology of higher plants, algae and cyanobacteria, Biotechnology and plant genetics, Phytopathology and plant gene resources
- Life strategy of animals, Evolutionary biology, Ecology and Behavioral ecology, Speciation, Systemic biology and Phylogeny of animals
- Ecology, Environmental protection, Hydrobiology
- Toxicology, Molecular pharmacology, Molecular biology

Student candidates

Despite the decreasing demographic curve in the Czech Republic and a lower number of high-school graduates, the Faculty enjoys steady numbers of applicants. In 2015/2016 the Department of Study accepted roughly 4,600 student applications. Each year there are over 1,400 first year students of Bachelor study programs and about 400 first year students of follow-up Master study programs.

www.prf.upol.cz/en/menu/study-in-english



10 reasons why study at Faculty of Science, UP in Olomouc

- friendly approach to students
- high-quality education in modern facilities
- top experts with excellent scientific achievements
- chance to participate in research
- contacts with future employers during studies
- motivational scholarships
- emphasis on internationalization, support of student stays abroad
- chance to participate on activities of student organizations to popularize science
- teaching internships at partner schools
- living in Olomouc—university city with rich offer of both cultural and sporting events

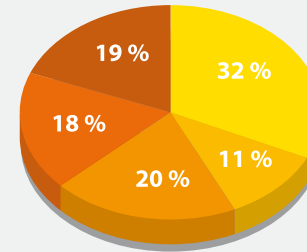


Students

In 2015/2016 there are almost 3,000 students in daily and distant Bachelor study programs, about 1,000 students in follow-up Master study programs, and 380 Doctoral students.

DIVISION OF STUDENTS ACCORDING TO MAJORS

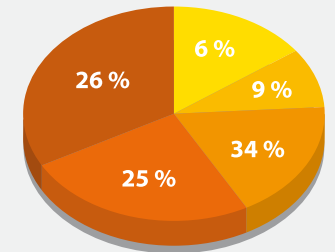
BACHELOR STUDY



- Mathematics and Computer Science
- Physics
- Chemistry
- Biology and Ecology
- Earth Sciences

DIVISION OF STUDENTS ACCORDING TO MAJORS

FOLLOW-UP MASTER STUDY



- Mathematics and Computer Science
- Physics
- Chemistry
- Biology and Ecology
- Earth Sciences

Students have at their disposal lecture rooms and laboratories with state-of-the-art equipment, libraries, study rooms with PCs and common facilities to spend time between lectures. Even during their studies the Faculty helps students get in touch with possible future employers, who offer internships or training programs where students can learn about job requirements.



Science and Research

Faculty of Science is the highest performing research facility apart from Prague and contributes essentially to the positive ranking of Palacký University. Due to the achievements and increasing publication activity of researchers the University's standing in national as well as international ratings has improved in the past few years.

COMPARISON OF RESEARCH OUTPUT ACCORDING TO RIV POINTS

	2014	2013	2012	2011	2010
Palacký University in Olomouc	188,254	182,071	153,671	122,834	101,708
therefrom Faculty of Science	105,998	101,947	84,550	70,780	60,539

Mathematics

Scientists mainly focus on theoretical and computational analysis of mathematic models and development of structural theories of algebraic and geometric systems. In computer science they tackle problems from theoretical computer science, logics, and new methods of data analysis. Active research takes place in differential equations and dynamic systems, applied statistics, fuzzy sets, multiple value and quantum logics, and didactics of mathematics. It is also possible to tailor mathematic and computer modelling to the needs of specific applications. Local computer scientists belong to leading experts in area of theoretical base and algorithms for relational data.

Department of Mathematical Analysis and Mathematical Applications belongs to a well established research facility for differential equations. Recently they have been studying fractal structures as well as how to statistically process data with relative information or how to make decisions via fuzzy methods. Department of Algebra and Geometry is not left behind with its study of so called quantum structures, multiple value logics structures, and differential geometry.

Physics

Experts from the field of Physics focus their attention to basic research in Quantum Optics, data transfer and processing, studying characteristics of new materials especially nanoparticles, and studying effects of physical factors on biological objects. Research group of Quantum Optics and Quantum Computer Science belong to leading European research facilities tackling the problematics of quantum transfer and processing of data. They create models of quantum gates, i.e. asic circuits for quantum data processing and quantum calculation.

Researchers at the Joint Laboratory of Optics are involved in an international project of Argentinian observatory Pierra Augera and have been developing special all-sky cameras and mirrors for telescopes in a new generation observatory of international consortium CTA (Cherenkov Telescope Array). They are also a part of interational ATLAS—CERN project. The Biophysics laboratory focuses on study of photosynthesis and production of human voice.

Chemistry

Researchers in the field of Chemistry focus on synthesis of new compounds and materials with potential for applications, developing methods for detection and identification of substances and the study of their structure and characteristics. Department of Anorganic Chemistry has two main research objectives, one focuses on development of new transition metal complexes, e.g.platinum or copper which can be potentially utilized in medicine with anticancerous, antibacterial or antiviral effects. The other research goal focuses on development of new materials with magnetic characteristics which could be used for recording data by the media. Also research of the Organic Chemistry department tackles the preparation and sudy of new organic heterocyclic compounds with potential biological activity. Considerable efforts are devoted to development of new synthetic procedures of orchanic chemistry.

The Department of Physical Chemistry is directed towards development and study of nanomaterials, especially graphene-based, and towards study of structure and characteristics of biomacromolecules such as proteins, nucleic acids or other more complex structures. Their research results may be applied in molecular electronics as well as in medicine.

Department of Analytical Chemistry focuses on development and application of new methods for detection and identification of compounds such as products of drug metabolism, biologically active substances in natural materials or substances contaminating drinking water or food. Bi-ochemists study defense mechanisms of plants and practical applications such as development of biosensors, and means of immobilization of proteins into nanomaterials and other carriers.





Biology and Ecology

Study fields of Biology and Ecology embrace a wide variety of research topics with interdisciplinary overlap. Research at the Department of Botany focuses on Plant and algae taxonomy and ecology, biotechnological applications and plant genetics, preservation of plant and microorganisms gene pools, and the impact of stress and pathological factors.

Research results of the Department of Zoology and Ornithological Laboratory are significant mostly in speciation and hybridization, beetle phylogeny, and evolution of bird parasitism. At the Department of Ecology and Environmental protection experts have been studying population dynamics of mammals, landscape ecology, processes in agricultural soil and in protection biology of invertebrates. They also study microbial ecology directed at greenhouse gas production in aquatic environment. Researchers at the Department of Cell Biology and Genetics focus on monitoring and screening of substances causing interactions between drugs or lead to hormonal regulation disorders.

Moreover they monitor biological activity of substances with anticancerous effects. The Laboratory of Growth Regulators connected to the Institute of Experimental Botany AS CR has achieved significant results in the study of plant hormones—cytokinins and their functions at molecular and cell level.

Earth Sciences

In this category we include research projects of wide spectrum of geographic, geoinformatic, and geologic disciplines. Main areas of applied research are modeling of geographic phenomena in GIS and contactless landscape monitoring, issue of Czech economic transformation, international migration, and study of development and sustainability indicators. Department of Geoinformatics is a leading Czech academic facility in atlas cartography, it also studies map reading via eye-tracking technology based on tracking the movement of human eyes.

Significant scientists

Students as well as young researchers from the Czech Republic and abroad have the opportunity to gain experience from world renowned colleagues. One of the most significant is a laureate of "Česká hlava" Award Pavel Hobza who is one of the most cited Czech scientists in the world. The Faculty research staff have won many awards for their accomplishments in science and research.



Pavel Hobza
Chemist

State Prize "Česká hlava"
Member of Czech Learned Society



Jaroslav Doležel
Plant Geneticist

Award of Minister of Education,
Youth and Sports for Research
Member of Czech Learned Society



Radek Zbořil
Chemist

Award of Minister of Education,
Youth and Sports for Research
Member of Czech Learned Society



Michal Otyepka
Physical Chemist

Investigator of ERC grant
to study graphene derivatives
Awarded an Impuls of Neuron foundation



Jaromír Fiurášek
Physicist

Award of Minister
of Education, Youth
and Sports for Research

Research centers

Thanks to funding from European Operation Program for Research and Development for Innovation we have managed to build two research centers with state-of-the-art equipment. Although they were opened in 2013, both centers have reached many excellent scientific accomplishments and published their results in prestigious journals including Nature or Chemical Reviews. On the verge of 2016, one of the centers received a prestigious grant of the European Research Council, the very first one at Palacký University.



The Centre of the Region Haná for Biotechnological and Agricultural Research

The Centre of the Region Haná for Biotechnological and Agricultural Research (CRH) is a joint facility of Faculty of Science, Palacký University, Institute of Experimental Botany of AS CR, and Crop Research Institute. Over 130 researchers, 20 % of whom are from abroad, devote their time to the following areas of research:

- Protein Biotechnology
- Bioenergetics
- Plant Cell Biology
- Chemical Biology
- Plant Biotechnology
- Plant Genetics and Genomics
- Phytofarm and Genetic Resources
- Metabolomics

Research here starts under the microscopes with individual molecules and goes all the way to field experiments. Enhancing utility characteristics of barley via genetic modification also used for so called molecular farming; an American patent for Incyde—compound derived from plant hormones, which should increase yields of crops; or a significant contribution of prof. Doležel's team on reading the bread wheat genome are the Center's most significant achievements.

One of the Center's main goals is to transfer research results into practical use. CRH then creates a bridge between academic and commercial sector, not only in agriculture, but also in pharmaceutical and other industries. The Center is very active in protecting its research results through licences, in promoting latest biotechnological advances in application sphere, or in strengthening competitiveness of regional products. CRH cooperates with both national and international partners. Research staff at the Center have access to technologies and equipment unique in the Czech Republic, some of it even in Europe. Researchers are involved in many international projects, and they are successful also in acquiring national project grants.

www.cr-hana.eu



Regional Centre of Advanced Technologies and Materials (RCPTM)

Experts at RCPTM focus mainly on development of nanomaterials and chemical substances which often find use in medicine, biotechnology, food processing as well as in environmental protection. Researchers from the optics department, who are able to observe the world of photons, quantum data processing, or penetrate into the mysteries of the outer space and cosmic radiation, achieved many excellent results. There are approximately 100 researchers working at the Center, 25 % of whom come from abroad. They get to work with state-of-the-art equipment including the most powerful high-resolution electron microscope in the Czech Republic. The research groups focus on chemical, material and optic research in the following areas:

- **Nanomaterials for environmental applications**
- **Carbon structures, biomolecules, and simulations**
- **Biologically active complexes and molecular magnets**
- **Optical and photonic technologies**
- **Nanosystems for use in Biomedicine**
- **Magnetic nanostructures**
- **Nanotechnologies in Analytical Chemistry**

Great efforts of the research staff at RCPTM is devoted to medical research. Together with experts from the Medical Faculty they have discovered and described high antibacterial and antimycotic activity of nanoparticles of silver. Czech and foreign companies have shown great interest in certain nanotechnologies used in medical diagnostics. RCPTM is one of European leaders in environmental research, is involved in key national and international projects for water treatment or remediation of soil via nanomaterials. Those can, however, be widely used in biotechnology and food processing as well. Researchers from Olomouc are in an advanced phase of commercial use of technology for separating lactoferrin, an important protein with antimicrobial and anticancerous activity in cow milk. Also graphene and its derivatives are very popular among local researchers. The world's renown was acquired by opticians engaged in ATLAS-CERN project or who develop all sky cameras or mirrors for telescopes for new generation observatories.

RCPTM actively cooperates with more than 80 regional, international, and multinational companies through contracted research.

www.rcptm.com



**REGIONAL CENTRE
OF ADVANCED TECHNOLOGIES
AND MATERIALS**

Regionální centrum pokročilých technologií a materiálů



Rudolf Zahradník Lecture Series

Rudolf Zahradník Lecture Series is organized under the auspices of the Regional Centre of Advanced Technologies and Materials. Its goal is to introduce the most famous and successful world's scientists from chemical and material research. This in the Czech Republic unique series was festively initiated in March 2014 by Rudolf Zahradník, the founder of Cuch Quantum Chemistry and former chairman of Academy of Sciences himself.

„I accepted the suggestion for the lecture series to bear my name with feelings of both joy and gratitude. A man would have to be very arrogant for taking the compliment which I have been given for granted. God knows I do not take it for granted.”

prof. Rudolf Zahradník



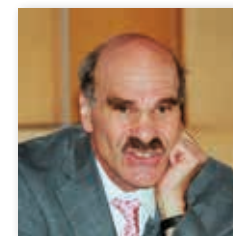
Josef Michl

University of Colorado and Institute of Organic Chemistry and Biochemistry, Prague



Andrey L. Rogach

City University of Hong Kong



Mark A. Ratner

Northwestern University, Illinois



Wolfgang Lindner

University of Vienna



Patrik Schmuki

Friedrich-Alexander-Universität
Erlangen-Nürnberg



Mario Ruben

Karlsruhe Institute of Technology



Adi Eisenberg

McGill University, Canada



Peter Sadler

University of Warwick

Applied research

Faculty departments and research centers actively cooperate on contract research with dozens of regional as well as international companies. Faculty staff are very successful at acquiring national patents and utility models. Compared to other faculties of Palacký University the Faculty of Science has a dominant position in this aspect. Academic staff also have many American and European patents under their belt. Moreover the 2014 Analysis of Research, Development, and Innovation comparing research institutes from the field of Chemistry in the Czech Republic as well as internationally proved dominant position of the Faculty among other research institutes engaged in applied research.

NUMBER OF PATENTS AND UTILITY MODELS

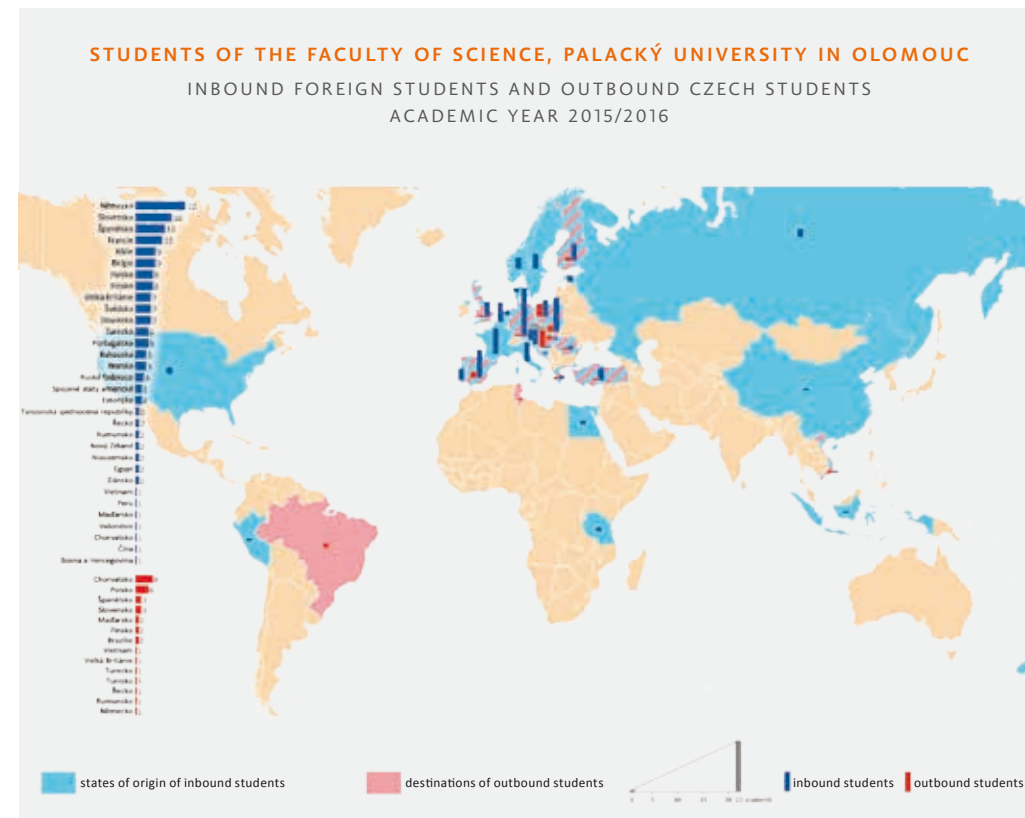
	2015	2014	2013
Palacký University in Olomouc	15	13	22
therefrom Faculty of Science	10	10	20

Source: Office of Industrial property

To name a few significant commercial partners, we can mention an American company Procter & Gamble, a German company Waters, Israeli pharmaceutical concern Teva, Japanese corporation Sumitomo Chemical or a Swiss company Syngenta International AG, not to forget Czech companies such as Meopta, Farmak, Fosfa, Mubea or Precheza.

Internationalization

Faculty Management stresses the importance of internationalization. Students have an opportunity to regularly go abroad to study for a semester or for summer school programs. For instance in 2014/2015 there were 171 outbound, and 33 inbound students. The Faculty offers courses held in English for foreigners. www.prf.upol.cz/en/menu/courses-for-erasmus-students



In 2015 the Faculty allocated about CZK 7,6 million for the purpose of internationalization. The money goes to departments actively involved in the development of internationalization. The Faculty cooperates with universities and research facilities in Japan, Italy, Spain, United Kingdom, USA, The Netherlands, Sweden, France, Germany and many other countries.



Graduates

Every year there are over 400 successful graduates of Bachelor and 300 graduates of Master study programs. Between 2003 and 2015 the Faculty produced 6,800 graduates, 4,187 Bachelors, 2,268 Masters, and 414 Doctors. The Faculty has been working and keeping in touch with graduates on a long term basis. The database of graduates contains over 14500 contact details. The Faculty also organizes reunions for former students after 25 and 50 years since graduation.

www.absolventiprf.upol.cz



Miloš Bešta

Staff Software Engineer
Google Inc.
New York, USA

„I have great memories of studying at the Department of Computer Science. It provided me with a solid theoretical base in informatics and algorithms as well as practical skills in programming. To this day I keep using knowledge I gained in courses such as Operational Systems, Algorithms and data structures, or Software project. Probably the most important thing I learned at university was the general overview, since Google prefers engineers with general knowledge able to work at any project to those who are specialized in one field only.“



Mojmír Havlík

Optics Designer
Sypro Optics GmbH,
Jena, Germany

„Study at the Faculty of Science helped me gain perspective in the world of Optics. New technologies enable us to grasp this world in greater detail, however, the rules of physics and mathematics still apply. During my studies I have met many friends whom I still meet at conferences or exhibitions. Optics design is a complex field with many variables. No two optics designers solve the same tasks the same way, experience plays a great role in this business. That is why it is important not to be alone, but share your experience with others and be able to get advice from them.“



Jan Raška

High-school Principal
Gymnázium Jakuba
Škody in Přerov

„Study at the Faculty of Science inspired me to teach Mathematics and so determined my career. I have been promoting Mathematics as an essential tool for studying not only natural sciences. Even nowadays I still find valuable contacts at the Faculty for national as well as international development and cooperation. Not only because of the high-standard of education, but also for taking care of the professional growth of its graduates I definitely recommend to study here.“



Aleš Gavenda

Research and Development
Manager, Teva Czech
Industries, s.r.o., Opava

„Study at the Faculty taught me everything I have needed in my career. Thanks to high-quality teachers and modern equipment I have learned expert knowledge in my field—Analytical Chemistry. During my studies I have been on several exchange stays at other Czech universities, and at University in Vienna which helped me gain experience in working in an international research team and improve my language skills. All of these experiences have helped me in my current job in an international pharmaceutical company.“



Popularization of Science

An essential part of our activities is promoting science. We introduce science and the results of basic as well as applied research to elementary, high-school students, and the general public in an understandable and interesting way. We wish to show the world outside the University that science is useful, inspiring, and adventurous. We organize events such as Children's University, Scientific night, Science and Research Exhibition. Our facilities are open to public during a Museum night or Open house. Many popularizational activities are conducted by the Stronghold of Knowledge, Botanical garden or student organizations UP Crowd or Pospol. Students of the Faculty may also contribute to promoting science in a project called Cherish your alma mater.

Stronghold of knowledge

In April 2015 a former military warehouse in area of Crown fortress was turned into an advanced science museum with the aim to entertain families with children, students, and general public. Visitors of the Stronghold of knowledge can see five interactive expositions with dozens of original exhibits created at the Faculty of Science. All of this with knowledgeable young student guides who take visitors on a tour through the history of Olomouc, introduce them to intriguing inhabitants of Litovel riverbed of river Morava, they disclose the nerve system via model of the human brain, or let them try the so called gyroscope for pilots and astronauts.

There are giant canvases with comics picturing the most interesting events from the historical fight over Olomouc. You may watch various popular scientific movies such as Conquering the Moon or Ice ecosystems in a digital planetarium. Especially because of its unique space and friendly atmosphere created by the guides, the Stronghold of knowledge has become an inspirational place where rich history meets the dynamic present.

www.pevnostpoznani.cz



Botanical garden

Botanical garden covers an area of about half a hectare not far from the city center near a Smetanovy sady parc. You may find around 1500 local and exotic plant species. The garden serves educational as well as relaxation purposes. The garden staff has created, maintains, and presents the collections. Furthermore, under the supervision of researchers from the Department of Botany they create genotype collections for morphological comparisons of plant material of different origin, or take samples for further observation in the labs. For these reasons the garden used to own complete collections of perspective feed crops of the Fabaceae family, diverse and not completely studied brambles, extremely variable dandelions or wild garlic.

Despite being primarily a botanical facility, other fields from the Faculty find it beneficial as well. It offers great conditions for bird watching to the Ornithology lab, future geographers learn how to measure by theodolite. Information about plant species is available in the garden, on-line (<http://botangis.upol.cz>), or through a cellphone app for Android phones. The staff of the Botanical garden are at your service and provide guided tours.

www.garden.upol.cz



Partner high-schools

We have created a network of partner high-schools which currently contains approximately 40 schools mainly from Olomouc region.



- Student and teacher coordinators create a bridge between the Faculty and schools.
- Faculty offers excursions at our facilities or lectures in schools.
- Faculty offers laboratory time during exam periods.
- Faculty welcomes cooperation on projects.
- Partner high-schools offer internships to student teachers.
- Together we find talented high-school students who take part in scientific competitions

www.prf.upol.cz/skupiny/verejnosti/fakultni-skoly

www.matematickyklok.net





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HOLICE CAMPUS
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OPTICS
 - 4. NP ALGEBRA AND GEOMETRY
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AND MATERIALS
- 9 RECEPTION
- 10 CAFETERIA + LIBRARY

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EXPERIMENTAL BOTANY, AS CR
 2 C.R.HANÁ—CROP RESEARCH INSTITUTE
 3 SCIENCE AND TECHNOLOGY PARK UP
BLOCK A
 4 SCIENCE AND TECHNOLOGY PARK UP
BLOCK B
 5 SCIENCE AND TECHNOLOGY PARK UP
BLOCK C



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