



FACULTY OF SCIENCE
Charles University

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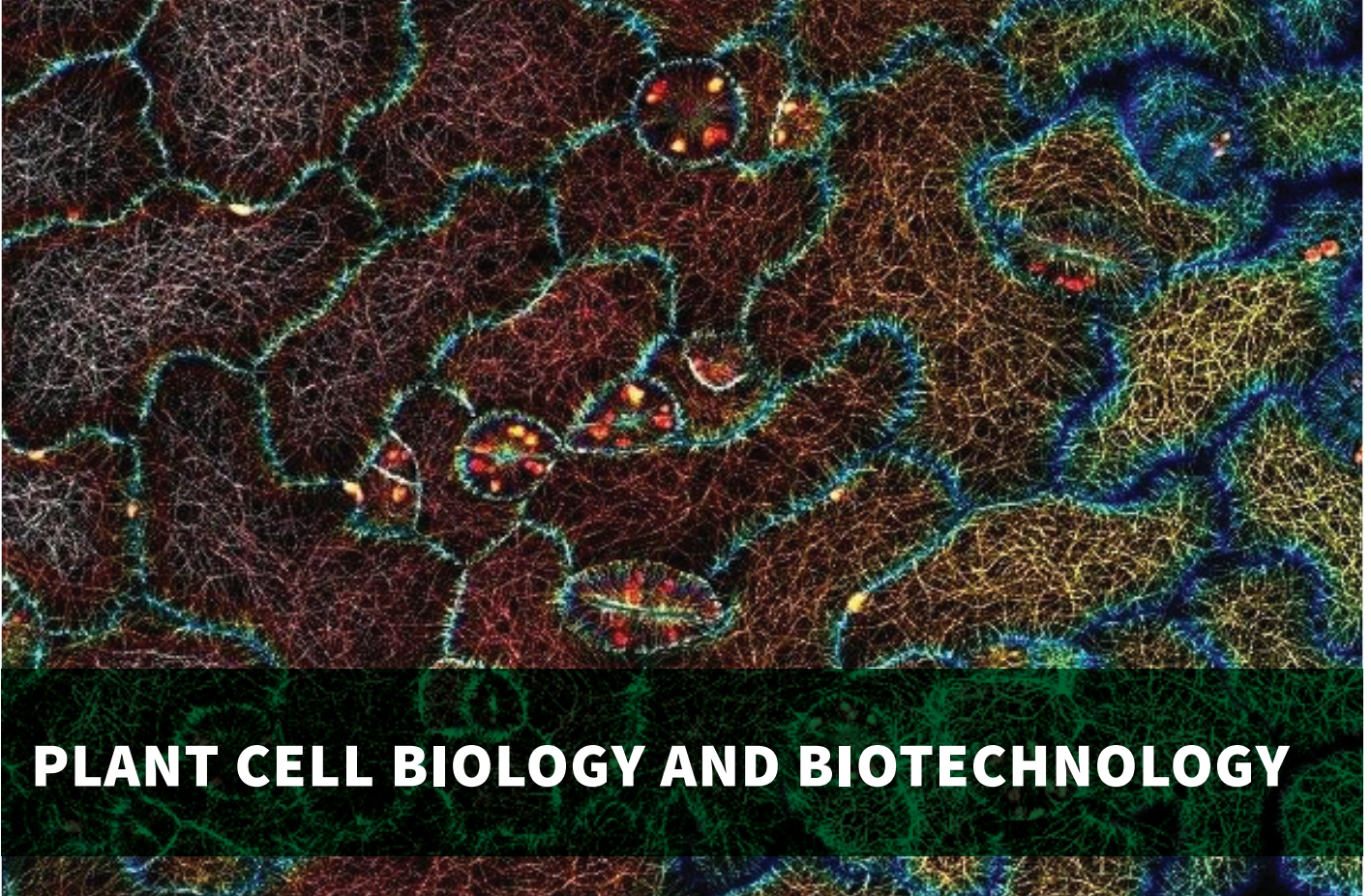
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PLANT CELL BIOLOGY AND BIOTECHNOLOGY

OFFER

We offer our expertise related to molecular and cellular biology of plants and plant cell lines:

- analyzing and discovering basic functions of plant genes,
- characterizing of genes and proteins potentially important in agriculture, horticulture and industry,
- introducing genes to produce genetically modified plants with desirable phenotype,
- inducing RNA interference for silencing of selected genes,
- knock-outing of selected genes by CRISPR-Cas9,
- utilizing plant cell lines for various basic research and biotechnological purposes,
- breeding of carnivorous plants.

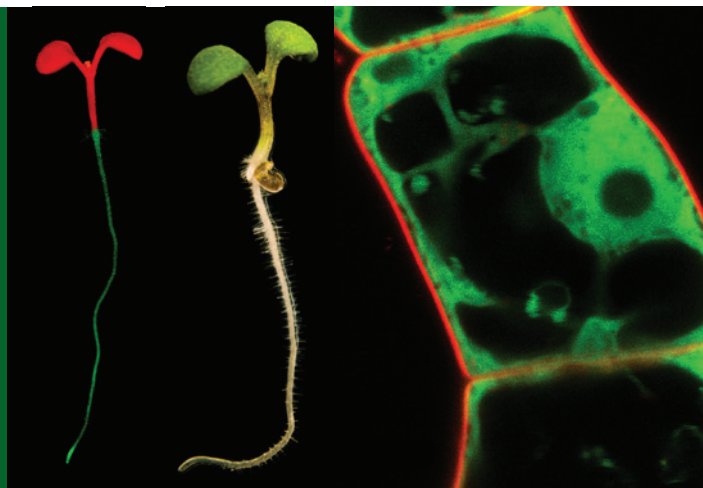
KNOW-HOW & TECHNOLOGIES

Plant cell biology and biotechnology is a fascinating research field focusing on basic functions of plant cells with the potential of connecting the high-quality fundamental research with many different applications in agriculture, horticulture and biotechnology. We study:

- cytoskeleton at the molecular and cellular level and its role in plant morphogenesis and signalling,
- mechanism of auxin transport and the role of cytoskeleton in auxin-directed plant development,
- mechanisms of RNA interference – (trans)gene silencing at transcriptional and posttranscriptional level,
- photosynthesis and nitrogen assimilation (role of PsbO and GS2 proteins),
- molecular interactions of plant cells with pathogens (fungus *Venturia inaequalis* causing apple scab disease).

We are looking for cooperation with public and private organizations in the field of plant physiology and molecular biology leading to publications in respected international journals.

We are open to a wide range of applied research resulting, for example, in collaboration on filing a patent application.



RESEARCH AREA & EXCELLENCE

Our research focuses on several topics extending the knowledge of molecular functioning of selected molecular components involved in cellular processes and intra- and intercellular signalling ranging from cytoskeleton and its role in morphogenesis of the cells, RNA interference (mechanisms of gene silencing) and photosynthesis to auxin transport mechanisms and molecular responses to pathogens.

KEY RESEARCH EQUIPMENT

State of art methods of molecular biology and biochemistry:

- DNA and RNA isolation, PCR, RT-PCR, DNA or RNA hybridization, methods of genetic manipulation: plant cells and tissues transformation via electroporation, biolistics or *Agrobacterium* mediated, native or recombinant plant proteins production in bacteria, profiling of mRNA and small RNA with RNAseq,
- proteomic approaches: (recombinant) protein isolation, SDS PAGE, blue native PAGE, 2D PAGE, mass spectrometry, studies on protein interactions *in vitro*,
- immunodetection of proteins (e.g. western blotting, immunostaining),
- *in silico* analysis: NGS data-mining, database screening, phylogenetic analysis,
- routine usage of facilities providing advanced methods of optical and electron microscopy (fluorescence confocal microscopy and super-resolution microscopy, including SIM, TIRF/VAEM, FLIM, FRAP, FRET, SEM, ESEM and TEM, flow cytometry,
- methods mentioned above are applied on our model organisms, such as *Arabidopsis thaliana*, *Nicotiana tabacum* (BY-2 and VBI-0 lines), *Malus domestica*, *Solanum tuberosum*, green algae (*Chlorella*, *Chara*, *Klebsormidium*, *Closterium* etc.) and yellow-green microalgae (*Vischeria*, *Nannochloropsis*).

ACHIEVEMENTS

Publications in peer-reviewed and high-impact journals such as Science, Nature, Cell, Current Biology, Proceedings of the National Academy of Sciences of the United States of America, New Phytologist, Molecular Plant, Plant Physiology, Journal of Experimental Botany, Plant Journal, Frontiers in Plant Science, BMC Plant Biology, Annals of Botany, Plant and Cell Physiology, etc.

MAIN PROJECTS

- 2015–2018: Enhanced efficiency of treatments for protection of apple trees against apple scab, Ministry of Agriculture, grant No. QJ1510353.
- 2015–2019: Centre of experimental biology of plants in Charles University, National Programme of Sustainability I, Ministry of Education, Youth and Sports, programme No. LO1417.
- 2015–2017: Signaling heterotrimeric G-proteins in regulation of cell proliferation and morphogenesis, COST – Ministry of Education, Youth and Sports, LD15149.

Numerous projects funded by Charles University Grant Agency, e.g.:

- Role of chloroplastic glutamine synthetase (GS2) in *Arabidopsis thaliana*.
- Analysis of initiation, dynamics and mechanism of transcriptional gene silencing.
- The role of SPT6L protein in RNA interference.
- Functional analysis of PsbO isoforms *in vitro* and in *Arabidopsis thaliana*.
- ARP2/3 complex function in association with plant peroxisomes.
- Study of the regulatory interplay between ARP2/3 complex and auxin signaling in plants.

PARTNERS AND COLLABORATIONS

Institute of Experimental Botany and J. Heyrovský Institute of Physical Chemistry, Czech Academy of Science, Prague | Institute of Scientific Instruments, Czech Academy of Science, Brno | Institute of Cellular Biology and Pathology, 1st Faculty of Medicine, Charles University, Prague | Research and Breeding Institute of Pomology, Holovousy | Karlsruhe Institute of Technology, Germany | Umea University, Sweden | Washington State University, USA | University of Edinburgh, UK | IST, Austria | PSB VIB Ghent, Belgium | BOKU Vienna, Austria

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