

Research topics for undergraduate students in the Biological Research Centre Szeged for the academic year of 2023-2024

Characterization of protein posttranslational modifications using mass spectrometry
Zsuzsanna Darula (Laboratory of Proteomics Research)

Mass spectrometry aided protein analysis
Éva Hunyadi-Gulyás (Laboratory of Proteomics Research)

Protein-protein interaction analysis by mass spectrometry
Aladár Pettkó-Szandtner (Laboratory of Proteomics Research)

Biological application of differential-polarization laser scanning microscopy. Hierarchically ordered structures.
Gábor Steinbach (Cellular Imaging Laboratory)

Studying structure-function relationship of ion-pumping rotational membrane proteins using state-of-the-art molecular biophysical methods
Krisztina Sebők-Nagy and Tibor Páli (Institute of Biophysics)

Molecular biophysical investigation of drug delivery processes using spectroscopic methods
Krisztina Sebők-Nagy and Tibor Páli (Institute of Biophysics)

Determining the structure of membrane proteins using combined machine learning (artificial intelligence) and molecular mechanics methods
Teruaki Koto and Páli Tibor (Institute of Biophysics)

Biophysics of biological and model membranes: a spectroscopic approach
Tibor Páli (Institute of Biophysics)

Examination of free radicals and free radical reactions in biological samples and food products
Tibor Páli (Institute of Biophysics)

Integrated optical devices in biology: biosensors, protein based optoelectronic devices
Sándor Valkai and András Dér (Institute of Biophysics)

Construction of microfluidic devices and their utilization in biophysical applications
Sándor Valkai and András Dér (Institute of Biophysics)

Investigation of the permeability and transport mechanisms at the blood-brain barrier under physiological and pathological conditions
Mária Deli and Fruzsina Walter (Institute of Biophysics)

Molecular bases of neurovascular functions
István Krizbai (Institute of Biophysics)

Role of the blood-brain barrier in the formation of brain metastases
Imola Wilhelm and Csilla Fazakas (Institute of Biophysics)

Molecular characteristics of the brain metastatic microenvironment
Imola Wilhelm (Institute of Biophysics)

Role of pericytes in neurovascular functions
István Krizbai and Imola Wilhelm (Institute of Biophysics)

Studying the neurovascular unit with two-photon microscopy
Attila Elek Farkas (Institute of Biophysics)

Restoration of cerebrovascular functions during aging
István Krizbai and Attila Elek Farkas (Institute of Biophysics)

Studying bacterial communication by microfluidic techniques
Péter Galajda, Krisztina Nagy (Institute of Biophysics)

Assembly and development of microbial communities in microfluidic chips
Péter Galajda, Krisztina Nagy (Institute of Biophysics)

Studying bacterial cells by optical tweezers
Péter Galajda, Krisztina Nagy (Institute of Biophysics)

Using photosynthetic reaction centres in biohybrid solar cells
Petar Lambrev and Melinda Magyar (Institute of Plant Biology)

Structure and function of photosynthetic reaction centre complexes
Petar Lambrev and Parveen Akhtar (Institute of Plant Biology)

Mechanisms and dynamics of the ultrafast processes in photosynthesis
Petar Lambrev (Institute of Plant Biology)

Electric current production by green algae
Szilvia Z. Tóth and Nia Petrova (Institute of Plant Biology)

Photosynthetic hydrogen production by green algae
Szilvia Z. Tóth and Valéria Nagy (Institute of Plant Biology)

Investigation of phosphate and ascorbate transporters in green algae
Szilvia Z. Tóth (Institute of Plant Biology)

Investigation of stress adaptation of microalgae
Bettina Ughy (Institute of Plant Biology)

Investigation of bacterial growth at the individual and population level
Bettina Ughy (Institute of Plant Biology)

Identification and functional analysis of plant genes involved in symbiotic nitrogen fixation.
Péter Kaló, Szilárd Kovács (Institute of Plant Biology)

Examination of mutant plants defective in symbiosis
Gabriella Endre (Institute of Plant Biology)

Functional study of symbiotic genes and proteins

Gabriella Endre (Institute of Plant Biology)

Investigation of the effect of new plant antimicrobial peptides on different bacteria

Gabriella Endre (Institute of Plant Biology)

Scenes from a (bad) marriage: Why does the symbiosis between leguminous plants and *Rhizobium* bacteria fail sometimes although the partners possess the necessary toolkits?

Attila Kereszt (Institute of Plant Biology)

Role of plant antimicrobial peptides in the selection and control of the bacterial partners in the course nitrogen-fixing symbiosis

Attila Kereszt (Institute of Plant Biology)

Antibiotic resistance in microbes

Csaba Pál (Institute of Biochemistry)

Evolution of human immune system in response to pathogens

Csaba Pál (Institute of Biochemistry)

Laboratory evolution of antibiotic-producing bacteria in the presence of antibiotic-resistant pathogens

Ana Martins (Institute of Biochemistry)

Microbial evolutionary experiments in the lab

Zoltán Farkas (Institute of Biochemistry)

Investigating the side-effects of compensatory evolution in baker's yeast: do deleterious mutations contribute to phenotypic novelties?

Zoltán Farkas (Institute of Biochemistry)

High-throughput laboratory experiments using baker's yeast as a model organism

Zoltán Farkas (Institute of Biochemistry)

The role of protein phosphatases in cell cycle regulation

Zoltán Lipinszki (Institute of Biochemistry)

Studying protein stability in mammalian cell cultures

Zoltán Lipinszki (Institute of Biochemistry)

Heterologous expression and purification of recombinant proteins for immunological assay

Zoltán Lipinszki (Institute of Biochemistry)

Exploring new strategies against genotoxin-producing gut pathogens

Viktória Lázár (MTA-SZBK Lendület "Momentum" Systems Biology of Antibiotic Action Research Group, Institute of Biochemistry)

In vivo and *in vitro* studies on formin function

József Mihály (Institute of Genetics)

Identification and characterization of myofibrillar actin regulatory proteins
Szilárd Szikora (Institute of Genetics)

Investigation of myofibril organisation with single molecule localization microscopy
Szilárd Szikora (Institute of Genetics)

Studies on the role of Cyclase-associated protein (CAP) during sarcomerogenesis
Szilárd Szikora (Institute of Genetics)

Analysis of a novel stem cell factor in *Drosophila*
Ferenc Jankovics (Institute of Genetics)

Lipid-protein interactions during autophagy
Hajnalka Laczkó-Dobos (Institute of Genetics)

Investigation of intracellular mechanisms affecting somatic LINE1 retrotransposition
Lajos Mátés (Institute of Genetics)

The relationship between the microbiome and cancer development in human cell model
Szilvia Juhász, BRC Institute of Biochemistry and HCEMM Hungarian Center

Autophagy in the nervous system
Áron Szabó (Institute of Genetics)

The mechanism of LC3-associated phagocytosis in *Drosophila* glia
Áron Szabó (Institute of Genetics)

Glial activation pathways in *Drosophila melanogaster*
Áron Szabó (Institute of Genetics)

Modelling neuroinflammation in *Drosophila melanogaster*
Áron Szabó (Institute of Genetics)

Production of organoid cultures from human pluripotent stem cells
Melinda Purity (Institute of Genetics)

Generation of fluorescently labelled mouse stem cell lines for cell fate tracking
Melinda Purity (Institute of Genetics)

Analysis of cell death signalling pathways in mouse and human stem cells
Melinda Purity (Institute of Genetics)

The role of ADP ribosylation in DNA repair and cellular senescence
Roberta Fajka-Boja (Institute of Genetics)

Analysis of blood cell transdifferentiation in *Drosophila melanogaster*
Erika Gábor (Institute of Genetics)

Analysis of the regulation of blood cell niche maintenance in *Drosophila melanogaster*
Viktor Honti (Institute of Genetics)

Analysis of the formation and therapeutic possibilities of blood cell originated tumors
Viktor Honti (Institute of Genetics)

Studying extracellular matrix degradation mechanisms in *Drosophila*
Gábor Csordás (Institute of Genetics)

Characterization of *Drosophila* extracellular matrix-immune cell interactions
Gábor Csordás (Institute of Genetics)

Investigation of piRNA/PIWI mediated transposon silencing
Melinda Bence (Institute of Genetics)

Regulation of mutagenesis in yeast
Ildikó Unk (Institute of Genetics)

Role of polyubiquitylation in DNA damage tolerance
Ildikó Unk (Institute of Genetics)

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