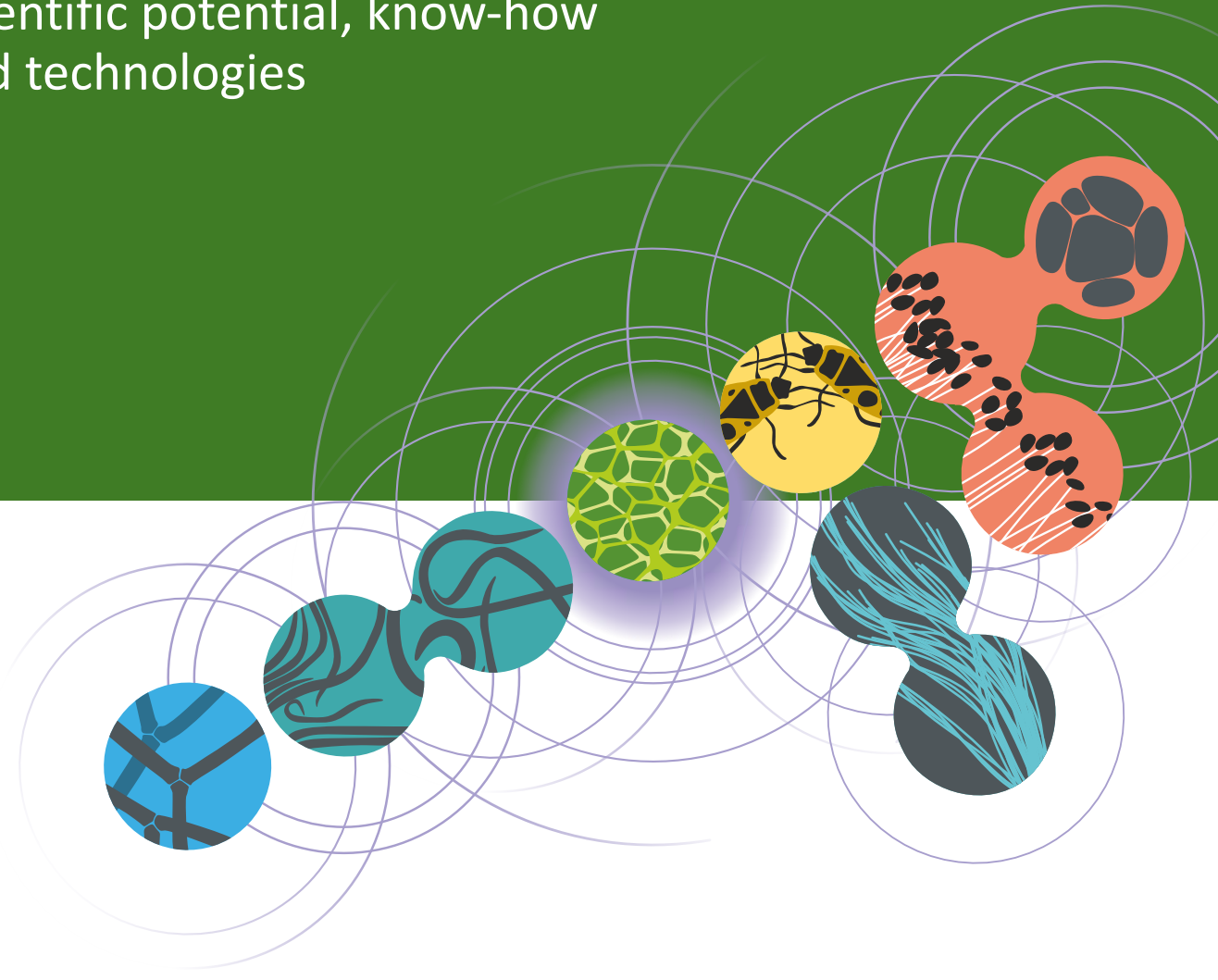
BIOLOGY CENTRE CAS

On the Path to Collaboration

Scientific potential, know-how and technologies



About us

We are a public research institution founded in 2006 by the Academy of Sciences of the Czech Republic. We associate five originally independent scientific institutes (Institute of Entomology, Institute of Hydrobiology, Institute of Parasitology, Institute of Plant Molecular Biology and Institute of Soil Biology). Since 2016, the SoWa Research Infrastructure is part of the Biology Centre, focused on a comprehensive study of soil and aquatic ecosystems. Having six hundred employees, we are the largest out-of-the-city-of-Prague institution of the Academy of Sciences of the Czech Republic and one of the largest scientific workplaces of ecologically oriented research in Europe.

photo: M. Podhora

Cooperation with the Biology Centre of the Czech Academy of Sciences

The common denominator of the scientific research of individual institutes of Biology Centre of the Academy of Sciences of the Czech Republic (BC) and RI SoWa are the themes of evolutionary biology and ecology with an emphasis on the origin and development of biodiversity and its sustainability. This forms a common platform for horizontal cooperation between individual science institutes and RI SoWa in the form of shared grant projects. This fact is a prerequisite not only for the enhancement of the quality of scientific research in the BC but also for the search for perspective interdisciplinary topics of scientific research.

The presented overview highlights possibilities for cooperation and potential of scientific research, which is also presented by the Strategy of research activities of the BC. The presented knowledge, skills and technologies overlap into many fields and are useful especially in agriculture, forestry, fisheries, nature conservation, human health, veterinary medicine and other areas of life. Within the framework of individual themes, it is possible to establish cooperation with the BC on the level of collaborative or contractual research, ensuring the international mobility of researchers, testing, verification and licensing of technologies, as well as through other ways of technology and knowledge transfer.

“Top research in the public’s interest.”

Technology Transfer Office

The Technology Transfer Office (TTO) is a contact point for companies and institutions interested in cooperation with the BC in the field of research and development or use of laboratory and instrumental capacities. It offers a professional approach from consulting with top academic staff to the placement of part of corporate research and development in our institution.

TTO vision

“Long-term support for the transfer of R&D results to practice in order to gain a strong and stable position in the field of interdisciplinary cooperation.”

TTO mission

1. Intellectual property protection.
2. Support for the implementation of applied research projects.
3. Use of research results.

ENVIRONMENT

- assessment of the quality of the components of the environment and biodiversity (soil, water, forest, meadow, landscape) and analysis of the state of the environment
- short-term and long-term environmental monitoring
- revitalization, recultivation and phytoremediation of the landscape (sites exhausted by intensive agriculture, post-industrial sites, sites with ecological burden)
- regeneration and revitalization of soil and water in the environment
- assessment of anthropogenic effects and pollution
- formulation of conservation measures to achieve a balanced state of ecosystem and high biodiversity
- formulation of measures for the management of protected landscapes
- assessment of ecological status and management of water bodies (Římov, Lipno, Šumava lakes) and their catchments
- prognosis of environment quality development in relation to human activities and climate change

AGRICULTURE
FORESTRY
FISHERY
FOOD INDUSTRY

- biological protection of plants against insect pests
- ecological fight against insect pests of forest trees
- analysis of antibiotics spreading and resistance to antibiotics in soil
- diagnosis of diseases of bees and other pollinators
- food supplement for bees to increase their resistance and immunity
- diagnosis of plant viruses and more effective defence against viral diseases
- detection of new plant viruses
- analysis of soil fertility and quality
- diagnosis of parasites in fish farms and their elimination
- use of soil microorganisms for food and industrial purposes
- biotechnologies

HEALTH OF PEOPLE AND ANIMALS

- solving economic and medical problems related to human and animal parasites development of vaccine against ticks for domestic and farm animals
- development of a universal human vaccine against ticks and potential drugs against tick-borne encephalitis and other viral diseases caused by parasites
- research of intestinal microbiome and use of safe intestinal parasites for treatment of autoimmune diseases
- using a collection of soil microorganisms for the search of biologically active substances suitable for medicine (antibiotics, anti-inflammatory substances)
- metabolomic analytics

QUALIFIED EXPERT ACTIVITIES

- The Biology Centre provides expert reports, opinions and recommendations in all fields of the Centre's activities.

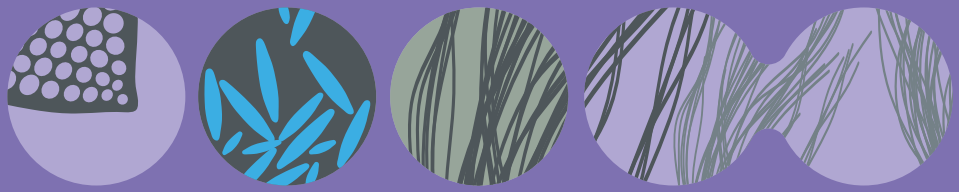


photo: P. Jáchimová

Institute of Entomology

The Institute of Entomology performs basic research of insects in the fields of molecular biology and genetics, biochemistry, physiology and developmental biology, systematics, biodiversity and protection of ecosystems and ecology. Selected results of the research are aimed towards nature and environment protection, are used in preparation of integrated strategies to control insect pest populations and as a basis for developing knowledge in biomedical sciences. These include, for example, methods of preparing bacteria, viruses and fungi for use in environmentally friendly insect pest control, development of pheromones to monitor the occurrence of harmful insects, use of parasitoids and predators to control aphids, development and application of analogues of insect juvenile hormones, etc. One of the most important by-products of entomopathogenic fungi research was, for example, the discovery of cyclosporine, a substance that suppresses the immune response of the organism. The institute research program is concentrated in four main areas and several research groups cooperate in each of them.

photo: J. Miklín

Molecular and genetic mechanisms of insect development

Molecular genetics – we are engaged in the study of cellular autonomy and system control of energy homeostasis of insect cells. We study growth regulators, insect cells both in tissue cultures *in vitro* and in insect body *in vivo*. Recently we focused to adenosine signalling.

Developmental genetics – we use reverse genetic approaches (transgenesis, mutagenesis, RNAi) to study biological processes in model species (the fly *Drosophila melanogaster*, the beetle *Tribolium castaneum* and the nematode *Caenorhabditis elegans*): (i) hormonal and genetic regulation of insect development, metamorphosis and oogenesis; (ii) role of nuclear receptors and other transcription factors; (iii) molecular mechanism of juvenile hormone action; (iv) developmental genetics of cell differentiation and asymmetric cell division.

Regulation of insect metabolism – we study the influence of metabolic stress on cell signalling and tissue development in the fruit fly *Drosophila melanogaster*. We are interested in how information on available nutrients and metabolic status of the organism is transmitted between tissues and how they affect their development and function. The aim of the research is to elucidate some of the regulatory mechanisms where cellular and systemic metabolism modulates intercellular signalling while understanding the signalling pathways governing tissue-specific and systemic metabolism during the development of the Drosophila.

Molecular chronobiology – we study circadian and photoperiodic clock systems in the insect, namely: (i) evolution of circadian clocks; (ii) molecular and genetic mechanisms regulating temperature compensation; (iii) photoperiodic timers on molecular, anatomical and genetic basis; (iv) input of light into photoperiodic timers.

Molecular cytogenetics – we study the structure and function of nuclear genomes in insects and other arthropods with emphasis on key issues of biology of sex chromosomes, especially their evolution, role in ecological adaptation, speciation and determination of sex. For chromosome research we use advanced methods of molecular cytogenetics including gene and repeat sequence annotation, and current genome sequencing methods and genome analysis using bioinformatics tools.

Insect telomeres – we study the role of telomeres and telomerase in regulating the life of insects, in the regulation of caste differentiation, and also in their resistance to stress. We focus primarily on social insect research.

Physiology and biochemistry of stress and seasonal responses of insects

Insect physiology – we study the insect neuropeptides (mostly from the adipokinetic hormone family) and their roles in important physiological and developmental processes in insect body. The study includes the issues of metabolism, digestive enzymes and anti-stress reactions elicited by various stressors including the insecticides, pathogens and natural toxins.

Insect diapause – we study the physiological principles of the changes in the insect's phenotype (diapause) and the related increase of resistance to low temperatures. Our focus lies in biochemical analysis of the metabolome and accumulation of low-molecular substances with cryoprotective activity. We also study changes in the phase behaviour of body water, change in the composition and function of biological membranes, expression of shock and other protective proteins.

Applied entomology – we have several projects focused on the development of biological methods of protection measures in forestry and agriculture: (i) research of diapause and photoperiodism in the Central European polyvoltine and Scandinavian univoltine populations of the spruce bark beetle; (ii) introduction of genetically modified (GM) maize with resistance to insect pests and tolerance to non-selective herbicides in the Czech Republic; (iii) alternative ways of regulating the horse chestnut leafminer to support natural enemies' biodiversity.

Analytical biochemistry – we focus on the research and development of new bioanalytical approaches and their application in the research of metabolism of insects and other important model organisms. We develop analytics of a large set of metabolites from small molecules derived from organic acids, amino acids, amines, nucleosides, nucleotides, lipids, steroids, sugars or their conjugates to peptide sequencing.

Biodiversity of temperate insects and its protection

Forest ecology – we study ecological principles that condition and create the biodiversity of temperate forest and grassland ecosystems. An important part of our program is the solution of practical issues of protection of selected ecosystems in the Czech Republic.

Temperate biodiversity – we perform population-based ecological studies of endangered and common species of insects, especially day butterflies. We study communities of day and night butterflies in terms of their functional properties. We investigate the causes of the threat and propose procedures for the rescue of endangered species of fauna, not only in the Czech Republic but also in the Mediterranean. We study the impact of modern methods of ecological management (free grazing by large herbivores) on insect populations and communities. We also study the physiology of mountain butterflies and their survival in harsh conditions.

Phylogeny of butterflies – we study evolutionary aspects in butterfly ecology (Lepidoptera) in spatial (biogeography) and environmental environments. We search for and test causes mainly in relation to the evolution of selected ecological phenomena. We study the genetic diversity of species and genera in parts of their habitats (population genetics) or whole area of distribution (fylogeography) in connection with current and past climate changes (during Tertiary and Quaternary).

Ecology of aquatic insects – we study communities of aquatic insects on stagnant water on environmental gradients. We mainly study the effects of anthropogenic changes (especially warming, eutrophication and industrial pollution) on the behaviour of individuals, life cycles, trophic interactions and community dynamics by combining field research, laboratory experiments and simulation modelling.

Phylogeny of aquatic insects – we study the taxonomy and life cycles of selected groups of mayflies (Ephemeroptera) and stoneflies (Plecoptera). We map the evolution of these groups using fossil material. We study the distribution, ecological demands and life cycles of individual species.

Entomopathogenic nematodes – we study the taxonomy of entomopathogenic and mollusc-parasitic nematodes, and we are looking for and describe new species. We study the phylogenesis of the entomopathogenic nematode-bacteria complex. We also address ecological issues and the use of nematodes to combat insect pests.

Ecology and evolution of insect communities

Tropical ecology – we study environmental factors determining the composition and function of food webs in forest ecosystems from tropics to temperate zones. We focus on all aspects of biodiversity, especially the evolutionary mechanisms of its origin and ecological mechanisms determining the composition of current ecosystems. Our research combines a detailed description of species and their interactions in tropical ecosystems, especially tropical rainforests, with manipulative experiments and molecular analysis of species and populations.

Ecology of social insects – we study ecology, phylogeography, evolution and diversity of ants, especially in tropical ecosystems. The aim is to elucidate the factors and mechanisms that affect species diversity and composition of ant communities along ecological gradients (influence of succession and stratification of forest, elevation, biogeography). We also study the influence of ants on plants and other insects and their interrelations. Our approaches include both classical research on biodiversity and ecology of communities, and more advanced statistical and molecular methods.

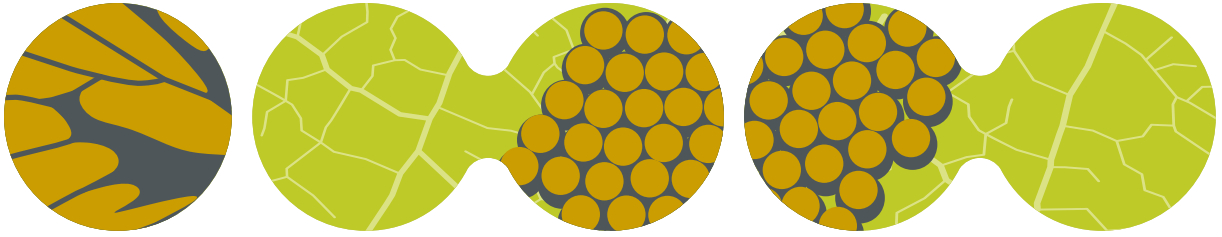
Theoretical ecology – we study mathematical modelling in behavioural, population and evolutionary ecology. We focus especially on the relationship between the behaviour of organisms (e.g. adaptive food selection or sexual behaviour) and population dynamics and the interaction between the individuals and their environment. We are also interested in the influence of infectious diseases on these interactions.

Multitrophic interactions – we study ecological factors determining trophic interactions among natural insect predators, insects and plants in forest ecosystems from tropics to temperate zones. We focus mainly on the description of species and their interactions, and we verify the importance and flexibility of these links by manipulative experiments. We also study the direct and indirect communication between different trophic levels.

Integrative ecology – we study the structure and dynamics of complex communities of interacting species. We focus on the interaction of plants and insect visitors of flowers.

Ecology of insect communities – we study the insect biodiversity of arthropods along environmental and geographic gradients. In addition to natural gradients (especially environmental productivity, altitude, latitude), we also focus on gradients of ecosystem disturbance, whether due to industrial or environmental pollution, or natural disturbances. We also focus on the role of insects in communities, especially in plant-pollinator relationships. We study all questions in both tropical and temperate ecosystems.

Experimental ecology – we study the influence of biotic and abiotic factors on the structure and function of food webs. We use both field observations and experiments on different insect groups, as well as a laboratory model based on food webs of fruit flies and their parasitoids. We use morphological and molecular methods to identify and detect individual species.



Institute of Hydrobiology

The Institute of Hydrobiology performs research on the relationships between aquatic organisms and their interactions with abiotic factors in stagnant water, especially in artificial reservoirs. We conduct surveys from partial processes to the level of ecosystems. The specializations of the Institute's researchers range from hydrochemistry through biochemistry, microbiology, algology, protozoology, zooplankton zoology to ichthyology. This structure enables the study of relationships in food webs with both basic approaches: “bottom-up” (from the bottom upwards – from nutrients towards fish – live mass production) and “top-down” (from top to bottom – from fish to nutrients – feedback process control from higher trophic levels).

photo: L. Vejřík

Water chemistry and eutrophication limitation

Hydrochemistry and ecological modelling – we study nutrients (carbon, nitrogen, phosphorus), their interconnection and interactions with the cycles of other ecologically important elements (sulfur, aluminium, iron, silicon) in the river basin-water system and their differences between differently anthropogenically burdened areas (alpine zone, natural and economic forests and agricultural landscape). We study individual processes affecting the relationships between living and non-living parts of aquatic eco-systems.

Macrophytes – we study the influence of water macrophytes on the quality of water and sediments (nutrient and contaminant content, water transparency) or the development of other primary producers (phytoplankton, periphyton). We study the functioning of aquatic macrophytes as highly structured natural habi-tats for other organisms in both natural lakes and artificial aquatic ecosystems such as dam reservoirs or hydrorevitalized mine pits.

Microbial ecology of water

Ecology of bacterivorous protozoa – (i) we study the main taxons of planktonic heterotrophic flagellates, the most important bacterial consumers in freshwater – taxonomically, it is an extremely diverse group of protozoans; (ii) we propose new phylogenetic FISH probes to study nutritional interactions of these minor protozoans that fundamentally affect the flow of carbon from bacteria to higher trophic levels; (iii) we introduce the so-called double hybridization method, which allows detection of both the predator and its bacterial prey.

Phytoplankton ecology and reservoir limnology – we deal with (i) the study of the spatial heterogeneity of phytoplankton in the longitudinal and vertical gradients of the reservoirs with different degrees of trophy; (ii) using the analysis of long-term time series we reveal long-term changes in reservoir communities depending on the river basin management and climate change; (iii) using the research of phytoplankton interactions with individual components of microbial communities (bacteria, fungi, flagellates) using fluorescence methods.

Ecology of complex microbial communities – we study the ecology of complex microbial communities – microbiomes – and the role they play in the ecology and ecophysiology of the host organisms, especially plants. We are mainly interested in the influence of host phylogeny, site and environmental changes on diversity, function, and interspecific interactions within microbiomes. Due to the interdisciplinary nature of the topics, we combine a wide range of methods, from microscopy and stable isotope analyses to molecular methods.

Genomics and ecotoxicology of cyanobacteria – (i) we perform cyanobacterial genome analysis to find new bioactive substances with biote-

chnological and ecotoxicological potential and elucidate their biosynthetic background; (ii) we develop methods of molecular detection of potential cyanotoxin producers in samples from freshwater ecosystems; (iii) we study the diversity and taxonomy of prominent representatives of cyanobacteria using a polyphasic approach.

Nutritional interactions and nutrient flows in hypertrophic water – we study the structure, function and seasonal dynamics of plankton, the flow of energy and nutrient cycles in hypertrophic ponds. We focus mainly on (i) microbial diversity of plankton; (ii) the efficiency of transferring primary and bacterial production to higher trophic levels; (iii) the importance of stoichiometry of resources for trophic interactions and nutrient regeneration.

Metagenomics of microbial and viral communities – we use metagenomics to study diversity, ecology, population dynamics and interaction of freshwater microorganisms and their viruses. In model ecosystems (e.g. the Římov and Jiřická reservoirs) we compile the genomes of all significant microbial and viral members of the community. The long-term goal is to reveal significant events in the evolutionary history of (fresh-)water microbial communities.

Diversity of freshwater bacteria – (i) we study the seasonal and spatial dynamics of the populations of planktonic bacteria using molecular methods (CARD-FISH, ribosomal diversity – amplicon sequencing) in freshwater reservoirs, lakes and ponds; (ii) we gain more information about their genomics, ecophysiology, and the evolutionary history of this important family of freshwater bacteria using targeted isolation of bacteria of the genus Limnohabitans; (iii) we deal with the description of new species of freshwater bacteria and their viruses.

Planktonic picocyanobacteria – we study diversity, genetic variability and the role of freshwater picoplanktonic cyanobacteria that are not sufficiently explored in comparison with widely studied marine species. We focus on (i) the isolation of a wide range of picocyanobacteria strains from different types of eutrophic freshwaters; (ii) their re-detection in nature by genetic probes; (iii) determining their role in food chains; (iv) comparison of genomes of these picocyanobacteria species with their marine relatives.

Ecology of fish and zooplankton

Ecology of juvenile fish stages – we focus on the study of diurnal vertical and horizontal migrations of juvenile carp and perch fish in reservoirs and lakes and ecological causes as well as the consequences of these migrations. Furthermore, the influence of management and nutrient loading on selected dam reservoirs on the main characteristics of juvenile fish communities (species composition, abundance, distribution, growth rate) will be studied.

Time-spatial ecology of fish – we focus on the study of the time-spatial distribution of fish in artificial and natural water bodies. Emphasis is

placed on clarification of the diurnal and seasonal aspects of fish distribution, the influence of abiotic and biotic factors and the understanding of intra- and interspecific differences in the habitat distribution and use. The research of the space-time distribution is linked to other aspects of ecology of species and communities (food interactions, population genetics and physiological adaptations), and will be integrated into a more general concept of ecology and function of fish in freshwater ecosystems.

Ecology of fish behaviour – we study the protandric behaviour of males of the Aral asp and individual strategies of individuals to maximize reproductive success. Other subjects of the research are climatic changes and predation on the course of breeding and survival of fish eggs in the model system of Asp/Bleak. Special attention is paid to the change of the water regime under hydropower plants and its impact on the mortality rate of fish eggs with potential global overlap on productivity and biodiversity in running water.

Food ecology of fish – we study interactions between biotic components of the aquatic environment on different time and space scales. Properties of food webs, energy flows and nutrient cycling in freshwater ecosystems will be studied. Ecological and anthropogenic factors that determine the structure and function of food webs in dam reservoirs and mine lakes will be assessed. Emphasis will be put on the research of the functional role of fish and invertebrates in large aquatic ecosystems.

Ecology of fish and zooplankton communities – we study changes in the composition of fish communities in long-term monitored dam reservoirs and newly emerging mining lakes. The abiotic and biotic factors responsible for the changes will be identified and, in particular, the intra- and inter-species interactions and implications of predator-prey relationships on the resulting structure of fish communities will be studied. The group also focuses on the study of eco-physio-genetic adaptations of zooplankton in the context of colonization of newly formed large lakes, sharing and differentiation of ecological niches with new invasive species and adaptive responses with regard to the variable and manipulative structure of the trophic pyramid in deep valley reservoirs.

Population dynamics of fish – we focus on studying the dynamics of fish populations and their relation to the environment. We try to obtain quantitative data and use them in ecological models to explore the role played by biotic (primary and secondary production, competition) and abiotic (water quality and temperature) factors for fish survival, growth, reproduction and population dynamics of target species. This information will then be used in mathematical models to simulate population dynamics of fish according to different management modes (fish stocking regime, fishing pressure and fishing rules) and climate scenarios (temperature and water level fluctuations).

Institute of Parasitology

The Institute of Parasitology performs mainly basic and partially applied research on human and animal parasites. It focuses on the study of life cycles, host relationships, evolution, and molecular aspects of unicellular and multicellular parasites of humans, livestock and fish. Significant attention is also devoted to the study of ticks and diseases transmitted by them. The common aim is a methodologically diverse, internationally successful, comprehensive research of parasitic organisms. The research in the Institute of Parasitology is organized on a long-term basis according to thematic areas of individual laboratories into the following sections: 1/ Molecular parasitology; 2/ Biology of transmitters and transmitted diseases; 3/ Evolutionary parasitology; 4/ Medical and veterinary parasitology.

photo: Laboratory of Electron Microscopy

Molecular parasitology

Molecular biology of protozoans – we study: (i) molecular and cell biology, life cycles and strategy of diplonemids; (ii) functional analysis of *Trypanosoma brucei* proteins involved in heme metabolism, synthesis of iron-sulfur clusters, transition from one developmental stage to another and interactions with the host; (iii) study of the evolution, diversity and unique molecular aspects of insect trypanosomatids.

Functional biology of protozoans – we study the mechanisms responsible for the metabolic changes occurring during the life cycle of *Trypanosoma brucei*. We focus mainly on the ability of mitochondria to function as a signalling organelle that determines cell metabolism. Furthermore, we map the metabolic potential of the mitochondria in infective stage trypanosomes, which is used to successfully infect various mammalian host tissues.

RNA of biology of protozoa – we use methods of molecular biology and biochemistry to study the maturation of transfer RNA (tRNA) and its role in the regulation of gene expression in parasitic protozoans. Our research is predominantly focused on cellular localization of processes involving modification, editing and splicing of tRNA, since these modifications provide control mechanisms for protein synthesis in the cell.

Biology of transmitters and transmitted diseases

Molecular ecology of vectors and pathogens – we study (i) species diversity of *Borrelia* from the complex of agents of Lyme disease, their biogeography and evolution; mechanisms of the pathogenesis of *Borrelia* and the causes of their adaptation to persistent infections; (ii) adhesion mechanisms of *Borrelia* surface molecules and relapsing fever agents; interaction of surface molecules with factors of the inner environment of ticks; (iii) molecular factors of natural immunity of host cells after infection with tick-borne encephalitis virus; interaction of genomic and subgenomic RNA flaviviruses with host and viral proteins.

Arbovirology – we study pathogenesis of significant arbovirus infections, with particular emphasis on tick-borne encephalitis (virus-brain interactions, role of blood-brain barrier in the development of neuroinfection, central nervous system immune response); we develop and test new antivirals active against medically important flaviviruses.

Electron microscopy – we perform (i) the latest preparation methods of preparations for 3D applications of high-resolution scanning electron microscopy (improvement of all key steps aimed at visualizing complex 3D structures); (ii)

we develop new biomarkers for correlative and cryo-electron microscopy, such as, in particular, non-toxic markers for finding individual molecules in the complex cell environment.

Tick-borne diseases – we focus on: (i) the study of essential biochemical pathways of the ticks in order to produce and test vaccines and drugs against ticks (improvement of existing Ferritin 2 based vaccine); (ii) introduction of complete transmission lab models for borrelia, babesia and anaplasma to test candidate tick proteins involved in the tick-parasite interaction using the RNAi method.

Genomics and proteomics of vectors – we study the characterization of tick saliva molecules, especially protease inhibitors and non-coding RNAs, which have the potential for new medical and biotechnology applications. We test their role in the tick-host interaction, focusing on their influence on manipulation of homeostasis and immunity in the host.

Immunology of vectors – we study the intestine of the *Ixodes ricinus* tick as an organ responsible for its vectorial competence. We will focus on the nutritional factors of host blood that are necessary for the development and reproduction of ticks. Furthermore, we will study the regulation of the digestive system and the immune response in the intestine of the ticks that affect the intestinal microbiome and its interaction with borrelia.

Evolutionary parasitology

Evolutionary protistology – we primarily study molecular phylogenesis based on: (i) proteomes of organelles in chromerid algae *Chromera velia* and *Vitrella brassicaformis;* (ii) their allelopathic interactions; (iii) heterotrophic flagellates from the Bicosoecida (Stramenopila) group.

Environmental genomics – we discover factors influencing the expansion of planktonic eupelagonemids, one of the most numerous and species-rich eukaryote groups, and their role in the ocean ecosystem. At the same time, we are creating a predator-prey model system to uncover the molecular mechanisms of adaptation of heterotrophic flagellates to different types of food strategies.

Molecular ecology and evolution of parasites – we study host specificity and co-evolutionary history that determine migratory abilities and population structure of parasites. We will focus on the influence of these factors on the formation of genomic diversity and speciation of new species in several parasite-host model systems, especially mammalian ectoparasites and fish helminths.

Genomics and protozoan diversity – we perform comparative genomics of parasitic, commensal and free-living protozoa in order to understand genomic evolution of parasites and secondary free-living species. We will also focus

on studying the diversity and interactions of parasites with the human intestinal ecosystem.

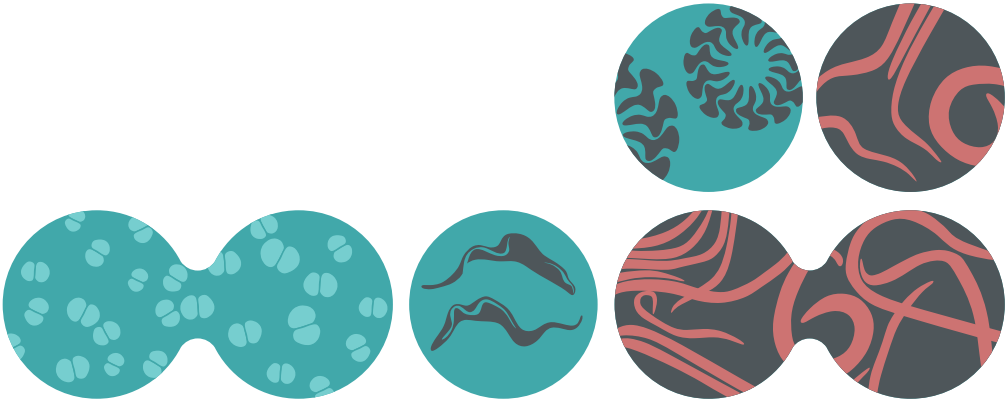
Medical and veterinary parasitology

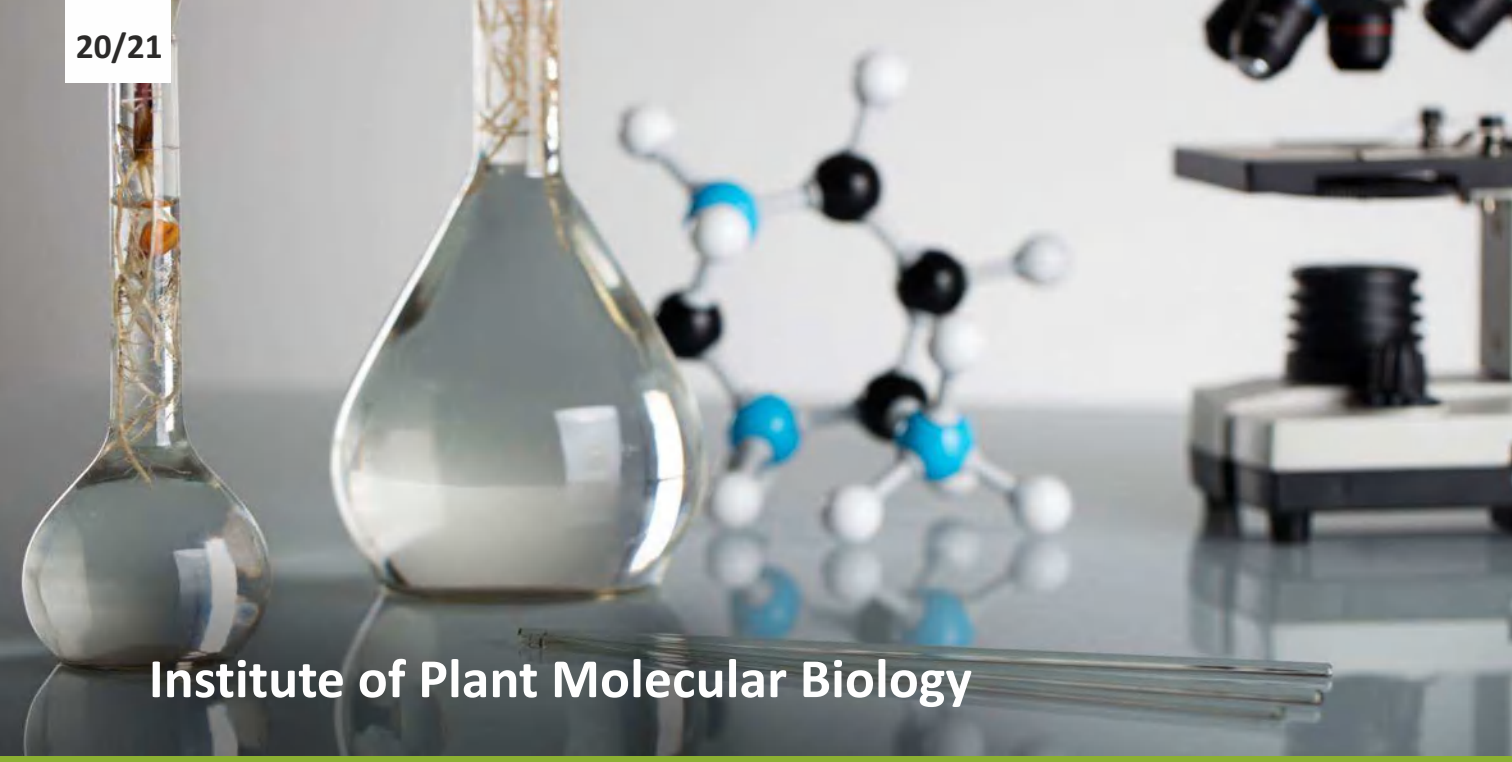
Helmintology – we study: (i) the integrative taxonomy and diversity of trematodes and tapeworms and their life cycles; (ii) systematics and evolution of tapeworms and fish nematodes; (iii) ecology of trematodes and their roles in the functioning of ecosystems; (iv) parasitic diseases transmitted by fish, so-called fish-borne diseases, e.g. the fish tapeworm *Diphyllobothrium latum*.

Fish protistology – we study mainly myxozoa, microparasites from the group of anemones in order to clarify: (i) the hidden diversity; (ii) the origin of the parasitism; (iii) phylogenesis and (iv) molecular mechanisms of host-parasite relationships of myxozoa and fish, including host immunology and parasite escape from its immunity. Everything is based on our unique laboratory model of the proliferative stage of myxozoa.

Veterinary and medical protistology – our efforts are aimed at understanding diversity, biology, host-parasite relationships and the co-evolution of cryptosporidia parasitic in rodents and birds. We also study the virulence, the spread by organism and drug resistance of genotypes of the widespread human parasite *Encephalitozoon cuniculi*.

Parasitic therapy – we study the role of candidate intestinal eukaryotes (helminths, protozoa) in human health and disease. We focus on (i) assessing the immunomodulatory capabilities of these eukaryotes with an impact on the host, (ii) identifying their active substances with anti-inflammatory properties, and (iii) studying the diversity of intestinal protozoa in human populations with varying levels of modern lifestyle.





Institute of Plant Molecular Biology

The Institute of Plant Molecular Biology deals with comprehensive plant research at the molecular level, which includes plant genome, structure and function of cells, understanding of epigenetic mechanisms, functional genomics of plant metabolites, molecular principles of photosynthesis, biophysics, biochemistry and molecular biology of metal metabolism and molecular biology of plant pathogens. The institute research program is concentrated in six main areas, some with the cooperation of several research groups.

photo: iStock

Virology – we study plant, fungal, lichen, moss, bacterial viruses and phytoplasma, their biological properties and vector relationships with molecular-biological methods, using new generation sequencing (NGS).

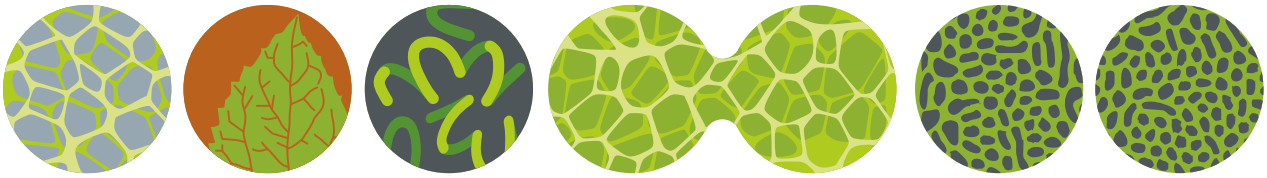
Photosynthesis – we study: (i) light-harvesting and photo-protective functions of pigment-protein complexes from photosynthetic organisms, especially using methods of optical spectroscopy and proteomic techniques: (ii) regulation of the development of plant stomata and their function depending on environment conditions, using modern molecular-biological methods.

Molecular genetics – we characterize functional genomics of hop using bioinformatic and molecular genetic methods for the production of lupulin and secondary metabolites. We analyze mechanisms of pathogenesis, propagation and evolution of plant viroids.

Molecular cytogenetics – we study the recognition of repetitive DNA sequences and their influence on the organization and evolution of the plant genome, the development of new bioinformatics for sequence analysis using next-generation sequencing and structural and functional analysis of plant centromeres.

Biophysics and biochemistry of plants – we study biophysics, biochemistry and molecular biology of photosynthetic organisms (algae, bacteria and higher plants) with a focus on metal metabolism (intake, physiological utilization, toxicity and detoxification) and photosynthesis regulation.

Plant epigenetics – we focus on the role of epigenetic mechanisms in the regulation of photoautotrophic growth of higher plants, bryophytes and green algae, and the evolution of the Polycomb repressive system in the green algae and embryophytes.



Institute of Soil Biology

The Institute of Soil Biology develops the multidisciplinary field of soil biology, i.e. soil zoology, microbiology, chemistry and micromorphology, and addresses basic issues related to soil formation, fertility and regeneration. Activities focus on the research of the structure and dynamics of the soil organisms in natural and anthropogenically influenced ecosystems, interactions among soil animals, microorganisms and abiotic components of the soil environment, study of humus formation and transformation, and the cycle of biogenic elements in soil. The institute research program is concentrated in three main areas, in two of them several research groups cooperate.

photo: iStock

Microbial processes in soil environment

Microorganisms and environments – we study the diversity and genetic potential of soil actinomycetes to produce secondary metabolites, biological relationships of actinomycetes with other soil organisms and humans. We investigate the influence of microorganisms on the behaviour of drugs in soils. We use cultures of microorganisms stored in BCCO (Biology Centre Collection of Organisms; www.actinomycetes.cz).

Bacterial adaptation – we study mutual interactions among resident soil microorganisms, microorganisms entering the soil with organic matter and environmental factors that modulate formation of ecological communities. We focus mainly on the processes of coalescence, competitive exclusion and selective environmental pressure influencing microbial biodiversity, as well as potential health risks in soils affected by intense human activity.

Soil microscopic fungi – we study the degree of biodegradation of plastics by soil fungi, focusing on: (i) the biodegradability of different types of plastic waste with the help of mushrooms in the short and long term; (ii) mechanisms used by fungi in plastic degradation processes. We continue to enrich the Collection of microscopic fungi of USB with fungal strains isolated from different environments.

Soil algae – we study: (i) diversity and function of soil algae and cyanobacteria in soil, especially during ecological succession; (ii) ability of different algae and cyanobacteria to survive in extreme habitats. Another area is the integrative (polyphasic approach) taxonomy and diversity of cyanobacteria and algae using the potential of strains from our own collection isolated from the soils all over the world.

Soil gases – we study the production of gaseous metabolites in soils and their emissions into the atmosphere. We concentrate on the role of soil invertebrates in methane production, on methane formation during decomposition of xenobiotics and on the possibility of reducing emissions of nitrogen oxides, methane and carbon dioxide from agricultural soils.

Ecology and functions of soil fauna

Extreme ecosystems – we study mainly the role of soil microfauna in the soil carbon cycle in different ecosystems and under the influence of various factors. We focus on extreme ecosystems where the relative role of the microfauna is greatest. We also identify main factors governing the development of invertebrates in the soil and their interactions.

Fauna of anthropogenic ecosystems – we study the structure of soil invertebrates in natural and

anthropogenically influenced ecosystems. We focus primarily on changes of communities in agricultural lands in the context of transition to environmentally friendly farming practices. Another area is the study of taxonomy of soil animals, including the use of molecular approaches.

Fauna of natural ecosystems – we study the parameters of soil meso- and macrofauna communities to assess and evaluate: (i) the impact of different management and long-term changes occurring in mountain and alpine ecosystems; (ii) direct and indirect impacts of artificial snow on the soil and its recovery, and (iii) long-term changes during secondary soil succession.

Functional biodiversity – we focus on the issues of coexistence of species in soil and processes that determine it. We will look at what role evolution plays in the current composition of communities. To explore the soil mesofauna communities in different ecosystems, we use both phylogenetic approaches and approaches based on functional properties of species.

Carbon cycling in soil – we study the supply of various forms of labile carbon into the soil and its influence on decomposition of organic matter and deposition of carbon in the soil. An important part of the research is the share of plants, fauna and microorganisms in these processes and climate change affecting these processes, such as the increase of CO_2.

Nanobiotechnologie

Use of magnetic (nano)materials – we study the preparation of new types of materials exhibiting magnetic response and their subsequent use in various areas of biological sciences, biotechnology and environmental technologies, for the isolation, detection and determination of target biologically active substances and xenobiotics, immobilization of nano- and microstructural materials and conversion of diamagnetic (nano)materials to magnetic materials. Attention will also be paid to the use of non-traditional materials and procedures in this area.

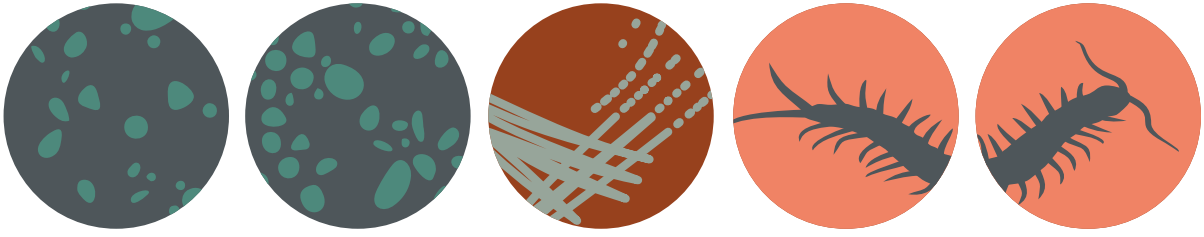


photo: V. Pižl

SoWa Research infrastructure

SoWa conducts its own research and provides services to other research entities in key issues of soil and water interaction. Emphasis is placed on interactions determining flows of water and main nutrients (especially N and P) through the ecosystem. There is particular emphasis on ecosystems under strong anthropogenic pressure. Many SoWa laboratories work closely with laboratories of Institute of Hydrobiology and Institute of Soil Biology.

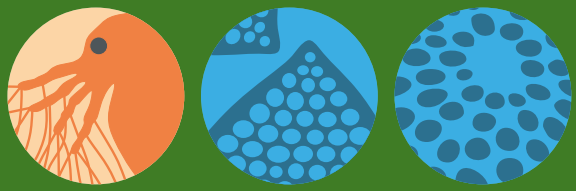
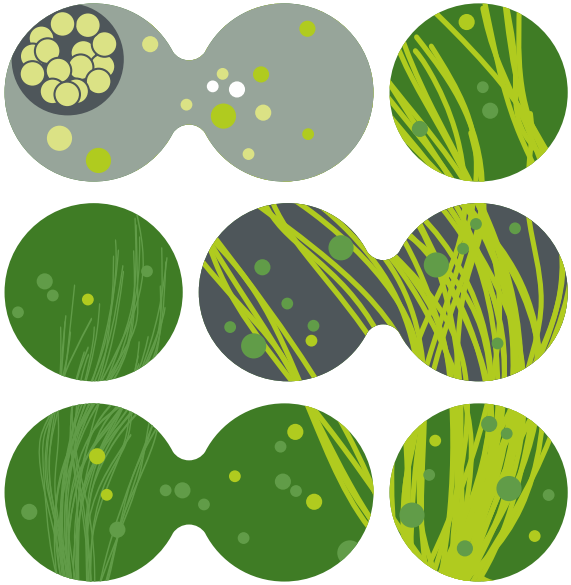


photo: J. Kopáček

Microbial communities on oxygen gradient – we study the structure and ecological role of soil fauna microbiome. Furthermore, we study oxygen gradients in soils, limitation of microorganism collections by choosing an inoculum.

Biotic and abiotic interactions in soil – we investigate interactions between plant roots, soil biota, and abiotic soil environment, and the role of these interactions for the development of ecosystems in different spatial scales, from aggregates to the whole ecosystem.

Communities of valley reservoirs – we study changes in the composition of fish communities in long-term monitored reservoirs and newly created lakes, distribution, energy flow functions, abiotic and biotic factors affecting it.



Sediments – we study the main processes governing the transformation of C, P and Fe in sedimenting seston, focusing on the importance of organic matter stabilization by metals, mainly Fe. We also investigate the consequences and significance of sediment disturbances or flood events for the aquatic ecosystem.

Use of stable isotopes in ecology – we study the isotopic composition of molecules as biomarkers of nutrient turnover, organic matter and microbial communities in water and soil.

Chemical processes – we study chemical processes in the soil environment that affect the transport of mineral and organic matter to surface waters. We study photochemical transformation of dissolved organic matter and its complexation with metals.

R&D – Business Partnership

Areas for International Cooperation

Institute of Entomology

- Targeted mutagenesis and homologous recombination – tools for editing the genome of insect models.
- Hormonal and genetic control of insect development with a focus on the juvenile hormone signalling pathway in insect development.
- Molecular differentiation of sex chromosomes and their role in butterfly evolution and speciation.
- Physiological, cellular and molecular regulatory mechanisms of circadian rhythms.
- Physiological, biochemical and molecular mechanisms of stress response in insect organisms.
- The study of theoretical fundamentals and mechanisms preserving biodiversity through mathematical models of population and evolutionary ecology.
- Mechanisms of creation and preservation of biodiversity in tropical ecosystems.
- Biology of endangered insect species and the preservation of biodiversity in temperate zone ecosystems.
- Phylogeny of entomophatogenic nematodes and their symbiotic bacteria with a focus on their coevolution.

photo: iStock

- The study of interactions between pathogens, herbivores and predators.
- Formation and dynamics of insect communities in aquatic and wetland ecosystems.

Institute of Hydrobiology

- Processes of acidification of the mountain lakes and their catchments.
- Eutrophication of water ecosystems as a result of external and internal nutrient loading.
- Photochemical processes involved in the transport of macro- and micronutrients via dissolved organic matter from soils to aquatic systems.
- The role of sediments and organic matter in the internal cycling of nutrients in lakes.
- Bacterioplankon composition, function and biogeography, factors regulating bacterial growth and mortality rates.
- Bacteria mediated decomposing processes in aquatic ecosystems.
- Long-term trends in developing of microbial food webs in reservoirs and changes in the phytoplankton in response to global climate change.
- Phytoplankton primary production, ecology and composition.
- Effects of extreme rainfalls on phyto-plankton structure and composition along the longitudinal gradient in reservoirs.
- Competition mechanisms among dominant phytoplanktonspecies.
- Polyphasic approach in taxonomic classifi-cation of cyanobacteria.
- Constrains and limits of biological recovery from acid stress.
- Analyses of long-term changes in the fish and zooplankton of model reservoirs.
- Research of newly colonized biotopes of lakes in former coal quarries.
- Development of fish sampling strategies, hydroacoustic sampling, netting approaches for fish sampling
- Complex fish stock assessment, combination of multiple sampling approaches into the complex assessment.
- Stock assessments in large inland waters across the world.

Institute of Parasitology

- Functional analysis of RNA editing in *Trypanosoma brucei*.
- Analysis of dyskinetoplastic trypanosomes.
- Diagnostics and epidemiology of European leishmaniasis.

- The assembly of iron-sulfur clusters in *Trypanosoma brucei*.
- Novel protists from corals; Diatom genomics.
- Mosaic biosynthetic pathways and evolution of eukaryotes.
- Apicomplexan parasites of invertebrates.
- Role of the only tRNA intron in trypanosomatids. Nuclear export of tRNAs in trypanosomes.
- Antimicrobial peptides in the immune system vectors of the *Borrelia burgdorferi*.
- Tick-borne encephalitis virus-host interaction.
- Tick Innate Immunity. Tick gut and blood digestion. Iron metabolism in ticks.
- *Ixodes scapularissalivary* cystatins facilitate tick blood feeding and pathogen transmission.
- Transcriptomic approaches in arthropod salivary glands. Salivary antigens of *Triatoma infestans*.
- Antigens for anew vaccine against ticks and ticktransmitted diseases.
- Lyme disease transmission model. Babesiosis transmission model.
- Anti-tick vaccines to prevent tick-borne diseases in Europe.
- Unique culture collection of amphizoic amoebae from different aquatic habitats and hosts, with hundreds of different trains.
- Immune response in gastric mucosa during *Cryptosporidium muris* infection.
- Molecular epidemiology of cryptosporidiosis. Epidemiology and immunology of microsporidiosis.

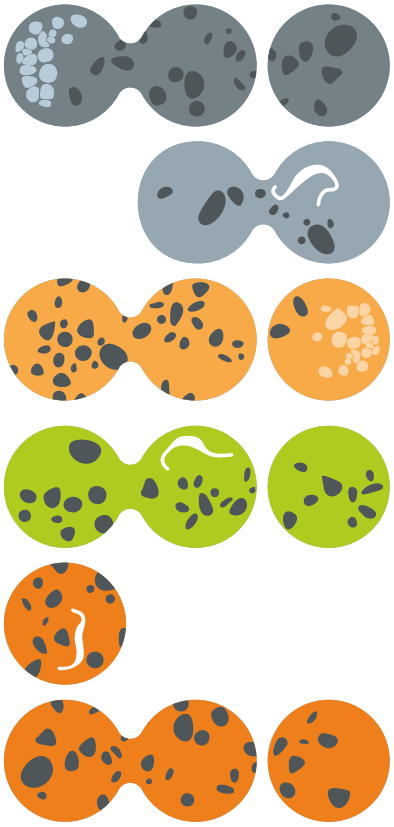
Institute of Plant Molecular Biology

- Research on diseases caused by viruses, phytoplasmas and bacteria. Focus on diseases of brassicas, legumes, small fruits and fruit trees that are difficult to diagnose.
- Development of molecular diagnostics, including those based on microarrays.
- Structure and function of photosynthetic membrane pigment-protein complexes.
- Research on plant nucleases, their function and potential utilization in medicine as an anti-cancer agents.
- Analysis of viroid evolution and pathogenesis.
- Functional genomics of hop, analysis of plant transcriptional factors in relation to metabolome regulation and analysis of mechanisms of gene silencing in relation to viroid propagation and pathogenesis.
- Study of plant genome organisation at the chromosomal, subchromosomal and molecular levels.

- Structural and functional analysis of repetitive DNA, and their impact on genome organization and evolution.
- Development of novel approaches for effcient mapping of complex plant genomes.

Institute of Soil Biology

- Diversity and dynamics of soil organism assemblages.
- Taxonomy and biology of soil organisms.
- Interactions between soil fauna, microorganisms and environmental conditions.
- Enzyme and metabolic activity and ecophysiology of soil microorganisms and invertebrates.
- Soil organic matter transformations and role of soil microorganisms in carbon and nitrogen cycle.
- Emissions of gaseous metabolites from soil.
- Soil metagenomics.
- Isolation and culture collections of soil microorganisms.
- Screening of soil organisms for the production of substances with potential therapeutic or biotechnological importance.
- Anthropogenic impact (agricultural practices, pollution, mining) on soil organisms.
- Antibiotic resistance in soil microorganisms.
- Mobile genetic elements as a driver of functional diversity in soil microorganisms.
- Reclamation of post mining sites and bioremediation.
- Isolation of bacterial plasmids from environmental samples.
- Bioindicative organisms for ecotoxicological



Technologies of the Biology Centre with commercial potential

TOXI-AUTO

BSL-3 robotic station for fully automated biological sample processing to allow further measurements in combination with various types of analytical instruments (not limited to a particular manufacturer). Generally usable station for both commercial and research bioanalytical laboratories, primarily for the analysis of xenobiotics (exogenous substances entering the organism from the environment, including drugs, pharmaceuticals, their metabolites, food, etc.), including analysis of endogenous metabolites. Designing, programming and tuning of the automatic operation of the robotic station allows preparation and processing of biological samples of various types (body fluids, such as urine, serum, cell extract, etc.) without supervision by the operator 24 hours a day. For the analysis of bioactive substances and toxic substances the device can be placed directly in the fume cupboard or other suitable space for handling such substances.

photo: iStock

Multi-user platform for analytical and data services

A software tool developed by BC, called Metabolite Mapper, and an associated database with profiles of specific metabolites. Metabolite Mapper is designed for automatic processing of data from analytical files generated by mass spectrometers. Since modern methods allow detection of hundreds of substances, the use of such a tool is necessary in research and during implementation of complex diagnostic methods in medicine, food industry, etc. Commercial use of the software and associated metabolomics database is provided through the cloud.

Diagnosis of viruses, viroids and phytoplasma using Next Generation Sequencing

Dozens of economically significant viruses are known to cause damage to the yield and quality of individual agricultural crops. There is no test capable to identify all the pathogens in one reaction. The use of Next Generation Sequencing (NGS) has the potential to detect all viruses in a plant sample (e.g. 22 viruses in a cherry); not only known viruses but also new disease-causing viruses, especially in case of multiple infections. It can be used not only in plant biology, where the current routine diagnosis of plant viruses, viroids and phytoplasma is based on ELISA (viruses) and polymerase chain reaction (viruses, viroids and phytoplasma), but also in agriculture. For example, for a specific area of genetic research aimed at the study of plant and animal genomes with the ultimate goal of generating agronomic enhancements, such as improving crop quality and yield, increasing plant resistance against pathogens, reducing herbicide use, improving plant breeding efficiency and increasing natural tolerance to abiotic stresses, such as drought or frost.

Diagnostics of the pre-clinical phase of American foulbrood with isothermal PCR

A diagnostic kit for the detection of American foulbrood, which is currently the most significant bee disease. The kit includes both isolation of whole genomic DNA and isothermal PCR itself. It allows early detection of the disease even before the clinical condition in the hive / at the site starts, when necessary steps can still be taken to prevent the infection from spreading and to save the bees. In the case of clinical manifestation, it is still necessary to comply with the applicable veterinary regulations and laws, including disposal of bee colonies, all combustible materials (hives, tools), setting a perimeter around the centre and subsequent several year monitoring of all bee colonies in this

area. The advantage of isothermal PCR against a classical procedure is a simplification of the entire process and shortening the reaction time to 30-50 min. Also, the sensitivity is higher than for classical PCR. DNA isolation remains, however, a necessity, and is therefore included in the kit.

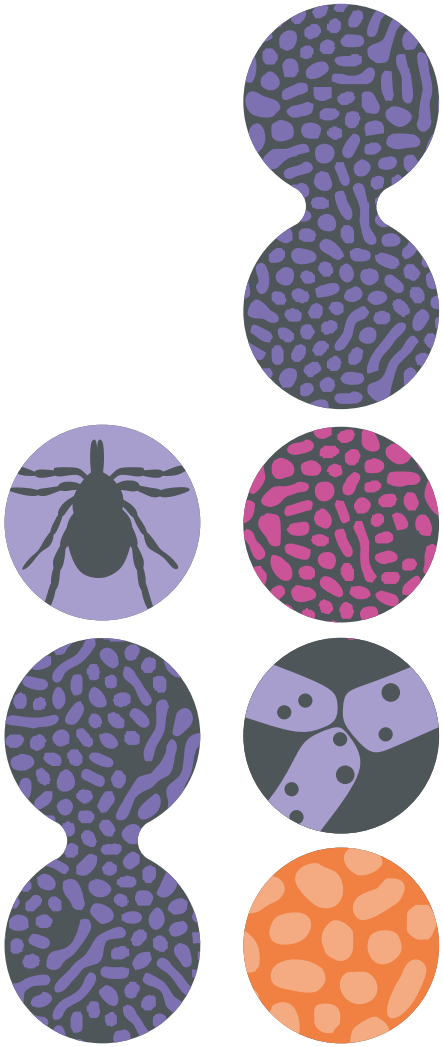
Therapy of immune-mediated diseases by means of preparations based on parasitic organism

In recent decades, there has been a steep increase in the prevalence of immune-mediated diseases (IMD) in humans both in advanced and developing countries. The increasing incidence of various IMDs is explained by generally improved hygiene, excessive use of antibiotics and, in particular, total dehelmintization. In addition to helminths, attention has recently turned to the human intestinal microbiome and the link between the intestinal microbiome and various civilization diseases, in particular IMDs. Dysbiosis of the intestinal microbiome appears to be another possible predisposing factor for the development of IMD (including, for example, Crohn's disease or ulcerative colitis). The results of recent studies show that microbiomes affect many physiological processes or the development of the immune system and its optimal diversity seems to be an integral part of human health.

In the case of the use of helminths in the commercial sphere for possible therapy of Crohn's disease and other IMDs, it is necessary to prepare a preparation with no risk of spreading the infection to the environment, thereby avoiding the infection of people in the vicinity of the patient undergoing biological treatment. From this point of view, it is necessary to test the protein extract from the helminth and to balance the optimal concentration of the total protein to be applied in order to stimulate the immune system and intestinal microflora.

EcoVault – software with database for storing a large volume of biological and ecological data

EcoVault is a database management system – a task researchers standardly delegate to software tools such as MS Excel, MS Access, Biota and others. However, EcoVault, is more intuitive than these other programs, working with it does not require deeper IT knowledge, and data from these programs can be exported to it and imported from it. EcoVault is a modern browser-based application with a user interface known to all who normally fill forms, filter and search for data on websites. The EcoVault interface also allows several users to work on a single dataset simultaneously, both on local networks and the worldwide network. The database has a basic



structure for working with taxons, samples, observations of individuals from different trophic levels, as well as for mutual specific interactions. Users can configure the system for individual projects based on their sampling and protocols, which can include adding user-defined variables, setting authentication rules, and setting rules for linking types or other variables.

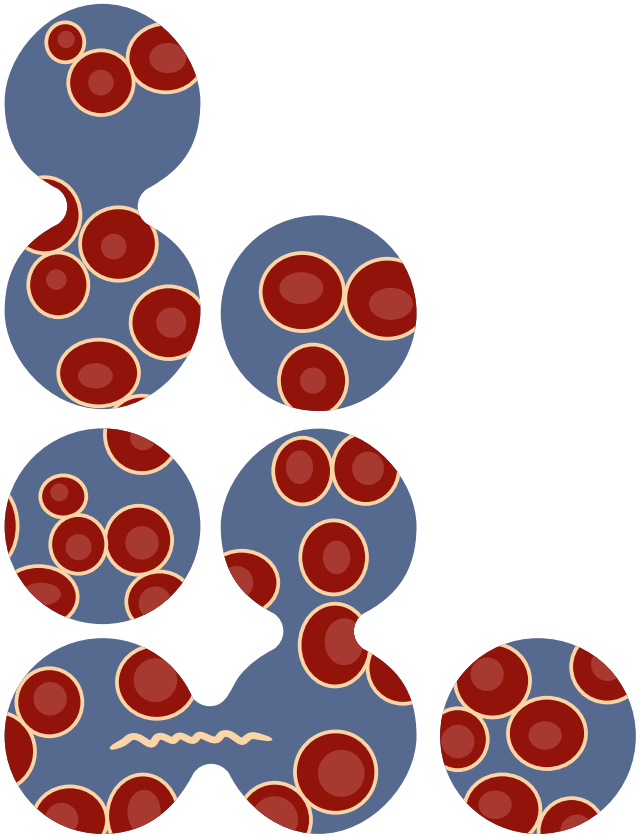
System for in vitro testing of anti-tick preparations and vaccines

Membrane feeding of ticks allows testing of anti-tick preparations and vaccines without the use of laboratory and experimental animals and therefore without the associated costs (purchase, breeding, operation). Membrane feeding greatly simplifies the entire testing process, and in addition to manipulation with animals itself, narcotics injections, which may have different effects on the test, and other injections are also avoided when testing organic compounds. In addition, the amount of test substances is lower in *in vitro* testing and the possibility of simultaneous testing of different preparations is greater than that of *in vivo* tests. This membrane feeding system allows you to work with all stages of development of ticks, i.e. also nymphs, which represent the stage with a highest risk for the transmission of infectious diseases. The ethical aspect is, however, also important, for example when testing anti-tick repellents, etc., it is

possible to apply for a certificate confirming the non-use of experimental animals, such as the Humane Cosmetics Standard – HCS.

Diagnosis of Lyme borreliosis with the help of markers of the early stage of the disease

This is a diagnostic kit for early diagnosis of patients with *Lyme borreliosis* which is able to detect the disease with higher efficacy than currently used tests. It also allows to diagnose the patient more quickly after tick infestation, especially when the patient is infected with rarer Borrelia pathogens. Although Lyme borreliosis is among the most intensively studied tick-borne diseases, there is no vaccine available for this disease so far. Current tests use markers of later stages of the disease, have an efficacy of about 70%, and are unable to detect the early stages. Lyme borreliosis does not cause death directly, but if the diagnosis is late, the spirochetes are able to settle in the body, for example, in joint fluid, and cause life-threatening health problems in patients, and there is a risk of relapse if the immune system is weakened. This test is ultimately able to save the costs of treating patients, as timely and accurate diagnostics will allow shorter treatment and reduce relapses and chronic disease states.



Transmission model of Lyme borreliosis

A reliable laboratory transmission model is necessary for routine testing of potential vaccines and preparations to prevent Borrelia transmission. At present, the workplaces of BC CAS are the only ones in the world to have a detailed transmission model including the European tick of *Ixodes ricinus* and the European Borrelia strains (in particular *Borrelia afzelii* – the most common borreliosis agent in Europe). In the US there is a transmission model for the American tick Ixodes scapularis and the American strain *Borrelia burgdorferi sensu stricto*. Due to different biology of the two systems, however, the US model cannot be used in European conditions. The transmission model developed at BC CAS worksites therefore has the potential to become sought after in the most important national and international projects on ticks and tick-transmitted pathogens, and at the same time also serves as a platform for applied and contractual research.

Testing parasiticidal and immunomodulatory substances to combat myxozoan infections in aquaculture using in vitro and in vivo models

Myxozoa are microscopic fish parasites whose spread can have a devastating effect on fish stocks in the wild, but especially in aquaculture. In addition, no legalized treatment of this disease is currently available. The parallel process of direct control of infection with parasiticides and simultaneous improvement of the host immune system, so-called immunomodulation, is a very effective approach to fighting this disease. However, a fully functional system for testing substances with parasiticide or immunostimulating properties is necessary for that purpose. The *in vitro* model with a focus on the blood stage is the key one for testing because most species of myxozoan dwell for at least a short time in their blood before attacking the target's organs. For immunostimulant testing, companies engaged in fish farming, nutrition for artificially reared fish and aquaculture in general, require an *in vivo* diagnostic system and the development of such a test model is a response to that need.

Special growing substrate

A special growing substrate ("smart growing substrate") with an increased resistance to diseases and pests. It is a substrate with added value (2 in 1 or 3 in 1) which is pre-colonized by strain CCM 8367 of entomopathogenic fungus *Isaria fumosorosea*, either alone or in combination with another bioagent based on the genus *Pythium or Trichoderma*, or, as the case may be, organic or mineral fertilizers. The substrate thus offers protection against significant plant pests that are part of a developmental cycle in the soil (e.g. root gnats (*Sciaridae*) and snout beetles (Otiorhynchus)). The use of entomopathogenic fungus preparations due to its very complex action on pests prevents the formation of resistance and does not leave residues. The CCM 8367 strain is highly virulent against butterflies and beetles, and it can be expected to be highly effective against rape pest complex. The fungus *Isaria fumosorosea* also has fungicidal effects in addition to insecticidal ones.

Use of a soil Actinomycetes collection to obtain therapeutically active substances

The resistance of many pathogens to antibiotics requires the search for new therapeutically active substances. An effective way to search for substances similar to known antibiotics is genomic analysis focused on the presence of genes necessary for the synthesis of antibiotics. The Institute of Soil Biology BC has created an extensive collection of actinomycetes, which is a potential source of unknown active substances. Most of the cultures belong to the family Streptomycetaceae (genera Streptomyces and Kitasatospora), however some other families are also represented (Pseudonocardiaceae: gg. Letznea, Amycolatopsis, Saccharothrix, and Nocardiaceae: gg. Nocardia). Representatives of the genus Streptomyces are known to produce many bioactive metabolites, which can be used in medicine as antifungal, antiviral, anti-rabies, immunomodification, antitumor drugs or as enzyme inhibitors. Furthermore, they can also be used in agriculture as insecticides, herbicides, fungicides or growth promoting substances for plants and animals.

Use of a soil Micromycetes collection to obtain biotechnologically useful substances

Soil microscopic fungi (Micromycetes) produce a number of industrially useful substances – enzymes, unsaturated (omega) fatty acids, antibiotics, pigments. In terms of application, they are attractive for food industry, agriculture and medicine. Collections of soil Micromycetes are potentially the source of such specific types of fungi that can be more effective producers of known substances, or producers of completely new substances. The collection of microscopic fungi contains over 2000 strains of predominantly filamentous fungi (ascomycetes, zygomycetes and anamorphic stages of Asco- and Basidiomycota) isolated from a variety of environments (soil, compost, waste, air, cave environment or invertebrate tracts and excrements, etc.). This currently represents a highly unique collection containing specific isolates that are not located in any other collection in the world.

photo: J. Jirout

Biology Centre In&For Society

Science Communication and Social Responsibility Institution

The Biology Centre is a „smart scientific institution" in the true sense. A great deal of emphasis is placed on two-way communication with the general public in the Southern Bohemian region as well as across the Czech Republic. We work to positively influence the lives of the population of the region and of the Czech Republic as a whole through encounters and dialogue with the general and professional public and stakeholders. In science communication, we focus on topics in biology and ecology, which are directed toward children and the education system as well. In this way, we are contributing to the efforts of raising a new first-class generation of scientists. We are focused on improving the quality of life of the individual as well as on the state of the environment in a national and international context.

Our goal is to conduct research whose results are in&for society.

Come join us!

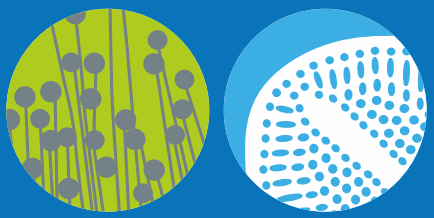


foto: J. Miklín

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