



## **Faculty of Science**

**University of South Bohemia in České Budějovice, Czech Republic**

### **Academic policies and regulations in doctoral study**

#### **Basic information**

Faculty of Science (FS) is a part of the University of South Bohemia in České Budějovice. It was founded in 1991 and in the academic year 1992-93 it was approved for doctoral studies. Great majority of teachers and tutors works in the institutes of the Academy of Sciences of the Czech Republic (AS CR). Ph.D. students have a full access to the research and information facilities either at the Faculty and in the affiliated institutes which involve: Biology Centre AS CR (Institute of Entomology, Hydrobiological Institute, Institute of Parasitology, Institute of Plant Molecular Biology, Institute of Soil Biology), Institute of Botany AS CR, Institute of Animal Physiology and Genetics AS CR and Institute of Vertebrate Biology AS CR.

The Faculty is a vibrant, active school which provides education and an excellent research environment in a number of areas of modern biology. It offers study programmes on three levels: bachelor's, master's and doctoral studies. The faculty is divided into 12 departments. A head of the Faculty is the Dean, which is supported by four Vice-Deans and the Secretary of the Faculty. There are currently over 100 full-time staff including 25 professors and over 150 Ph.D. students. The Faculty occupies two modern buildings; several other laboratories and lecture rooms are shared with the institutes of the Academy of Sciences. The Faculty and affiliated institutes are well equipped and most of joint research laboratories provide a very spacious and pleasant working environment.

#### **Doctoral study at FS**

The intention of doctoral study is the education for highly qualified scientific and research work. The main duty of Ph.D. students is seen in an individual work on their thesis. During the study programme which lasts 3 or 4 years (and can be interrupted for up to 2 years), the students enlarge their knowledge in a specific field of study. They attend recommended lectures and courses and also are involved in teaching of undergraduate students. Each year the students have to give a seminar or talk focused on the methodology (first year) and results of own experimental work. The students are encouraged to present the results on international conference(s). The study is finished by the examinations and by the defence of doctoral thesis. The thesis preferentially comprises of published and accepted papers in recognized international journals (at least a part of the thesis must be published in the journal with the impact factor exceeding 0.5 in past 4 years).

The student is supervised by a tutor, who is responsible for high scientific background of the work.

The title Doctor of Philosophy (Ph.D.) in a given area of specialization is awarded to successful graduates.

Areas of specialization involve: Botany, Biology of Ecosystems (Ecology), Entomology, Hydrobiology, Molecular and Cell Biology and Genetics, Parasitology, Physiology and Developmental Biology (both animal and plant), and Zoology (see below for details).

## **Requirements**

Citizen of any country is eligible for the enrolment if he (she) meets the requirements for the selected area of specialisation, is able to meet the financial obligations related to the studies – tuition fees and the obligations with the residence in the Czech Republic.

## **Financial rules and stay in the Czech Republic**

Throughout the study students must conform to rules for stay of foreigners in the Czech Republic. Foreign students should meet the health standards which are required for all foreign nationals living in the Czech Republic. Czech side reserves the right to examine the health conditions of an applicant. Medical examination carried out by the faculty doctor before the enrolment is compulsory and is paid by student. Student is obliged to have a medical insurance for his (her) stay in the Czech Republic. All medical expenses are paid by student or using his (her) insurance.

## **Fees**

Study in Czech language is free of any fee. The annual composite fee (covering tuition, examinations, assessment, graduation) which applies for study in English is currently as follows: 4 000 Euro. More detailed information can be obtained at the bellow address.

## **Programmes (areas of specialization) for doctoral studies**

### **Biology: Entomology**

**Programme Director: Ass. Prof. Oldřich Nedvěd, PhD.**

Contact: phone (420)- 387772253; e-mail: nedved@entu.cas.cz

Co-operating institution: Institute of Entomology, Biology Centre of Academy of Sciences of the Czech Republic

**Characteristics:** Study specialization in entomology offers training of students in basic entomological disciplines and their general scientific basis with respect to modern, contemporary field and laboratory methods and laboratory equipment. All the tutors are actively working in the field in question and most of them represent distinguished specialists in entomology. Subjects of Ph.D. theses are related to both the general and/or theoretical research in (arachno-) entomology, i.e. morphology, physiology, genetics, systematics and taxonomy, and fylogeny, as well as to the applied research (e.g. integrated plant protection or protection of biodiversity). Knowledge acquired enables future professional career in both specialized institutions and companies (e.g. plant protection and biological control in agriculture and forestry, management of environment, protected areas) and in basic research or university activities. Students are trained to

application of modern methodical approach in their work and to be able to summarize their results in original scientific publications or oral presentation in English.

**Areas of Ph.D. research:** Effects of natural plant substances on development, metamorphosis and endocrine regulation on insects. Study of ultrastructure and ontogenetic changes of insect cuticle. Relations of herbivores and plants in the tropical rain forest ecosystem. Relations of diapausis and cold resistance in some species of Heteroptera. Taxonomy of selected insect groups (e.g. Ephemeroptera, Diptera). Aphidophagous insects and their use in biological control.

## **Biology: Hydrobiology**

**Programme Director: Prof. Karel Šimek, PhD.**

Contact: phone (420)-387775873; e-mail: ksimek@hbu.cas.cz

Co-operating institution: Hydrobiological Institute, Biology Centre of Academy of Sciences of the Czech Republic

**Characteristics:** The doctoral programme in hydrobiology assures training of students in various areas of current limnology, dealing mainly with production, microbial and chemical processes and nutrient transformation in reservoir and lake ecosystems and their watersheds. In the scope of the programme, one can select specific topics of fundamental research of different aspects of functioning of reservoir and lake ecosystems. Alternatively, a holistic approach or other approaches suitable in applied research and water management area are taught. Specific aspects of fundamental research can be solved by means of cultivation of organisms under controlled conditions in simplified model systems. Special attention is paid to acquiring the proper experimental and monitoring skills, supporting the students' ability of an appropriate planning of experiments, sampling strategy, and the adequate statistical evaluation. The research conducted by doctorates combines applications of modern methodical approaches and sophisticated laboratory instruments, being based on a tight collaboration between the Biological Faculty and Hydrobiological Institute AS CR. The doctoral graduates will: (i) acquire competency as autonomous researchers in the field of limnology, (ii) be able to plan and carry out their own original limnological research and disseminate its results and implications, and (iii) this will enhance their capacity of competition for academic and professional posts in the public and private sectors (water management authorities).

**Areas of Ph.D. research:** Nutrient resources in watershed and their transport by streams and rivers to reservoirs and lakes. Chemistry and microbiology of sediments in reservoirs and lakes – importance for nutrient cycles. Mathematical modelling of hydrodynamics, eutrophication, and water chemistry in reservoirs. Feeding biology of fish, spatial distribution of fish in reservoirs and lakes, interactions fish-zooplankton. The zooplankton population structure in relationship to environmental conditions in lakes and reservoirs. Trophic relationships within predaceous crustacean zooplankton. Life strategy and migration of the genus *Daphnia*. Ecological interactions in reservoir and lake phytoplankton communities. Extracellular enzyme activities in a water environment: ecological significance, resources, kinetics. Factors shaping bacterial dynamics and community composition in lakes and reservoirs. Food-web interactions of pelagic protists with bacteria and phytoplankton.

## **Biology: Parasitology**

**Programme Director: Prof. Iva Dyková, DSc.**

Contact: phone (420)-387775415, e-mail [iva@paru.cas.cz](mailto:iva@paru.cas.cz)

Co-operating institution: Institute of Parasitology, Biology Centre of Academy of Sciences of the Czech Republic

**Characteristics:** This study program offers training in the basic fields of parasitology. The lectures and practicals are given by teachers engaged in parasitological research. They have at their disposal the most modern laboratory equipment. Topics of dissertations involve fundamental research of biology of parasitic organisms and their host relations and the region of medical and veterinary parasitology. With this knowledge the graduates will find working opportunities in basic research and specialised laboratories of medical and veterinary parasitology.

**Areas of Ph.D. research:** Human parasitoses: protozoan infections in immunodeficient patients, host-parasite relation including the immune response. Protozoan and myxosporean parasites in fish: morphology, life cycles and pathogenicity. Amphizoic amoebae – distribution in fishes, pathogenicity and molecular phylogeny. Biology, ecology and diversity of all principal groups of helminths parasitic in fishes. Molecular biology and biochemistry of parasites: phylogenetic relationships of selected groups of protists based on the analysis of ribosomal RNA genes; structure of mitochondrial DNA in various groups of protists. Molecular ecology of blood sucking vectors in relation to mechanisms of pathogen transmission: protein-saccharide interactions, immune reactions in disease vectors.

## **Botany**

**Programme Director: Prof. Karel Prach, PhD.**

Contact: phone (420)-387772220; e-mail: [prach@prf.jcu.cz](mailto:prach@prf.jcu.cz)

Co-operating institution: Institute of Botany, Academy of Sciences of the Czech Republic, Průhonice u Prahy and Třeboň

**Characteristics:** Education of students in all basic botanical disciplines including problems of both cryptogams and vascular plants. Lectures are performed by specialists experienced in very different branches of botanical science, who have usually long research practice and who participate in projects and scientific programs at the Faculty of Biological Sciences of the University of South Bohemia, or/and at the Institute of Botany of the Academy of Sciences. The teaching staff is complemented by the best young graduate students of the Biological Faculty who have the needed pedagogical level and who proved their scientific ability by results published in prominent specialised journals. The themes of dissertations and diploma theses represent a wide spectrum of botanical research. Several projects are closely connected with the essential program of Czech botanists, i.e. the elaboration of the complete Flora of the Czech Republic, but concern widely also important hydrobiological, ecological or landscape ecological problems. The complex of studies focused on problematic of speciation, diversification, and modern molecular taxonomy of cyanobacteria, algae, bryophytes and vascular plants, are particularly preferred. The most modern laboratory (genetic, physiological) and field methodological procedures (population biology, ecological and autecological approach) are used to this work; the methods oriented to investigation of ecology of plant communities, succession, invasive plants, role of plants in ecosystems and in landscape are the integral part of

educational procedures. Students participate in several important Czech or international research projects. The mastering in progressive methodology and in evaluation procedures, and oral presentation and preparation of published texts in English are the integral part of education. The graduate students have qualification for application in specialised scientific botanical and ecological disciplines, in water research and water management, in landscape ecology, nature protection, and as teachers of biology.

**Areas of Ph.D. research:** Taxonomy and ecology of cyanobacteria, algae and vascular plants, their speciation, diversification and function in ecosystems. Population ecology, dynamics and variability in population development. Fytogeography and chorology of higher plants. Geobotany. Co-existence and competition of species in plant communities. Invasive plants. Vegetation succession. Archeobotany and palynology.

## **Biology of Ecosystems / Ecology**

**Programme Director: Prof. Hana Šantrůčková, PhD.**

Contact: phone (420)-387772361; e-mail: hana.santruckova@prf.jcu.cz

Co-operating institutions: Institute of Entomology, and Institute of Soil Biology, Biology Centre of Academy of Sciences of the Czech Republic; Institute of Botany, Academy of Sciences of the Czech Republic, Průhonice u Prahy and Třeboň

**Characteristics:** The programme is focused on principles and methods of the contemporary ecology, with special attention paid to mechanisms of ecosystem functioning. The interactions among plants and animals, in both aquatic and terrestrial ecosystems are considered, with emphasis on the evolutionary consequences of ecological phenomena. Experimental approaches are emphasised, with courses on the design of ecological experiments and analysis of ecological data. Ecological theory is treated in several courses. The Ph.D. theses are mostly based on a research carried out in the institutes of Academy of Sciences.

**Areas of Ph.D. research:** Population ecology of selected species. Community ecology of plants and animals. Theoretical ecology and mathematical modelling of ecological systems. Mechanisms of species coexistence. Plant roots and their symbionts. Community ecology of soil organisms. Carbon and nitrogen cycling in soil and ecosystem. Greenhouse gas production in and emissions from soil. Soil biological processes and their impact on soil fertility/quality.

## **Molecular and Cell Biology and Genetics**

**Programme Director: Ass. Prof. Marek Jindra, Ph.D.**

Contact: phone/fax (420)-387775232; e-mail: jindra@entu.cas.cz

Co-operating institutions: Institute of Entomology, Institute of Parasitology, and Institute of Plant Molecular Biology, Biology Centre of the Academy of Sciences of the Czech Republic; Institute of Animal Physiology and Genetics of the Academy of Sciences of the Czech Republic

**Characteristics:** Independent thinking, good English, and motivation to strive to discover new things, even at the expense of one's own comfort, are the main prerequisites to succeed in this programme. Students are guided toward independent scientific research in

the fields of molecular, cell and developmental biology. They need to master molecular and genetic methods of work with diverse model organisms ranging from protists and yeast to plants and animals, and must be able to talk and write about their results in English. Student projects are secured by supervisors active in international research. Topics of Ph.D. theses derive from the aims of grant projects and rely on high level technical equipment as well as on international collaboration; most students experience a stay in a foreign partner laboratory. Their projects typically aim to clarify some of the fundamental issues of current biology, such as those concerning the regulation of cell functioning or differentiation. Students are also trained in molecular cytogenetics, gene engineering and animal and plant genetics; a special attention is devoted to techniques of genetic modifications. Graduates of this programme possess a broad theoretical and technical background, which allows them to find jobs not only in the basic and applied research, but also in health care, agriculture and in teaching.

**Areas of Ph.D. research:** Structure of proteins and nucleic acids. Function of mitochondrial proteins, mechanisms of transcription and RNA editing in parasitic protists (*Trypanosoma*, *Leishmania*). Evolution of the telomere structure. Sex chromosomes. Transcription factors and regulation of gene expression. Cell cycle and proliferation (growth factors, oncogenes and tumour suppressors). Development and differentiation (*Drosophila melanogaster* and *Caenorhabditis elegans* models). Molecular basis of photosynthesis. Genes encoding silk. Molecular mechanism of circadian rhythms. Transgenic approaches in plants and animals. Functional genomics of plant viruses. Repetitive sequences in eukaryotic genomes. Development of DNA chips.

## **Physiology and Developmental Biology**

The programme consists of two specialisations - (1) Anatomy and Physiology of Plants and (2) Animal Physiology and Developmental Biology:

### **1. Anatomy and Physiology of Plants**

**Programme Director: Ass. Prof. Jiří Šantrůček, PhD.**

Contact: phone (420)-387772353; e-mail: jsan@umbr.cas.cz

Co-operating institution: Institute of Plant Molecular Biology, Biology Centre of Academy of Sciences of the Czech Republic

**Characteristics:** The Ph.D. course offers advanced education in several main streams of plant physiology and anatomy. It is supported by the experience of supervisors, renewed scientists working in the Institutes of the Academy of Sciences of the Czech Republic, employing new biochemical and biophysical methods and hi-tech equipment in plant physiology, anatomy and ecophysiology projects. Subjects of the doctoral thesis are focussed on various topics of photochemistry of photosynthesis of higher plants, algae and cyanobacteria, on structural and functional aspects of biomembranes and on interactions of the leaf and the whole plant with environment (environmental and stress plant biology). The graduates will be competent in a broad scale of plant science research, agricultural, forestry, horticultural and biotechnology programs and should have advanced skills in scientific communication.

**Areas of Ph.D. research:** Photosystem (PS) II studies. Light induced degradation of PS II proteins. Structure and function of small PS II proteins. Adaptation of algae to abiotic stress. Fractionation of stable isotopes in photosynthesis and in plant metabolism. Function and structure of plant cuticle. Spatial heterogeneity of leaf and plant photosynthesis. Plant carbon economy and optimization of stomatal function.

## **2. Animal Physiology and Developmental Biology**

**Programme Director: Prof. Dalibor Kodrik, Ph.D.**

Contact: phone (420)-38-7775271; e-mail:kodrik@entu.cas.cz

Co-operating institution: Institute of Entomology, Biology Centre of Academy of Sciences of the Czech Republic

**Characteristics:** Study discipline animal physiology and developmental biology yields schooling in various general and specialised physiological fields. Basic research at molecular, cellular or organismic levels from the environmental aspect is being performed on insect, vertebrate and human models. Tutors are well known scientists working actively in the field with the help of modern methodology. Students learn to use the up-to-date methods of physiology, biochemistry, endocrinology, cell biology and immunology using computerised data acquisition systems and are trained to present their data at scientific meetings in English language. The acquired knowledge will allow them to apply for jobs at specialised biological, medical and veterinary laboratories at research institutes as well as at universities.

**Areas of Ph.D. research:** Regulations and mechanisms of metabolic adaptations to cold in insects and mammals. Physiological basis of cold hardiness. Adaptations of anaerobic metabolism of fish. Cold adaptation in man. Physiological and immunological mechanisms of fever. Regulatory mechanisms controlling insect diapause and mammalian hibernation. Mode of action of brain-gut peptides at cellular and molecular levels. Insect hormones - control of secretion. Insect hormone agonists and antagonists - practical aspects. Effect of plant protective compounds on nutrients utilisation of phytophagous insects.

## **Zoology**

**Programme Director: Ass. Prof. František Sedláček, Ph.D.**

Contact: phone (420)-387772258; e-mail: sedlacek@usbe.cas.cz

Collaborating institutions: Institute of Soil Biology, and Institute of Parasitology, Biology Centre of the Academy of Sciences of the Czech Republic; Institute of Vertebrate Biology, Academy of Sciences of the Czech Republic; Institute of Animal Physiology and Genetics, Academy of Sciences of the Czech Republic

**Characteristics:** The Ph.D. program provides teaching in basic zoological disciplines, supervised by tutors who are active zoological and ecological research workers able to apply modern methods and laboratory equipment. The topics of Ph.D. theses include problems and methodology of modern biology and ecology of the animals, especially animal phylogeny, tropical ecology, host-parasite coevolution, arthropod morphology, bird ecology and behaviour, mammal ecology, neuroethology and sociobiology, fish ecology, and amphibian population biology and biodiversity. Various orientations of Ph.D. theses help students to receive positions in fundamental and applied research institutes, environment protection (e.g. in national parks' and protected landscape regions' managements), forestry, agriculture, education, and culture (e.g. museums, ZOO's).

**Areas of Ph.D. research:** Phylogeny of selected animal taxa (e.g. Platyhelminthes, Arthropoda, Vertebrata). Experimental and evolutionary analysis of insect warning coloration and its relations to bird predacy. Influence of fluctuating temperatures on development and survival of the heterotherm animals; infraspecific geographic variability of the parameters of cold hardiness and diapause. Population and feeding ecology of fish. Phylogeny and historical ecology of the selected fish taxa (Cichlidae). Behavior, population biology and speciation of amphibians. Nesting biology, feeding ecology and habitat

preferences of selected bird species. Behaviour and sociobiology of fossorial mammals (Arvicolidae, Bathyergidae). Sense ecology and neuroethology of small mammals.

### About the place

České Budějovice is a capital of South Bohemia region. It is a historical city established in 1265 as one of royal towns by King Přemysl Otakar II. At present the number of inhabitants of the city is just around 100,000 (visit [www.c-budejovice.cz](http://www.c-budejovice.cz) for more information and photographs).

*Prof. Libor Grubhoffer, PhD., Dean*

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