UNIVERSITY OF PRESOV IN PRESOV
FACULTY OF HUMANITIES AND NATURAL SCIENCES
17. NOVEMBRA 1, 080 01 PRESOV, SLOVAK REPUBLIC

Admission procedure for PhD studies – full time form academic year 2026/2027

Pursuant to § 54 of Act No. 131/2002 Coll. on universities and on Amendments to Certain Acts, as amended by later regulations, the Dean of the Faculty of Humanities and Natural Sciences of the University of Presov announces the commencement of the admission procedure for PhD studies in the academic year **2026/2027** in internal and external form. The study is opened in 4 PhD study programs:

1. **Anthropology** in the field of study: **biology**

2. **Environmental ecology** in the field of study: **ecological and environmental sciences**

3. **Regional geography and regional development** in the field of study: **earth sciences**

4. **Theory of Physics Education** in the field of study: **physics**

Candidates can send applications for studies (using form „Application for university studies, PhD - third degree") by **1 June 2026**. Admission interviews will take place on 22 June 2026.

To the application the candidate shall attach:

1. Curriculum vitae - CV
2. Notarized copies of educational qualifications (diploma)
3. Form for applicants for PhD studies (the form can be found on the faculty´s website: Faculty of Humanities and Natural Sciences, students, PhD studies, menu, Forms and documents)
4. A list of published and unpublished works, citations and references, peer reviews of these works, if any, and a list of the results of other professional activities
5. Submission of a project proposal (in English) on the selected topic of the dissertation
6. List of grades (from the faculty´s study department)
7. Admission fee payment receipt: **50.- EUR**

paid by postal order (U type) to:	or by bank transfer to:
Prešovská univerzita v Prešove Dekanát Fakulty humanitných a prírodných vied Ul. 17. novembra 1 081 16 Prešov	**Bank:** Štátna pokladnica ***IBAN SK68 8180 0000 0070 0007 8256*** ***SWIFT SPSRSKBA*** **Variable symbol:** 103003 **Constant symbol**: 0308

In case of bank transfer, a signed bank transfer order, payment order or printed proof of payment via internet banking must be sent, stating the applicant's first and last name and signature. The deadline for sending is within 5 working days after payment, to:

Prešovská univerzita v Prešove
Fakulta humanitných a prírodných vied
Ul. 17. novembra 1
081 16 Prešov

The admission fee must be attached to the 3rd page of the application form, otherwise the application will not be accepted.

Filled-in applications should be sent to:

Fakulta humanitných a prírodných vied Prešovskej univerzity v Prešove
Oddelenie pre vzdelávanie
Ul. 17. novembra č. 1
081 16 Prešov
More information:: Mgr. A. Boldižárová (tel. no. 051/75 70 621, e-mail: anna.boldizarova@unipo.sk)

Dissertation thesis topics in academic year 2026/2027

Study program: Anthropology, full time study
Field of study: Biology

Prof. RNDr. Jarmila Bernasovská, PhD.

1. **Anthropometric Differences Between Roma and Non-Roma Newborns in a Temporal Context**

Supervisor: Prof. RNDr. Jarmila Bernasovská, PhD.

This study focuses on a comparative analysis of the anthropometric characteristics of Roma and non-Roma newborns, specifically birth weight, body length, chest circumference, head circumference, and other selected parameters. The main aim is to identify potential differences between the observed groups and to analyze the factors that may influence them, particularly socioeconomic conditions and the quality of prenatal healthcare. The obtained results will also be compared with earlier data in order to assess temporal trends in the development of the monitored indicators. The findings will further allow for an evaluation of the relevance of existing growth and anthropometric standards. The results may contribute to a deeper understanding of newborn needs and to the optimization of preventive and healthcare interventions.
Keywords: anthropometric characteristics, newborns, Roma population, non-Roma population, comparative analysis, socioeconomic factors, growth standards, public health

2. **Genetic and Environmental Factors in the Etiology of Dental Caries in Children: A Population-Comparative Study**

Supervisor: Prof. RNDr. Jarmila Bernasovská, PhD.

The topic focuses on the genetic research of predisposition to dental caries in children from Roma and non-Roma populations. The aim of is to identify genetic factors contributing to susceptibility to dental caries and to analyze their distribution among the observed population groups. The research focuses on polymorphisms of genes associated with enamel mineralization (e.g., AMELX, ENAM), immune response (e.g., IL1, TNF), and salivary properties (e.g., genes influencing the composition and protective function of saliva). The study also includes the evaluation of interactions between genetic predispositions and environmental factors such as dietary habits, oral hygiene, and socioeconomic conditions. The expected outcome is the identification of risk genetic markers and the creation of a basis for targeted prevention and personalized approaches to oral health care in children across different population groups.
Keywords: dental caries, genetic predisposition, gene polymorphisms, pediatric population, Roma and non-Roma population, environmental factors

3. **Predictive-Interoceptive Regulation of Behavior and Health under Conditions of Chronic Social Stress**

Supervisor: Prof. RNDr. Jarmila Bernasovská, PhD.

The topic focuses on distinguishing types of “present-oriented orientation” using behavioral, interoceptive, and autonomic indicators (PME vs. short-term regulatory adaptation), and on examining the relationships between allostatic load (physiological and molecular markers), interoceptive coherence, and future-oriented decision-making. Subsequently, the study aims to verify whether biological markers of stress and inflammation, including epigenetic indicators, modulate behavioral regulatory strategies. The expected contribution is a shift from a descriptive to a mechanistic understanding of behavior and lifestyle.
Keywords: present-oriented orientation, interoception, allostatic load, epigenetic markers, regulatory behavior

Assoc. Prof. RNDr. Iveta Boroňová, PhD., univ. prof.

1. Genetics and epigenetics of osteoporosis

Supervisor: Assoc. Prof. RNDr. Iveta Boroňová, PhD., univ. prof.

Osteoporosis is one of the most common diseases associated with aging, its course varies significantly between individuals. The research work will focus on the analysis of genetic predispositions and epigenetic factors affecting the risk of developing the disease in a group of postmenopausal women in the Slovak population and their comparison with a control group. The research offers a connection between anthropology, genetics and medicine with the potential of use the obtained research results in clinical practice (personalized prevention, identification of risk groups).
Keywords: osteoporosis, genetic polymorphism, epigenetics

Assoc. Prof. Dana Dojčáková, PhD.

1. Epigenetic Determinants of Body Fat Distribution with a Focus on Visceral Adiposity Assessed by Bioimpedance Analysis

Supervisor: Assoc. Prof. Dana Dojčáková, PhD.

This dissertation focuses on investigating epigenetic factors influencing body fat distribution in the population of Slovakia, with particular emphasis on visceral adiposity as a key risk factor for metabolic diseases. Body composition will be assessed using bioimpedance analysis, enabling non-invasive estimation of visceral fat. The molecular component of the study will examine epigenetic modifications (primarily DNA methylation) and gene expression of selected genes involved in energy metabolism, adipogenesis, and inflammatory response. The research will employ real-time PCR and sequencing methods. The aim is to identify associations between epigenetic profiles and body fat distribution, contributing to a better understanding of obesity pathogenesis and the identification of potential risk biomarkers.
Keywords: epigenetic modifications, visceral adiposity, bioelectrical impedance analysis, metabolic diseases

2. Population Genetics and Health Characteristics of the Roma Population in Slovakia

Supervisor: Assoc. Prof. Dana Dojčáková, PhD.

The dissertation focuses on a comprehensive overview of health specifics of the Roma population in Slovakia, with particular emphasis on genetically determined diseases, especially rare monogenic disorders. In the analytical part, the doctoral candidate will concentrate on selected diseases and map their occurrence across different regions of Slovakia, taking into account the microstructure of the population. The research will be conducted in collaboration with clinical geneticists, healthcare institutions, and non-governmental organizations, aiming to contribute to a better understanding of disease distribution and to the optimization of healthcare delivery.
Keywords: rare diseases, Roma population, genetic epidemiology, regional variability

Assoc. Prof. Soňa Mačeková, PhD.

1. Adipose Tissue Distribution as a Determinant of Metabolic Phenotype in the Context of Population Heterogeneity

Supervisor: Assoc. Prof. Soňa Mačeková, PhD.

The doctoral thesis focuses on the analysis of regional adipose tissue distribution as a key indicator of the human metabolic phenotype. In contemporary biological anthropology, the topography of fat deposits represents a critical factor that significantly modifies the physiological response of the organism and overall metabolic homeostasis. From the perspective of metabolic phenotype formation, the total adiposity of the organism is not the decisive factor; rather, it is the regional fat deposition, whose compartment-specific character determines the susceptibility to metabolic dysfunctions. The aim of the research is to identify the relationships between anthropometric parameters of fat distribution and the characteristics of the metabolic profile in the adult population of the Slovak Republic.
Keywords: regional adiposity, metabolic health, body composition, obesity

2. Population Genetics and Health Characteristics of the Roma Population in Slovakia

Supervisor: Assoc. Prof. Soňa Mačeková, PhD.

The dissertation is focused on the characterization of the genetic variability of the Roma minority in Slovakia with regard to its unique population history. The Roma gene pool shows specific features shaped by the founder effect and long-term reproductive isolation, which led to an increased frequency of occurrence of rare population-specific variants. The aim of the research is to analyze the degree of genetic drift and biodiversity within selected subpopulations and to identify key genetic determinants related to the health profile of this minority.
Keywords: population genetics, Roma population, genetic diversity, hereditary diseases

Assoc. Prof. Marta Mydlárová Blaščáková, PhD.

1. Assessment of selected adipokines, body composition, and atherogenic indices in postmenopausal women with osteoporosis: implications for cardiovascular disease risk

Supervisor: Assoc. Prof. Marta Mydlárová Blaščáková, PhD.

Many scientific studies indicate that osteoporosis is associated with atherosclerosis and cardiovascular mortality. Although it is known that high plasma concentrations of LDL cholesterol (low-density lipoproteins) and low plasma concentrations of HDL cholesterol (high-density lipoproteins) are risk factors for atherosclerosis, it is unclear whether these lipid metabolism disorders are also related to the pathogenesis of osteoporosis. Comprehensive lipid profiles are considered better predictors of coronary artery disease than individual lipid parameters. It is hypothesized that adipokines secreted by adipose tissue are potential factors in the pathogenesis of osteoporosis. The dissertation will focus on measuring the concentrations of selected adipokines (leptin, adiponectin) and examining associations between body composition, plasma lipid concentrations, and atherogenic indices in postmenopausal women. Using a multiple linear regression model, it will be necessary to determine which markers significantly influence T-score values in postmenopausal women.
Keywords: BMD, leptin/adiponectin, TBS, plasma atherogenic index

Assoc. Prof. Eva Petrejčíková, PhD.

1. Digital Analysis of Anthropological Finds Using 3D Scanning and Artificial Intelligence

Supervisor: Assoc. Prof. Eva Petrejčíková,PhD.
This dissertation thesis deals with the use of modern digital technologies, particularly 3D scanning and artificial intelligence, in the analysis of anthropological findings, with a focus on creating a database of pathological changes, anomalies, varieties, and taphonomic characteristics. The main aim of the thesis is to create a systematic digital tool for the documentation, classification, and evaluation of these features on skeletal remains. The research includes the application of artificial intelligence tools aimed at the automated recognition and classification of characteristics of anthropological finds.
Keywords: 3D scanning, database, skeletal remains, paleopathology, artificial intelligence

2. Analysis of the dietary habits of historical populations based on isotopic findings in bones

Supervisor: Assoc. Prof. Eva Petrejčíková,PhD.
This thesis deals with the analysis of the dietary habits of historical populations based on the isotopic composition of skeletal remains. The main objective of the research is to reconstruct the dietary patterns and dietary strategies of past populations through the analysis of stable isotopes, particularly carbon, nitrogen, and strontium, and to identify differences in diet depending on the time period, geographical environment, and social factors. The result of this work is a comprehensive assessment of the dietary strategies of historical populations and a contribution to a deeper understanding of their lifestyle, social organization, and adaptive mechanisms.
Keywords: adaptation, skeletal remains, isotopes, paleodiet, nutrition

Prof. MVDr. Janka Poráčová, PhD., MBA

1. Relationship of polymorphisms of the MC4R (rs17782313) and LEPR (rs1137101) genes to biochemical markers of obesity and metabolic risk

Supervisor: Prof. MVDr, Janka Poráčová, PhD. MBA

The aim of the work is to investigate the influence of polymorphisms of the MC4R and LEPR genes on the regulation of energy intake and body weight. The analysis will focus on the relationship between genetic variants and levels of leptin, adiponectin and basic metabolic markers. Anthropometric measurements will allow to assess the distribution of body fat and the degree of obesity. The results may clarify the role of genetic factors in the development of obesity. At the same time, they may contribute to the individualization of preventive strategies.
Keywords: polymorphisms, anthropometry, biomarkers of obesity, lipid profile

2. Polymorphisms of the PPARG (rs1801282) and LPL (rs328) genes and their association with body fat distribution and lipid profile in cardiometabolic risk

Supervisor: Prof. MVDr, Janka Poráčová, PhD. MBA

This work investigates the relationship between PPARG and LPL gene polymorphisms and lipid metabolism in the context of cardiometabolic risk. The PPARG gene plays a key role in adipocyte differentiation, while LPL influences triglyceride hydrolysis. Biochemical analysis will include lipid profile and apolipoproteins. Anthropometric data will allow the assessment of body fat distribution. The results may contribute to the identification of genetic factors influencing the risk of atherosclerosis.
Keywords: gene polymorphisms, lipid profile, anthropometry, cardiometabolic risk

Assoc. Prof. Vincent Sedlák, PhD.

1. Application of biometric and anthropometric analysis and comparison of selected populations

Supervisor: Assoc. Prof. Vincent Sedlák, PhD.

Anthropometric and biometric analysis are currently of great interest from a biological, physiological, anatomical and ecological point of view, focusing on research into human identification characteristics (eg. anthropometric parameters and indices, dermatoglyphic parameters, iris biometrics, etc.). It is necessary to create the databases of biometric and anthropometric parameters and their analysis. Biometric and anthropometric methods also have an irreplaceable role in the administrative area, which is not one of the forensic and commercial applications. It is an area focused on identity cards and passports, which requires the speed and accuracy of verification of persons on an international scale, which underlines the topicality of this issue. Another aspect of the topic are possible associations with various biological and medical aspects of man – correlations of the frequency of individual analysed parameters with selected diseases, respectively. other biomarkers.
Keywords: anthropometry, biomarkers, biometrics, identification, papillary lines, Iris

2. Association of FTO (rs9939609) and ADIPOQ (rs1501299) gene polymorphisms with anthropometric parameters and lipid profile at risk of metabolic syndrome

Supervisor: Assoc. Prof. Vincent Sedlák, PhD.

The work focuses on the analysis of the relationship between genetic polymorphisms of the FTO and ADIPOQ genes and selected anthropometric and biochemical parameters. The association with lipid profile, glucose and body fat distribution will be evaluated in particular. The FTO gene is associated with body weight regulation, while ADIPOQ affects fat metabolism through adiponectin. The results may contribute to a better understanding of genetic predispositions to metabolic syndrome. The study has the potential to identify risk groups in the population.
Keywords: anthropometry, biomarkers, lipids, polymorphism, risk factors

Conditions for accepting applicants:
• completed university education in biology or in a related field (MSc) • language requirements • a prepared written project (in English) on the selected topic of the dissertation thesis • an overview of knowledge in the addressed issue
Entrance exam content:
• verbal exam in the subjects: molecular biology, genetics, anthropology • presentation of a completed project on a selected topic for the dissertation thesis
Contact person:
prof. RNDr. Jarmila Bernasovská, PhD. mail: jarmila.bernasovska@unipo.sk Department of Biology, p.n.: 051/75 70 369

Study program: Environmental Ecology, full time study
Field of study: Ecological and Environmental Sciences

Assoc. Prof. Lenka Bobuľská, PhD.

1. Diversity and Biochemical Activity in Weatlands: The Impact of Environmental Factors on Microbial Communities

Supervisor: Assoc. Prof. Lenka Bobuľská, PhD.

Wetlands represent unique ecosystems with a significant role in the global carbon cycle and climate regulation. Microorganisms play a key role in the decomposition of organic matter, methanogenesis, and other biogeochemical processes occurring in these unique and pristine ecosystems. This dissertation thesis focuses on analyzing the diversity and activity of microbial communities in various types of peatlands to identify environmental factors influencing their structure and function. Several environmental factors can influence the diversity and activity of microorganisms in wetlands, with the most important being physicochemical properties, chemical composition, hydrological conditions, and biotic interactions. Using modern metagenomic methods, spectrophotometric analyses, and enzymatic assays, dominant microbial groups and their metabolic activity will be characterized. The results of this study will contribute to a deeper understanding of peatland microbial ecology and their role in ecosystem processes, which is crucial for the conservation of these sensitive habitats in the context of climate change.

Assoc. Prof. RNDr. Alexander Csanády, PhD.

1. The influence of habitat, season and long-term temporal changes on phenotypic variability and population characteristics of dominant rodents in eastern Slovakia

Supervisor: Assoc. Prof. RNDr. Alexander Csanády, PhD.

Rodents (Rodentia) represent a sensitive model group reflecting environmental changes at the level of individuals, populations, and communities. Variability in their phenotypic traits, body condition, population structure, and reproductive characteristics is primarily influenced by habitat type, seasonal dynamics, and long-term environmental changes, with these factors also being reflected in species abundance and community composition.

The aim of the project is to evaluate the influence of habitat, season, and decadal changes (1980–2010) on phenotypic variability, population structure, reproductive characteristics, and abundance of dominant rodent species in eastern Slovakia. The analysis will be based on morphometric traits, body condition (body condition index, BCI), population parameters, and capture-based abundance data at the level of individual trapping events, in relation to sex, age, and habitat type (e.g. riparian, forest, and agricultural environments). The study will also include reproductive characteristics of populations, particularly the proportion of reproductively active individuals and the seasonal dynamics of reproduction. The project integrates individual, population, and community levels, enabling the identification of ecological patterns of variability across both space and time.

It is expected that phenotypic variability will be significantly influenced by sex and age, with the most pronounced differences occurring in adult individuals. Body condition and reproductive characteristics are anticipated to exhibit strong seasonal variation as well as differences among habitat types. Abundance and community composition are expected to reflect environmental quality and to vary across habitats, seasons, and decades. At the same time, a partial consistency of ecological responses across species is anticipated.

The project will contribute to a better understanding of the relationships between phenotypic variability, population structure, reproductive characteristics, and community dynamics of rodents, and will enable the identification of parameters that can be used as indicators of environmental quality over long-term temporal scales.

Assoc. Prof. Daniela Gruľová, PhD.

1. Influence of Environmental and Agronomic Factors on the Phytochemical Profile of Cannabis sativa Cultivars for Ecological Agro-Applications

Supervisor: Assoc. Prof. Daniela Gruľová, PhD.

This dissertation investigates how selected exogenous factors (light spectrum, irrigation regime, soil composition, nutrient availability, temperature variability) affect the quantitative and qualitative composition of key secondary metabolites in low-THC Cannabis sativa cultivars. Emphasis is placed on terpenes, flavonoids, cannabinoids and other bioactive compounds relevant for the development of ecological fertilizers and plant-derived pesticides. The research integrates controlled cultivation experiments with advanced analytical approaches (HPLC, GC-MS) to determine metabolic shifts under defined conditions. Results will support the selection and optimization of hemp varieties with maximized agronomic and ecological potential for sustainable agricultural applications within the HempPestOrg project.

Assoc. Prof. Martin Hromada, PhD.

1. Human life-history evolution as a product of bio-cultural coevolution

Supervisor: Assoc. Prof. Martin Hromada, PhD.

Approximately five million years ago, the ancestors of humans were just one among many species of great apes. Today, however, Homo sapiens represents an ecologically dominant species that has occupied nearly all of the planet's biomes, exploits unprecedented amounts of energy, and exhibits an extraordinary diversity of social systems. This transformation is often attributed to the human capacity to adapt through culture, which enables faster and more flexible responses to environmental challenges than genetic evolution alone.
Humans constitute a paradigmatic example of a species dependent on cumulative culture, in which knowledge and behavior accumulate across generations. This form of adaptation gives rise to solutions that exceed individual cognitive capacities and are maintained through uniquely human mechanisms of social learning, including teaching and pedagogy. At the same time, cultural processes feed back into human biology, resulting in a dynamic process of biocultural coevolution.
From the perspective of evolutionary ecology, humans are characterized by a unique life-history strategy, which includes:

- prolonged childhood and adolescence,
- high investment in learning and social development,
- and the potential for high fertility contrasted with extended offspring dependency.

However, contemporary human populations exhibit pronounced secular changes in life-history traits, including:

- earlier onset of puberty,
- a prolonged interval between biological and social maturity,
- delayed reproduction and declining fertility.

These changes create a decoupling between biological and social markers of life history, providing a unique opportunity to study evolutionary processes in real time.
This dissertation is based on the hypothesis that the human life-history strategy represents a biocultural adaptation, shaped by interactions among:

- energetic constraints (metabolic ecology),
- cumulative culture,
- cooperative behavior (cooperative breeding),
- and mechanisms of social learning.

Particular emphasis will be placed on adolescence as an evolutionarily derived life-history stage, potentially representing an adaptive period of "biocultural apprenticeship" that facilitates the acquisition of complex skills required in culturally rich environments.
The research will adopt an integrative approach combining:

- behavioral ecology,
- evolutionary psychology,
- comparative and phylogenetic analysis,
- and a multi-proxy framework (including endocrine, demographic, behavioral, and social indicators).

The aim of the dissertation is to determine the extent to which modern changes in human life history reflect a mismatch between evolutionarily shaped strategies and contemporary cultural environments, and to clarify how cultural processes feedback to shape biological and ecological developmental trajectories.

2. Quill mites of the family Syringophilidae associated with estrildid finches (Aves: Estrildidae) - diversity and host-parasite relationship

Supervisor: Assoc. Prof. Martin Hromada, PhD.

Knowing how many species inhabit Earth is among the most fundamental questions in science. One of the major components and driving forces behind Earth´s biodiversity are parasites, which are often neglected, despite they are comprising at least half of all species and up to 75% of all interactions in food webs involve a parasitic species. Many estimates of parasite global species diversity are based on extrapolations of patterns of host specificity studied on a local scale, a contrast between the proportion that parasites comprise of local and global faunas suggests that parasites are most probably less host specific and much more widespread than local scale studies suggest. Host specificity is most often measured as the number of host species used by a parasite, or as their phylogenetic diversity; both of these measures ignore the larger scale component of host use by parasites. A parasite may exploit very few host species in one locality but these hosts may be substituted for completely different species elsewhere; in contrast, another parasite may exploit many host species in one locality, with the identity of these hosts remaining the same throughout the parasite's geographical range.

Despite majority of interactions in ecological communities comprises parasites, their networks are understudied. One possible approach how to study host and parasite communities and interactions among them is an ecological network research, which aims to understand how the complexity observed in nature can persist and how this affects ecosystem functioning. This is essential for prediction, and eventually mitigation, the consequences of increasing environmental perturbations such as habitat loss, climate change, invasions of exotic species, but also zoonotic spillovers. Therefore, it is crucial to study ecological networks on different regional scales, from small- to large-scale.

Family Estrildidae (waxbills and allies) includes ca 140 species in 41 genera. They occur in Etiopian, Oriental and Australian biogeographic regions, however, they are commonly kept in captivity wordwidely and in some regions they established massive introduced populations. Despite their ecologicical significance, the extoparasites of waxbill only rarely has been studied.

Assoc. Prof. Peter Manko, PhD.

1. Ecological responses of aquatic insect communities to environmental gradients: a trait-based and multivariate approach

Supervisor: Assoc. Prof. Peter Manko, PhD.

Aquatic insects represent a fundamental component of freshwater ecosystems and are widely recognized as sensitive indicators of ecological integrity. Their diversity, functional traits, and community structure respond predictably to a variety of anthropogenic stressors, including nutrient enrichment, habitat degradation, and climate-induced hydrological changes. Understanding these responses is essential not only for biodiversity conservation but also for ecosystem monitoring and management. The aim of the dissertation will be to investigate the ecological responses of aquatic insect communities to environmental gradients using modern ecological assessment methods. The research will integrate multivariate statistical analyses, trait-based approaches, and ecological modelling to identify key bioindicator taxa and to quantify biodiversity–environment relationships across different spatial scales. The results will contribute to the development of scientifically robust and practically applicable bioassessment frameworks to support environmental policy, water quality regulation, and conservation planning.

Assoc. Prof. Ruslan Mariychuk, CSc.

1. Green synthesis of metal nanoparticles and the study of their optical and photothermal properties for biomedical applications

Supervisor: Assoc. Prof. Ruslan Mariychuk, CSc.

Green synthesis of nanomaterials represents a new trend in modern science due to their unique optical, electrical, magnetic, catalytic, and other properties. This opens up new possibilities in electronics, mechanical engineering, the chemical industry, and medicine. Therefore, there is a growing need to develop new environmentally friendly and low-cost methods for the preparation of carbon-based and metallic nanoparticles. The study will focus on the development of advanced protocols for the synthesis of biocompatible metal nanoparticles (such as silver, gold, platinum, etc.) using extracts (or their isolated components) from selected plants that are readily available in Slovakia. Particular attention will be paid to controlling the size and shape of the resulting biocompatible nanoparticles.
In the initial phase, the research will focus on the preparation of plant extracts and the characterization of their composition using chromatographic, photometric, gravimetric, and other analytical methods. Subsequently, plant extract-mediated syntheses of metal nanoparticles and their components will be investigated based on the evaluation of nanocolloidal solution properties using UV–Vis and infrared spectroscopy, photoluminescence, scanning and transmission electron microscopy, and photothermal heating.
The properties of the resulting nanoparticles will be studied with the aim of their application in photothermal therapy and targeted drug delivery.

Prof. PaedDr. Ján Koščo, PhD.

1. Habitat niche and adaptability of established rainbow trout

Supervisor: Prof. PaedDr. Ján Koščo, PhD.

Salmonids (Salmonidae) are of global interest primarily due to their importance in recreational fisheries and aquaculture (FAO FishStat). In Europe, native salmonid species are of particular importance, especially from the perspective of biodiversity conservation. However, native salmonid genera (e.g., Salmo, Hucho, Thymallus) are experiencing declines in population density and local extinctions, largely reflecting climate change and the progressive degradation of their habitats (Donovan et al. 2021). To meet the demand of aquaculture and recreational fisheries, alternative solutions are increasingly employed, particularly the use of non-native species. The invasive potential of these species raises concerns, especially regarding threats to native biodiversity. As a result, a significant conflict arises between their socio-economic importance and the negative impacts of non-native species on European river ecosystems. The most frequently introduced salmonid species is the rainbow trout (O. mykiss) (MacCrimmon 1971; Stanković et al. 2015). In Europe, this species has long been considered dependent on continuous propagule pressure (stocking, farm escapes) and lacking the ability for effective natural reproduction. However, this assumption has been increasingly challenged in recent years by a growing number of documented self-sustaining populations across various parts of Europe (Stanković et al. 2015; Kazakov et al. 2023; Mueller et al. 2025; Pinter et al. 2025). Currently, this species is regarded as one of the 100 most invasive non-native species worldwide (Global Invasive Species Database 2026). Among the general factors facilitating its widespread establishment are high adaptability, tolerance to elevated temperatures, and intensive stocking. In the context of the increased adaptability of this species, the dissertation aims to contribute to the understanding of the breadth of the habitat niche of an established rainbow trout population in a model area.

Assoc. Prof. Ing. Jozef Oboňa, PhD.

1. Biodiversity and Ecology of Selected Families of Diptera in Montenegro

Supervisor: Assoc. Prof. Ing. Jozef Oboňa, PhD.

This dissertation topic is directly linked to the implementation of the bilateral project SK-MNE-25-0001 entitled “Methods for Mapping Biodiversity in the Context of Invasive Alien Species.” The region of Montenegro, located on the Balkan Peninsula, is characterized by unique ecosystems with a high degree of endemism. Nevertheless, several insect groups, particularly selected families of Diptera, remain insufficiently studied in this area.

The main aim of the dissertation will be to contribute to the knowledge of the diversity of selected groups of Diptera in Montenegro and to evaluate their significance in the context of environmental changes and the spread of non-native species.

The specific objectives of the dissertation will be:

to carry out an inventory survey focused on the species diversity of selected Diptera families in aquatic and adjacent habitats,

to analyze the ecological requirements of the recorded species and identify factors influencing their distribution, especially in relation to environmental changes and anthropogenic impacts,

to focus on the detection of non-native and potentially invasive species that may utilize the south–north migration corridor passing through this region.

The PhD student will actively participate in joint field surveys and expert workshops conducted in cooperation with the University of Montenegro. The work will also include the harmonization of sampling and sample-processing methodologies between partner institutions. The results of the dissertation will contribute to expanding knowledge of the Balkan entomofauna and will also provide a scientific basis for more effective biodiversity monitoring and nature conservation in the region.

Conditions for accepting applicants:
The condition for admission to PhD studies in Environmental Ecology is completion of a Master's study program in the field of Ecology or in a related field. In the case of graduates of related fields, the committee will decide the possibility of PhD studies.
Form of admission procedure:
Candidates for PhD studies apply for one of the dissertation topics. The admission procedure for PhD studies begins for the applicant with the delivery of his application to the faculty. Part of the admission procedure is the entrance exam, which is held at the FHPV Department of Ecology before a committee of at least three members, appointed by the dean of the FHPV on the proposal of the trade union committee. The admission committee will evaluate the result of the entrance exam in a closed meeting. In the case of several applicants for studies, they will determine the order of success.
Determining the scope and extent of required knowledge:
The content of the entrance exam is the presentation of: • work project focusing on the future dissertation, • knowledge of ecology and environmental science and related fields (according to the chosen topic) at the level of a master's degree graduate.
Additional terms and conditions:
Active knowledge of one world language.
Contact person:
prof. PaedDr. Ján Koščo, PhD. Department of Ecology, FHPV PU v Prešove Ul. 17. novembra 1 081 16 Prešov tel.: 051/757061

Study program: Regional Geography and Regional Development, full time study
Field of study: Earth Sciences

Assoc. Prof. Vladimír Čech, PhD.

1. Geographical aspects of underground tourism

Supervisor: Assoc. Prof. Vladimír Čech, PhD.

The activities of human society in the field of tourism have been oriented towards new progressive forms and areas, especially in recent times. In addition to the "classical" forms and ways of spending leisure time in connection with tourism, other forms and ways that have not been so widespread until now are also dynamically developing. One such form of tourism is adventure tourism, which is differentiated mainly by the environment in which its activities are carried out. Underground tourism is often classified as adventure tourism. It is carried out in underground spaces, and natural underground spaces are distinguished - caves and chasms, tunnels in glaciers, lava tunnels, etc. and artificial (anthropogenic) - mine corridors and shafts, underground catacombs, canals, cellars, etc. The most typical underground tourism is a classic tour of a cave with artificial lighting, with a guide, along prepared paths with railings. However, there are several activities that are more adventurous and are related to underground spaces. They can be carried out in cave spaces (secured caving, underground via ferrata) and artificial ones (mining trekking, etc.). There is no work in the professional and scientific literature that deals specifically with underground tourism, there are only brief mentions of this form with basic divisions. In particular, there is a lack of a proposal for the internal structure and division of underground tourism, a mapping of the current state and a prediction of future developments in this area. The aim of the dissertation will be a comprehensive geographical analysis of the issue of underground tourism, also focusing on a specific region.

Prof. RNDr. Robert Ištok, PhD.

1. Geographical aspects of underground tourism

Supervisor: Prof. RNDr. Robert Ištok, PhD.

The issue of separatism in Western European countries is a current topic of discussion, particularly within the fields of political geography, geopolitics, and political science. In most cases, emphasis is placed on its ethnic or political aspects. However, the background of separatism in Western European countries should also be examined in the context of differing levels of socio-economic development among their regions. This paper will focus on analyzing the relationships between the activities and objectives of separatist movements and regional development, presented through case studies.

Assoc. Prof. Radoslav Klamár, PhD.

1. Regional disparities as a reflection of spatial differentiations in the development of regions

Supervisor: Assoc. Prof. Radoslav Klamár, PhD.

The dissertation will focus on the significance, measurement, and evaluation of regional disparities in the context of spatially differentiated socio-economic development of regions. Regional inequalities are understood not only as differences or lagging behind a certain accepted level, but also as a unique structure with specific conditions that can be utilized as a form of comparative advantage. In the introduction, attention will be devoted to the conceptual framework and the assessment of current knowledge on the issue based on available literature. Relevant observational units, the selection of appropriate evaluation indicators, as well as suitable measurement methods (both direct and indirect), will be defined. Within the applied part, based on

the obtained empirical results, recommendations will be formulated for the main actors of regional development, as the identified inequalities have not only informative value but also decision-making significance for supporting the creation of development strategies, as well as for identifying problematic regions and supporting them through instruments of regional policy.

Assoc. Prof. Štefan Koco, PhD.,

1. Monitoring the Impacts of Drought on Agricultural Production in Slovakia Using Remote Sensing

Supervisor: Assoc. Prof. Štefan Koco, PhD.

Drought represents one of the most significant limiting factors affecting agricultural production in Slovakia, with its frequency and intensity increasing due to ongoing climate change. Despite the availability of meteorological observations, there is still a lack of spatially detailed and operational systems capable of monitoring drought impacts on vegetation and crop yields. Remote sensing (RS) provides an effective means for continuous observation of vegetation conditions and the detection of stress factors across landscapes in near real time, making it highly relevant for agricultural management. The aim of this doctoral research is to develop a methodological framework for assessing the impacts of drought on agricultural production across Slovakia using time series of remote sensing data (primarily Sentinel-2, potentially complemented by Sentinel-1) in combination with climatic data. The methodology will include the calculation of vegetation and drought-related indices (e.g., NDVI, NDMI, VCI), anomaly detection, and integration of meteorological variables such as precipitation and temperature. Statistical approaches and machine learning techniques will be applied to model the relationships between drought indicators and crop production characteristics. The research will focus on selected agricultural regions of Slovakia, particularly lowland areas that are most vulnerable to drought. The expected outcomes include the development of a spatially explicit model for drought assessment and its impacts on agricultural production, as well as the design of an operational monitoring framework applicable in practice (e.g., for public administration or farmers). Additional outputs will include drought risk maps and the identification of the most vulnerable regions. The prospective PhD candidate is expected to have a solid background in GIS and remote sensing, experience with time series analysis and statistical methods, and the ability to independently process and interpret large geospatial datasets. Skills in programming (R, Python) and an interest in climate change-related research are considered advantageous.

2. Identification of Spatial Variability of Crops Using Sentinel-2 Time Series and Its Application in Precision Agriculture

Supervisor: Assoc. Prof. Štefan Koco, PhD.

Agricultural landscapes in Slovakia are characterized by significant spatial heterogeneity in soil and production conditions, which is often insufficiently reflected in current management practices. Conventional approaches typically assume homogeneity within large agricultural parcels, leading to inefficient use of inputs such as fertilizers and pesticides and contributing to environmental degradation. Precision agriculture, based on detailed spatial analysis of crop variability, represents a modern approach that enables optimization of production while minimizing environmental impacts. The aim of this doctoral research is to analyse the spatial and temporal variability of crops in Slovakia and to develop a methodological approach for its application in precision agriculture. The study will be based on the analysis of multispectral time series data, primarily from Sentinel-2, from which vegetation indices (e.g., NDVI, EVI, SAVI) will be derived. Subsequently, crop classification and the identification of management zones will be performed using geostatistical methods and machine learning algorithms (e.g., random forest, clustering techniques). The methodology will also include validation using available field data and/or yield records. The expected outcomes include the development of a methodological framework for delineating management zones within agricultural parcels and their cartographic representation for selected regions of Slovakia. The results are expected to contribute to more efficient farm management, reduced input costs, and the promotion of sustainable agricultural practices. The prospective PhD candidate should have a strong background in GIS and remote sensing, an interest in

advanced analytical methods, and the ability to work with large datasets. Knowledge of programming (Python, R) and basic understanding of machine learning techniques are considered an advantage, as well as the ability to link theoretical approaches with practical agricultural applications.

Conditions for accepting applicants:
Submission of a project proposal (in English) on the selected topic of the dissertation (on a prescribed form), with specified goals of the research.
Entrance exam content (oral exam):
• Geography (master's degree graduate level – areas stated below), • presentation of the project on the selected topic of the dissertation (5 minutes).
Areas of questioning:
1. Human geography (methods and techniques of human geography research, geographical interpretation of issues related to population, settlements, transport, productive and non-productive activities of human society). **2. Physical geography (methods and techniques of physical geography research, geographic interpretation of the issues studied by physical geography).** **3. Political geography and geopolitics.** **4. Regional geography and theories of regional development.** **5. Geoecology.** **6. Fundamentals of geoinformatics.**
Contact person:
prof. Ing. Jozef Vilček, PhD. mail: jozef.vilcek@unipo.sk Department of Geography, p.n.: +421 51 757 0393

Study program: Theory of Physics Education, full time study
Field of study: Physics

Assoc. Prof. Sergej Iľkovič, PhD., univer. profesor

1. **Implementation of an alternative measurement system into the teaching process of secondary school students in the context of educational reform**

Supervisor: Assoc. Prof. Sergej Iľkovič, PhD., univer. profesor

The work focuses on the implementation of the uLAB measurement system (MS), developed at the home workplace, into the teaching process of science subjects, especially physics, and to study its impact on the quality of education. The main objective is to adapt students' experimental activities in science subjects so that they can be implemented by the MS, taking into account the ongoing educational reform. The research will include checking the level of students' understanding of knowledge and their ability to think critically, to think in wider contexts and to come up with their own solutions, which may be theoretical, experimental and technical in nature. The conclusions of this research will be used both for the continuous improvement of the features of the MS itself and for the optimization of the didactic content created.

Prof. RNDr. Marián Reiffers, DrSc.

1. **Utilization of experimental devices QUANTUM DESIGN as DYNACOOL and VERSALAB in teaching of physics at secondary school, resp. primary school**

Supervisor: Prof. RNDr. Marián Reiffers, DrSc.

Thesis will be oriented to didactical research in a field of utilization of experimental Devices of fy QUANTUM DESIGN, resp. other similar at the realization of teaching of physics at secondary schools, resp. primary schools. Main aim of PhD. thesis will be study, choosing and preparation of educational activities in physics by method of direct using at teaching or by method of hobby group. After preparation of materials for teaching the main aim will be the using in practice at proper school.

Assoc. Prof. Miriam Spodniaková Pfefferová, PhD.

2. **The Use of Artificial Intelligence for Personalized Learning in Physics**

Supervisor: Assoc. Prof. Miriam Spodniaková Pfefferová, PhD.

This thesis focuses on exploring the use of available AI tools (e.g., ChatGPT, Google Gemini, Khan Academy AI Tutor, etc.) for personalized physics learning. The main objective is to analyze the effectiveness of these tools in providing individualized support, improving the understanding of physics concepts, and increasing student motivation at the high school level. In the first phase of the research, a systematic analysis of existing AI solutions and the definition of scenarios for their implementation in the teaching process will be conducted. These scenarios include using AI as an individual tutor, a diagnostic tool for identifying student errors, and a personalized task generator.
The experimental part of the work will be carried out on a selected sample of pupils, comparing results before and after the implementation of AI tools using non-standardized tests and questionnaires. Additionally, methodological materials for physics teachers will be developed, including recommendations for integrating AI into the classroom and practical guidelines for using these tools in various educational contexts

Conditions for accepting applicants:

Graduation in the Master's program – Teacher Training in Physics. The application form must include a project proposal of the future dissertation and an overview of previous scientific works and publication activities.
The mandatory conditions for admission to the PhD study programme are:

- master's degree in Teacher Training in Physics and related fields,
- submission of a project (in Slovak, English) on the selected topic of the dissertation,
- language proficiency in at least one world language at the level of maturita's exam (B2).

Entrance exam content:

The main condition of admission is passing the admission interview. During the admission procedure, the applicant's academic performance throughout his/her university studies, world language proficiency, publications, and qualifications for scientific work are considered. In addition, applicants are expected to be able to:

- transform scientific knowledge into a didactic system of physics,
- demonstrate the ability to solve a research problem, including the use of pedagogical research methods and techniques,
- present the main areas of the pedagogical research project for the chosen topic of the dissertation,
- demonstrate language proficiency for studying foreign literature,
- demonstrate knowledge about research institutions and research groups working on the research of related phenomena in the field of didactics, to which the dissertation belongs and with which the candidate is applying.

Areas of questioning:

1. **Didactics of physics – current state of physics didactics, problems and trends of teaching physics at primary and secondary schools**
2. **General physics**
3. **Fundamentals of pedagogical research**

Recommended literature:

GAVORA, P. a kol. 2010. Elektronická učebnica pedagogického výskumu. [online]. Bratislava: Univerzita Komenského. ISBN 978–80–223–2951–4. Dostupné na: http://www.e-metodologia.fedu.uniba.sk/
GAVORA, P. 2001. Úvod do pedagogického výskumu. Bratislava: Univerzita Komenského. ISBN 80-223-1628-8
DARÁK, M. a J. FERENCOVÁ, 2001. Metodológia pedagogického výskumu. Terminologické minimum. Prešov: ManaCon. ISBN80-89040-07-1.
DARÁK, M. a N. KRAJČOVÁ, 1995. Empirický výskum v pedagogike. Prešov: ManaCon. ISBN80-85668-22-X.
JANOVIČ,J. 1990. Didaktika fyziky.Skriptum. UK Bratislava.
JANOVIČ,J. 1998.Vybrané kapitoly z didaktiky fyziky. Skriptum, UK Bratislava.
TUREK,I. 2005.Inovácie v didaktike. Bratislava, MPC. Druhé vydanie,360 s. IBN 80-8052-230-8
Časopisecká literatúra napr. : Matematika, fyzika a informatika, Fyzikálne obzory. Internetové zdroje
HALLIDAY, D. - R. RESNICK - J. WALKER, 2000. Fyzika. Vysokoškolská učebnice fyziky. Praha: Nakladatelství PROMETHEUS. ISBN 978-80-7367-314-7.
Beiser, A. 1978. Úvod do moderní fyziky, Praha, 1978
FEYNMAN, R. P. a kol. 2007. Feynmanove prednášky I.-V. Vydavateľstvo: Nakladatelství Fragment, 2007. ISBN 80-720-042-12
KREMPASKÝ, J. 1988. Fyzika. Bratislava: ALFA.
HAJKO, V. - SZABÓ, D. J. 1983. Základy fyziky. Bratislava: VEDA. ISBN 63-144-83.

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