CURRENT LIST OF TOPICS IN 2017, DOCTORAL SCHOOL OF BIOLOGY

supervisor	*supervisor's e-mail address*	*topic*	*description*	*place of research*	*knowledge of English required*	*professional requirements*
Péter Csermely	csermelynet@gmail.com	Structure and dynamics of biological networks	The LINK-Group offers the following projects: -- comparative analysis of the overlapping network modules of the real world networks using our in-house developed modularization method (www.linkgroup.hu/modules.php) -- analysis of the cooperation of complex, real world networks using the model of spatial games (where social dilemma games, such as the Prisoners' Dilemma game are played by agents, who are neighbors in a real world network) and the NetworGame program developed by the LINK-Group (http://www.linkgroup.hu/NetworGame.php) you may write a Cytoscape plug-in leading to a prompt publication -- analysis of signal propagation, adaptation and learning of complex, real world networks, as well as the determination of the attractor-network of the state-space of complex systems (+ determining their intervention points) using the Turbine perturbation analysis program developed by the LINK-Group (http://www.linkgroup.hu/Turbine.php) -- visualization, coarse-graining, ordering of network data (http://linkgroup.hu/networkrepresentation.php, http://apps.cytoscape.org/apps/entoptlayout) -- analysis of network entropy (finalization of an almost ready manuscript) -- analysis of network rigidity and plasticity (functional and structural): ask for info at csermelynet@gmail.com!	Semmelweis University, Department of Medical Chemistry	At least B2 level	Experience in C++/Java etc. programming is preferred but not required.
Enikő Kubinyi	eniko.kubinyi@ttk.elte.hu	Cognitive Ageing in Dogs	We seek outstanding PhD candidates who are interested in exploring the cognitive ageing of family dogs. We are developing a behavioural test battery using an interdisciplinary approach with behavioural, genetic and neuroscience testing methods in both longitudinal and cross-sectional studies. The results are expected to aid our understanding of pathologies associated with human cognition during ageing, to create guidelines for a healthy lifestyle toward successful ageing, and to pave the way for the development of therapies and preventive methods to increase welfare. The project is funded by an ERC Starting Grant.	Eötvös Loránd University, Department of Ethology, Senior Family Dog Project	at least B2 level	Experience in any of these areas is an advantage: behaviour testing in Canines, motion path analysis, identification of behaviour using inertial sensors, EEG, fMRI, behaviour genetics, DNA/RNA sequencing technologies, bioinformatics.
Katalin Schlett	schlett.katalin@ttk.elte.hu	Synapse formation and neuronal plasticity	The project aims to elucidate novel molecular pathways regulating neuronal plasticity, concentrating primarily on the role of a novel serine –threonine kinase, protein kinase D (PKD) in neurons. Experiments are carried out in embryonic hippocampal cell cultures or in acute brain slices. When relevant, we have experience with validating molecular findings with behavioral or learning tests carried out in transgenic mouse lines. Our major interests are focused on synapse formation, maturation and maintenance, including the regulation of actin polymerization within dendritic spines (see Bencsik et al., J. Cell Biol., 2015) or the traffic and turnover of neurotransmitter receptors (see Sziber et al., Mol. Biol. Cell, 2017). Besides using standard molecular biological methods, we are keen on applying fluorescent live cell imaging and quantitative microscopy, optogenetics and electrophysiology in cultivated neurons. The successful candidate must speak fluent English and should have experience with mammalian cell culture and animal handling.	Eötvös Loránd University, Dept. Physiology and Neurobiology, Neuronal Cell Biology Research Group	fluent; at least B2 level	MSc thesis in neuroscience, cell biology or molecular biology; previous experience with mammalian cell culture and animal handling is an advantage

Gábor Juhász	gabor.juhasz@ttk.elte.hu	Regulation of autophagy and endocytosis	The project aims to identify novel regulators of autophagosome and endosome fusion with lysosomes, using a combination of genetics, cell biology, microscopy and biochemistry. See Takats 2013 J Cell Biol, Takats 2014 Mol Biol Cell, Lorincz 2016 Elife, Hegedus 2016 Mol Biol Cell for recent examples of our work. Details of the project will be established together with the candidate.	Eötvös Loránd University, Department of Anatomy, Cell and Developmental Biology	at least B2 level	MSc degree
Ákos Pogány	akos.pogany@ttk.elte.hu	Parental resource allocation in zebra finch families under nutritional stress	In sexually reproducing species, parents and offspring have different optima for parental investment. For offspring, higher investment than the parental optimum generally increases fitness, however, such higher investment will likely result in net parental fitness loss because increased benefits from current offspring compensate only partially any potential decrease in survival or future reproduction. Whether and how parents respond to shortfall in resources, might therefore have important fitness consequences. The PhD candidate will manipulate nutritional condition of zebra finch (Taeniopygia guttata) families to investigate how variation in environmental conditions influences resource allocation to self and young. Using the same research paradigm, the candidate will also test the terminal investment hypothesis that predicts old parents should allocate more of the limited resources to their offspring compared to young parents. During these experiments, we will also investigate the flexibility of resource allocation over a given breeding attempt. The candidate will join an international research group and will benefit from close collaboration with a German behavioural laboratory.	Department of Ethology, Eötvös Loránd University	fluent; at least B2 level	
Ferenc Fodor	ferenc.fodor@ttk.elte.hu	Effect of nanoparticles on plant productivity and metabolism	Production and industrial utilization of manufactured nanoparticles has been increasing rapidly in the last decade. It is inevitable that a considerable fraction of the total produced nanoparticles will finally find its way from the industry and consumer products to different environmental compartments such as air, water and soil. Despite growing concerns regarding the environmental risks of nanoparticles, as of today's knowledge about their transport, possible transformations, final fate and concentration in the ecosystems is scarce. In this program various nanoparticles are tested to characterize their effect on plant productivity and metabolism through different exposition ways. Both potential toxicity and stimulatory effects are evaluated especially for new nanoparticles manufactured for using as fertilizers.	Eötvös Loránd University, Institute of Biology, Department of Plant Physiology and Molecular Plant Biology	at least B2 level	basic knowledge in plant physiology and or plant nutrition
Tamás Orbán	orbant@biomembrane.hu	Domestication of eukaryotic DNA transposons	Mobile genetic elements have played an important role of genome evolution, and our knowledge about their role in shaping of the human genome is constantly growing. Our group focuses on the activity and domestication of DNA transposons in mammalian model systems, in particular on the role of piggyBac-derived elements in the human genome. (Recent references: Kolacsek et al, Hum Gene Ther Meth, 2014; Kolacsek et al, Gene, 2017.)	Biomembrane Research Group Institute of Enzymology, RCNS, HAS Budapest, Hungary	at least B2 level	

Ádám Solti	adam.solti@ttk.elte.hu	Ferric chelate reductases: key enzymes of plant iron metabolism	I am seeking PhD candidates interested in plant science, especially in the biochemistry and the regulation of physiological processes. Iron deficiency is a serious problem in the agriculture worldwide that limits the crop production, but also has human nutritional issues. Among higher plants, two iron uptake strategies are known. The strategy-I, widespread in most of the angiosperm families, is based on the reduction of ferric iron, and the soluble free ferrous iron is transported across the membranes. The movement of iron into any other cells or cell organelles requires a similar mechanism. The key enzymes of this process are the ferric chelate reductases, the precise localisation and protein-protein interactions of which, together with their mechanism of action, including the role of phenolic compounds and flavonoids in the reduction of ferric iron is intended to be revealed in this project. The research project is supported by different grants, among others by that of the National Institute of Research, Development and Innovation, Hungary.	Eötvös Loránd University, Department of Plant Physiology and Molecular Plant Biology	at least B2 level	experience in molecular biology
Attila Reményi	remenyi.attila@ttk.mta.hu	Cell signalling: structure, function and drug design	Cells respond to a myriad of environmental cues and turn these into intracellular information by engaging signalling proteins (enzymes, adaptor, anchoring and scaffold proteins). The project is focused on elucidating the structure and function of key signalling protein-protein complexes that govern intracellular information flow. The ultimate goal is to develop pharmaceutically viable strategies to modulate intracellular signalling activity of signalling proteins implicated in cancer or in inflammatory diseases. The Research Center for Natural Sciences, Hungarian Academy of Sciences is located on the ELTE TTK campus just 200 meters away from the Chemistry and Biology buildings of ELTE. The Protein-Protein Interaction group is part of the Institute of Enzymology housing 17 research groups all interested in Protein Science.	Institute of Enzymology, Research Center for Natural Sciences, Hungarian Academy of Sciences	fluent	Some former experience in molecular biology is needed. Experience in structural biology and/or cell culture based techniques is an advantage.
Attila Reményi	remenyi.attila@ttk.mta.hu	Systems biology of protein kinase mediated gene expression regulation	Extracellular signals turn on the activity of protein kinases which in turn control gene expression of specific genes. How transient activation of receptors in the cell membrane initiate specific transcriptional programs in the nucleus? The project will map out how kinases interact with transcription factors and allow access to the genetic information stored in the DNA. The Research Center for Natural Sciences, Hungarian Academy of Sciences is located on the ELTE TTK campus just 200 meters away from the Chemistry and Biology buildings of ELTE. The Protein-Protein Interaction group is part of the Institute of Enzymology housing 17 research groups all interested in Protein Science.	Institute of Enzymology, Research Center for Natural Sciences, Hungarian Academy of Sciences	fluent	Some former experience in molecular biology is required.
András Perczel	perczel@chem.elte.hu	BioNMR Spectroscopy of polypeptides and proteins	Research topics focusing on structure elucidation, dynamic properties, intermolecular interaction, ligand and small molecule interaction screening, MM and QM calculated NMR properties, etc.	ELTE Institute of Chemistry	at least B2 level	basic knowledge of spectroscopy (NMR, MS), organic chemistry, biochemsitry, structural chemsitry
András Perczel	perczel@chem.elte.hu	Amyloid and self aggregating polypeptides and proteins	research topics focusing on self associating petides related to type II *diabetes mellitus* (e.g. Exenatid, GLP-1), gel forming peptide and carbohydrate derivatives, cellular essays, structure function relationship, spectroscopic (NMR, ECD, VCD, FT-IR) characterisation of folding, unfolding and amyloid formation, etc.	ELTE Institute of Chemistry	at least B2 level	basic knowledge of spectroscopy (NMR, MS), organic chemistry, biochemsitry, structural chemsitry

István Tóth	tothi@vmri.hu, toth.istvan@agrar.mta.hu	Pathogenomic, evolutionary and diagnostic significance of bacteriophages	Bacteriophages (shortly phages) are the most abundant organisms in the biosphere, and have been playing a leading role in the evolution of bacteria. Several virulence genes, first of all toxin genes are frequently located in the genome of phages, and these genes may spread by horizontal gene transfer(HGT). Non pathogenic strains can be converted to pathogenic ones or pathogenic strains could gain higher virulence by HGT. Additionally to the free lytic phages, a great number of integrated phages, termed temperated prophages have been discovered by bacterial genomes' sequence analysis. This knowledge provides a suitable basis for a doctoral programme aiming to isolate and characterize phages from different environmental and food sources as well as from bacterial isolates of human and animal origin. Our object is to set up a phage collection and conduct phenotypic (morphology, bacterial host specificity) and genotypic characterization of phages. As a main goal, determination of phages' host specificity will promote the development of diagnostic and typing methods in bacteriology (phage typing). Identification of phages effective against multi drug resistant (MDR) bacteria would promote an alternative strategy (phage therapy) against MDR strains.	Institute for Veterinary Medical Research, Agricultural Research Center, Hungarian Academy of Sciences	at least B2 level	MSc in biology and pharmaceutics or DVM, MD. Scientific curiosity and dedication,
Katalin TÖRÖK senior researcher (PhD, Dr habil)	torok.katalin@okologia.mta.hu	The use of agricultural and conservation practices in the restoration of native plant communities and native seed propagation	The unprecedented loss of biodiversity, the degradation of habitats requires human intervention to restore habitats. Ongoing human disturbances, including land use and climate change require relevant knowledge to overcome these problems. The restoration of habitats can improve the provision of ecosystem services and human livelihoods for the benefit of the society, besides enhancing biodiversity. Ecological restoration applies interdisciplinary knowledge to re-establish native habitats or increase the natural state of degraded areas. It uses ecological principles to understand the processes and applies diverse management methodologies, including widely used agricultural practices. The later has gained importance in order to cope with the scale of the problem; experimental fine scale management has to be expanded to large scale interventions. The lack of restoration seed banks that can provide sufficient material of native seeds requires the development of large scale propagation methodology. The programme has two pillars: habitat management and seed propagation knowledge. The results of previous and ongoing restoration experiments guided by the supervisor will provide the basis of the studies on habitat management. The collection of the Pannon Seed Bank and the knowledge gained during its establishment will contribute to the programme to support seed propagation. Research will include habitat management and seed propagation experimenting. The knowledge gained during the programme will be synthesised in the final period.	Centre for Ecological Research, Institute of Ecology and Botany, Vácrátót 2163 Hungary	Good knowledge of English, reading, writing and oral presentation is required	Experience in vegetation research, botany, gardening or agronomy; skill in basic computer use; exeperience in data statistics (advantage)
Ágnes Enyedi	enyedi.agnes@med.semmelweis-univ.hu	Role of calcium signaling in cancer cell migration.	Migration of tumor cells often leads to tumor-cell invasion and metastasis, which is the major cancerous process that causes death. This project is focusing on the molecular mechanisms by which cytosolic calcium controls migration of tumor cells. The specific aims are 1. to study spatial organization of calcium signaling molecules in melanoma and breast cancer cell types; 2. to determine specific trafficking and sorting motifs in these molecules; 3. to study cytoskeletal dynamics and cell shape at different conditions; and 4. to study local and global calcium signaling by using genetically encoded calcium indicators. Proper control of cellular calcium homeostasis is critical for cell physiology; any disturbances in this pathway can result in the development of diseases such as cancer and metastasis. Therefore, understanding the role of calcium signaling elements in cell migration can provide information that may lead to new therapy options of metastatic cancer.	Molecular Oncology Research Group of the Hungarian Academy of Sciences and Semmelweis University, 2nd Institute of Pathology, Budapest, Hungary	at least B2 level	Experience with essential laboratory techniques: gelelectrophoresis, Western blot, cell culture techniques Exprerience in statistics and computer skills (MS Excel and other MS Office applications)

Árpád Dobolyi	dobolyia@caesar.elte.hu	Neurobiology of parental behavior in rodents	The preoptic area of the hypothalamus (Wu et al., Nature, 2014) has been identified recently as the major regulartory center of maternal behaviors in mice. Our objective is to determine the inputs that reach the preoptic area in rodents as well as to describe the neuronal circuitry that controls maternal behaviors. Molecular biological, behavioral, histological and electrophysiological techniques will be combined to reveal the molecular background of parental control in mother as well as in caring rodent fathers.	Laboratory of Molecular and Systems Neurobiology, Department of Physiology and Neurobiology, Institute of Biology, Eötvös Loránd University and the Hungarian Academy of Sciences	advanced level	MSc thesis in neuroscience, physiology, or molecular biology
Csilla Laczka	lozvegy@biomembrane.hu	Organic Anion Transporting Polypeptides as new pharmacological targets	Organic Anion Transporting Polypeptides (OATPs) are membrane proteins that mediate the uptake of large anionic or amphipatic organic molecules. In addition to their transport of endogenous compounds (bile acids and various hormones), several members of the family are also able to transport clinically applied drugs. Therefore OATPs may influence the in vivo fate of drugs. In addition to their physiological relevance, altered expression or function of OATPs has also been documented in cancer and inflammation. Hence OATPs are potential targets in anti-cancer or anti-inflammatory therapy. Our group focuses on the comprehensive biochemical characterization of OATPs, including structure-function studies and the screening of potential OATP substrates and inhibitors.	Institute of Enzymology, RCNS, HAS, Budapest (MTA TTK)	at least B2 level	- MSc in health sciences - experience in molecular and cell biology techniques - diligence - good communication skills (English at least B2 level) - enthusiasm - motivation
László Négyessy	negyessy.laszlo@wigner.mta.hu	Neural basis of tactile object perception in the SI somatosensory cortex	Goal: Determining the intrinsic and inter-areal connections between functionally identified (soomatotopy, tactile submodality) micro-regionsof the somatosensory cortex. Task: Electrohysiolgical and fMRI mapping of the distal finger pad representations and the submodality sensitivity (pressure, flutter, vibration) of the activated cortical regions. Mapping the connections of the physiologically identified regions by neuronal tract tracing. analysing the relationship of the anatomical and functional connectivites.	Hu.Acad.Sci. Wigner RCP, Semmelweis Univ. Anatomy, Division of Neuroscience, Oregon Health and Science University, Portland. OR, USA	at least B2 level	experience in Matlab or R is advantage
Péter Kaló	kalo.peter@abc.naik.hu	Genetic analysis of the symbiotic nitrogen fixation using the M. truncatula-Sinorhizobium model system	Legumes compose the third largest family of flowering plants. Medicago truncatula and other leguminous plants are able to establish nitrogen-fixing symbiotic associations with soil bacteria belonging to the genus rhizobia. The legume-rhizobial symbiosis accounts for a significant proportion of biological nitrogen fixation worldwide. Symbiotic nitrogen fixation takes place in specialized organs on the root, termed nodules. The aim of our research is to study the molecular steps of the nodule invasion and function to better understand the molecular basis of symbiotic nitrogen fixation. We use plant symbiotic mutants to analyze the development of the symbiotic nodule. In order to assess the actual function of the genes (Nod or Fix genes) conditioning the mutant phenotype, we plan to clone these genes. The project of the PhD student would be to characterize the symbiotic phenotype of the mutants, identify the impaired genes, characterize their gene products and determine its function in the symbiotic process.	NARIC Agricultural Biotechnology Center, Gödöllő	at least B2 level	MSc degree in Molecular Biology

Tamás Hajdu and Ildikó Pap	hajdut@elte.hu, pap.ildiko@nhmus.hu	Reconstruction of the lifestyle of the past population lived from the Neolithic to Bronze Age in he Polgár microregion	Numerous archaeological sites and burial grounds and are known in the Polgár microregion of Hajdu-Bihar county from the early Neolithic (Körös culture) to the Middle Bronze Age (Füzesabony culture). Anthropological finds from this area are exceptional since they allow us to compare the lifestyles of historical populations that lived under similar environmental conditions but in different archaeological periods. Certain morphological alteration (and pathological changes) occurring at muscle, tendon and ligament attachment sites (entheses) reflect the extent of physical activity of the individual. . The activity-induced so-called 'musculo-skeletal stress markers' or 'MSM') can provide information on the lifestyle of the past people. By studying them, we can learn about the lives, customs and lifestlyes. Numerous methods have been developed to record entheseal changes, however, their efficiency and reproducibility has not yet been tested on larger samples that lived under similar environmental conditions. By studying entheseal changes we aim to address and find an answer to two main issues: 1) which entheseal change recording method can be applied the most efficiently to biologically reconstruct historical populations, 2) can we find any similarities or differences in the lifestyle and living conditions of individuals of past populations that lived in the Polgár microregion, but in different historical periods.	ELTE, Department of Biological Anthropology and Hung. Natural Hist. Museum, Department of Anthropology	advanced level	Biology BSc, Forensic anthropology MSc, historical anthropology and paleopathology
Tibor Vellai	vellai@falco.elte.hu	Genetics of aging: age associated decline in autophagic capacity during the adult lifespan	Autophagy (cellular self-eating) plays a central role in the regulation of the aging process. Here we intend to assess age-associated changes in the capacity of autophagy in the central nervous system during the adult lifespan in diferent genetic modell systems including C. elegans, Drosophila and mice. We aim to uncover regulatory proteins that inhibit autophagy at advanced ages, and identify mobile genetic elements (transposons)-mediated mutations in autophagy genes in old animals. Potential results may help to bette understand the molecular mechanisms underlying age-associated degenerative changes.	ELTE TTK, Department of Genetics	intermediate level	MSc diploma
Tibor Vellai	vellai@falco.elte.hu	Regulation of autophagy by myotubularin phosphatases	Autophagy (cellular self-eating) is a cell protective mechanims that play a central role in eliminating cellular damage generated during stress. When autophagy is hyperactivated, it can lead to the loss of the affected cell (type II cell death). To inhibit the harmful hyperactivation of the process, certain myotubularin phosphatases have been evolved that are implicated in the development of specific afe-associated degenerative diseases,. We intend to perform the functional analysis of the active myotubularyn phosphatases in the genetic model system Drosophila melanogaster.	ELTE TTK, Department of Genetics	intermediate level	MSc diploma
Eszter Ari	arieszter@gmail.com	Investigating antimicrobial resistance genes with bioinformatic approaches	The aim of the research is to investigate the genetics and evolution of antibiotic (AB) and antimicrobial peptide (AMP) resistance using second- and third-generation sequencing platforms. By these, we would like to find answers to one of the most important questions of the medical and pharmaceutical industry. We will investigate why there are differences in horizontal gene transfer and taxonomic distribution of AB and AMP resistance genes. The research includes the development of appropriate bioinformatic pipelines and models that helps to assign the direction of further investigations. The researches will be done in collaboration with the Synthetic and Systems Biology Unit of the Biological Research Centre, Szeged, Hungary (http://group.szbk.u-szeged.hu/sysbiol/).	ELTE, Department of Genetics and Biological Research Centre, Szeged	medium level conversation, ability to read scientific literature	Bioinformatic skills, genomic knowledge

András Perczel	perczel@chem.elte.hu	Conformational analysis of peptides and proteins	Comprehensive knowledge on secondary and tertiary structure elucidation of polypeptides and proteins is a general requirement for understanding structural chemistry and biology. This special course is dedicated to knos more about NMR, X-ray, ECD, IR and computational aspects of this filed. No need to know much about these biophysical technics, just sign up if you want to learn more about it.	ELTE Institute of Chemistry	at least B2 level	No need to know much about these biophysical technics, just sign up if you want to learn more about it.
András Perczel	perczel@chem.elte.hu	Pulse sequences in bioNMR spectroscopy	Modern bioNMR spectroscopy comprises a set of manufacturer provided and a set of home made pulse sequences. Understanding NMR pulse sequences is important for understanding NMR and for selecting the proper NMR experiment. This lecture explains basic pulse sequences from screech based on Product Operator Formalism. No need to know much about NMR, just sign up if you want to learn more about it.	ELTE Institute of Chemistry	at least B2 level	No need to know much about NMR, just sign up if you want to learn more about it