

National Institute of Mental Health

The National Institute of Mental Health offers the below listed internship opportunities, please make sure to specify the department in your application.

Department of Experimental Neurobiology

The Department of Experimental Neurobiology would be happy to offer an opportunity for a short-term internship in fluorescence confocal imaging of molecular correlates of structural plasticity in animal models of psychiatric disease. The focus of this mini-project will be a characterization of the formation of synaptic connections, axonal sprouting, dendritic growth and branching, and spine plasticity in primary cortical and hippocampal cultures of *tsc2* $-/-$ and *tsc2* $-/+$ autism spectrum disorders rat model. The experimental research will involve isolation of neurons and tissue culturing (7-8 days), genotyping, fixation, immunostaining, and confocal imaging with morphometric analysis. Dr. Pala and Prof. Ovsepian will supervise the project.

Department of Sleep Medicine and Chronobiology

The Department of Sleep and Chronobiology at the National Institute of Mental health in Klecany, Czech Republic focuses on diagnostics and treatment of sleep and circadian rhythms disorders, with emphasis on detection of early stages of the disease, long-term monitoring and preventive potential of early interventions. Disorders of regulatory systems (circadian rhythms, sleep/wake and arousal), especially sleep disorders are among the most common non-specific symptoms of neuropsychiatric disorders and occur across numerous nosological units. Moreover, abnormalities of sleep and circadian rhythms often precede development of mental, somatic and neurodegenerative diseases, regardless if they are a genetically determined end phenotype or a result of an unhealthy lifestyle. Their early diagnostics, long-term monitoring and development of targeted interventions has a great preventive and therapeutic potential.

Current research projects include evaluation of sleep macrostructure and microstructure in patients (esp. parasomnias, insomnia, hypersomnia), relate to sleep and memory consolidation, no pharmacological stimulation during sleep as well as to a broad range of chronobiological issues. The trainees can gain experience in sleep monitoring, sleep scoring, quantitative EEG processing, no pharmacological stimulations, actigraphy as well as in laboratory methods such as qPCR, radioimmunoassay, cell cultures and luminometry — depending on the schedule of each particular two-week period. Dr. Koprivova will supervise the project.

Department of Applied Neuroscience and Neuroimaging

The main objective is to evaluate the main neurobiological modalities of the brain in the context of mental illness. In addition to clinical neurobiology research (MRi, Genetics, Neuropsychology, EEG), we will focus on creating a flexible and modern electronic health information system for complex personalized care that will integrate the clinical data of individual patients. This electronic system will further exploit mobile technologies that will be used to automate real-time mental fault evaluation. The ultimate goal is a module of individualized assessment of these data, which will provide a professional decision-making system for physicians who meet the concept of CAD (Computer Aided Decision).

- Position: advanced analysis of MRI data (fMRI, VBM, SBM, rsfMRI etc). Expertise required.

- Data from large-scale longitudinal multimodal MRI study in first episode schizophrenia spectrum subjects.
- Three one-month slots.

Dr. Spaniel will supervise the project.

Department of Translational Neuroscience

My scientific work is focused on pharmacology, neurochemistry, research, and development of psych pharmaceuticals and compounds affecting central nervous system function. I also study the neurobiology of cognitive deficits and related behavioral changes in neuropsychiatric diseases. Finally yet importantly, I deal with translational medicine and technology transfer. I am also a coinventor of multiple patents for the neuroprotective and neuroactive compounds (including PCT and EU patents) and I publish more than 70 impacted papers.

Scientific interests:

The group's main lines of research include the study neurochemical, behavioral and neurodegenerative processes in schizophrenia in the animal model. We develop the model based on the early immune stimulation and induced repeated psychotic attacks.

There is a contemporary consensus that there is further worsening of symptoms with each relapse in schizophrenia. These symptoms include pathophysiological changes and neurodegeneration, which may ultimately, leads to gray matter shrinkage in the final stages of schizophrenia. Our research focuses on the studying this phenomenon and at designing an innovative animal model. Design and evaluation of the valid animal model of schizophrenia progression is important for studying the neurobiological mechanism as well as for suggesting potential pharmacological approaches to its treatment. Recently designed model is based on the early immune stimulation and repeated injection of drugs causing psychosis-like behavior in animals. Thus, important output of this study is to facilitate testing of the neuro protective effect of the substances with antipsychotic properties on the progression of the disease and selecting the most appropriate ones.

Content of the internship:

During the internship, Dr. Vales and members of his team will supervise the junior scientist. There will be an opportunity for the intern to engage in a piece of original research. He/she will also attend the research meetings, journal clubs and all the regular activities of the Department. Students and postdoctoral fellows as well as members of the senior staff present their ongoing projects and experiments. Such meetings are interactive and create a dynamic forum where ideas that range from the basal to the translational neuroscience are exchanged and discussed.

Department of Brain Electrophysiology:

Brain Electrophysiology Research Programme at the National Institute of Mental Health in Czech Republic, is devoted to the clarification of open issues in the dynamics of complex brain functioning under normal and pathological conditions, as well as in terms of changes elicited by various therapeutic approaches. Working groups on preclinical and clinical neurophysiology form innovative concepts interlinking the advances in basic neuropsychiatric and cognitive research with the appropriate clinical applications

(improvement of the diagnostics of various mental disorders by means of newly developed diagnostic markers and neurophysiological indicators, development of a comprehensive system with

early predictors of therapeutic response to a broad spectrum of various treatment interventions). The Translational neurophysiology research group focuses on neurophysiological research of neuropsychiatric disorders, primarily on the models of psychotic diseases. In this field, one of our main tasks is to compare data from animal studies with human data, the so-called translational approach. For this reason, we are working on the analysis of multichannel EEG recordings in animal models and we will try to implement the same advanced analytic procedures to human data registered with 256channel EEG system. Most of the experiments are focused on pharmac-EEG, thus affecting the EEG using a variety of pharmaceuticals (e.g. models of acute pharmacological psychosis and its pharmacological interference). The ongoing research is focused on the comparison of serotonergic models of psychosis in humans and animals (analyses of the changes in EEG induced by psilocybin administration to human volunteers and by psychedelic substances in an animal models) as well as the phenomenology of psychedelic experience and searching for correlates of classical and electronic music perception during psilocybin intoxication.

lab /clinical options: laboratory

Subjects of research:

- 1) Translational validity of serotonergic models of psychosis in humans and animals changes in EEG induced by psilocybin administration to human volunteers and by psychedelic substances in an animal model.
- 2) Phenomenology of psychedelic experience — qualitative assessment of guided imagery sessions, quantitative assessment (laboratory x online drug survey), searching for correlates of classical and electronic music perception during psilocybin intoxication.

Facility equipment: multichannel EEG recordings in animal models, 256-channel MRI compatible EEG system EGI GES 400 MR,