IBRO-APRC Advanced School of Neuroscience

Tehran, Iran

29 April - 11 May 2017

Aims and Scope of the School

The Advanced School will focus on "**in depth discussions on a planned project, using novel techniques, with an emphasize on possible mechanisms, data analysis and data presentation in neuroscience research".**

The Advanced School will provide a platform for young researchers to increase their depth of understanding from the theoretical basis up to the methodological know-hows of a neuroscience research.

The course of the Advanced School consists of two weeks of practical experiences in the laboratory, together with related lectures. The laboratory experiences will be divided into two 5 days blocks (the first and second weeks). The course will also include proposal writing and presentation and group discussions.

Students selected to attend the School will have their travel (round-trip airfare from a major international airport in their country to Tehran) and living expenses (housing and meals) covered by the School.

The School is intended for 10-15 young researchers and junior faculties, post-doctoral researchers, and PhD students (with at least one year of training in the program), in the neuroscience-related fields. Particularly, those who can contribute to neuroscience in their own countries are welcome. The applicants should be fluent in English (written/spoken).

Applicants' qualifications

The age under 35 years is preferred. Applicants from the Asia-Pacific region will have some priority. Preference will be given to IBRO alumni of previous 2-week Schools.

Students will be chosen on the basis of their academic records and their potential for leadership in the scientific community of their home country. The criteria include: academic achievements, publications, letters of reference, and in particular, the statement of how this School will benefit the applicant's own research career.

All applications for the IBRO-APRC Advanced School are handled through IBRO Schools On-line Application site.

How to apply

Please expect to submit on-line the following pieces of information or items:

1. Application form
2. CV (Curriculum Vitae) with Publication List (including conference presentations)
3. Statement of Purpose (how you will benefit from attending the school) and also characterizing the two first priorities from the 5 different lab groups
4. Two letters of recommendation

Location

All lectures and laboratory experiences are provided at Tarbiat Modares University (TMU), and Neuroscience Research Center, Shahid Beheshti Medical Sciences University (SBMU), located in Tehran, Iran.

All applicants would be transferred from IKA airport to their guest-house (about one hour) in Tehran.

Course

The School comprises in lectures by invited speakers, project planning, laboratory hands-on training, with an emphasize on data analysis and data presentation, and also presentations by the applicants. During the course, participants will have deep scientific discussion with lab mentors and project presentation

Timetable:

Time	Day 1	Days 2-6 TMU	Day 7	Days 8-12 SBMU	Day 13
9:00-10:00 AM		Lecture	**Excursion**	Lecture	Lecture
10:30-12:30		Laboratories		Laboratories	Report Presentation
12:30-13:30		Lunch		Lunch	Lunch
13:30-18:00		Laboratories and group discussions		Laboratories and group discussions	Wrap-up session
19:00-21:00	Registration & Welcome Dinner				

Mentors & Laboratory Experiences

Group 1: In vitro and in vivo recording of synaptic plasticity in health and diseases
TMU lab head
Prof. Yaghoub Fathollahi
Details: NMDA receptors are not functioning in basal synaptic transmission take place in CA1 area, while this receptor is involved in potentiated and potentiation of synapses in healthy state. On the other hand, pathological potentiation such as seizure induced changes in synaptic plasticity require calcium channels rather than NMDA receptors. Using in vitro field potential recording, participants will learn to record population activity of neurons in CA1 area of hippocampus and investigate the role of NMDA receptor and calcium channels in physiological and pathological potentiation, respectively.

SBMU lab head
Prof. Fereshteh Motamedi

Details: Aberrant synaptic plasticity may lie at the heart of many brain disorders: specially the dentate gyrus (DG) of hippocampus, which is susceptible to such alteration due to Alzheimer's disease. Therefore, the study of synaptic plasticity in that area, offers a promising route by which the pathological electrical events could be monitored. By employing paired pulse stimulation and also inducing long term potentiation and depression, in the perforant path-DG synapse we are able to navigate the changes in hippocampal excitability in the DG as the gatekeeper of hippocampus. By using in vivo field potential recording from DG synaptic network, participants will learn to capture electrical events in the anesthetized and freely moving healthy and A–beta treated rats and the data will be analyzed thereafter.

Group 2: Studying the role of orexin neuropeptide in drug addiction (Single unit extracellular recording from anesthetized and behaving animals)

TMU lab head

Prof. Saeed Semnanian

Details: Drug addiction is a chronic and often relapsing brain disease which leads to changes in structure and function of the brain and consequently causes compulsive drug seeking and use despite having harmful effects to the drug addict. Various brain regions (such as Locus Coeruleus nucleus and Lateral paragigantocellularis nucleus) have been shown to be involved in drug dependence. In addition, orexinergic system have been reported as an important endogenous factor for mediating the cellular mechanisms underlying this phenomenon. In spite of the numerous studies performed during the recent years, most cellular and molecular aspects are still poorly unveiled. In this laboratory the main aim is to reveal the role of orexinergic system in development of drug dependence through affecting specific neuronal pathways within the brain stem structures.

SBMU lab head

Prof. Abbas Haghparast

Details: Single-unit extracellular recording is a tool to explore the brains of animals and humans to study behaviors and functions. This method is widely used in cognitive science, where it permits the analysis of animal/human cognition and cortical mapping. This information can then be applied to brain machine interface (BMI) technologies for brain control of external devices. One primary line of research in this lab focuses on studying the interrelationship of the Reward-Pain-Stress circuits and involvement of orexinergic system in sub-cortical areas such as NAc, VTA, LH and Hippocampus, and the Prefrontal cortex. Also, in this lab, the second research line is investigation of decision-making processes in specific conditions such as induction of addiction, stress, sleep-deprivation, sleep disorders and neurodegenerative diseases in prefrontal-striatal-hippocampal circuitry.

Group 3: Neural Degeneration and Regeneration

TMU lab head

Prof. Mohammad Javan

Details: Adults' brain has a limited capacity for repair. Neural cell loss frequently happens due to neurodegenerative diseases and traumatic brain injuries. Optic never provides a unique platform to study axon regeneration and remyelination and screening for related therapies. Using visual evoked potential recording from mice the extent of axon degeneration and demyelination would be functionally assessed. Injection of tracing dyes into the superior colliculus and counting the number of retrograde- labelled retinal ganglionic cells provide an accurate method for detecting primary axonal damage due to traumatic injury or secondary axon degeneration following chronic demyelination. Visual cliff and visual placing as behavioral tests can be used for evaluating the visual acuity. Immunohistofluorescence studies can provide histological data concerning the level of axon degeneration and demyelination.

SBMSU lab head

Prof. Abolhassan Ahmadiani

Details: Alzheimer's disease (AD), the most common neurodegenerative disease in humans and the most common cause of dementia in older adults, is an irreversible brain disorder that progressively destroys cognitive functioning, eventually erasing memory and disabling reasoning skills. Studying the basic mechanisms of Alzheimer's, using in vivo and in vitro models, focuses the long-term goal of finding a way to cure and possibly prevent the disease. Viral mediated gene expression in early adult rats are used to simulate the sporadic form of AD which the disease pathogenesis begins many years before the clinical manifestations. Behavioural tests of cognitive function in parallel to molecular and histological tools are used to verify the disease modelling and further therapeutic interventions. In vitro primary culturing of neural cells also provides a platform for the study of the signalling events as well as screening the efficacy and toxicity of therapeutic candidates.

Group 4: Electrophysiological basis of epilepsy

TMU lab head

Prof. Javad Mirnajafi-Zadeh

Details: Seizure occurrence is accompanied with changes in excitation/inhibition ratio and results to potentiation of synaptic transmission in many areas of the brain, including the hippocampus. These changes can affect the induction of new synaptic plasticity in this area. Using extracellular field potential recording and whole cell patch clamp recording, we can measure the changes in extracellular field potentials, glutamatergic or GABAergic synaptic transmission and study the effect of different factors and mechanisms which may be involved. In addition, the ability of plasticity induction in these synapses is evaluated following different treatments and data are discussed.

SBMSU lab head

Prof. Mahyar Janahmadi

Details: Ion channels play a critical role in the function of excitable cells and dysfunction of both voltage and receptor-gated ion channels can cause diseases including epilepsy. Therefore they could be interesting targets for therapeutic or preventive intervention. Using conventional intracellular recording and whole cell patch clamp recording techniques the dysfunction of individual ion channels, particularly HCN pacemaker channels and TRP channels, which may alter intrinsic neuronal excitability and firing pattern in epileptic condition is assessed and electrophysiological consequences of altered neuronal function are discussed.

Group 5: Electrophysiological signatures of behavior and visual perception

TMU lab head

Dr. Mohammad Reza Raoufy

The brain and immune system form a bidirectional communication network, known as "immune to brain communication". For instance, systemic inflammation does communicate with the brain leading to a distinctive pattern of neural activity and behavioral changes such as anxiety and depression. It seems that the dynamic interactions between hippocampus and amygdala are critical for such behaviors, but the cellular mechanisms are unknown. Using well-established electrophysiological and behavioral techniques, accompanied with signal processing, we investigate the biological nature of immune-to-brain communication elicited by systemic inflammation.

SBMSU lab head

Dr. Mir Shahram Safari

Details: Importance of top-down (corticocortical) and bottom-up (subcortical) pathways in regulating visual responsiveness are crucial, how these two pathways working independently and interact during coincident engagement in vivo to optimize vision while maintaining network stability is unknown. Sensory-evoked responses in V1 neurons are highly dependent on subcortical neuromodulation pathways that regulate brain state. With cell-type-specific resolution using optogenetics and optopatcher in vivo, we are addressing how corticocortical and subcortical pathways (cholinergic and serotonergic systems) interact to regulate responsiveness of layer II/III neurons of V1. Our studies provide insight into the rules and conditions governing activity propagation in connected networks of brain.

School Web Site URL:

Honorary Director: Prof. Fereshteh Motamedi

Director: Prof. Saeed Semnanian

General Secretary: Dr. Hossein Azizi

Application deadline: March 5, 2017

Sponsors:

International Brain Research Organization (IBRO)

Neuroscience Research Center, Shahid Beheshti Univ Med Sci

Tarbiat Modares University

Iranian Society of Physiology and Pharmacology

Iranian Neuroscience Society

Cognitive Sciences and Technologies Council of Iran

Iranian National Science Foundation

If you have further questions, please contact Dr Hossein Azizi (azizih@modares.ac.ir)