

**IBRO-ISN Neuroscience School @ NUS**  
**to be held in Singapore, 26-30 June, 2006, as a pre-conference event of**  
**the 7<sup>th</sup> Biennial Meeting of the Asian Pacific Society for**  
**Neurochemistry, 2-5 July, 2006**

This school is structured according to the Associate Schools run by IBRO. It is targeted to recruit 40 students (36 from outside Singapore and 4 from Singapore) who are registered postgraduate students in universities in the Asia Pacific regions. Preference will be given to applicants from developing countries. All students accepted into this school will be registered for the APSN 2006 meeting.

The school will last for 4½ days as scheduled below (content may subject to change).

The international faculties are:

1. Dr Roger Butterworth (University of Montreal, Canada)
2. Dr Kazuhiro Ikenaka (National Institute for Physiological Sciences, Japan)
3. Dr Peter Dunkley (University of Newcastle, Australia)

Each of these 3 faculties is expected to give one special lecture.

The local organizers and faculties are:

1. Dr Peter T.-H. Wong
2. Dr Boon-Seng Wong
3. Dr Chian-Ming Low
4. Dr Wei-Yi Ong
5. Dr Yee-Kong Ng
6. Dr Yih-Cherng Liou

Tentative Schedule:

Time	Day 1 (Theme: The Brain)	Day 2 (Theme: Neurotransmission)	Day 3 (Theme: Neuronal Metabolism)	Day 4 (Theme: Neurodegeneration)	Day 5	
8:00-9:00	The brain: structure and function	Neurotransmitters in the Brain	Energy metabolism of the Brain	Metabolic Disorders	Special Lecture 3	
9:00-10:00	The Neuron: structure and function	Receptors and Ion Channels	Nutrition & Brain Function	Genetics of neurodegenerative diseases	Presentations of project work	
10:00-10:30	TEA BREAK					
10:30-11:30	ditto	Modulation of Neurotransmission	Special Lecture 1	Special Lecture 2	ditto	
11:30-12:30	Glial Cells: structure and function	Electrophysiological Techniques	Neuroendocrine control of metabolism	Proteomics of neurodegenerative diseases	Closing Discussion and Certificate Presentation	
12:30-13:30	LUNCH					
13:30-14:30	ditto	Group discussion	Neurochemical Techniques	Animal Models of neurodegenerative diseases		
14:30-15:30	Group discussion	Project Work	Group discussion			
15:30-16:00	TEA BREAK					
16:00-17:00	Project Work					
17:00-18:00						

## **Day 1**

The theme of the day is “The brain”. It starts with a lecture to overview the brain. This is followed by 2 parallel sessions, one on neuron and one on glial cells. Students will be divided into two groups of about 20 each so that these sessions can be conducted in an interactive discussion style.

### **Suggested content:**

The brain: gross morphology and function of important brain regions.

The Neuron: form and function, subcellular structure, electrical properties, intracellular communication, behaviour and plasticity.

Glial cells: Types, origin, development and function.

The day ends with a small group discussion (groups of 10) on the materials covered, and project work (see below).

## **Day 2**

The theme of the day is “Neurotransmission”. There will be 3 lectures in the morning session, followed by 1 lecture on techniques in the afternoon.

### **Suggested content:**

Neurotransmitters in the Brain: Overview of neurotransmitter systems; neurotransmitter synthesis, storage, release, binding to target and recycling; disease caused by abnormal neurotransmission

Receptors and Ion Channels: ligand-gated ion channels; ligand-gated receptors (GPCRs); disease caused by receptor/ion channel malfunction

Modulation of Neurotransmission: Excitatory and inhibitory neurotransmission; long term potentiation – Hippocampal pathway; long term depression – cerebellum pathway

### **Electrophysiological techniques:**

- (a) Primary neuronal and cell line cultures.
- (b) Transfection techniques (Transient and stable).
- (c) Two-electrode voltage clamp recording.
- (d) Patch clamp recording (whole cell, patch, single channel).
- (e) Brain slice (field and patch recording).
- (f) Whole animal field recording.

The day ends with a small group discussion (groups of 10) on the materials covered and project work.

### **Day 3**

The theme of the day is “Neuronal metabolism”. There will be 3 lectures in the morning session, followed by an afternoon session on techniques.

#### **Suggested content:**

Energy metabolism of the Brain: Carbohydrate and fatty acid metabolic pathways; differences between in vitro and in vivo neuronal metabolism; regulation of energy metabolism

Nutrition and Brain Function: focusing on brain development and neuronal ageing

Neuroendocrine control of metabolism: Hypothalamic-anterior pituitary pathways; hypothalamic-pituitary-adrenal pathways; hypothalamic-pituitary-thyroid pathways.

#### **Neurochemical techniques:**

- (a) Primary neuronal and glial cultures.
- (b) Cloning and selection.
- (c) Transformation and immortalization.
- (d) Cryopreservation.
- (e) Immunocytochemistry.
- (f) Immunoprecipitation.
- (e) Immunoblotting.

The day ends with a small group discussion (groups of 10) on the materials covered and project work.

### **Day 4**

The theme of the day is “Neurodegeneration”. There will be 3 lectures in the morning session, followed by 1 on disease models in the afternoon.

#### **Suggested content:**

Metabolic disorders: Defective carbohydrate and fatty acid metabolism; role of mitochondrial dysfunction in neurodegenerative diseases.

Genetics of neurodegenerative diseases: Nature of mutations in inherited neurodegenerative diseases; influence of genetic polymorphisms in sporadic brain diseases.

Proteomics of neurodegenerative diseases: Protein folding and misfolding; protein processing and degradation.

Animal Models:

- (a) Isolation, culture and manipulation of post-implantation embryos.
- (b) Gene targeting strategies.
- (c) Introduction of foreign DNA into embryonic stem cells.
- (d) Phenotypic analysis.
- (e) Cryopreservation.

The day ends with a small group discussion (groups of 10) on the materials covered and project work.

## **Day 5**

Students present their project work on this last day. Each presentation should last 30 min, including question time.

As it is anticipated that the standards in science and English vary widely in the cohort of students, detailed handouts will be compiled and printed for the students.

## **Project work:**

Students will be divided into 4 groups of 10 and each assigned one of the four themes. Each group is expected to identify a topic relevant to the theme and prepare a 20 min presentation on the last day.