Full Time MSc Neuroscience Programme 2015-2016

Titles for Essay A2

Submission Deadline: Monday 9th of November 2015, at 15.00pm

A2.1 Neurogenetics

1. Rare large recurrent copy number variants have been associated with a variety of psychiatric and neurological disorders. Outline the range of phenotypes associated with these copy number variants and the potential insights into the neurobiology of psychiatric disorders that they provide.

2. Studies have identified mutations in gene X as being linked to a neurological disorder that affects both the motor and cognitive systems. Following preliminary cellular work, you now wish to investigate the effect of this mutation *in vivo*. You have access to labs that work with *Drosophila*, zebrafish and mice. Discuss which of these species you might use to establish your transgenic animals, with reference to the benefits and drawbacks of each model system.

A2.2 Developmental Neurobiology

3. Explain how tritiated thymidine can be used to label dividing cells in the neuroepithelium. Discuss two features of neural development that have been revealed using this technique.

4. Choose three key experiments in Developmental Neurobiology and explain your choice by justifying their importance.

5. In describing the formation of neuronal circuits, the phrase "molecular cues define and activity refines" is often used. What do you understand by this phrase and how good is the evidence to support it?

6. Have neural stem cells fulfilled their therapeutic potential?

7. The gut microbiota: An important player in both neurodevelopmental disorders and neurodegenerative diseases?

A2.3 Neuronal Plasticity

8. What are recurrent artificial neural networks? Is there evidence for recurrent processing in the brain? Compare and contrast Elman and Hopfield networks in your essay.

9. Discuss the role of CaMKII autophosphorylation in long-term potentiation.

A2.4 Neuroimmunology

10. How does the blood-brain barrier prevent the movement of therapeutic drugs and biomolecules (cytokines, siRNA, etc.) into the brain? What approaches are available to circumvent the barrier and to deliver these treatments?

11. Describe the effects of pro- and anti-inflammatory cytokines on the development of Alzheimer's disease, using specific examples from transgenic rodent models.