List of BMedSc(Hons) Projects
Colin Ingram Travel Award Monash-Newcastle (UK)

PROJECT OPTION 1

PROJECT TITLE:

Neuropharmacology of Decision Making

SUPERVISORS:

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PROJECT DESCRIPTION:

Decision-making deficits are a prominent feature of a number of clinical disorders, including attention deficit hyperactivity disorder (ADHD), schizophrenia, depression and Parkinson's disease (PD). Although decision neuroscience has made great strides in identifying neural metrics of decision-making that are comparable across species and time scales, critical knowledge gaps remain. These gaps include an incomplete understanding of: (i) the exact underlying cognitive components that affect complex decision making and (ii) how neurochemicals modulate these decision-making communications. In this project we will investigate decision making in human subjects in a difficult evidence accumulation task under control and under 'drug' conditions. Subjects will learn the 'value' of different shapes and how they provide information, which of two possible decisions is correct [1]. You will be part of a team running these experiments in humans under control and drug applied conditions. In collaboration with computational neuroscientists you will determine how components such as impulsivity, working memory limitations, or bias contribute to an individual's decision making. To understand the underlying neuropharmacology, cholinergic antagonist will be given to study its impact on decision-making.

1. Kira, S., T. Yang, and M.N. Shadlen, A neural implementation of Wald's sequential probability ratio test. Neuron, 2015. 85(4): p. 861-73.

https://research.monash.edu/en/persons/mark-bellgrove
https://www.ncl.ac.uk/psychology/people/profile/alexthiele.html

PROJECT OPTION 2

PROJECT TITLE:

Effects of novel antidepressants on neural function

SUPERVISORS:

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PROJECT DESCRIPTION:

Conventional antidepressants which target monoamine reuptake have a suboptimal therapeutic profile. There is a delay in the onset of antidepressant action of several weeks and a substantial proportion of patients have an incomplete response or no response at all. In recent years, the dissociative anaesthetic ketamine, and the psychedelic psilocybin, have been trialled in treatment resistant depression. Remarkably these drugs induce rapid antidepressant responses which in some studies has been shown to be maintained for weeks or months. The mechanism of action of these drugs in the treatment of depression remains unclear. Although the two drugs have very different receptor binding profiles (ketamine is an NMDA-receptor antagonist, while psilocybin is a 5-HT2A receptor agonist), we propose that they have common effects on neural network activity which underpin their rapid effects on mood. This project will use a combination of in vitro and in vivo electrophysiological methods in rodents to explore the effects of ketamine, psilocybin, and other psychedelics, on the firing activity of neurons in the prefrontal cortex as well as local network activity and distributed activity across the cerebral cortex. Understanding how these drugs alter neural activity can inform the development of novel antidepressants with improved therapeutic and safety profiles.

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