

Project Title	Understanding the role of mitochondrial metabolic efficiency in synaptic transmission and plasticity
Supervisor(s)	Dr Kambiz Alavian (Department of Brain Sciences) Dr Andrew Shevchuk (Department of Metabolism, Digestion and Reproduction)
Themes	Biomedical Sensing Diagnostics and Imaging Image Acquisition and Signal Processing Microscopy
Project Type	Lab based
Project Description	<p>An ageing-related decline in mitochondrial function is associated with physiological imbalance and neurodegenerative conditions. Deficiency in mitochondrial genetic integrity, ATP production and redox balance is either directly associated with or can be ameliorated by regulation of mitochondrial metabolic efficiency. Particularly, mitochondrial dysfunction and decline in efficiency of ATP production seems to be connected with the impairment of synaptic plasticity and long-term potentiation (LTP), i.e. the long-lasting enhancement of synaptic activity as a result of high-frequency stimulation followed by biochemical and structural changes and metabolic growth of the pre- and post-synaptic neurons.</p> <p>The overall goal of this project is to characterise the synaptic metabolic changes associated with high-frequency stimulation and synaptic plasticity. We will utilise an electrochemical method using platinum-coated nano-electrodes (Shevchuk lab) and primary hippocampal neuron cultures, as well as imaging and biochemical assays (Allavian lab) to achieve this goal. The results of this study will, for the first time, elucidate the role of mitochondrial metabolic efficiency in synaptic plasticity, potentially providing an explanation for the dysfunction associated with normal aging and degenerative conditions such as Alzheimer's disease.</p>