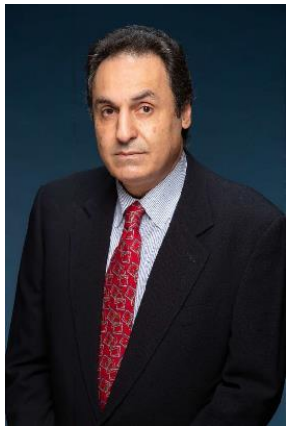
Project Abstracts for PhD Student Recruitment AY2025/26

Department of Chemistry

<table>
<tr><th>Project title</th><th colspan="2">Excitation of Upconversion Nanoparticles via Near Infra-red LED Illumination for Neuromodulation</th></tr>
<tr><td>Research Clusters</td><td colspan="2">☐Creative Media/Practice
√ Health and Drug Discovery
☐ Data Analytics and Artificial Intelligence in X
☐ Humanities and Cultures</td></tr>
<tr><td>Keywords</td><td colspan="2">Upconversion Nanoparticles, Near Infra-Red LED, Neuromodulation</td></tr>
<tr><td>Project abstract</td><td>The main objective is to develop a minimally invasive method to stimulate selective neuropathways in the CNS (central Nervus System) to depolarize targeted neurons. We intend to replace a conventional approach to emit visible light by stimulating dye-sensitized upconversion nanoparticles (UCNPs) using our Near Infrared – Light Emitting Diodes (NIR-LED) illumination system with a broadband excitation wavelength range (800 nm) to activate light sensitive ion channels, Channelrhodopsin-2 (ChR2), in transfected neuropathways. Our ability to selectively and semi-invasively depolarize and induce action potential in neurons presents a powerful tool for functional recovery and neuromodulation.</td><td> 
Dr ALL Angelo

Email address:
angelo@hkbu.edu.hk

Learn more:
https://chem.hkbu.edu.hk/Angelo-Lab</td></tr>
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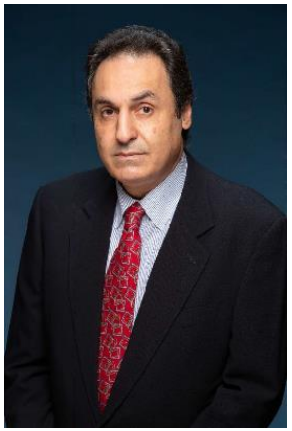
Project title	Conjugated polymeric nanoparticles and their axonal transport	
Research Clusters	☐Creative Media/Practice **√ Health and Drug Discovery** ☐ Data Analytics and Artificial Intelligence in X ☐ Humanities and Cultures	 ***Dr ALL Angelo*** *Email address:* *angelo@hkbu.edu.hk* *Learn more:* *https://chem.hkbu.edu.hk/Angelo-Lab*
Keywords	*Polymer, Nanoparticles, Axonal transport, drug delivery*	
Project abstract	The main objective of this project is to develop novel polymeric nanoparticles capable of noninvasively transporting therapeutic agents from neuronal terminals into the brain via axonal transport and bypassing the Brain-Blood Barrier (BBB). We are investigating the potential to use existing anatomical pathways (nerves) to deliver nanoparticles conjugated with therapeutic agents. Students mainly work on developing polymeric nanomaterials. As analytical chemistry is one of the main core concepts, students will learn about various equipment and tools and will be taught how to characterize these newly generated nanomaterials.	

Project title	Primary cilium in neurological diseases	
Research Clusters	☐Creative Media/Practice **√ Health and Drug Discovery** ☐ Data Analytics and Artificial Intelligence in X ☐ Humanities and Cultures	 ***Dr Catherine Hong-Huan HOR*** *Email address:* *catherinehor@hkbu.edu.hk* *Learn more:* *https://chem.hkbu.edu.hk/hor* *https://catherinehor.wixsite.com/website*
Keywords	*Neuron, Primary Cilium, Genetic, Brain*	
Project abstract	The project aims to understand the molecular and cellular pathology of hereditary neurological and neuropsychiatric disorders, with particular interest in deciphering the neurochemistry and neurological roles of an under-appreciated but instrumental cell-cell signaling organelle, the primary cilium. The experimental platforms involve mouse genetic disease models, and human induced-pluripotent stem cells disease modeling of ciliopathy-like disorders. Current project focuses on unravelling the relationship between primary cilium and G-protein coupled receptor mediated neuronal signalling pathways in neurometabolism and aging.	

Project title	Strive for the Betterment of Human Health Through Analytical Science	
Research Clusters	☐Creative Media/Practice **√ Health and Drug Discovery** ☐ Data Analytics and Artificial Intelligence in X ☐ Humanities and Cultures	 ***Prof Kelvin Sze-Yin LEUNG*** *Email address:* *s9362284@hkbu.edu.hk* *Learn more:* *https://chem.hkbu.edu.hk/kelvinleung*
Keywords	*Environment; Emerging Micropollutants; Health; Disinfection Byproduct*	
Project abstract	Our research focuses on studying the environmental fate of emerging micropollutants - chemicals or materials that have been detected in the environment that may pose a present or potential threat to human health. Our Laboratory is interested in determining their formation mechanisms; developing treatment approaches for controlling / mitigating toxic byproducts; and exploring their impact on human health.	

Project title	Molecular Imaging Probes for MRI	
Research Clusters	☐Creative Media/Practice **√ Health and Drug Discovery** ☐ Data Analytics and Artificial Intelligence in X ☐ Humanities and Cultures	 ***Dr Nicola ROGERS*** *Email address:* *nicolarogers@hkbu.edu.hk* *Learn more:* *https://www.parkerrogerslab.com/current-projects*
Keywords	*MRI; contrast agents; transition metals; molecular imaging*	
Project abstract	MRI is a useful diagnostic technique in medicine, which can be enhanced by using molecular imaging agents. The research team is developing of new imaging agents that can map molecular process and local physiological environments in the body, e.g. temperature, pH, concentration of metal ions, using 'Parashift' agents and MR Spectroscopic Imaging. We are also exploring lanthanide-free alternatives, using first row transition metals. The project involves collaboration with groups at Nottingham University, UK.	

Project title	Chiral Probes for Proteins	
Research Clusters	☐Creative Media/Practice **√ Health and Drug Discovery** ☐ Data Analytics and Artificial Intelligence in X ☐ Humanities and Cultures	 ***Prof David PARKER*** *Email address:* *davidparker@hkbu.edu.hk* *Learn more:* *https://www.parkerrogerslab.com/current-projects*
Keywords	*Rare earth; luminescence; chirality; imaging; proteins*	
Project abstract	Many chemical molecules have left and right-handed or chiral configurations. The two versions often have very different biochemical behaviour. As all proteins, nucleic acids and sugars are chiral and usually exist in Nature in one “handedness”, the research team is creating luminescent rare earth probes to detect the chirality of these molecules and their modifications. The project involves collaboration with groups in Durham University, UK.	