Summer 2018 USRA Opportunities in Spinal MEG Neuroimaging using Optical Magnetometers
Supervisor: Teresa Cheung

Magnetoencephalography (MEG) is a non-invasive brain imaging technology that measures the electromagnetic signals generated by neuronal activity. These magnetic fields are small and require very sensitive equipment to measure. MEG is used to assess brain health and has played an increasingly important role in our understanding of how the brain functions. SQUID based magnetometers have been the gold standard for MEG instrumentation – with helmet shaped machines dominating commercially available systems. Recently, optically pumped magnetometers have been developed that are small and portable with similar sensitivity to SQUID sensors. We are studying these magnetometers with the intention of building a multichannel system for magnetic spinal cord imaging.

This undergraduate-level research opportunity will provide excellent training in the area of medical imaging development and signal processing techniques. The student will also have opportunity to contribute to commercial instrument development through a partnership with local MEG manufacturer CTF. We are looking for a student who is interested in employing their skills towards improving the lives of patients’ and their families by creating novel medical technologies. Applicants should be familiar with MATLAB and have good programming skills as well as a strong mathematical background in linear algebra.

You'll play a key role in the establishment of a new research initiative aimed at developing and deploying the next generation of diagnostic and therapeutic medical devices for functional spinal cord imaging. In this project you will collect brain and spinal data from healthy volunteer participants using both SQUID based and OPM based MEG and use signal processing techniques to compare the similarities and differences between the biomagnetic data obtained from these technologies. You will be based at the SFU ImageTech Lab located in Surrey Memorial Hospital and will be trained to collect data using the SQUID MEG system at ImageTech as well as OPM based MEG. You will also be trained in advanced signal processing techniques to analyze the collected data. You will work within a multidisciplinary team of neuroscientists, biomedical engineers, computer scientists, medical physicists, neurologists and other medical professionals; you will have the opportunity to not only learn about the spine and the brain but will gain exposure to the latest advances in medical imaging, bio-informatics, medical technology development and patient centric research. Finally, this project may lead to both journal and/or conference opportunities.