MSc and PhD position

The Quantitative Physiological Imaging laboratory of Concordia University in Montreal, under the directorship of Dr. Claudine Gauthier, is currently accepting applications from potential PhD students and MSc students to join a multidisciplinary team of neuroscientists, physicists and engineers investigating changes in metabolism and hemodynamics with plasticity, aging, lifestyle and stroke. We study populations ranging from healthy adults, to seniors to patients who suffer from diseases such as heart diseases, stroke and Alzheimer's disease. The research will take place at the Montreal Heart Institute and the Physics department of Concordia University. Students will take part in all components of projects, including data acquisition, data analysis and development of biophysical models of MRI signals and physiology.

Project Descriptions:

Impact of COVID-19 on cerebral health measured with quantitative MRI

Long COVID is thought to affect up to 20% of the individuals who contract COVID 19. Long COVID is associated with brain fog and fatigue, but its effects on brain health is currently unknown. In this project, we study the impact of long Covid-19 on the brain, especially on vascular and metabolic health and cognition, using brain imaging techniques (MRI) and cognitive tests. We also explore how risk factors, such as hypertension, diabetes, and smoking, influence the impact of long COVID. This project also explores the role of inflammation in determining the effects of long COVID on the brain.

Brain health in females at menopause: quantitative imaging of the effect of estradiol, arterial stiffness, and inflammation on the brain

Vascular diseases are the leading cause of death in females, with one out of three females dying from cardiovascular or cerebrovascular diseases. Cerebrovascular disease develops about a decade later in females, but 60% of stroke deaths are in females, who are also more likely to suffer from disability and recurrent strokes. Despite this, two thirds of vascular studies focus on male health and we currently know considerably less about the interaction between female sex and risk factors for vascular diseases. While the cerebral aging process is complex and multifactorial, three components are likely to play key roles in female cerebrovascular aging and be the target of interventions: estradiol levels, arterial stiffening and systemic inflammation. It is therefore crucial to understand the nature and timeline of cerebral vascular and metabolic aging in females, and the role of estradiol and hormone replacement therapy in mediating changes across the lifespan. Here we investigate the brain changes associated with female aging and how these changes relate to these three components. This research is a first step in devising sex-relevant biomarkers of cerebral aging to tailor the timing and target of preventative and therapeutic interventions to effectively prevent cerebrovascular disease in females*.*

The following requirements are a must:

- B.Sc or M.Sc in a discipline related to neuroscience or in applied sciences - e.g., engineering, physiology, biomedical science, physics.
- Good communication skills (English oral and written proficiency – a must; French oral and written proficiency – a must).
- Some knowledge of MatLAB and/or other imaging softwares.
- Some knowledge of signal processing and/or statistics.

The following requirements are an asset:
- Experience with one of the main neuroimaging software (SPM, FSL, etc.) in either functional or structural neuroimaging or both.
- Background in neuroscience and advanced knowledge of the structure and function of the brain
- Experience with neuroimaging data collection
- Prior research experience with human participants (interaction with patients – a bonus).
- Good scientific writing skills (in English).

We seek the following personal qualities:
- Team player and dedication to the work at hand.
- Ability to work independently, while under the guidance of senior lab members.
- Willingness to learn new imaging and data analysis techniques.

To apply, please send a letter of interest, CV and contact information for two references in a single pdf document. Only applicants considered for employment will be contacted. **All applications should be sent to Dalia Sabra (dalia.Sabra1@gmail.com)**

Deadline for applications: **December 23rd 2022** for Fall 2023.