



Project title – Computational and experimental studies of aptamers for their use in electrochemical DNA-based biosensors

Start Date – Fall 2022 (Full funding)

Candidate profile – B.Sc. in Chemistry/Physics/Engineering/Biochemistry with minimal GPA 3.3/4.3 or M.Sc. in the same disciplines. Prior laboratory experience and basic computational skills are highly sought out.

Research groups description – Research will be conducted under the co-mentorship of professor Philippe Dauphin Ducharme (<http://ebiosensors.recherche.usherbrooke.ca>) at the University of Sherbrooke and professor Lena Simine (<https://www.siminegroup.ca/>) at McGill University. Experiments will be conducted in the Chemistry department of the Université de Sherbrooke (Québec), Canada. Computational studies will be conducted in the Chemistry department of McGill University. Prof. Dauphin Ducharme's research group uses electrochemistry to investigate the interface of biomolecule-modified electrodes in the hopes of developing biosensors. These are notably based on DNA and allow to measure the concentrations of molecules in complex matrices and directly in the body to develop new tools for diagnostics and precision medicine (see recent publications : [ACS Sensors 2019 4 2832-2837](#); [J. Am. Chem. Soc. 2017 139 11207-11213](#)). Prof. Simine's research group is focused on modeling DNA aptamers by combining traditional simulation techniques with machine learning to achieve the necessary scope and accuracy (see recent publications [J. Chem. Inf. Model. 2021 61 4139-4144](#)).

Project description – We are currently seeking highly motivated candidates to work on a multidisciplinary research project at the interface of Chemistry, Physics, Engineering and Biochemistry. The project will consist of an application of a computational approach to predict aptamer binding competency and experimental translation into electrochemical DNA-based biosensors for the monitoring of molecules in complex matrices. For this you will be trained in:

- Solution-based techniques (fluorescence, UV-vis, calorimetry, etc.)
- Surface-based techniques (SPR and electrochemistry)
- Computational chemistry and machine learning

To apply please send your CV, a motivation letter and transcripts to Philippe Dauphin Ducharme (philippe.dauphin.ducharme@usherbrooke.ca) or Lena Simine (lena.simine@mcgill.ca)