Employer: Dr. Alan Doucette, Professor, Department of Chemistry, Dalhousie University

Application Deadline: April 11, 2025 11:59 PM (through MyCareer)

Title: Analytical Laboratory Research Assistant

Duration of employment: 16 weeks full time (35 hours per week) taking place between May 5 – Sept 1, 2025

PAY: $19.28 / hour + 4% vacation pay

Requirement: Candidate must be currently enrolled in a BSc program, majoring in Chemistry, Biochemistry, or Molecular Biology. Candidate must have a strong knowledge of chemistry, as demonstrated through their academic transcripts, or through prior work experience in a chemistry/biochemistry laboratory. Prior experience working in an analytical chemistry laboratory, particularly working with mass spectrometry is an asset.

Project Description:

Just like the invention of the microscope opened our eyes to a microscopic world, our lab strives to create new technologies in order to better study proteins. We previously introduced revolutionary devices, now considered standard tools in the field of proteomics. Google these two examples: (1) GELFrEE is our custom device that fractionates proteins according to their molecular weight; (2) The ProTrap XG was patented and commercialized by Allumiqs, to process proteins ahead of mass spectrometry. We recently turned our attention to a brand new technology, with potential to revolutionize proteome analysis: Droplet microfluidics is an emerging platform for microscale, high-throughput sample manipulations. Here, biological samples are confined in aqueous microdroplets, formed by mixing solvent with an immiscible carrier fluid. Imagine tiny droplets of water being carried by a stream of oil. The merger of droplet microfluidics technology with mass spectrometry for chemical detection would present a powerful analytical platform for high-throughput microscale analysis of proteomic systems. However, a major problem is that droplet generators currently rely on oil & surfactants to stabilize the droplets, neither of which are compatible with mass spectrometry. Our approach was to redesign the droplet microfluidic solvent system to become fully compatible with mass spectrometry. But what can we do with this technology? This is the focus of this position. Our lab is currently working with a major pharmaceutical company to apply droplet microfluidics – mass spectrometry to analyze proteins. We are trying to generate what we call a peptide barcode, which will tag another protein, and allow us to identify that protein by mass spectrometry sequencing of the barcode. Peptides are made of amino acids, whereby each one has a different mass. We use mass spectrometry to 'read' the barcode (amino acid sequence) through the mass of the tags, and following chemical fragmentation. It sounds complicated, but it's based on a lot of prior history in this field.

The successful candidate will split a portion of their time working in a chemistry lab, with mass spectrometry instrumentation. The candidate will assist with the preparation of peptide barcode mixtures (derived from chemical synthesis) as well as the barcode-tagged proteins. The candidate will also use computational tools to analyze mass spectrometry data and look for patterns that would translate information as to which amino acids give the most favorable barcode properties.

Priority consideration will be given to candidates who self identify as a member of an equity seeking group, including women, Black Nova Scotian, Indigenous, member of LGBTQIA2S+ , visible minority, or living with a physical disability