

Funded Graduate Student Position Available, Fall 2024

Group of Professor Mansbach

Department of Physics, Concordia University, Montreal, Canada

We do computational research on physics-based understanding and design of complex biophysical systems. We use a combination of machine learning and molecular dynamics techniques to tease out the basic science underlying biomolecules and their interactions. My goal for our group is to work hard, have fun, maintain a good work-life balance, and cultivate a just and equitable environment where students of many different backgrounds can thrive.

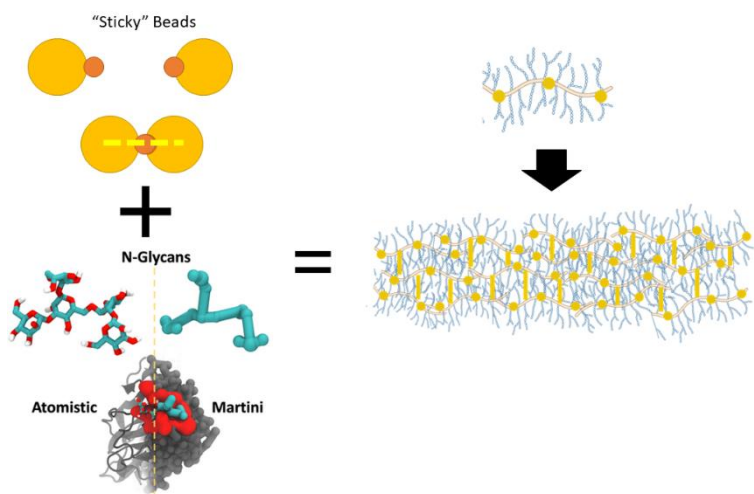


Figure 1. Schematic of potential mucin model.

Impact of length and glycosylation on mucin-based polymeric materials.

Self-assembly of polymeric structures is often a critical process in living organisms and biomimetic materials. The mucosal network is an important example of this phenomenon, in which diverse monomers known as mucins naturally self-assemble into complex aggregates. Because it is a natural hydrogel that provides an indiscriminate protective barrier on the wet epithelial surfaces of the body, it has evolved a diverse repertoire of functions and material properties dependent upon the many different possible compositions, connectivity patterns, and assembly mechanisms.

This multifunctionality means that modeling the

mucosal network offers a rich opportunity for learning lessons that will be applicable to the design of various biomimetic materials.

We are looking for a student to design, validate, and investigate a highly coarse-grained model of mucin that takes into account important physicochemical properties, including the formation and breakage of the many covalent disulfide bonds that cross-link the polymeric mucins, as well as the effects of the many glycans (a type of flexible sugar molecule) that decorate the mucin exterior. Simulations of the model are to be performed in the OpenMM simulation environment. Interested candidates should have a strong background in statistical and computational physics, with knowledge of biochemistry or molecular biology a plus.

Concordia's Department of Physics is a growing department in a growing university. We offer research-based M.Sc. and Ph.D. programs. Our faculty members conduct research in the areas of Condensed Matter Physics (theoretical and experimental), Molecular Biophysics, Medical Physics/Imaging, Photonics, Theoretical High Energy Physics, Computational Physics and Physics Education.

Successful applicants will be offered financial packages consisting of RA, TA, and various awards of at least 20,000 CAD per year (often more), for 4 years (Ph.D.) or 2 years (M.Sc.). International students will be offered tuition remissions or other awards to compensate for the international tuition fees. Please contact Professor Ré Mansbach; re.mansbach@concordia.ca for more information.