BIOENGINEERING & BIOMEDICAL ENGINEERING
RESEARCH SEMINAR

BIOLOGICAL FABRICATION OF HIERARCHICALLY STRUCTURED SOFT MATTER

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A number of living organisms, such as mussels and spiders, rapidly fabricate hierarchically structured polymeric fibers with excellent material properties (e.g. high toughness, self-healing). These materials exhibit bottom-up supramolecular self-assembly from biomolecular building blocks via rapid “fluid-to-fiber” transformation. Employing a cross-disciplinary approach, our group has harnessed advanced material characterization techniques, including confocal Raman spectroscopy, X-ray diffraction and focused ion beam scanning electron microscopy (FIB-SEM), as well as traditional biochemical approaches to investigate the fabrication of a number of bio-fibers, including the mussel byssus, velvet worm slime fibers and mistletoe viscin fibers. Elucidation of the physical and chemical forces driving assembly of such materials provides design principles for inspiring “green” polymer processing methods, as well as for fabrication of materials for biomedical applications (e.g. tissue scaffolds, surgical adhesives). Our comparative study has identified several novel assembly mechanisms, which may have relevance in these realms. In this talk, I will highlight recent results from our investigations.

Matthew Harrington is Associate Professor and Canada Research Chair Tier 2 in Green Chemistry in the Department of Chemistry at McGill University, as well as co-director of the McGill Institute of Advanced Materials (MIAM). He received his Ph.D. in 2008 from the University of California, Santa Barbara in the lab of J. Herbert Waite. This was followed by a Humboldt postdoctoral fellowship at the Max Planck Institute of Colloids and Interfaces in the Department of Biomaterials, where he was later a research group leader from 2010 until 2017. His research is focused on understanding biochemical structure–property relationships in the function and formation of biological materials and applying extracted design principles for the development and sustainable production of bio-inspired materials.

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