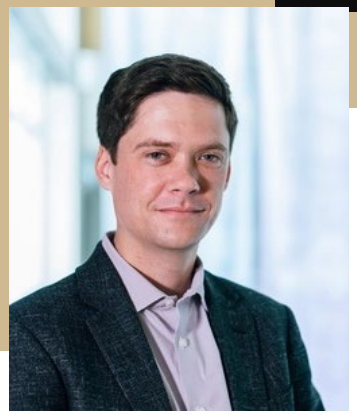
# ORGANIC SEMINAR



## Professor Graeme Howe

Department of Chemistry
Queen's University

### *Genome Mining for Extremozymes to Facilitate Closed-Loop Plastic Biorecycling*

Plastic pollution is an environmental crisis, yet production levels are still projected to rise for decades. This is a consequence of the same durability and inertness that make these materials useful also precluding their efficient recycling. While PEThydrolyzing biocatalysts have advanced considerably over the past decade, enzymes that process other classes of plastic remain scarce, and those described are rarely robust enough for the temperatures and timescales likely to be required for industrial recycling efforts. To provide better suited biocatalysts for these efforts, the genomes of thermophilic microorganisms and other extremophiles have been mined for plasticdegrading enzymes that are stable by nature rather than by design. This strategy led to the identification of TvgC, an extremely stable amidase that endohydrolytically releases short oligomers from nylon-6 and nylon-6,6 films. More recently, a thermostable exohydrolytic amidase (TmbB) from an unidentified *Thermomicrobiales* bacterium was identified that converts those oligomers into the monomeric building blocks of each polymer. TmbB retains activity for ~24 hours at 50 °C, where the only previously known enzyme of this class loses half its activity in 22 minutes at 40 °C; substrate scope mapping and semi-rational engineering then yielded a triple mutant with significantly enhanced activity toward authentic nylon-6 dimers and trimers. Efforts towards enzyme cocktails that combine endo- and exohydrolytic amidases for nylon recycling will be described, as will two new extremozymes with potential utility as polyurethane hydrolases. Collectively, this talk will demonstrate that biology offers several potential routes to address the plastic pollution crisis in a sustainable, biocatalytic manner.

PURDUE UNIVERSITY | James Tarpo Jr. and Margaret Tarpo Department of Chemistry

**Tuesday, September 29, 2026 | 4:30 PM | WTHR 104**