

# Evolution of Fungal Enzymes for Breakdown of Polymeric Materials

**PI:** Meagan Small, Army Research Laboratory

**Co-PI:** Jordan Baumbach, Army Research Laboratory

**Academic Collaborator:** Mo Khalil, Boston University

---

**Project Summary:** The ability to repurpose plastic-based materials will have a major impact on Logistics, Sustainment. The platform being proposed here will enable understanding and optimization of the mechanisms by which microbes breakdown materials, which is a vital fundamental step toward achieving the ability to repurpose materials.

Toward achieving this mechanistic understanding of how microbes break down materials, we propose to develop a synthetic biology platform that autonomously evolves fungal organisms that degrade polymeric materials. The work advances the state of the art in the field in fungal engineering for military applications, whereby user-defined functions can be engineered into fungal organisms and the organisms evolved to perform those functions at an accelerated rate or capacity. We propose a holistic, comprehensive approach targeting the evolution of fungal organisms to grow on and utilize polymeric materials for metabolism. This work builds fundamental bioengineering strategies to add to the arsenal of synthetic biology tools developed at ARL through the TRANSFORME ERP (Transformational Synthetic Biology for Military Environments Essential Research Program). With a suite of modular tools in place, the full potential of synbio-based capabilities on the battlefield can begin to be realized.

---