Self-recycling materials with engineered living polymers

Today's plastics are designed for permanence — not renewal. We're creating *living materials* that can break that cycle. By embedding engineered bacterial spores into polymer backbones, we can design plastics that sense and respond to their environment, initiating controlled biodegradation or self-healing when triggered.

Project Aims:

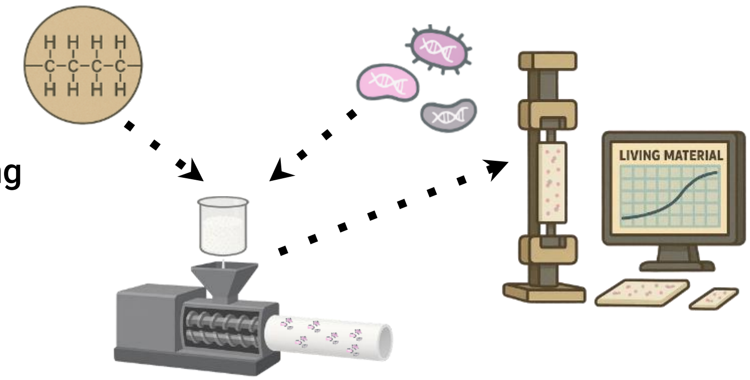
- Define which polymers and microbes can form stable, functional living composites
- Engineer biological functions that add new performance traits while preserving material strength
- Develop scalable fabrication methods compatible with industrial polymer processing

Why it matters:

- Reduces plastic waste by enabling on-demand, biological recycling
- Unlocks a new class of programmable materials for sustainable manufacturing
- Trains a new generation of scientists at the interface of biology and materials science

Investment opportunities:

- 4-6 graduate fellowships for 4 years in material science, strain engineering and product formulation.



UC San Diego Future Biomanufacturing Center

The Self-driving lab for sustainable biomanufacturing

Industrial biotechnology remains slow and costly because strain improvement and process tuning require countless manual experiments. This project establishes an autonomous experimentation platform — a self-driving lab — that uses robotics, real-time analytics, and AI-guided decision-making to evolve and optimize microbial systems automatically.

Project Aims:

- Automate adaptive laboratory evolution and strain optimization using robotics and AI-guided decision-making
- Integrate real-time sensing, modeling, and data feedback loops for continuous learning and control
- Generate open, standardized multi-omics datasets (genomics, transcriptomics, phenotypes) for community use
- Demonstrate rapid, autonomous strain improvement for industrially relevant processes and feedstocks

Why it matters:

- Speeds discovery from years to months while reducing resource use
- Creates the foundation for AI-driven design and circular bioeconomy innovation
- Establishes a shared UC San Diego infrastructure for scalable, data-rich biomanufacturing
- Trains future bioengineers to work at the intersection of biology, automation, and machine learning

Investment opportunities:

- 4 graduate students for 4 years, and support for laboratory automation, data infrastructure and lab materials.

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Designing microbial teams that make bioprocessing reliable and resilient

Industrial fermentation is often unpredictable — microbes behave differently at scale. We're addressing this by designing synthetic microbial communities where different species share the workload, creating more stable, efficient, and controllable production systems for converting waste into value-added products.

Project Aims:

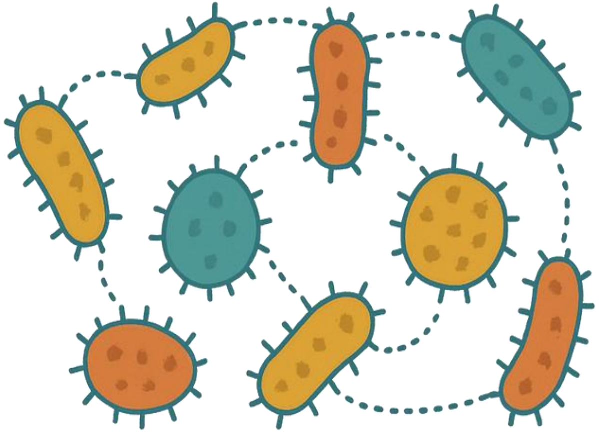
- Model and experimentally validate community-based waste valorization
- Predict and control community composition using AI and advanced analytics
- Demonstrate improved process stability and yield using division-of-labor strategies

Why it matters:

- Unlocks consistent, scalable production from variable waste feedstocks
- Builds the foundation for adaptive, nature-inspired manufacturing systems
- De-risks a promising approach for industrial adoption

Investment opportunities:

- 4-6 graduate fellowships for 4 years in computational modeling and experimental validation and core lab supplies



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