Olsen Research Group
Engineering Polymers and Bio-inspired Functional Materials to Understand Novel Physics and Create Useful Technologies

**Protein Engineering**
The highly specific binding and self-associating properties of proteins makes these biomolecules ideal materials for healing and sensing applications.

- Sequence-defined protein polymer design
- Directed evolution of protein materials
- Hybrid biosensors from protein-polymer conjugates enable greater sensor selectivity and sensitivity
- Fibrinogen-mimetic proteins aid in coagulation
- Complex coacervate thin films for plug-and-play coatings

**Sustainable Materials**
We are building a new sustainable polymer processing lab space to support our efforts in bio-based, degradable materials design.

- High-throughput screening to develop degradable materials
- New recycling processes
- Utilizing waste biomaterials for sustainable polyurethane development

**Networks and Gels**
We use a combination of theory, simulations, and experiments to understand relationships between molecular structure and macroscopic properties like elasticity and toughness.

- Real Elastic Network Theory (RENT) describes how loops affect bulk elasticity
- Associative polymer and protein networks display anomalous diffusion due to molecular hopping
- Topology of entangled networks

**Automation and Informatics**
Our goal is to create and share infrastructures to enable data-driven materials discovery.

- Big SMILES: a universal polymer language
- Pipetting robots to automate high-throughput protein expression and polymerizations

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**Figure credit: Julia Zhao**
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