

Biocatalysis and Biotechnology Program

Research Areas:

- Enzyme and pathway engineering for chemical synthesis, bioremediation, biofuels, and bioenergy.
- Protein engineering and design.
- Microbial functional genomics and metagenomics for enzyme discovery.
- Enzyme evolution for catalytic efficiency and substrate specificity.
- Enzymatic synthesis and pathway engineering for biopolymer production.
- Biocatalysis in nanoscale environments.

Applications:

- Fine and specialty chemical production
- Biofuels and biosensors
- Bioremediation
- Biodegradable polymers and biocoatings

Principal Investigators and their primary areas of expertise:

Mikael Elias Program Leader (Biochemistry, Molecular Biology and Biophysics) Molecular engineering and evolution of protein systems and enzymes. Engineering and development of biological solutions for sustainable food production (phosphate bioremediation and recycling) and bacterial specific control using optimized anti-virulence and anti-fouling enzymes.

Mark D. Distefano (Chemistry and Medicinal Chemistry) - Organic chemistry, biochemistry and recombinant DNA methods to design proteins that accelerate chemical reactions to produce chemicals either for end use or as intermediates for synthesis of value added chemicals.

Wei-Shou Hu (CEMS) - Systems biotechnology, biochemical engineering, cell culture bioprocessing, stem cell technology

Romas Kazlauskas (Biochemistry, Molecular Biology and Biophysics) Biocatalysis synthesis of chemical intermediates and biofuels, modification of enzymes for use in nonaqueous solvents & new chemical reactions.

Lawrence P. Wackett (Biochemistry, Molecular Biology and Biophysics) - Microbial catabolic enzymology and functional genomics: enzyme evolution and applications for biotechnology. Development of microbial enzymes for use in bioremediation and the synthesis of specialty chemicals for bioenergy and other uses.

Ping Wang (Bioproducts and Biosystems Engineering). Enzyme engineering and nanotechnology. Enzymatic synthesis of biofuels, biopolymers, specialty chemicals. Biocatalysis in nanoscale environment, structures for micro bioreactors, membrane and interfacial catalysis, bioactive materials and coatings, and biofuel cells and biosensors.

Facilities: **BioTechnology Resource Center** (Fermentation process development and scale-up ranging from 5L to 450L, downstream processing (centrifugation, cell breakage, tangential flow filtration, chromatography), recombinant protein expression and purification); **High-throughput Biological Analysis Facility**; **Imaging Center** (Scanning and transmission electron microscopy including x-ray elemental analysis capabilities (EDAX), (hyper-spectral) fluorescence microscopy, laser scanning confocal microscopy with particular expertise in imaging living biological specimens).

Contact: To learn more about the Biocatalysis and Biosynthesis Program and **IPRIME**; contact Bob Lewis, IPRIME Executive Director, at 612-625-1269 or boblewis@umn.edu