ORGANIC SYNTHESES LECTURE

Sponsored by AbbVie

Monday, November 10, 2025

STEW 218

3:00 – 4:00 PM **Dr. Aaron Featherston**

Senior Scientist, Process Chemistry
AbbVie

From Batch to Flow: Kilo-scale Continuous Cryogenic Manufacturing Processes

Abstract: Continuous processes can provide improved efficiency for reactions that involve unstable intermediates and cryogenic conditions due to enhanced temperature control, and the ability to conduct multiple unit operations in parallel. Recently, two such flow processes have been developed and executed on kilo-scale, utilizing proof-of-concept batch reactions and process-analytical tools (PAT) to develop an understanding of the reaction kinetics to inform the design of the flow process, such as residence time and equivalents. The first example is a continuous flow amination process using three cascading continuous stirred tank reactors (CSTR). The initial reaction requires cryogenic temperatures (< -45 °C) to prevent the formation of a diazo byproduct during diphenyl phosphoryl azide (DPPA) addition to a pre-formed enolate. In the second example, a multi-stage flow reaction was developed for the synthesis of phospholigands utilizing sequential CSTR-PFR-PFR design. The new process allowed for the rapid assembly of the ligands and significant yield improvements, in addition to increased process safety. Key process parameters were fully controlled through the implementation of numerous PAT tools, including mass flow controllers, oxygen monitoring, pH, and online HPLCs. The demonstration of these processes at multi kilogram scale in a GMP facility is discussed, highlighting strategies for efficient continuous processing.

4:00 – 4:30 PM **Break**

4:30 – 5:30 PM **Professor Eric N. Jacobsen**

Department of Chemistry and Chemical Biology
Harvard University

Studies in Selective Catalysis

Abstract: Throughout my group's efforts to discover new stereoselective catalytic reactions, we have had occasion to perform deep mechanistic analyses of several of the catalysts we have discovered, often using the enantioselectivity of the catalysts as a primary tool to obtain deep insight into critical transition states. The marriage of physical-organic and synthetic approaches led us to broadly useful concepts such as electronic tuning of chiral catalysts, homo- and hetero-catalytic cooperativity, noncovalent catalysis, and formal elucidation of catalyst generality. This lecture will provide an overview of some of our key findings, and then focus on our most recent efforts aimed at the elucidation and discovery of general catalytic systems based on new classes of chiral dual H-bond donors. Detailed case studies on the mechanism of enantioinduction with these catalysts highlight the cooperative features of these simple organic molecules that are both reminiscent and fundamentally different from those of enzymes.