

Student Seminar Series

9:45 a.m. Tuesday, September 20, 2011 • 331 Smith Hall

Professor

David W. C. MacMillan

Department of Chemistry
Merck Center for Catalysis
Princeton University

*Enantioselective Photoredox Organocatalysis:
A New Catalysis Concept of Broad Utility to
Chemical Synthesis*

Website:

<http://www.princeton.edu/chemistry/macmillan/david-macmillan/>

Abstract

Over the past 30 years enantioselective catalysis has become one of the most important frontiers in exploratory organic synthetic research. During this time, remarkable advances have been made in the development of organometallic asymmetric catalysts that in turn have provided a wealth of enantioselective oxidation, reduction, pi-bond activation and Lewis acid catalyzed processes.

Surprisingly, however, until 2000, relatively few asymmetric transformations have been reported that employ organic molecules as reaction catalysts, despite the accordant potential for academic, economic and environmental benefit. With this in mind, we embarked upon the development of a new strategy for enantioselective organocatalysis that would be amenable to a diverse range of asymmetric transformations. In 2000, our laboratory introduced a "generic activation mode" termed iminium catalysis that has now been used in the invention of more than 50 new reactions and in the large-scale production of at least two drug entities.

Given the wide-scale success of iminium catalysis, we recently sought to find alternative modes of activation in organocatalysis. In this presentation, we will demonstrate that inorganic photoredox catalysts in combination with organic catalysts can allow for a novel type of tandem catalysis mechanism that has enabled the development of a variety of new chemical transformations of broad value to practitioners of molecule construction in both academic and industrial settings. In addition we will describe a new approach to reaction discovery that we term "accelerated serendipity."



Professor David W.C. MacMillan received his undergraduate degree in chemistry from the University of Glasgow, and his doctorate from the University of California, Irvine.

He began his independent research career at the California Institute of Technology where he also was appointed professor.

MacMillan became a professor at Princeton University in 2006, where he serves as chair of the Department of Chemistry. Recently, he was appointed the James S. McDonnell Distinguished University Professor of Chemistry. He also serves as editor-in-chief of Chemical Science.

MacMillan is a renowned and award-winning researcher, recently receiving the American Chemical Society Award for Creative Work in Synthetic Organic Chemistry.

Research in the MacMillan Group is centered on the field of organic synthesis and catalysis. Researchers are inspired by the pursuit of new concepts in synthetic organic chemistry involving organocatalysis, organo-cascade catalysis, metal-mediated catalysis, and total synthesis of natural products and pharmaceuticals.

Host:
Rajan Vatsery