

THE SECOND ANNUAL
**John Eisch Lectureship
in Organic Synthesis**

Friday, October 11, 2013, 4:30 p.m.
Academic Building A, Room G-008

BINGHAMTON
UNIVERSITY
STATE UNIVERSITY OF NEW YORK

DEPARTMENT OF CHEMISTRY

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**“The Use of Photoredox Catalysis in
New Organic Bond Forming Reactions”**

David W. C. MacMillan
Merck Center for Catalysis, Princeton University

Abstract. This lecture will discuss the advent and development of new concepts in chemical synthesis, specifically the combination of photoredox catalysis with organic catalysis. This new approach to “synergistic catalysis” will demonstrate that multiple yet separate catalytic cycles can be aligned to generate activated intermediates that rapidly combine with each other, thereby allowing new approaches to enantioselective C–C and C-heteroatom bond formation.

We will also introduce an approach to the discovery of new chemical reactions that we term accelerated serendipity. Accidental or “serendipitous” discoveries have led to some of the most important breakthroughs in scientific history, many of which have directly affected human life. Given our overarching goal of developing fundamentally new and useful chemical transformations using catalysis and by acknowledging the tremendous impact of serendipity in scientific discovery, we questioned whether this phenomenon could be forced or simulated and therefore employed as a tool for reaction discovery.

In this presentation, we will describe several new transformations that have been discovered via “accelerated serendipity” that we expect will find widespread adoption throughout the field of chemical synthesis. Moreover, we will further describe how mechanistic understanding of these processes has led to the design of a valuable, new, yet fundamental chemical transformation, in particular, a new catalysis activation mode that allows for the direct functionalization of ketones and aldehydes at the β -carbon position.

Professor John J. Eisch

John Joseph Eisch joined the Department of Chemistry at Binghamton University in 1972 as chair and professor of chemistry with the mandate of fostering the national reputation of its graduate teaching and research. Over the next six years as chair, he guided the recruiting of six senior and junior faculty with this goal in mind, while expanding his own research in organometallic chemistry to a yearly group of 8 to 12 graduate and postdoctoral students with support from Federal and industrial resources. In 1983 his composite achievements were recognized by his promotion to the SUNY-wide rank of Distinguished Professor of Chemistry.



His prior education and professional experience consisted of receiving his BS degree in chemistry, summa cum laude, from Marquette University in 1952; earning his PhD degree in 1956, with Henry Gilman, at Iowa State University; and serving as Union Carbide Research Fellow with Karl Ziegler at the Max-Planck-Institut für Kohlenforschung, Mülheim, Germany

(1956-57). After junior professional appointments at St. Louis University (1957-59) and at the University of Michigan (1959-63), he became Ordinary Professor and Department Head at the Catholic University of America (1963-1972).

Over the years, his research has involved the fruitful collaboration of more than 200 students as master's, doctoral, postdoctoral or baccalaureate associates. The results have been reported in more than 380 scientific publications, in some 275 invited lectures worldwide, in the monograph "The Chemistry of Organometallic Compounds" (Macmillan, 1967), and in the edited series, "Organometallic Syntheses" (four volumes, J.J. Eisch and R.B. King, authors and editors). He has been an industrial consultant on organometallic chemistry and an expert witness in several patent litigations on Ziegler-Natta polymerization catalysis. Recently he has published his reminiscences as a postdoctoral fellow with Karl Ziegler and as a young academic, in the invited review, "Fifty Years of Ziegler-Natta Polymerization: From Serendipity to Science. A Personal Account," in *Organometallics*, **2012**, *31*, 4917-4932, one of the most frequently downloaded articles from this journal in 2012.

Professor David W. C. MacMillan

Dave MacMillan was born in Bellshill, Scotland, and received his undergraduate degree in chemistry at the University of Glasgow, where he worked with Dr. Ernie Colvin. In 1990, he began his doctoral studies under the direction of Professor Larry Overman at the University of California, Irvine, before undertaking a postdoctoral position with Professor Dave Evans at Harvard University in 1996.



He began his independent career at the University of California, Berkeley, in July 1998 before moving to Caltech in June 2000 as the Earle C. Anthony Chair of Organic Chemistry. In 2006, Dave moved to the U.S. east coast to take up the position of James S. McDonnell Distinguished University Professor at Princeton University, where he became department chair in 2010.

Dave's awards include the ACS Harrison Howe Award (2014), ACS Award for Creativity in Organic Synthesis (2011),

Mitsui Catalysis Award (2011), ACS Cope Scholar Award (2007), ACS EJ Corey Award (2005) and RSC Corday-Morgan Medal (2005).

In 2012, Dave became a Fellow of the Royal Society (FRS) and a Fellow of the American Academy of Arts and Sciences.

Dave is currently editor-in-chief of the new RSC journal, *Chemical Sciences*.

Dave is a member of the scientific advisory boards of Lexicon Pharmaceuticals and Firmenich, and a permanent member of the RSRC board at Merck. He is also a scientific consultant with Merck (worldwide), Amgen (worldwide), Abbott Research Laboratories, Johnson & Johnson Pharmaceuticals, UCB-Celtech, Constellation Pharmaceuticals and Gilead Research Laboratories.

Along with Dr. Paul Reider, Dave is a co-founder of Chiromics LLC, a growing biotech company that seeks to devise new strategies and screening techniques for the identification of drug-like molecules.