2024-2025 POCC Lecture Series

The Allan R. Day Award Lecture:

March 27, 2025, 7:30 PM

Prof. Dave W. C. MacMillan

Princeton University

The Development of Asymmetric Organocatalysis and Metallaphotoredox

IN PERSON @:

The CHEM 102 Lecture Hall

Chemistry Building, University of Pennsylvania

6:30 Reception in the Nobel Hall

Food and drinks to be provided!

The Philadelphia Organic Chemist's Club

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Abstract: This lecture will first discuss the advent of organocatalysis in my laboratory. As part of this overview, we will highlight why organic catalysts have become widely explored in modern synthetic chemistry. This lecture will also discuss the application of visible light photocatalysis to the discovery or invention of transformations that will be conceptually or synthetically valuable (and sometimes, hopefully, both). We will describe why a healthy balance of reaction discovery and mechanistic understanding has been important to the development of a field of research that is now being widely adopted in both industrial and academic settings. In particular, we will discuss the application of photocatalysis to the development of new metallaphotoredox reactions involving copper, a development that we hope will have an impact on the discovery of new biologically relevant molecules. Finally, we will examine an exciting recent application of photoredox catalysis in my group; namely, the high-resolution μMap technology, which provides a powerful means to probe biological pathways at the subcellular level.

Bio: 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 started his independent career at the University of California, Berkeley, in July 1998, then moved to Caltech in 2000 as the Earle C. Anthony Chair of Organic Chemistry. In 2006, Dave moved to Princeton University as the A. Barton Hepburn Professor of Chemistry. He served as Department Chair from 2010–2015 and is currently the James S. McDonnell Distinguished University Professor of Chemistry. MacMillan shares the 2021 Nobel Prize in Chemistry with Benjamin List "for the development of asymmetric organocatalysis." He is the recipient of numerous additional awards, including the ACS F.A. Cotton Medal for Excellence in Chemical Research (2024), Centenary Prize of the Royal Society (2020), Nagoya Medal, Japan (2019), Noyori Prize, Japan (2018), Janssen Pharmaceutica Prize (2016), ACS Award for Creativity in Synthesis (2011), ACS Cope Scholar Award (2007), ACS EJ Corey Award (2005), and the Corday-Morgan Medal (2005). MacMillan was knighted by Queen Elizabeth II in July 2022 and by King Charles III at Buckingham Palace in February 2023. In 2012, MacMillan became a Fellow of the Royal Society and a Fellow of the American Academy of Arts and Sciences; in 2018, he was elected to the National Academy of Sciences. MacMillan helped launch *Chemical Science* and served as the journal's Editor-in-Chief from 2009 to 2014. He was Chair of the NIH Study Section SBCA from 2014 to 2017. MacMillan is a scientific consultant with numerous pharmaceuital companies and a permanent member of the RSRC board at Merck Research Laboratories. MacMillan is a co-founder of Chiromics LLC, Dexterity Pharma LLC, and a 5AM NewCo. With generous gifts from Eric Schmidt (Google), Tony Evnin (Venrock), and Princeton University, MacMillan was asked to launch the Princeton Catalysis Initiative (PCI), of which he is now Director. This Initiative has signed agreements to conduct collaborative research with several societal impact companies, including Merck, Pfizer, BMS, Johnson & Johnson, Genentech, and GenMab, and has brought more than $100 million in external research funding to Princeton University. MacMillan's research interests include the development of new areas in organocatalysis, photoredox catalysis, and microenvironment mapping.