



Covestro is guided by a simple and powerful purpose: **to make the world a brighter place.** The company focuses on four topics: Alternative Raw Materials to reduce fossil fuels, Innovative Recycling using energy-efficient technologies to reuse and recycle products, Renewable Energy for cleaner energy to power the Circular Economy, and Joint Solutions, collaborating across industries to advance the initiatives.

With its materials and application solutions found in nearly every area of modern life, Covestro is among the leading suppliers of high-performance polymers. Covestro develops sustainable solutions to the greatest challenges of our age: climate change, resource depletion, urban expansion, and population growth. These concerns will inevitably lead to a higher demand for renewable energies, alternative resources, energy-efficient transportation, and sustainable, affordable housing.

Covestro aims to meet this demand with long-lasting, light, environmentally friendly and cost-effective materials, which in many cases are suitable replacements for conventional, less sustainable materials such as steel and glass. The main segments served are the automotive, electrical and electronics, construction, medical, sports, and leisure industries.

At the backbone of their organization's success are its 17,900 employees, who work at around 50 sites across the globe – from smaller technical centers and innovation hubs, to large-scale production plants. Covestro's activities are coordinated from its corporate headquarters in Leverkusen, Germany. More at www.covestro.com.

Previous Stein-Covestro Speakers

Professor Zhenan Bao, 2021-2022

Professor Jeffrey Moore, 2020-2021

Professor Timothy P. Lodge, 2019-2020

Professor Paula T. Hammond, 2018-2019

Professor Karen L. Wooley, 2017-2018

Prof. Krzysztof Matyjaszewski, 2016-2017

Professor Mitch Winnik, 2015-2016

Professor David A. Tirrell, 2014-2015

Professor Christopher Ober, 2013-2014

Professor Frank S. Bates, 2012-2013

Dr. Mohan Srinivasarao, 2011-2012

Professor James Heath, 2010-2011

Dr. Catherine Coleman, 2009-2010

Professor Edwin L. Thomas, 2008-2009

Professor George Whitesides, 2007-2008

Professor Julia Kornfield, 2006-2007

Professor Jean M.J. Fréchet, 2005-2006

Professor Samuel Stupp, 2004-2005

Dr. Craig J. Hawker, 2003-2004

Dr. Richard Turner, 2002-2003

Dr. Elsa Reichmanis, 2001-2002

Dr. Robert Langer, 2000-2001

Professor Robert H. Grubbs, 1999-2000

Professor Herbert Morawetz, 1998-1999

Dr. Robert L. Kruse, 1997-1998

A background image featuring a complex molecular structure with various colored spheres (red, white, blue, brown, green) and connecting lines, set against a dark, textured background with some green foliage-like elements.

Richard Stein—Covestro

Annives Kravonoy

in Polymer Chemistry

The Department of Chemistry, University of Massachusetts Amherst
presents

PROFESSOR TIMOTHY SWAGGER

MIT
Department of Chemistry

“Chemistry of Dynamic Liquid-Liquid Interfaces”

Thursday, November 3, 2022
11:30 a.m., 330-340 LSL

Timothy Swager



TIMOTHY SWAGER is the John D. MacArthur Professor of Chemistry at the Massachusetts Institute of Technology. A native of Montana, he received a BS from Montana State University in 1983 and a Ph.D. from the California Institute of Technology in 1988. After a postdoctoral appointment at MIT he was on the chemistry faculty at the University of Pennsylvania (1990-1996) and returned to MIT in 1996 as a Professor of Chemistry and served as the Head of Chemistry from 2005-2010. He has published more than 500 peer-reviewed papers and more than 120 issued/pending patents. Swager's honors include: Election to the National Academy of Sciences, an Honorary Doctorate from Montana State University, National Academy of Inventors Fellow, The Pauling Medal, The Lemelson-MIT Award for Invention and Innovation, Election to the American Academy of Arts and Sciences, The American Chemical Society Award for Creative Invention, The American Chemical Society Award in Polymer Chemistry, The Christopher Columbus Foundation Homeland Security Award, and The Carl S. Marvel Creative Polymer Chemistry Award (ACS).

Swager's research interests are in design, synthesis, and study of organic-based electronic, sensory, energy harvesting, membrane, high-strength, liquid crystalline, and colloid materials. His liquid crystal designs demonstrated shape complementarity to generate specific interactions between molecules and includes fundamental mechanisms for increasing liquid crystal order by a new mechanism referred to as minimization of free volume. Swager's research in electronic polymers has been mainly directed at the demonstration of new conceptual approaches to the construction of sensory materials. These methods are the basis of the Fido™ explosives detectors (FLIR Systems Inc), which have the highest sensitivity of any explosives sensor. Other areas actively investigated by the Swager group include radicals for dynamic nuclear polarization, applications of nano-carbon materials, organic photovoltaic materials, polymer actuators, separation membranes, and luminescent molecular probes for medical diagnostics. He has founded five companies (DyNuPol, Iptyx, PolyJoule, C₂ Sense and Xibus Systems) and has served on a number of corporate and government boards.

ABSTRACT This lecture will focus on the design of systems wherein reconfiguration of complex liquid emulsions (droplets) and related materials can be triggered chemically, biochemically, or with magnetic fields. The utility of these methods is to generate new transduction mechanisms by which chemical and biological sensors can be developed. Complex liquid droplets behave as optical lens systems and small changes in surface tensions can change focal lengths or cause systems to switch between optically transmissive or scattering states. Central to this scheme is that the fluids in the droplets have different densities and hence are aligned by the earth's gravity. The induced optical changes can be triggered with chemical, photochemical, or biochemical stimuli and thereby create new generations of sensors. Demonstrations of these methods for the detection of enzyme concentrations, pathogens, and antibodies will be presented. Droplets containing birefringent liquid crystals (LCs), including chiral nematic phases, have been prepared and designer surfactants cause either planar or vertical anchoring at the water-liquid crystal interface. The liquid crystals can be used for precise positioning of magnetic particles and biomolecular elements. Magnetic particles can be used to create novel optical functions, including steering of light and selective reflection, which will be detailed.



RICHARD STEIN was born in Far Rockaway, New York in 1925. He was an undergraduate at Brooklyn Polytechnic, where he made some of the first light scattering studies of the dimensions of polymers in solution. He received his PhD from Princeton for work with Professor Tobolsky on using birefringence and X-ray diffraction to study polymer orientational relaxation. He then spent a postdoctoral year at Cambridge University to extend his studies using infrared dichroism. Stein joined the University of Massachusetts Chemistry faculty in 1950, where he began his pioneering studies into the development of rheo-optical techniques for studying orientation and phase transition phenomena in amorphous, crystalline and liquid crystalline polymers. Stein initiated the Polymer Science and Engineering Department and now serves as Emeritus Goessmann Professor in Chemistry. He has over 400 publications, and has been consulting for companies such as Monsanto and Bayer for over 45 years.

Dr. Stein's efforts have been recognized by awards from the American Chemical Society, the American Physical Society, the Society of Rheology, the Society of Plastics Engineers, the Society of Polymer Science in Japan, and the Plastics Hall of Fame. In 1999, the Materials Research Society conferred on him its highest honor, the Von Hippel Award. He received a Distinguished Alumni Award from Polytechnic University in Brooklyn, and has been awarded three honorary doctorates. Dr. Stein was named to the National Science and National Engineering Academies, as well as the American Academy of Arts and Sciences. He was a member of the first delegation in Chemistry to the People's Republic of China.

Professor Stein remained actively involved in research until his passing in the summer of 2021. He was a founder of the Pioneer Valley Biochar Initiative, a member of the Planning Committee for the North American Biochar Symposium in 2013, co-organizer of the UMass contribution to the National Teach-In for Global Warming Solutions, and of the New England Biochar Symposium, in 2009. He gives public lectures on the topic, and in 2011, he co-authored a book titled "The Energy Problem." In June of 2014, Prof. Stein was presented with a certificate of Congressional Recognition for his outstanding service to UMass and to the community. In August of 2015, Senator Rosenberg presented Prof. Stein with an official Joint House Senate resolution recognizing his many accomplishments and contributions to the Commonwealth.



It was his desire to leave the world a better place, and all who knew him would agree that he did.

Richard Stein