



UNIVERSITY OF MINNESOTA
Driven to Discover™

Department of Chemistry

Etter Memorial Lecture

9:45 a.m. Thursday, May 8, 2014 • 331 Smith Hall

Cooperative Function in Atomically Precise Nanoscale Assemblies

Abstract

We use molecular design, tailored syntheses, intermolecular interactions, and selective chemistry to direct molecules into desired positions to create nanostructures, to connect functional molecules to the outside world, and to serve as test structures for measuring single or bundled molecules. Interactions within and between molecules can be designed, directed, measured, understood, and exploited at unprecedented scales. Such interactions can be used to form precise molecular assemblies, nanostructures, and patterns, and to control and to stabilize function. We selectively test hypothesized mechanisms by varying molecular design, chemical environment, and measurement conditions to enable or to disable function and control using predictive and testable means. Critical to understanding these variations has been developing the means to make tens to hundreds of thousands of independent single-molecule/assembly measurements in order to develop sufficiently significant statistical distributions, while retaining the heterogeneity inherent in the measurements. We measure the electronic coupling of the molecules and substrates by measuring the polarizabilities of the connected functional molecules. The next step in such devices is to learn to assemble and to operate molecules together, both cooperatively and hierarchically, in analogy to biological muscles. We discuss our initial efforts in this area, in which we find both interferences and cooperativity.

Margaret C. Etter Memorial Lecture in Materials Chemistry

Margaret "Peggy" Cairns Etter was born on September 12, 1943. She died on June 10, 1992, from cancer. In 1974, she received her doctorate in chemistry from the University of Minnesota under the direction of Jack Gougoutas. She taught organic chemistry at Augsburg College in 1975-76, and worked at the 3M Company from 1976 to 1983. She returned to the University of Minnesota as a postdoctoral fellow with Robert Bryant in 1984 and, within a year, had secured an independent academic appointment. Peggy rose rapidly through the ranks and in 1990 was promoted to full professor. Peggy's outstanding characteristics as a scientist were her infectious enthusiasm, uncompromising scientific standards, and creativity. Her research group made major contributions in the applications of solid-state nuclear magnetic resonance spectroscopy, the design and properties of organic non-linear optical materials, and most significantly, in the understanding and utilization of hydrogen-bonding interactions in crystals. This was reflected in nearly 80 research papers and in several landmark review articles in prestigious journals. Outside recognition in the form of fellowships from the Sloan and Bush Foundations and an Iota Sigma Pi Award for Excellence in Chemistry represent incomplete reflections of the impact of this work. One of her extramural "side projects" was to found a company called "Rochelle Crystal Corporation," for which Peggy was named St. Paul Businessperson of the Year in 1986.



Professor

**Paul
Weiss**

Department of Chemistry
& Biochemistry
University of California,
Los Angeles

Research focuses on the atomic-scale chemical, physical, optical, mechanical and electronic properties of surfaces and supra-molecular assemblies. He and his students have developed new techniques to expand the applicability and chemical specificity of scanning probe microscopies. They work to advance nanofabrication down to ever smaller scales and greater chemical specificity in order to connect, to operate, and to test molecular devices.

Website: <http://www.chemistry.ucla.edu/directory/weiss-paul-s>

**Host: Professor
Timothy Lodge
Refreshments
will be served prior
to the seminar.**