

“Cooperative Function in Atomically Precise Nanoscale Assemblies”

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**LECTURE: 1:00PM - 2:00 PM
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ROOM EC 2300**



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 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.

Biography: Paul S. Weiss is director of the California NanoSystems Institute, Fred Kavli Chair in NanoSystems Sciences, and distinguished professor of chemistry & biochemistry and of materials science & engineering at the University of California, Los Angeles. He received his S.B. and S.M. degrees in chemistry from MIT in 1980 and his Ph.D. in chemistry from the University of California at Berkeley in 1986. He was a postdoctoral member of technical staff at Bell Laboratories from 1986-1988 and a visiting scientist at IBM Almaden Research Center from 1988-1989. Before coming to UCLA in 2009, he was a distinguished professor of chemistry and physics at the Pennsylvania State University, where he began his academic career as an assistant professor in 1989. Weiss has been awarded a National Science Foundation Presidential Young Investigator Award (1991-1996), the American Chemical Society Nobel Laureate Signature Award for Graduate Education in Chemistry (1996), a John Simon Guggenheim Memorial Foundation Fellowship (1997), and a National Science Foundation Creativity Award (1997-1999), among others. He was elected a Fellow of: the American Association for the Advancement of Science (2000), the American Physical Society (2002), the American Vacuum Society (2007), and the American Chemical Society (2010), and an Honorary Fellow of the Chinese Chemical Society (2010). He was the Senior Editor of *IEEE Electron Device Letters* for molecular and organic electronics (2005-2007), and is the founding Editor-in-Chief of *ACS Nano* (2007-). At *ACS Nano*, he won the Association of American Publishers, Professional Scholarly Publishing PROSE Award for 2008, Best New Journal in Science, Technology, and Medicine, and ISI's Rising Star Award a record ten times.