SJSU San Jose State University
NSF/DOD CHE Award 0552961
Joseph Pesek
SJSU and IBM Almaden Research Center Partnership

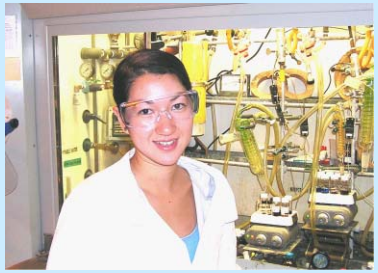
The ***Analysis, Fabrication and Engineering of Surfaces and Materials in Information Technology*** summer program is a unique academic/industrial research partnership between San Jose State University and IBM's Almaden Research Center. As a result of the REU site Eight undergraduates and two teachers did publishable, interdisciplinary research on the chemistry and engineering of materials important to the microelectronic, semiconductor and computer industries. Under the mentorship of Almaden Research staff and SJSU faculty, they experienced firsthand the fast moving, team- oriented environment that leads to technology development.

Projects for 2006 included:

- The synthesis, patterning and characterization of organic and polymeric photolithographic materials;
- The synthesis of nanomaterials, and;
- The development of spectroscopic techniques for characterizing ultra-thin films, organo-metallic complexes, and porous silicon.

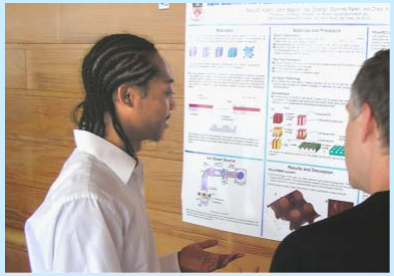
Activities for the summer interns included:

- Attended special seminars;
- Career and graduate school workshops and a;
- Poster Presentations of their work to the entire Almaden community.



Ilan Jen-La Plante, U. of Washington, who did research on "Self-Assembling Monolayers and Multilayers on Gold Nanoparticles" is at her bench in the lab.

Interns interact regularly with those from other programs. Shown here: Science & Technology interns and staff at the technical poster meeting.



Ranulfo Allen, Princeton U., discusses his work on "Ion Beam Patterning of Block Copolymer Thin Films" at the poster meeting.

Dominic Baker, Whitman College, studied the "Orientational Order of Polymers on Surfaces" using nuclear magnetic resonance spectroscopy.

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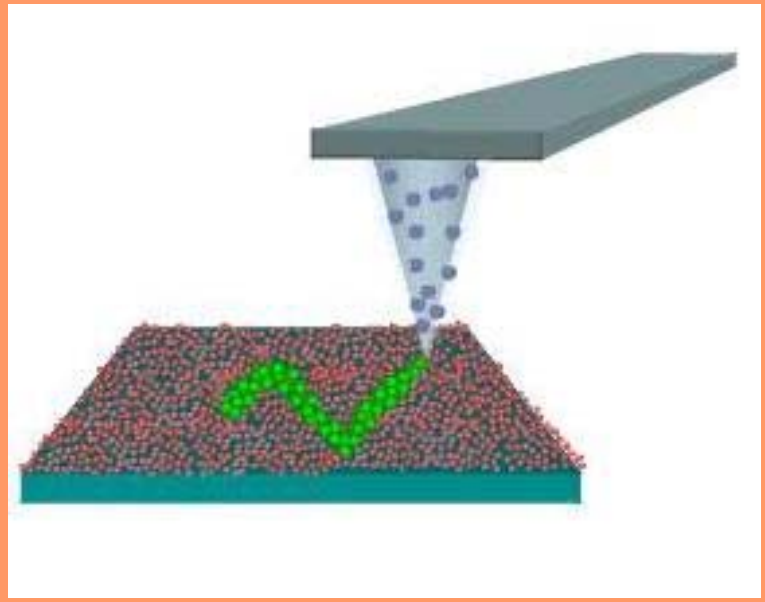
Award # CHE-0552961

The ability to position molecules in a precise location is often critical for the development of devices.

David Long, an undergraduate from Kenyon College working at the IBM Almaden Research Center combined two known techniques with special chemical compounds he synthesized to enable positioning of molecules on surfaces. David's work made use of an increasingly popular synthetic strategy - click chemistry – in a specialized set-up of an atomic force microscope (AFM) known as defined dip-pen nanolithography. The AFM provided high resolution placement capability on a surface.

The research enables a wide variety of organic species to be selectively and separately bound to a single surface on the sub-micrometer scale. A publication has been submitted on this work. David was chosen by the American Chemical Society to give an oral presentation of the project at the Chicago National Meeting in March 2007 for which he has been awarded an NSF travel grant.



Schematic showing the delivery of reactive chemicals from an AFM-tip to a specially prepared silicon surface. The products of this coupling reaction are confined to the area under the AFM tip, representing direct writing of surface features at speeds of 1.20 micrometers/sec.