

Nanoscale Science and Engineering Center



The Science of Nanoscale Systems and Their Device Applications

Harvard University
Massachusetts Institute of Technology
University of California, Santa Barbara
Museum of Science, Boston

With collaborations at...

Delft University of Technology
University of Tokyo
Brookhaven, Sandia, and Oak Ridge National Laboratories

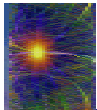
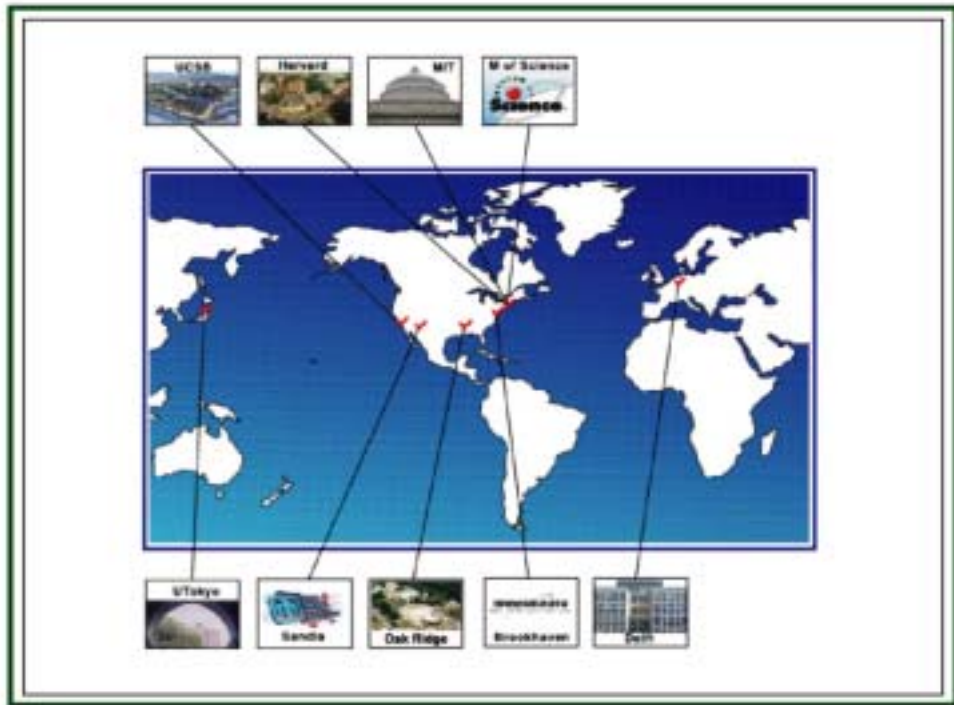
nsec.harvard.edu

Robert Westervelt
Robert Graham

Director
Assistant Director

Research Theme of the Center

Combine 'top down' and 'bottom up' approaches
to construct novel **electronic** and **magnetic**
devices with nanoscale sizes and understand
their behavior, including **quantum** phenomena.



NSEC Participants

Growth of Nanoscale Structures

Michael Aziz (Harvard)
 Mounji Bawendi (MIT)
 Cynthia Friend (Harvard)
 Arthur Gossard (UCSB)
 Efthimios Kaxiras (Harvard)
 Eric Mazur (Harvard)
 Howard Stone (Harvard)
 *Terry Michalske (Sandia)
 *Hiroyuki Sakaki (U Tokyo)

Imaging Electrons

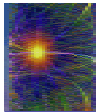
Raymond Ashoori (MIT)
 Eric Heller (Harvard)
 Venky Narayanamurti (Harvard)
 Robert Westervelt (Harvard)

Spin and Charge

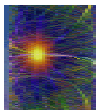
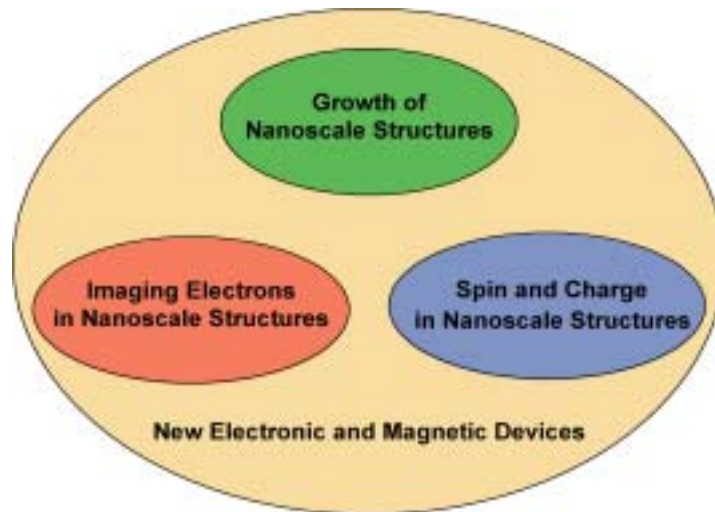
Federico Capasso (Harvard)
 Eugene Demler (Harvard)
 Bertrand Halperin (Harvard)
 Marc Kastner (MIT)
 *Leo Kouwenhoven (Delft)
 Charles Marcus (Harvard)
 Hongkun Park (Harvard)
 *Seigo Tarucha (U Tokyo)
 Michael Tinkham (Harvard)
 Xiaowei Zhuang (Harvard)

Museum of Science, Boston

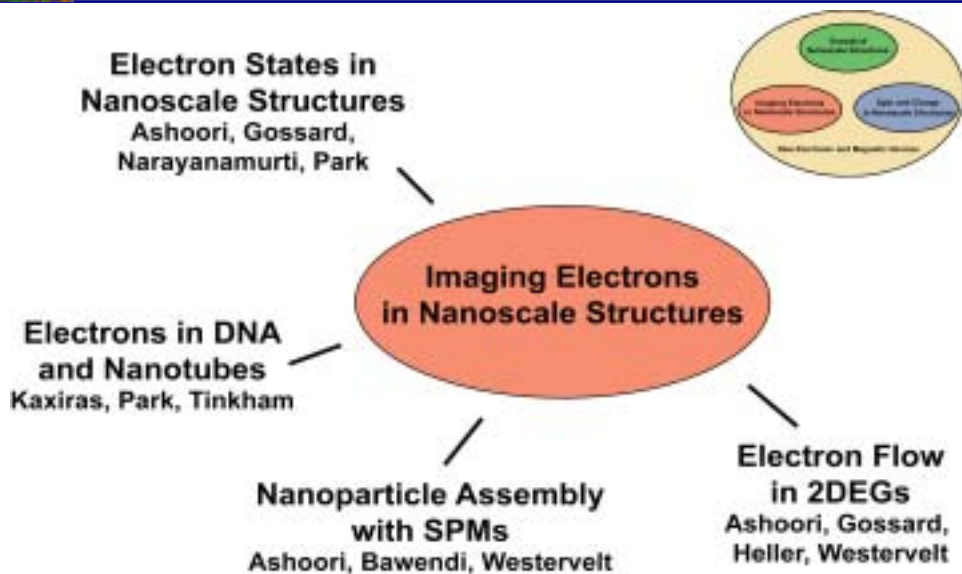
Carol Lynn Alpert
 Joel Rosenberg
 *Collaborators

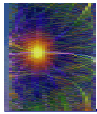


Interlocking Areas of Research

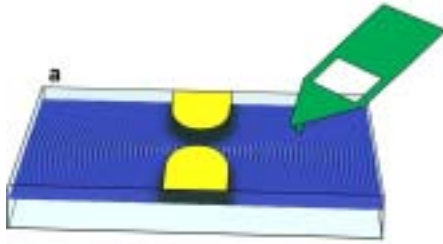


Imaging Electrons with SPM



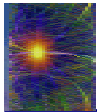
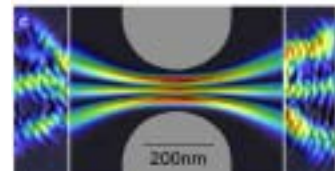
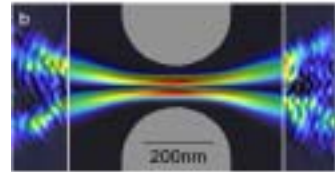
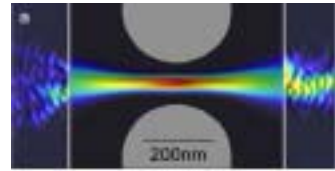


Imaging Coherent Electron Flow (Westervelt, Gossard, Heller)

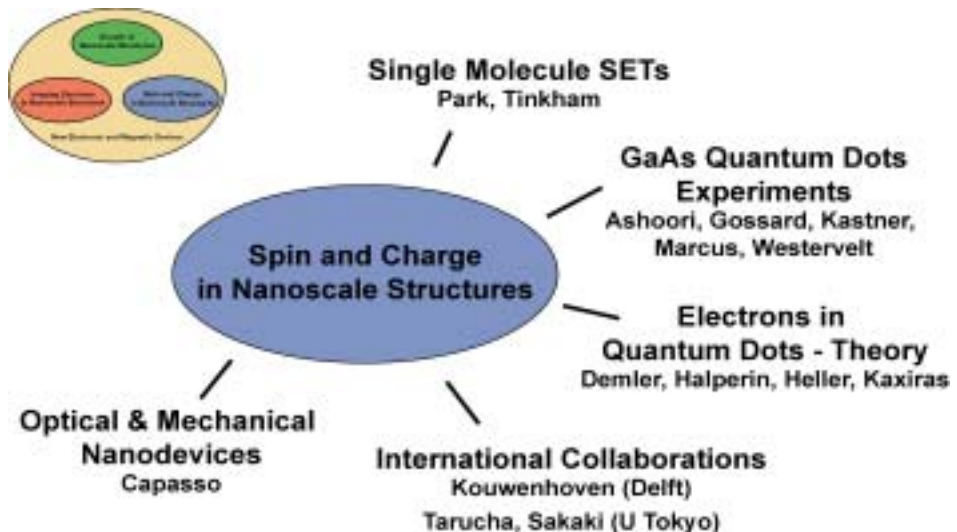


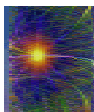
Scanning probe microscopy of electron flow using a capacitively-coupled tip.

Images of electron flow through the first three modes of a quantum point contact in a 2D electron gas; expt outside, theory inside; fringes spaced by $1/2$ Fermi wavelength demonstrate coherence. (Physics Today)

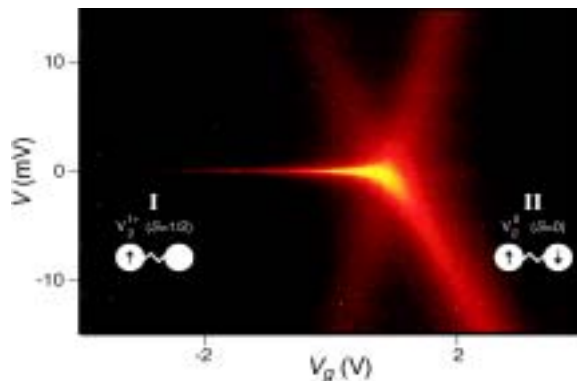


Spin and Charge in Nanoscale Structures

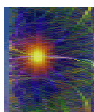




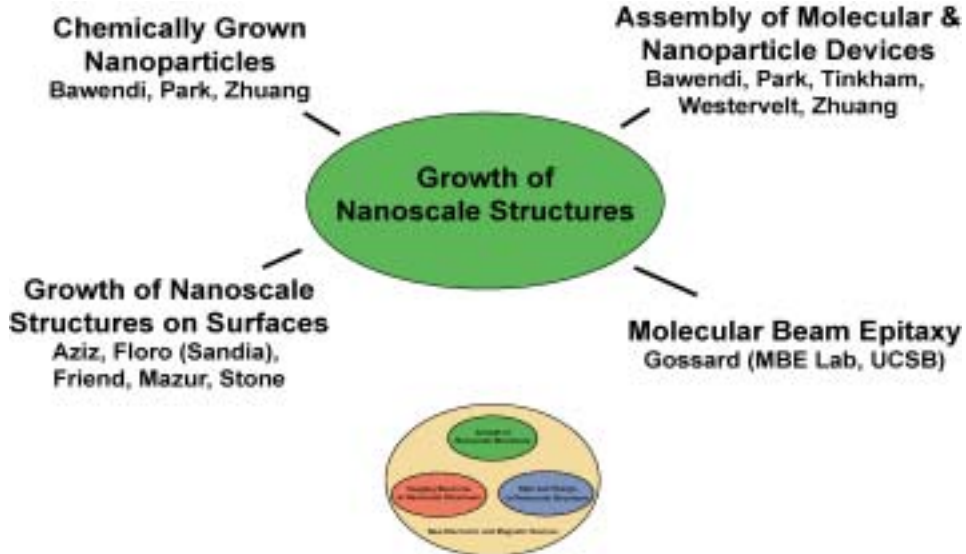
Molecular Transistor (Park, Long)

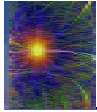


A single electron transistor made from a molecular cluster shows a Kondo resonance that can be tuned to alter its charge and spin.

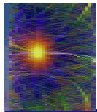
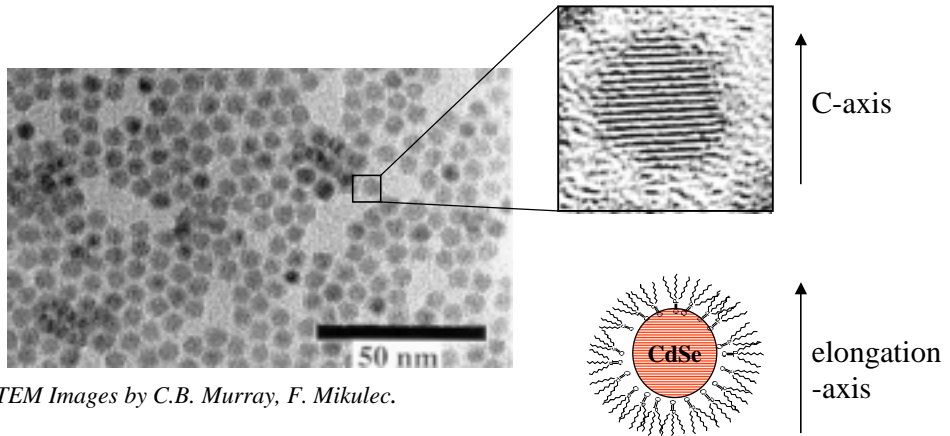


Growth of Nanoscale Structures





CdSe Quantum Dots (Bawendi)



International Workshops

Frontiers in Nanoscience and Technology

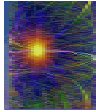
July 10-12, 2003, Japan

Joint Japan/US Workshop, organized with
Prof. H. Sakaki at the Univ. Tokyo

Solid State Quantum Information Processing

December 15-18, 2003, Amsterdam

Organized by Kouwenhoven, Vandersypen & Mooij
NSEC Scholarships for students



Laboratory for Interface Science & Engineering



NSEC Overview

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Nanoscale Science and Engineering Center

Science of Nanoscale Systems and their Device Applications

Harvard, MIT, UC Santa Barbara and Museum of Science, Boston

Robert Westervelt, Principal Investigator

Bertrand Halperin, Co-Principal Investigator

The Nanoscale Science and Engineering Center (NSEC) is a collaboration among Harvard University, the Massachusetts Institute of Technology, the University of California at Santa Barbara and the Museum of Science, Boston with participation by Delft University of Technology (Netherlands), the University of Tokyo (Japan), and Brookhaven National Laboratory, Oak Ridge National Laboratory and Sandia National Laboratory.

This Center combines "top down" and "bottom up" approaches to construct novel electronic and magnetic devices with nanoscale sizes and understand their behavior, including quantum phenomena. Through a close integration of research, education, and public outreach, our NSEC encourages and promotes the training of a diverse group of people to be leaders in this new interdisciplinary field.

Websites

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NSEC Overview

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