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...

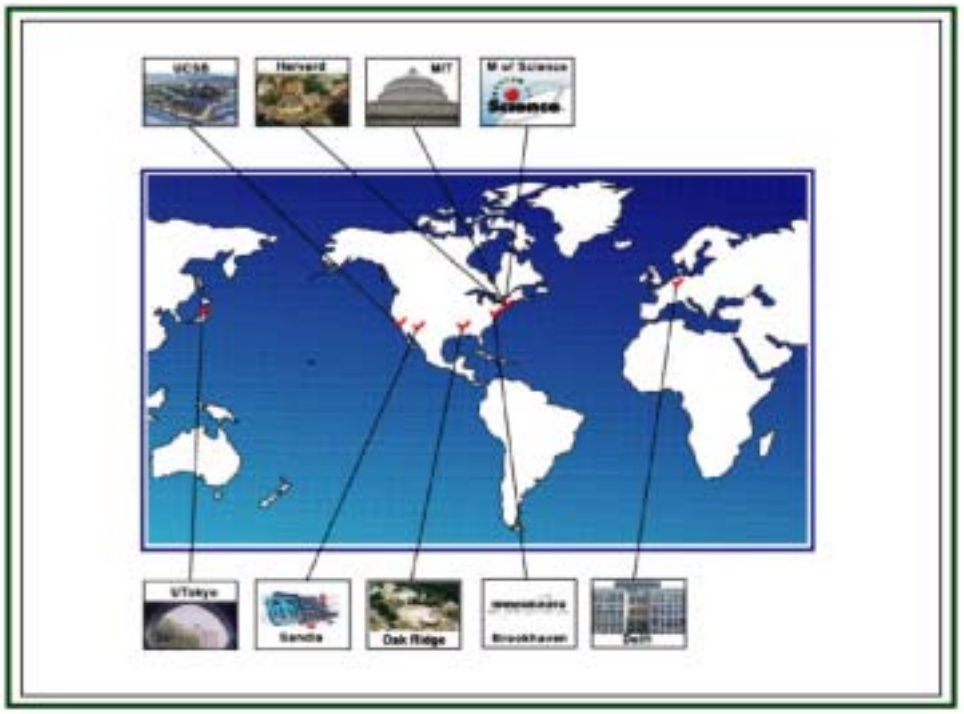
Delft University of Technology
University of Tokyo
Brookhaven, Sandia, and Oak Ridge National Laboratories

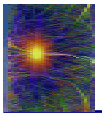
nsec.harvard.edu

Robert Westervelt — Director
Robert Graham — 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)
Moungi 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

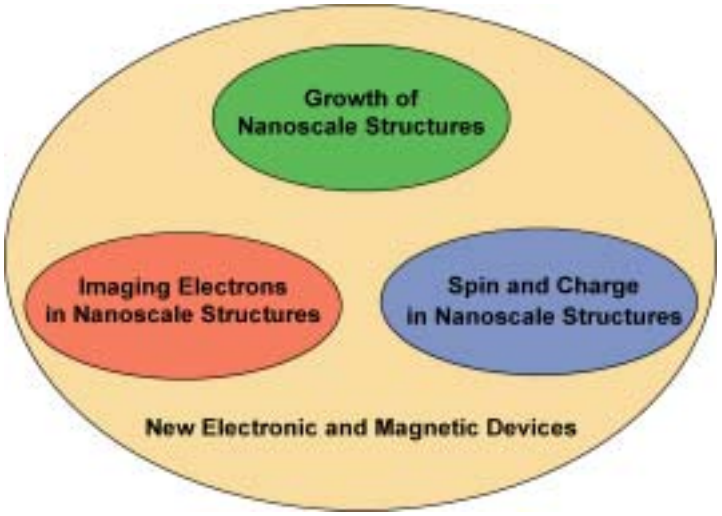
Federico Capasso (Harvard)
Eugene Demler (Harvard)
Bertrand Halperin (Harvard)
Marc Kastner (MIT)
*Leo Kouwenhoven (Delft)
Charles Marcus (Harvard)
Hongkun Park (Harvard)
*Seigo Tarucha (U Tokyo)
Michael Tinkham (Harvard)
Xiaowei Zhuang (Harvard)

Museum of Science, Boston

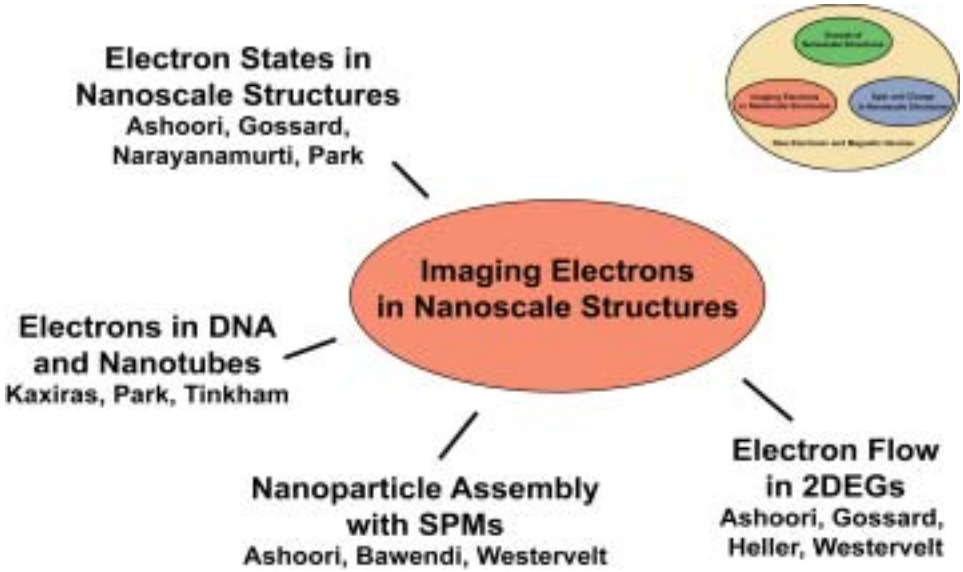
Carol Lynn Alpert
Joel Rosenberg

*Collaborators

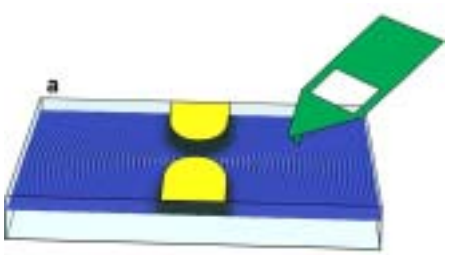
Interlocking Areas of Research

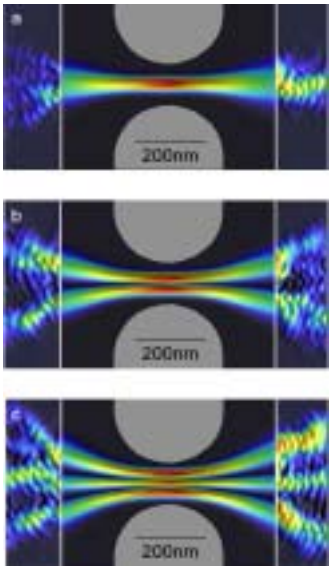


Imaging Electrons with SPM



Imaging Coherent Electron Flow (Westervelt, Gossard, Heller)

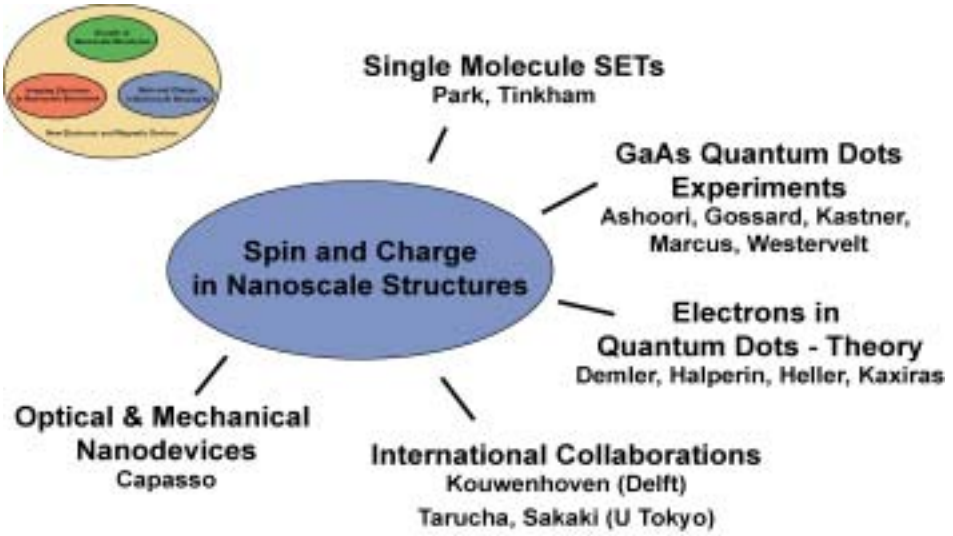




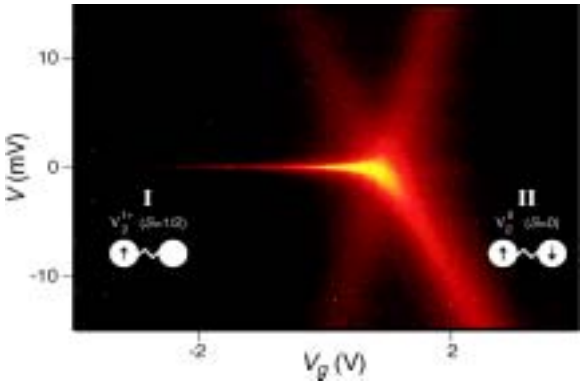
Scanning probe microscopy of electron flow using a capacitively-coupled tip.

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

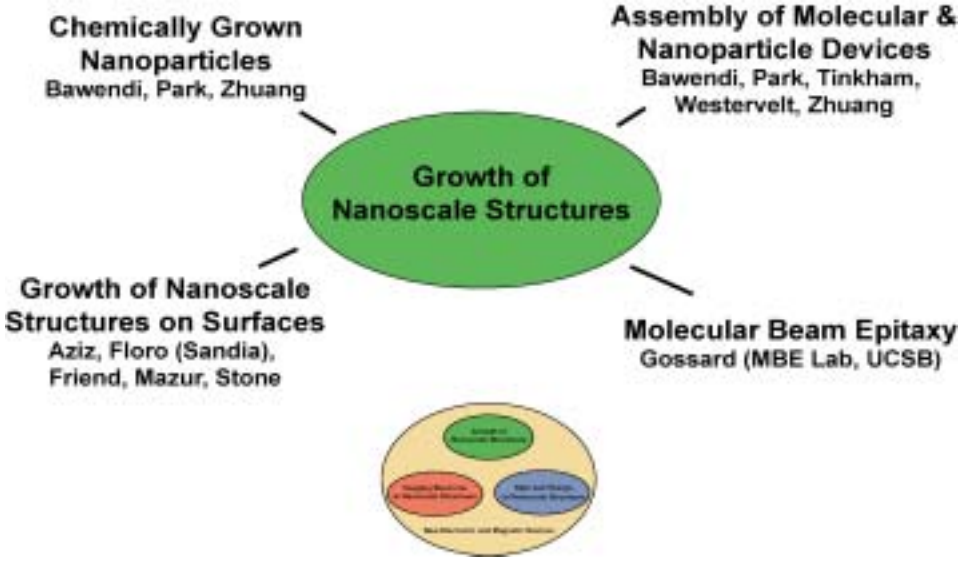


Molecular Transistor (Park, Long)

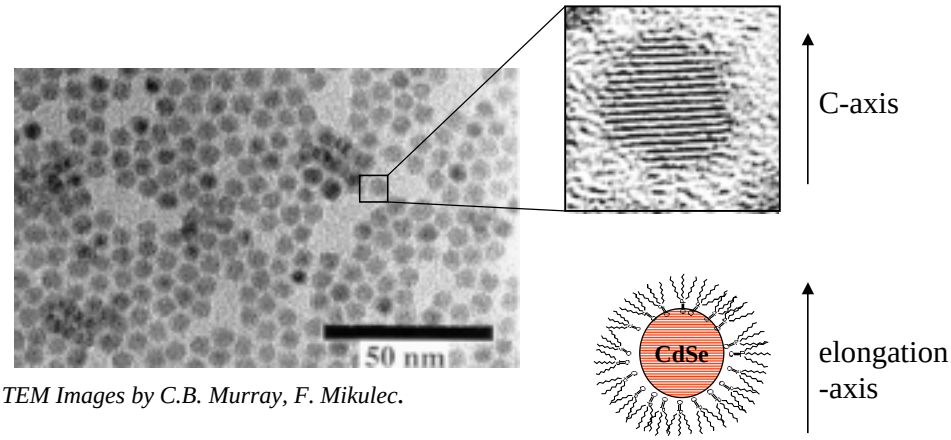


A single electron transistor made from a molecular cluster shows a Kondo resonance that can be tuned to alter its charge and spin.

Growth of Nanoscale Structures



CdSe Quantum Dots (Bawendi)



TEM Images by C.B. Murray, F. Mikulec.

International Workshops

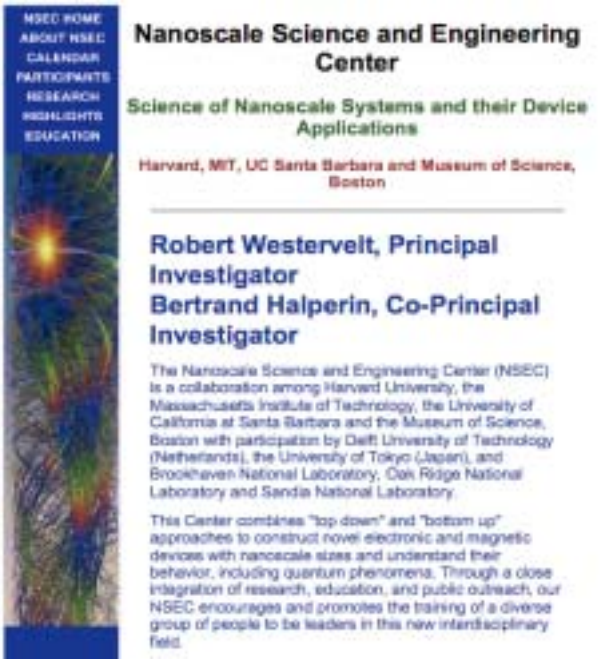
Frontiers in Nanoscience and Technology

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



Websites

NSEC.Harvard.edu

CIMS.Harvard.edu