

Fostering Interdisciplinary R&D in the National Nanotechnology Initiative



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Nanotechnology = multidisciplinary

- Beyond “materials science”
- Nanoscale research is at the forefront of in physical science, life science, & computational science/IT
- Nanotechnology applications are based on multidisciplinary solutions

What is the NNI and how does it promote multidisciplinary research?



National Nanotechnology Initiative

- Established in FY 2001
- Invested over \$4 billion in R&D since FY 2001
- Over 30 research centers & user facilities with 80+ university partners
- Over 20 participating Federal agencies (11 w/ nano R&D \$\$)

- Agriculture
- Commerce
(TA, BIS)
- Defense
- Energy
- EPA
- FDA
- Justice

- NSF
- NIST
- NIH
- NIOSH
- NASA
- Transportation
- Homeland
Security

- Labor
- USPTO
- Treasury
- Consumer Prod.
Safety Comm.
- Nuc. Reg. Comm.
- Int. Trade Comm.
- Intell. Community



21st Century Nanotechnology Research & Development Act of 2003



One Hundred Eighth Congress of the United States of America

AT THE FIRST SESSION

*Begun and held at the City of Washington on Tuesday,
the seventh day of January, two thousand and three*

An Act

To authorize appropriations for nanoscience, nanoengineering, and nanotechnology research, and for other purposes.

*Be it enacted by the Senate and House of Representatives of
the United States of America in Congress assembled,*

SECTION 1. SHORT TITLE.

This Act may be cited as the “21st Century Nanotechnology Research and Development Act”.

SEC. 2. NATIONAL NANOTECHNOLOGY PROGRAM.

(a) NATIONAL NANOTECHNOLOGY PROGRAM.—The President shall implement a National Nanotechnology Program. Through appropriate agencies, councils, and the National Nanotechnology Coordination Office established in section 3, the Program shall—

(1) establish the goals, priorities, and metrics for evaluation for Federal nanotechnology research, development, and other activities;

(2) invest in Federal research and development programs in nanotechnology and related sciences to achieve those goals; and

(3) provide for interagency coordination of Federal nanotechnology research, development, and other activities undertaken pursuant to the Program.

(b) PROGRAM ACTIVITIES.—The activities of the Program shall include—

(1) developing a fundamental understanding of matter that enables control and manipulation at the nanoscale;

(2) providing grants to individual investigators and interdisciplinary teams of investigators;

(3) establishing a network of advanced technology user facilities and centers;

(4) establishing, on a merit-reviewed and competitive basis, interdisciplinary nanotechnology research centers, which shall—

(A) interact and collaborate to foster the exchange of technical information and best practices;

(B) involve academic institutions or national laboratories and other partners, which may include States and industry;



21st Century Nanotechnology Research & Development Act of 2003

Program Activities shall include:

- Providing grants to individual investigators and **interdisciplinary** teams of investigators
- Establishing **interdisciplinary** nanotechnology research centers
- Encouraging **interdisciplinary** research, and ensuring that processes for solicitation and evaluation of proposals under the Program encourage **interdisciplinary** projects and collaborations
- Providing effective education and training for researchers and professionals skilled in the **interdisciplinary** perspectives necessary for nanotechnology so that a true **interdisciplinary** research culture for nanoscale science, engineering, and technology can emerge



Executive Office of the President
Office of Management and Budget



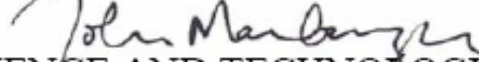
Executive Office of the President
Office of Science and Technology Policy

M-05-18

July 8, 2005

MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

FROM:

JOHN H. MARBURGER, III 
DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY POLICY

JOSHUA B. BOLTEN 
DIRECTOR, OFFICE OF MANAGEMENT AND BUDGET

SUBJECT:

FY 2007 Administration Research and Development Budget Priorities

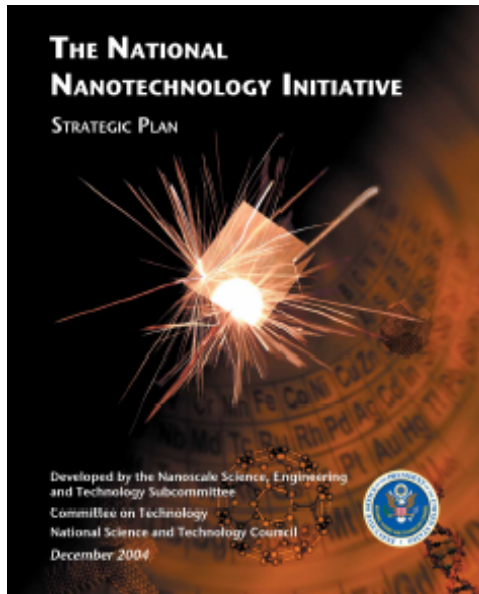
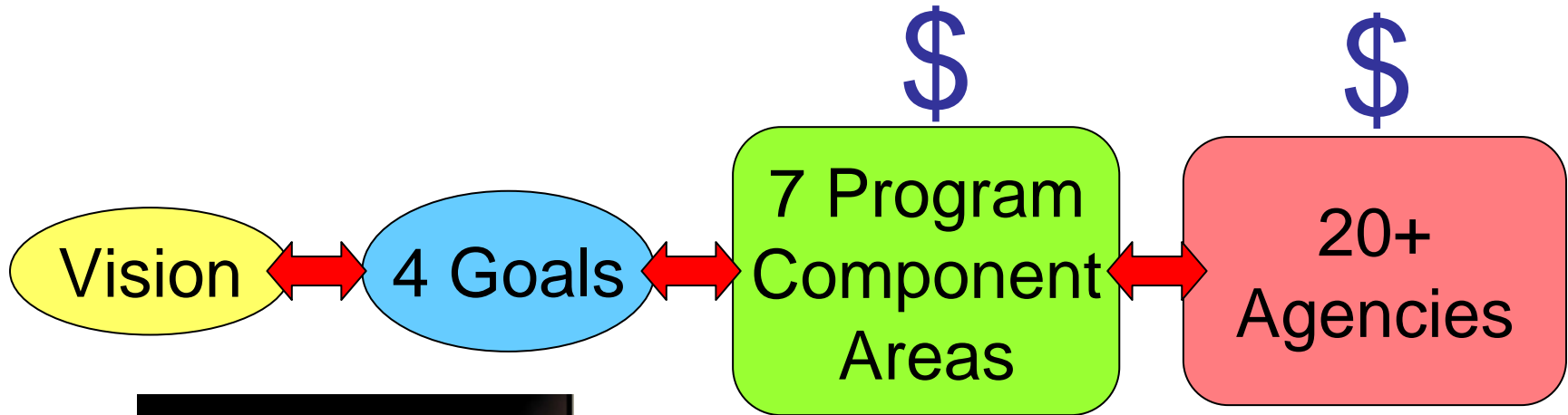


FY07 Administration R&D Budget Priorities

"Because research at the nanoscale offers natural bridges to interdisciplinary collaboration, especially at the intersection of the life and physical sciences, the Administration encourages novel approaches to accelerating interdisciplinary and interagency collaboration. Activities such as joint programs utilizing shared resources, as well as support for interdisciplinary activities at centers and user facilities, are encouraged."



NNI Strategic Plan (Dec 2004)



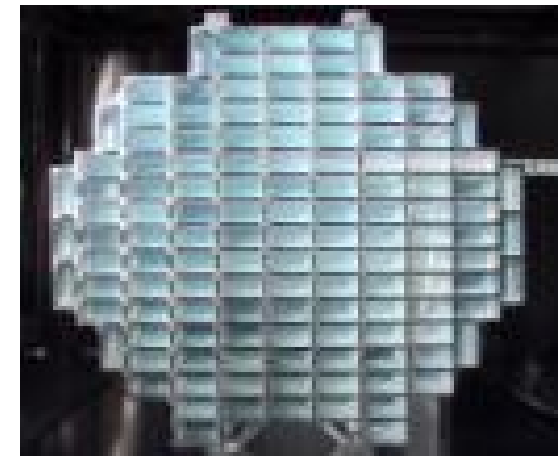


NNI Strategic Plan: Vision

A future in which the ability to understand and control matter on the nanoscale leads to a revolution in technology and industry.

Expedite discovery, development, and deployment of nanotechnology for:

- ❖ Economic benefit
- ❖ National & homeland security
- ❖ Improved quality of life





NNI Strategic Plan: Goals

- ***Sustain world class R&D***
- ***Facilitate technology transfer***
- ***Develop infrastructure: education; workforce preparation; facilities & instrumentation***
- ***Support responsible development of nanotechnology***



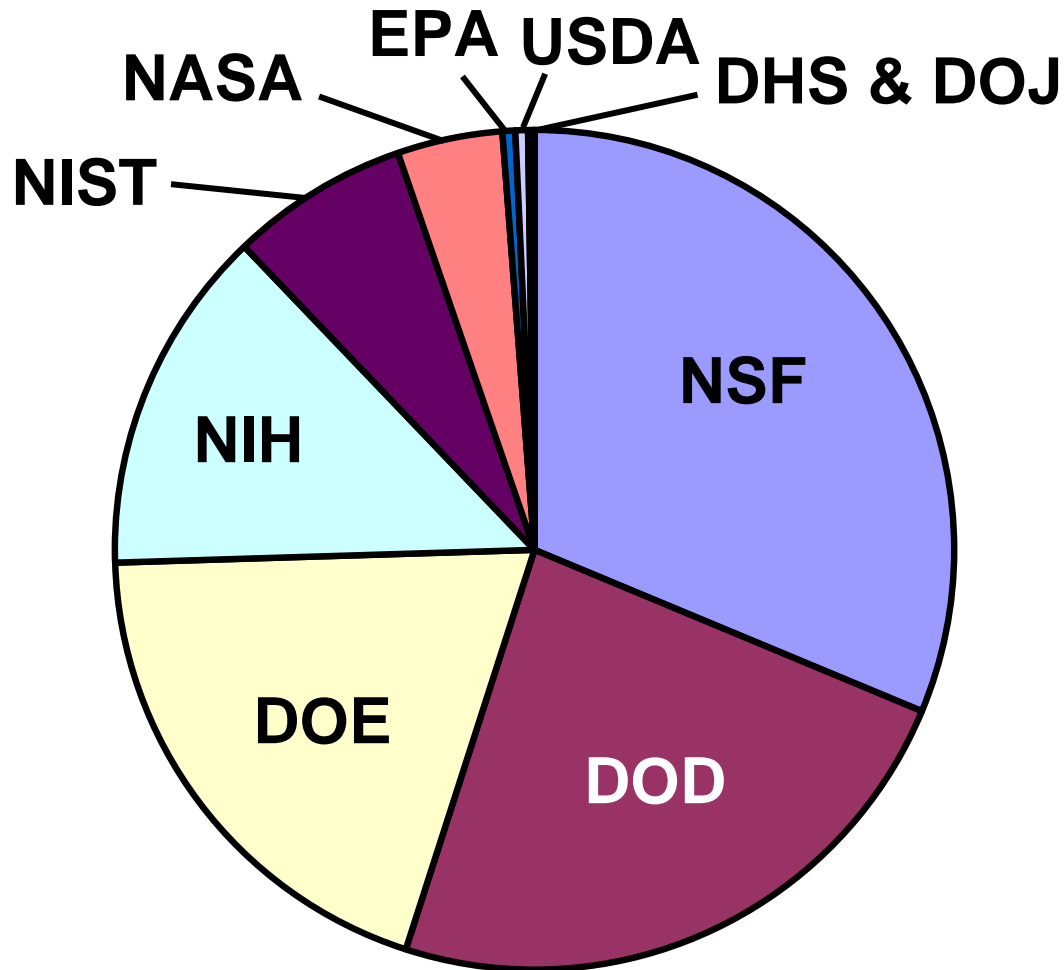
Areas of investment (aka Program Component Areas)

1. Fundamental Nanoscale Phenomena and Processes
2. Nanomaterials
3. Nanoscale Devices and Systems
4. Instrumentation Research, Metrology, and Standards for Nanotechnology
5. Nanomanufacturing
6. Major Research Facilities and Instrumentation Acquisition
7. Societal Dimensions (EHS, ELSI, Educ.)



NNI FY 2006 Budget Request

Total = \$1,054 million





NNI Multidisciplinary R&D: NSF



- **Nanoscale Interdisciplinary Research Teams**
 - 3-5 PIs from multiple departments
 - Typically \$1-2 million/year for 3-5 years
 - 259 awarded since 2001; 30 to be awarded in May '06

- **Nanoscale Science and Engineering Centers**
 - 10's of researchers from multiple research institutions
 - Typically ~\$4 million/year for 5+5 years
 - 15 awarded since 2001; 1 to be awarded in May '06



NNI Multidisciplinary R&D: DOD



- Institute for Soldier Nanotechnology (MIT)
 - ~45 faculty members from 10 academic departments
 - ~10 visitors from industry, the government, or academia
 - Over 100 students and post-docs
 - 13 staff members
- Multidisciplinary University Research Initiatives (MURIs)
 - ~\$1M/yr for 3-5 yrs
 - 38 for nanotechnology-related research since 2001
 - Areas of interest: nanoelectronics, nanomaterials, nano-bio-devices





NNI Multidisciplinary R&D: NIH



- Nanomedicine Development Centers – support multidisciplinary scientific teams including biologists, physicians, mathematicians, engineers and computer scientists; “brings an engineering approach to the study of subcellular and cellular systems.”
(<http://nihroadmap.nih.gov/nanomedicine/>)
- NCI Nanotechnology Characterization Laboratory– offers characterization services to nanomaterial providers to accelerate the transition into clinical applications; in partnership with FDA and NIST (<http://nano.cancer.gov>)

NCI Alliance for
Nanotechnology
 in Cancer

Transforming the diagnosis, prevention, treatment and clinical outcomes for cancer patients

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Scientific Bibliography

Technology
 Backgrounder

Glossary

**Nanotechnology
 Teaming Site**

Nanotechnology
 Related Links

Cancer Nanotechnology
 Brochure

Video Journey Into
 Nanotechnology

Exploring
 Nanotechnology
 in Cancer

Nanotechnology Teaming Site

The Nanotechnology Teaming Site is intended to be a resource for interested investigators from any discipline to explore collaborative opportunities with investigators from other disciplines. Participants may search the database of users via key areas of self-identified expertise as well as by specific comments made by other participants. For example, academic investigators in biomedical engineering may identify participants with expertise in materials science and/or potential, interested commercial sector partners.

Participants are encouraged to include a short summary of their particular research and/or interests, including key words and websites, when signing up to join the Nanotechnology Teaming Site.

[Enter the NCI Alliance for Nanotechnology in Cancer Teaming Site](#)

ALLIANCE AWARDS

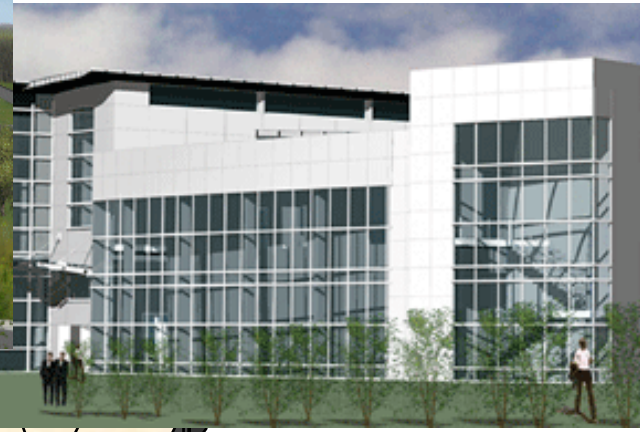
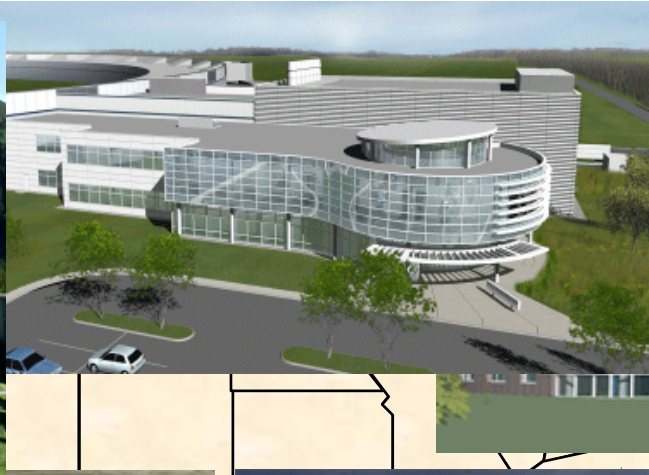
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 awards and programs
 being funded](#)





DOE Nanoscale Science Research Centers

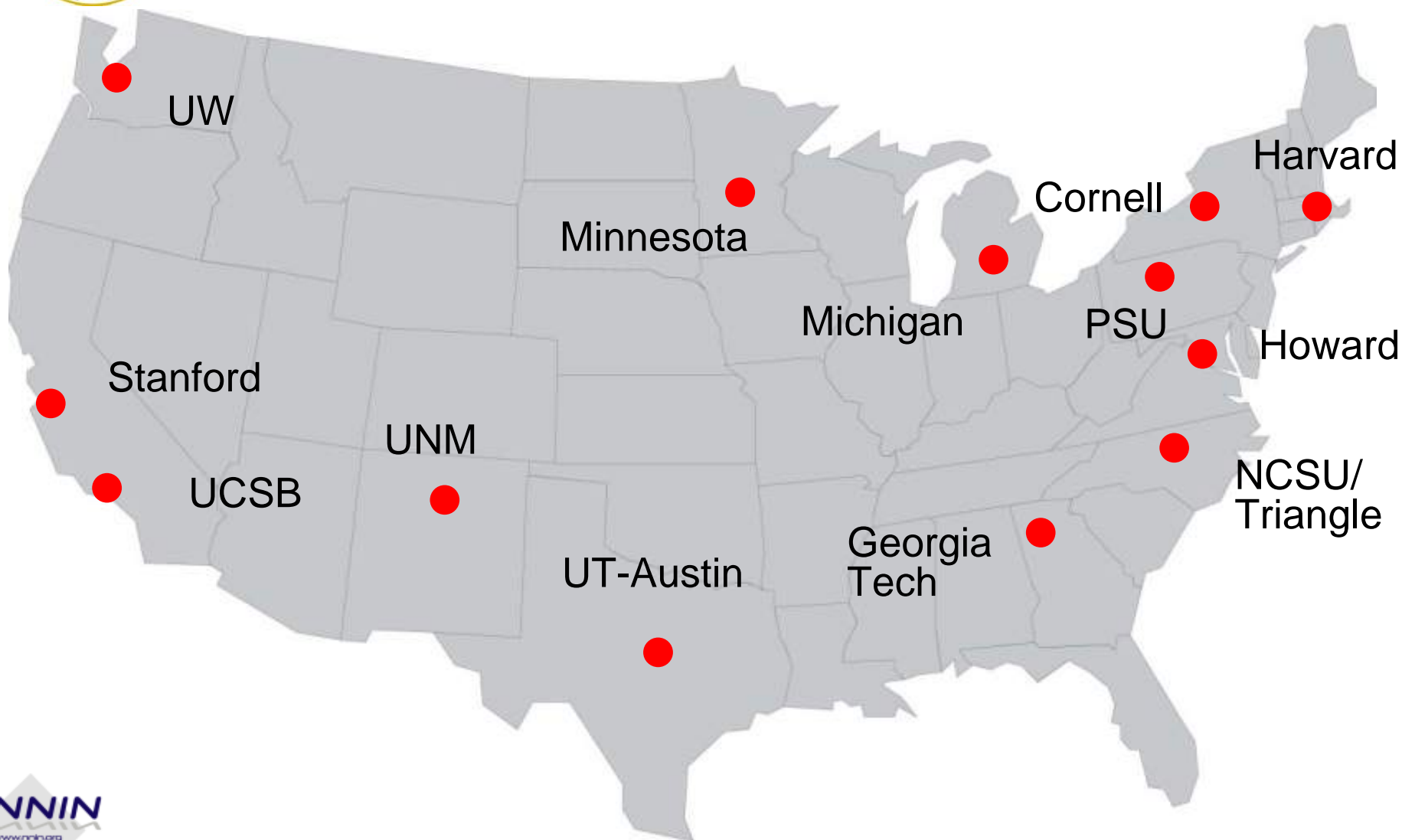
State-of-the-art facilities



<http://www.science.doe.gov/bes/NNI.htm>



National Nanotechnology Infrastructure Network





National Nanotechnology Infrastructure Network

Serving Nanoscale Science, Engineering & Technology



photo credits

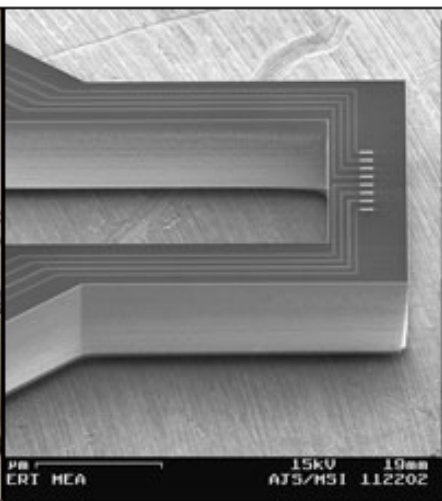


photo credits

What is Nanotechnology? *A multimedia scientific discussion at the graduate / undergraduate level by Sandip Tiwari*
[Additional mulitmedia instructional presentations](#)

The **National Nanotechnology Infrastructure Network (NNIN)** is an integrated networked partnership of user facilities, supported by the National Science Foundation, serving the

- [Discussions and Mailings](#)
- [NNIN Education Portal](#)
- [NNIN SEI Portal](#)
- [NNIN Computation Portal](#)
- [Technical Liaisons](#)
- [Nanooze](#)
- [Science Magazine for Kids](#)

Featured Events

Nanoshop for Teachers

Date: Jan. 19, 2006

This is a free half-day workshop offered by the Michigan Nanofabrication Facility at the Univ. of Michigan. It is targeted towards middle and H.S.



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- Home
- Research
- Education
- Outreach**
- Infrastructure
- Leadership
- NCN Students
- Participants
- In the News
- Calendar
- Newsletter

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- Staff Directory
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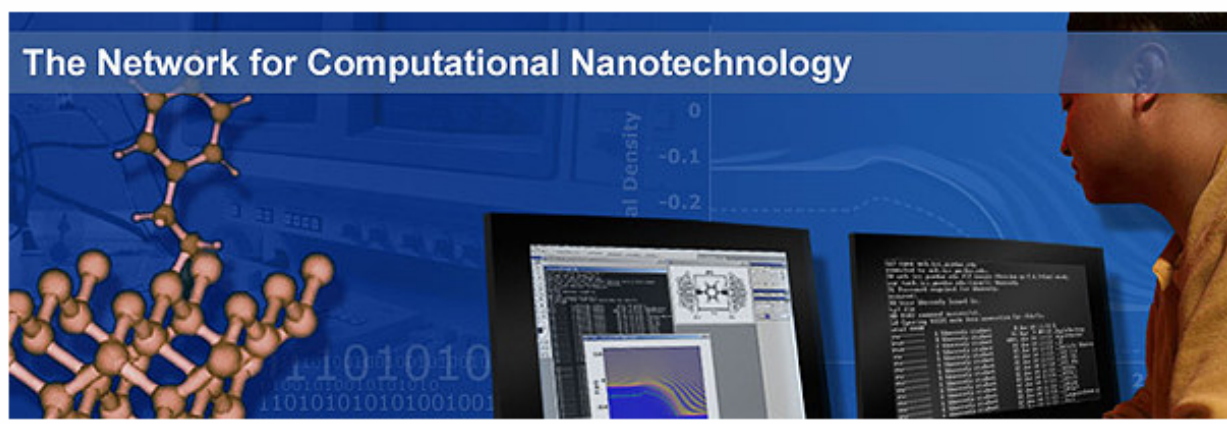
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The Network for Computational Nanotechnology



[Click here](#) to visit nanohub.org

The **nanohub** is a web-based initiative spearheaded by the NCN. Its mission is to serve as a resource for research and education in the areas of nanoelectronics, NEMS, and their application to nanobiosystems. The nanohub provides online simulation services as well as courses, tutorials, seminars, debates, and facilities for collaboration.

2006 Summer Undergraduate Research Internship

The Summer Undergraduate Research Intern Program is open to undergraduate students majoring in the Engineering disciplines, Physics, Chemistry, Computer Science, Biology, and Pharmacy.

June 12-August 4, **Apply Today!**



Welcome to nanoHUB.org

➔ A resource for [online simulation](#) and more. [Learn more](#) and sign up for a [free account](#). Here's [why you should](#). Contribute your own content! [Here's how](#).

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- ➔ [Carbon Nanotubes](#)
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What's New ➔

NCN Nuggets ➔



Multidisciplinary R&D: Educ.

- Nanoscale Informal Science Education Network
 - Museum of Science, Boston
 - Science Museum of Minnesota
 - Exploratorium in San Francisco

- Center for Learning and Teaching
 - Northwestern University
 - Purdue University
 - University of Michigan
 - Argonne National Laboratories
 - Universities of Illinois at Chicago and Urbana-Champaign



Multidisciplinary R&D: ELSI

- Centers for Nanotechnology in Society
 - *University of California-Santa Barbara*
 - *Arizona State University*
 - University of South Carolina
 - Harvard University



THE WHITE HOUSE
WASHINGTON