



# The DOE Center for Integrated Nanotechnologies

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CINT User Program Manager

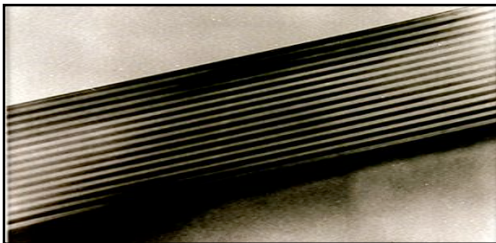
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Sandia is a Multiprogram Laboratory Operated by Sandia Corporation,  
a Lockheed Martin Company, for the United States Department of Energy  
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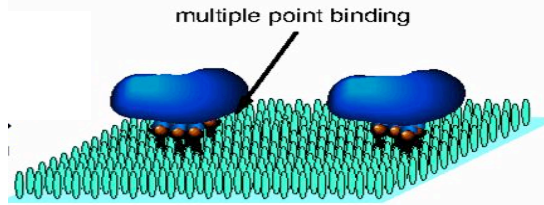


# Nanoscience discoveries will have impact via integrated nanotechnologies

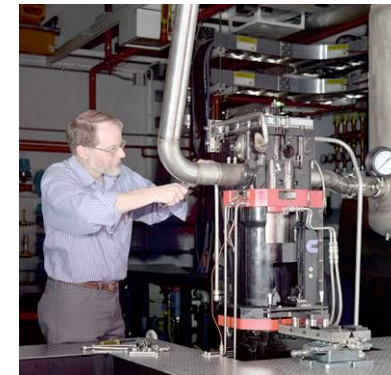
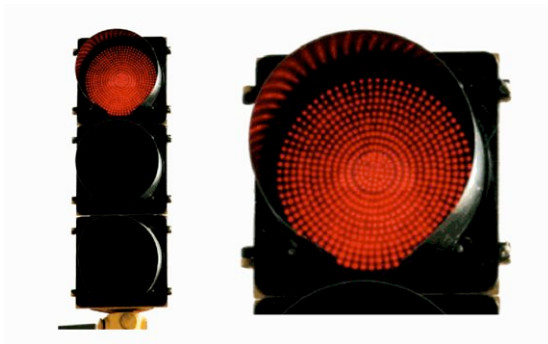
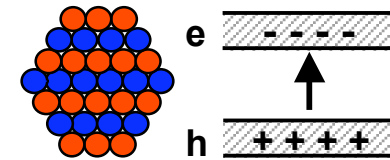
Energy



Health Care



Environment



**Connecting scientific disciplines and length-scales is key to success**

# Center for Integrated Nanotechnologies

Sandia National Laboratories • Los Alamos National Laboratory



- Highly collaborative  
DOE National User Facility
- Focused on nanoscience and its integration across scientific disciplines and multiple length scales.
- Access to tools and expertise (pre-competitive or proprietary)
- Explore the continuum from scientific discovery to the integration of nanostructures into the micro and macro worlds.

***“One scientific community focused on nanoscience integration”***

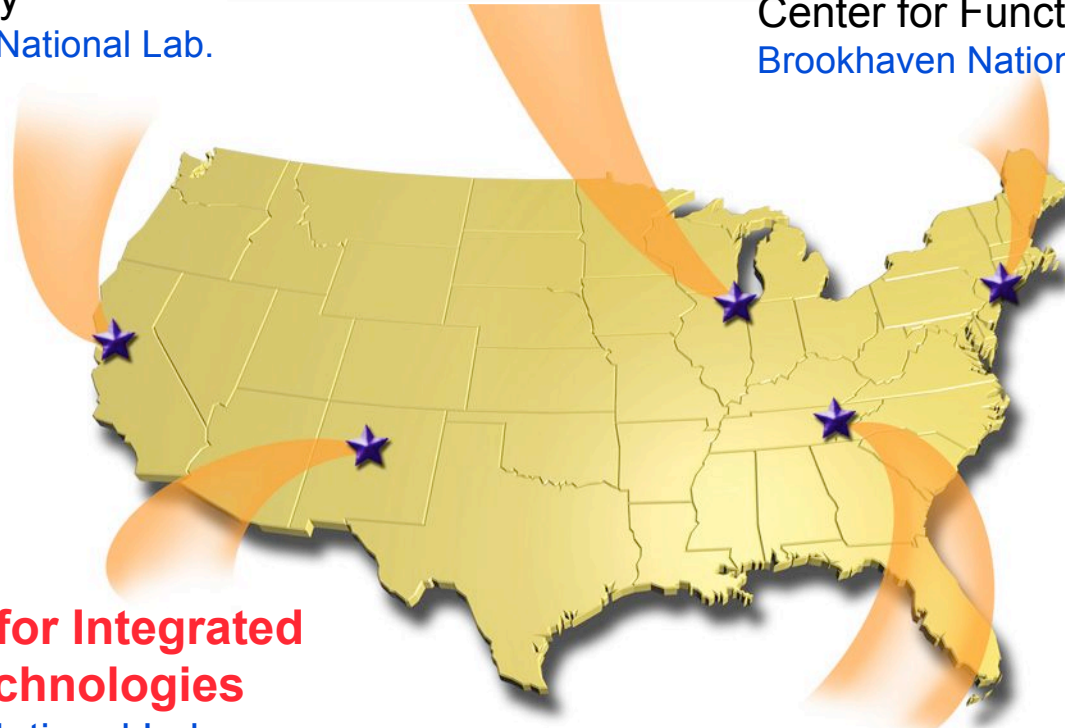


# ***CINT is one of five U.S. Dept. of Energy Nanoscience Centers***

Center for Nanoscale Materials  
Argonne National Lab.

Molecular Foundry  
Lawrence Berkeley National Lab.

Center for Functional Nanomaterials  
Brookhaven National Lab.

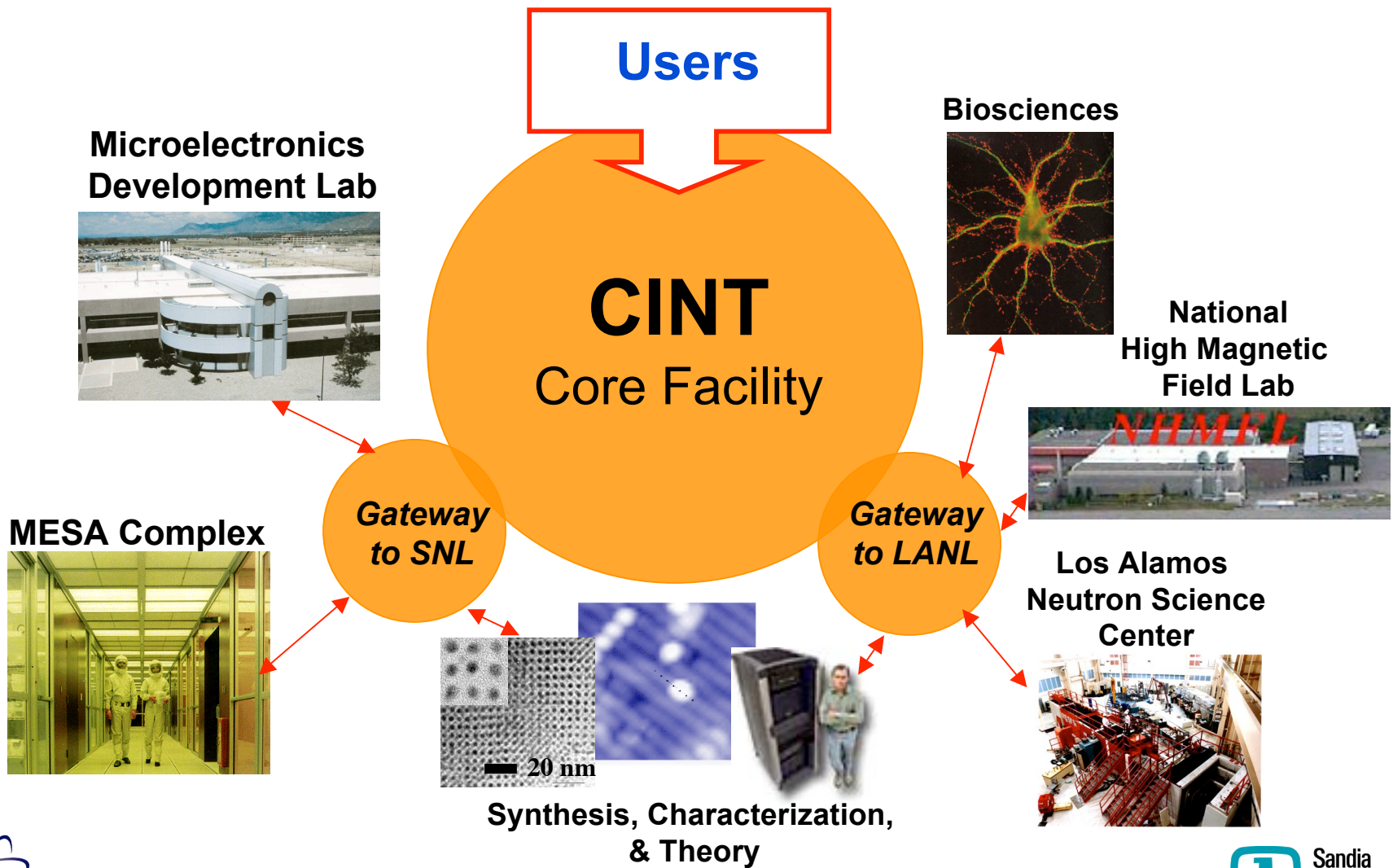


**Center for Integrated  
Nanotechnologies**  
Sandia National Labs.  
Los Alamos National Lab.

Center for Nanophase Materials Sciences  
Oak Ridge National Lab.



# Two Laboratories creating one community focused on nanoscience integration





# *The CINT Core/Gateway model embodied with physical user facilities*

## Core Facility in Albuquerque



**CINT Gateway to Sandia**  
*Nanomaterials/Microfabrication*



**CINT Gateway to Los Alamos**  
*Nanomaterials/Biosciences*

**Begin Operations**  
**Fully Operational**

**April 2006**  
**May 2007**



# ***Core Facility is located adjacent to the Sandia Science & Technology Park***



- **Low vibration characterization labs**
- **Chemical/biological synthesis labs**
- **Class 1000 clean room**
- **93,000 GSF**



# The Core Facility





# ***Key laboratory assets will be available through Gateway Facilities***

## **CINT Gateway to Los Alamos (Nanomaterials/Biosciences)**



**Biosciences**  
**Nanomaterials**  
**Theory & Computing**  
**Visitor Space**

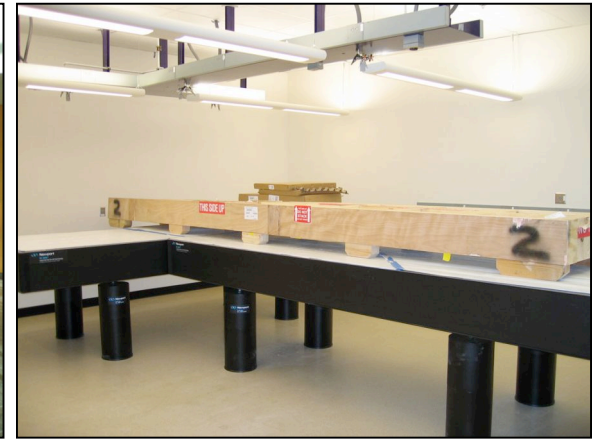
## **CINT Gateway to Sandia (Nanomaterials/Microfabrication)**



**Microsystems - MESA**  
**Nanomaterials**  
**Theory & Computing**  
**Visitor Space**



# *The Gateway to Los Alamos Facility*





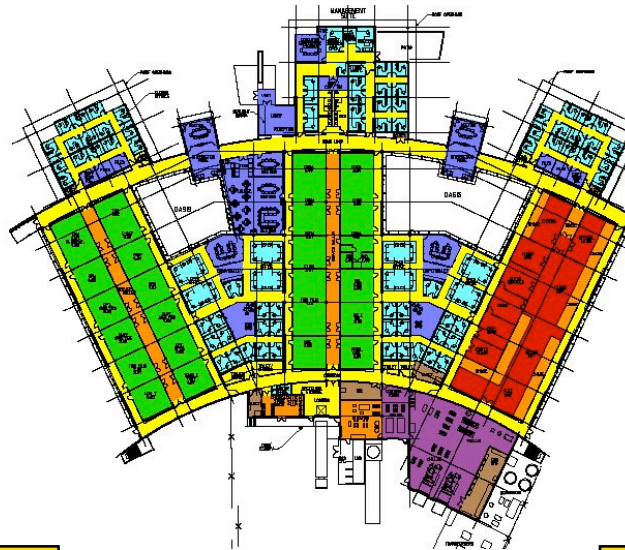
# ***CINT laboratories are supported by state-of-art special equipment***

## **Characterization**

- TEM
- AFM
- FTIR, UV-VIS
- Nano-indenter
- Low Temp Transport
- Ultra-fast Laser Spec.
- Raman Spec.

## **Gateway to Sandia**

- AT-STM
- IFM
- Chemistry labs
- LB Film
- $\mu$ -fluidics



## **Synthesis**

- MBE
- PLD
- Wet Chemistry
- Bio labs
- Molecular films

## **Integration**

- E-beam lithography
- Photolithography
- Thin Film Deposition
- Reactive Ion Etch
- Plasma Etch
- Dual beam SEM

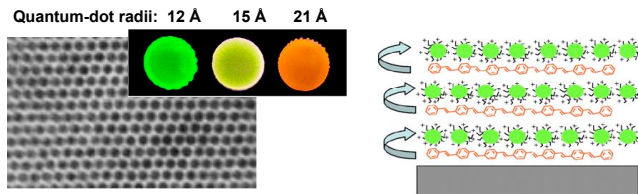
## **Gateway to Los Alamos**

- NSOM, AFM
- Environmental SEM
- Nano-indenter
- Ultra-fast Laser
- Computer Cluster

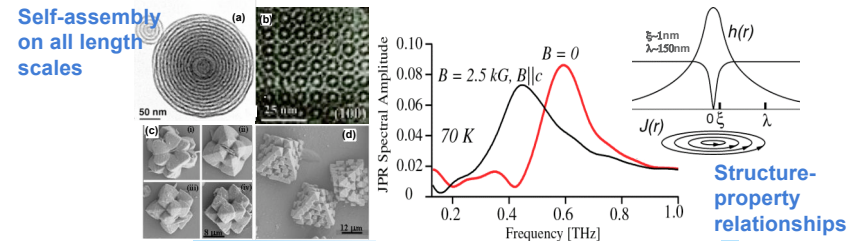


# CINT Thrust Areas provide expertise for integration science challenges

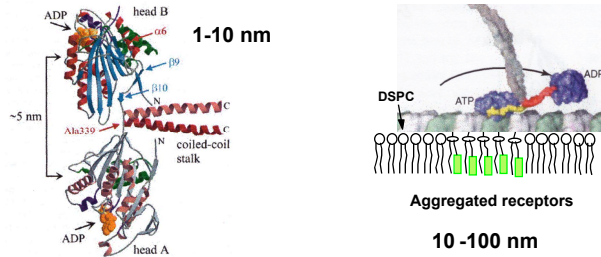
## Nanoelectronics & Nanophotonics: Precise control of electronic and photonic wavefunctions



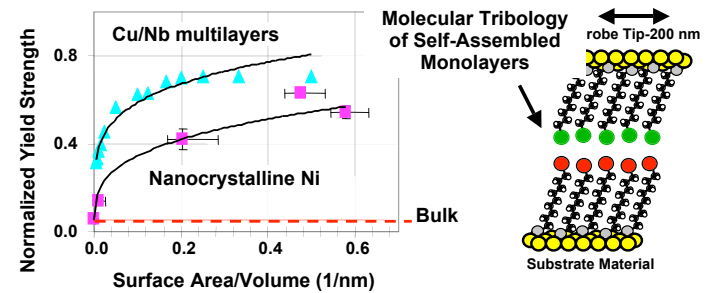
## Complex Functional Nanomaterials: Relationships between synthesis, structure and complex and emergent properties



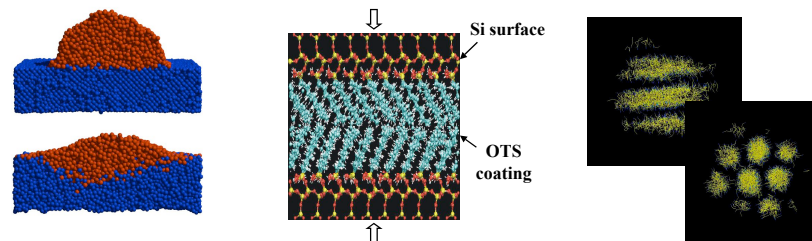
## Nano-Bio-Micro Interfaces: Biological principles & functions imported into artificial bio-mimetic systems



## Nanomechanics: Understanding the mechanical behavior of nanostructured materials



## Theory & Simulation: Theoretical, modeling and simulation techniques for multiple length and time scales and functionality





# ***CINT Nanoscience Integration Challenges***

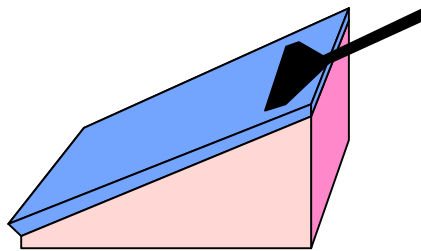
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- Energy Transfer
  - **fundamental limits and principles for the use and integration of nanoscale structures to detect, transfer, and harvest energy with extreme efficiency or sensitivity**
- Transduction of Molecular Events
  - **fundamental principles of transduction events in natural systems and how these may be incorporated into artificial nanosystems to convert single events into large scale responses**
- Emergent Properties
  - **understanding collective properties of composite nanoscale systems that cannot be predicted in terms of the individual constituents and using integration to design systems with desired behavior**

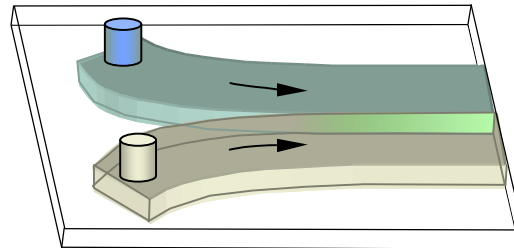


# ***CINT Users can access a spectrum of research tools in one place***

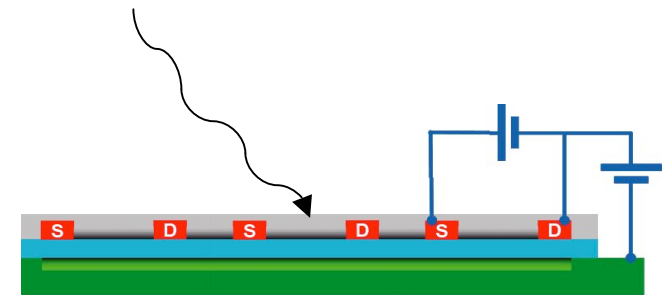
- **Micro-Nano fabrication and analysis**
- **Innovative techniques**
  - Atom Tracking STM
  - Magnetic Force Microscope
  - Interfacial Force Microscope
- **Theory and Simulation**
- **Discovery Platforms™**



**nanomechanics**



**microfluidics**

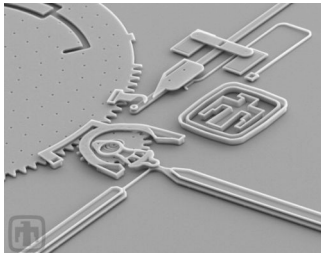


**optical, transport**

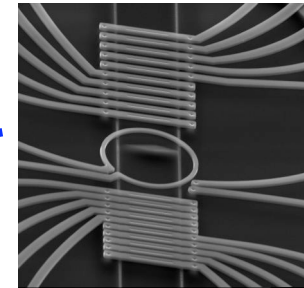


# ***CINT Discovery Platforms™: micro-labs for nanoscience exploration***

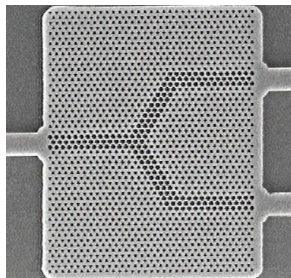
**Mechanics**



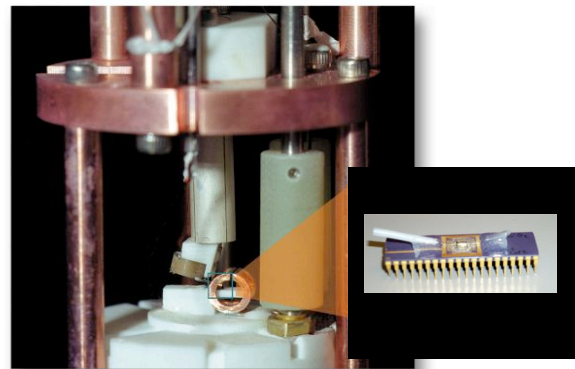
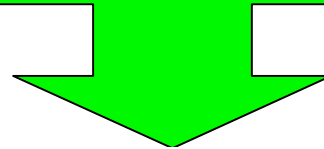
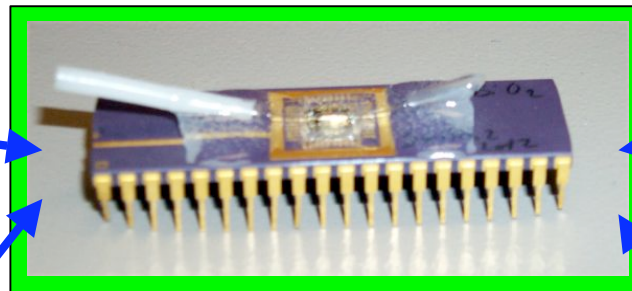
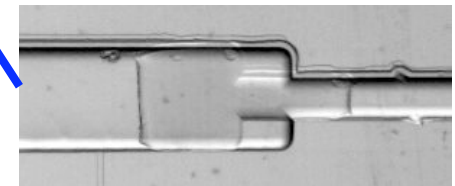
**Electronics**



**Optics**



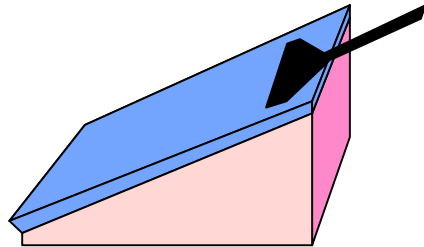
**Fluidics**



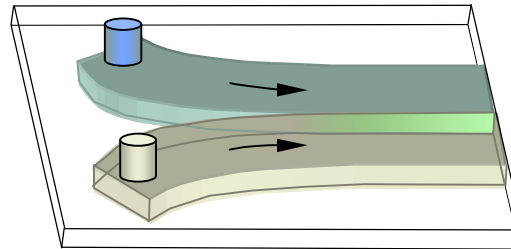
***Discovery Platforms™ will be compatible  
with characterization instruments***



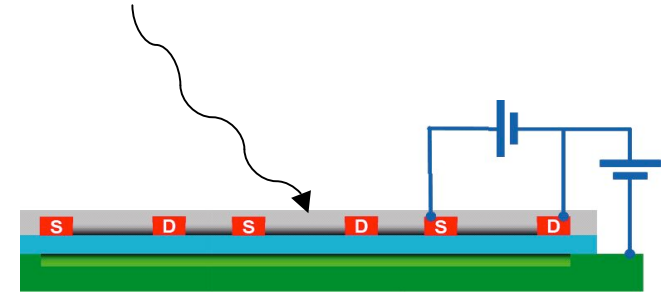
# We are developing the first CINT Discovery Platforms™



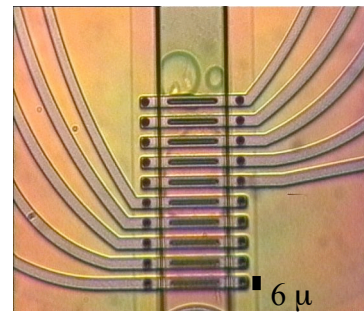
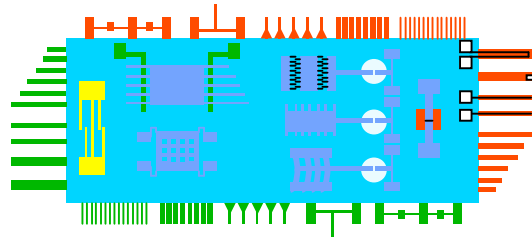
nanomechanics



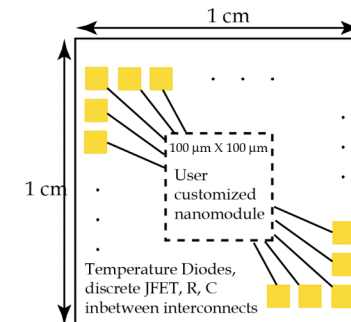
microfluidics



optical, transport



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# ***Researchers access CINT via the User Program***

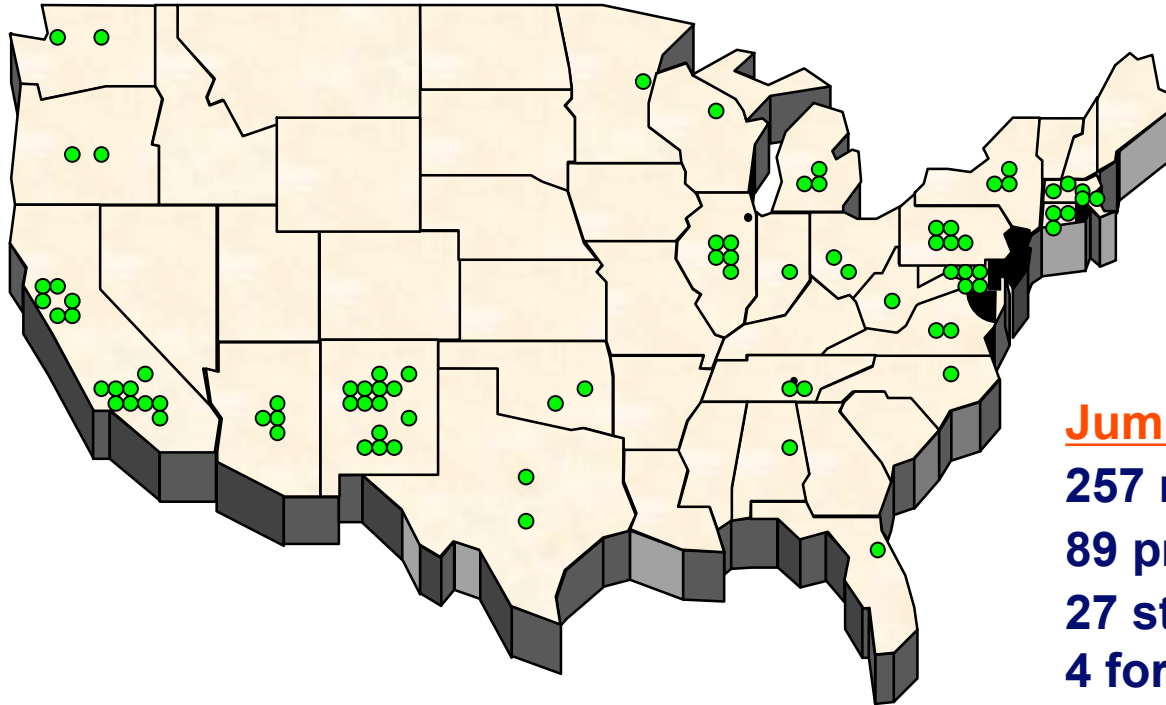
- **Universities**
  - Postdocs, students and visiting faculty researchers.
- **Industry**
  - Pre-competitive and propriety research mechanisms.
- **Other Laboratories**
  - Other Federal agencies.
- **International Science Community**
  - Open to the international science community

## **Key Aspects of User Program**

- **Open access to facilities based on user proposal quality**
- **Spectrum of user modes**
  - Access to equipment
  - Collaborative research
  - Multi-year projects
- **External proposal review**
- **Mechanisms for proprietary work**



# *External users are already working at CINT*



## Jump-start User Projects

257 requests (2003-05)

89 projects approved

27 states

4 foreign countries

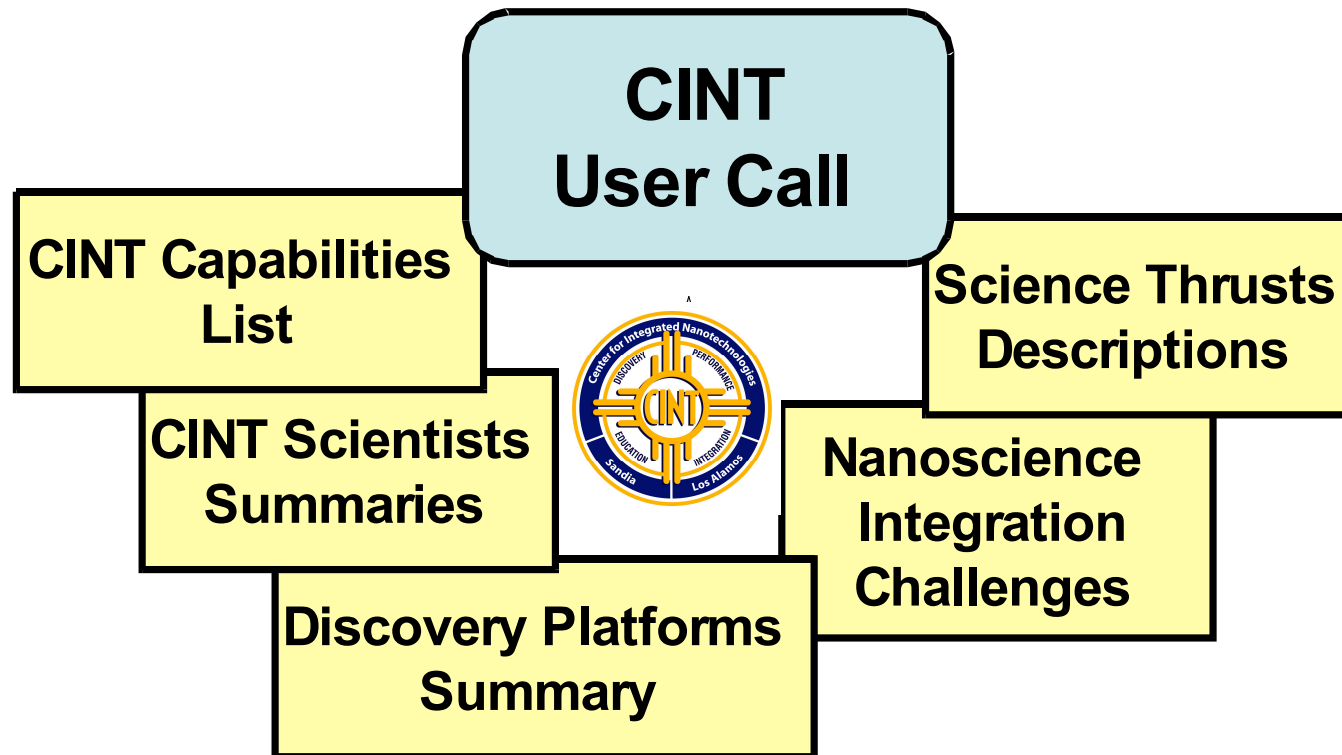
43 universities

5 private-sector

5 government labs



# *2006 Call for User Proposals open now*



**Proposal Submission via the Web only!**  
**Deadline: March 30, 2006**



# Center for Integrated Nanotechnologies Core Facility Tour

