



# The DOE Center for Integrated Nanotechnologies

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*Commissariat à l'Energie Atomique*  
*November 29, 2005*

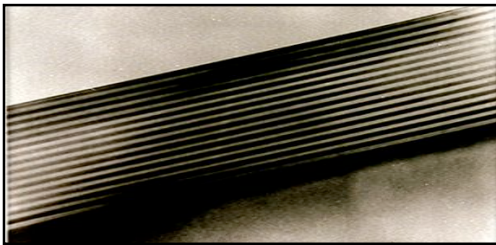
Sandia is a Multiprogram Laboratory Operated by Sandia Corporation,  
a Lockheed Martin Company, for the United States Department of Energy  
Under Contract DE-ACO4-94AL85000.



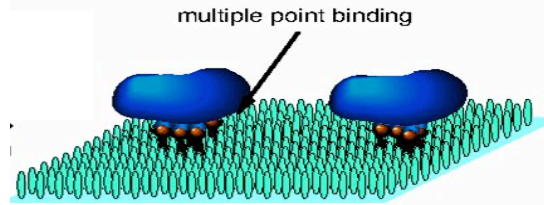


# ***Nanoscience discoveries will have impact via integrated nanotechnologies***

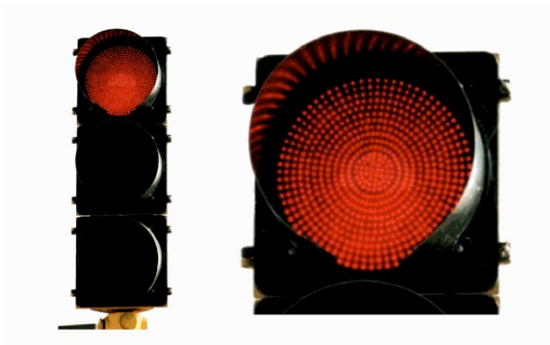
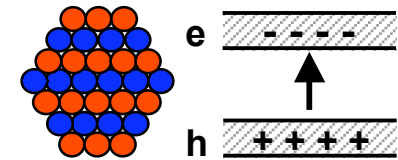
## **Energy**



## **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”***



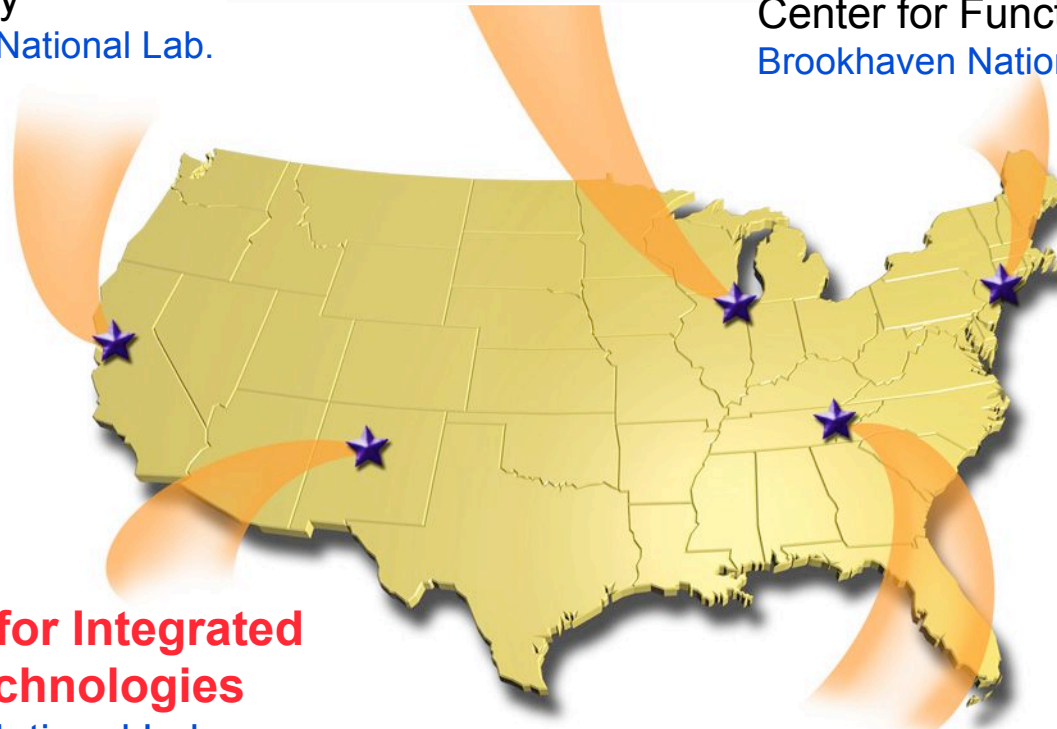
# ***CIINT is one of five U.S. Dept. of Energy Nanoscience Centers***

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Center for Nanoscale Materials  
Argonne National Lab.

Molecular Foundry  
Lawrence Berkeley National Lab.

Center for Functional Nanomaterials  
Brookhaven National Lab.



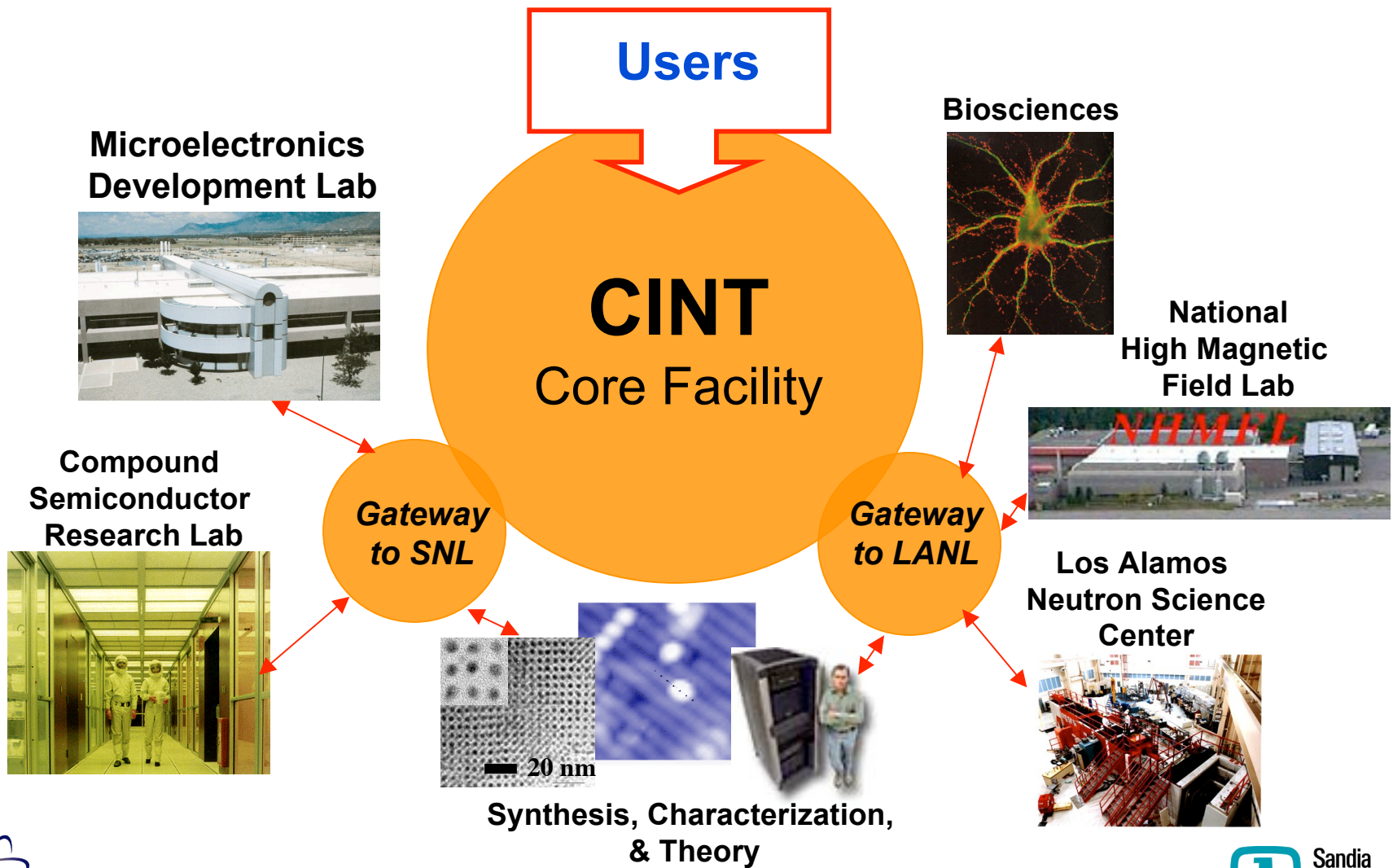
**Center for Integrated  
Nanotechnologies**  
Sandia National Labs.  
Los Alamos National Lab.

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*

**Buildings Complete**  
**Begin Operations**  
**Fully Operational**

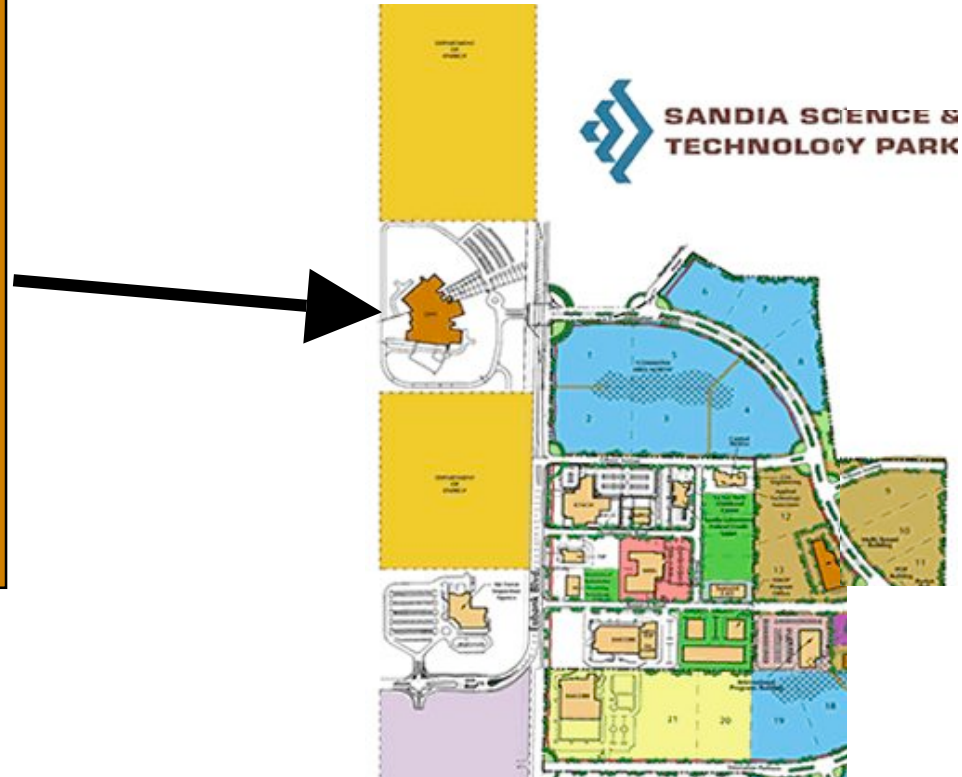
**December 2005**  
**April 2006**  
**May 2007**



# ***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







# Construction Status - Core Facility





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

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## **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**





## Construction Status--LANL Gateway





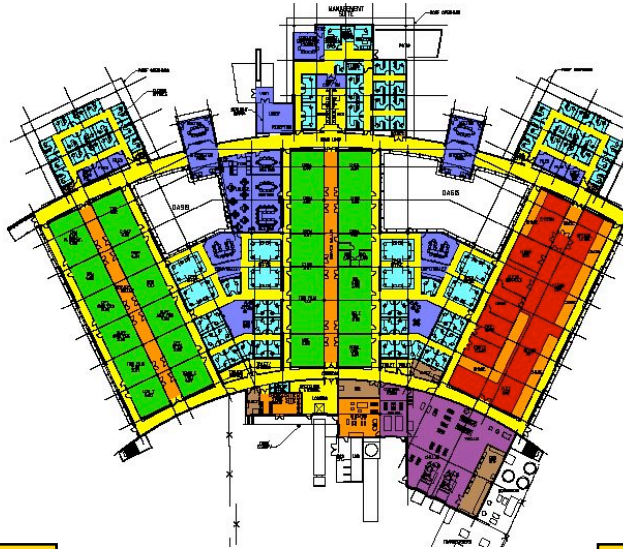
# ***CINT laboratories are supported by state-of-art special equipment***

## **Characterization**

- TEM, SEM, FE-SEM
- AFM
- FTIR, UV/VIS, X-ray
- 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
- P-CVD
- Wet Chem
- Bio

## **Integration**

- E-beam lithography
- Photolithography
- Thin Film Deposition
- REI, Plasma Etch

## **Gateway to Los Alamos**

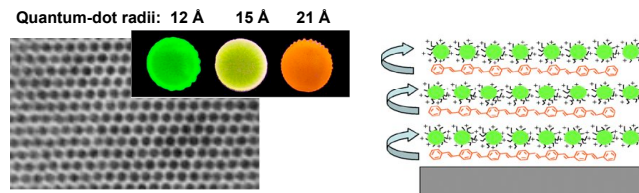
- NSOM, AFM
- Environmental SEM
- Nano-indenter
- Ultra-fast Laser
- Computer Cluster



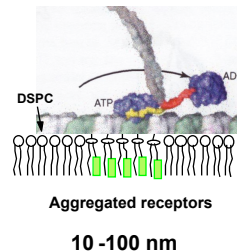
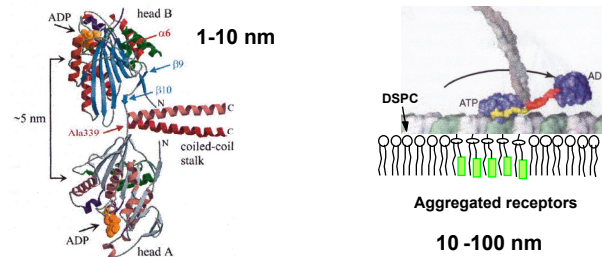


# CINT Thrust Areas provide expertise for integration science challenges

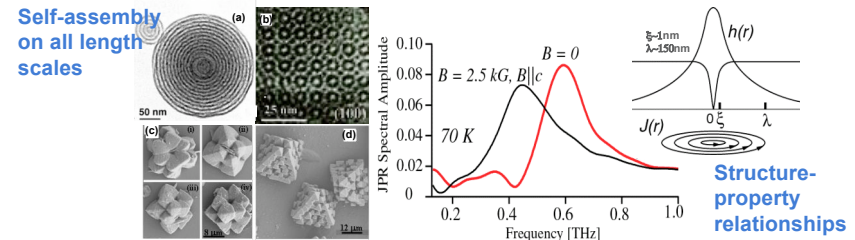
## Nanoelectronics & Nanophotonics: Precise control of electronic and photonic wavefunctions



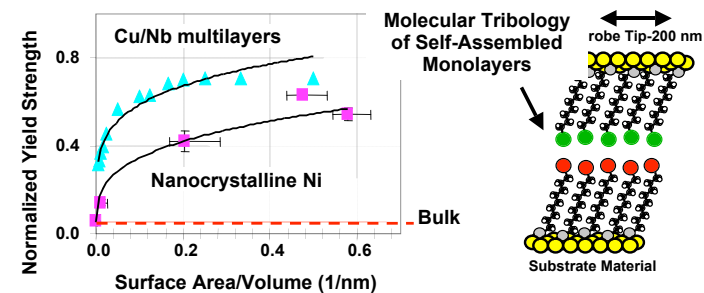
## Nano-Bio-Micro Interfaces: Biological principles & functions imported into artificial bio-mimetic systems



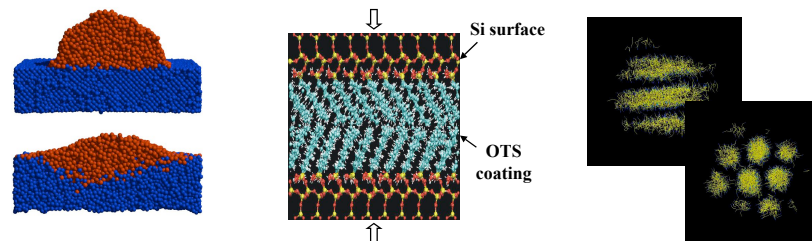
## Complex Functional Nanomaterials: Relationships between synthesis, structure and complex and emergent properties



## Nanomechanics: Understanding the mechanical behavior of nanostructured materials

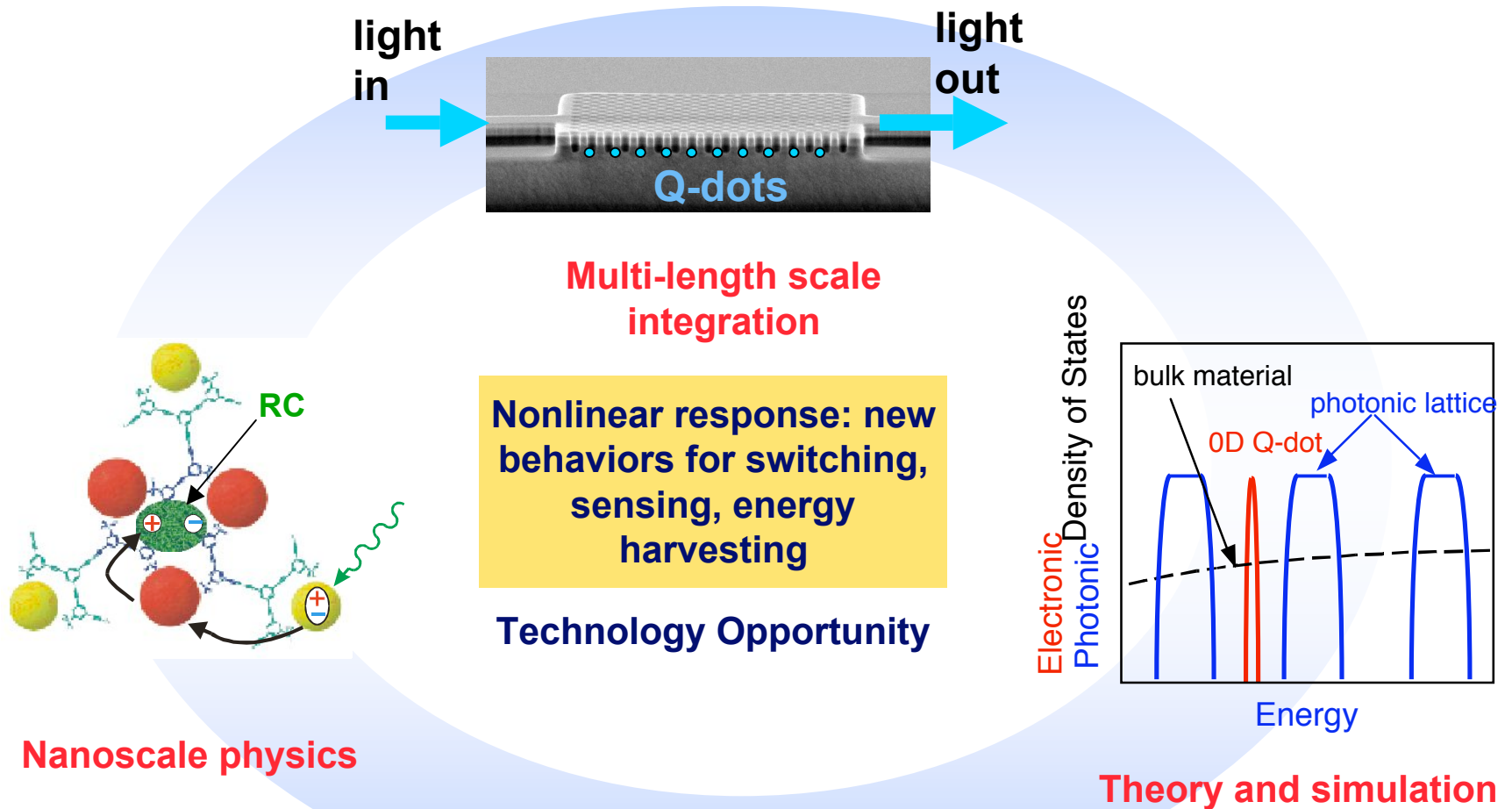


## Theory & Simulation: Theoretical, modeling and simulation techniques for multiple length and time scales and functionality





# Integration Science Challenge: Energy transfer





# ***New techniques will be developed and made available to user community***

- **Innovative Instrumentation**

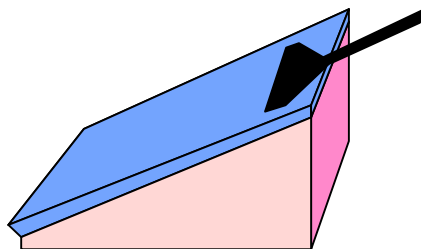
Atom Tracking STM

Magnetic Force Microscope

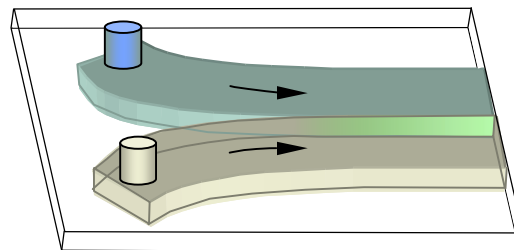
Interfacial Force Microscope

- **Theory and Simulation**

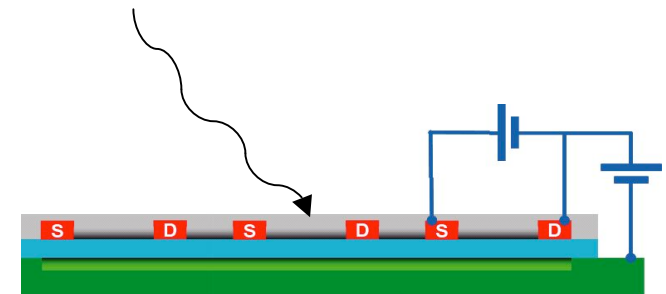
- **Discovery Platforms™**



nanomechanics



microfluidics



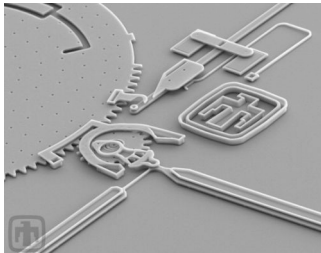
optical, transport



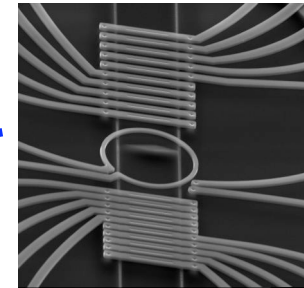


# ***CINT Discovery Platforms™ are micro-labs for nanoscience exploration***

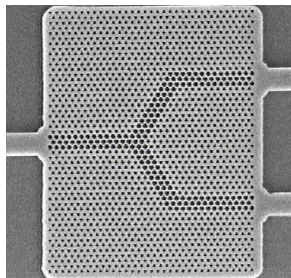
**Mechanics**



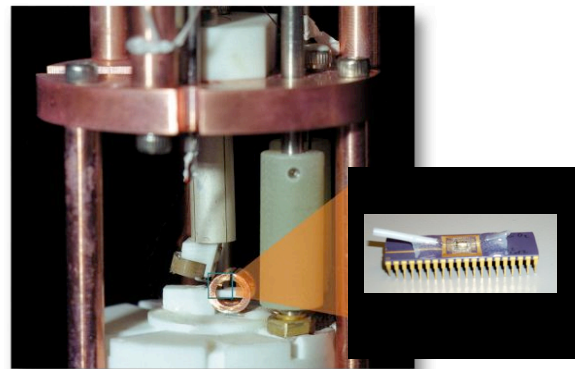
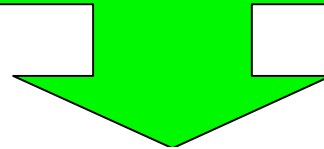
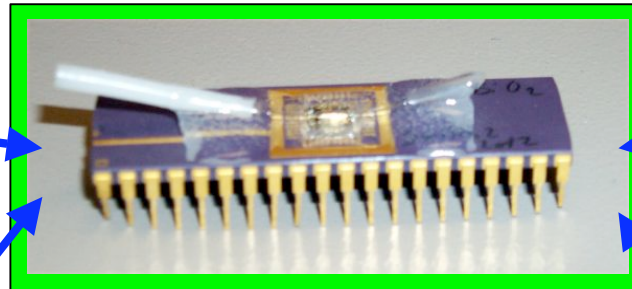
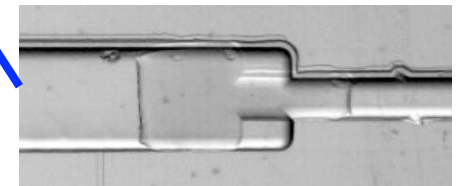
**Electronics**



**Optics**



**Fluidics**



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



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

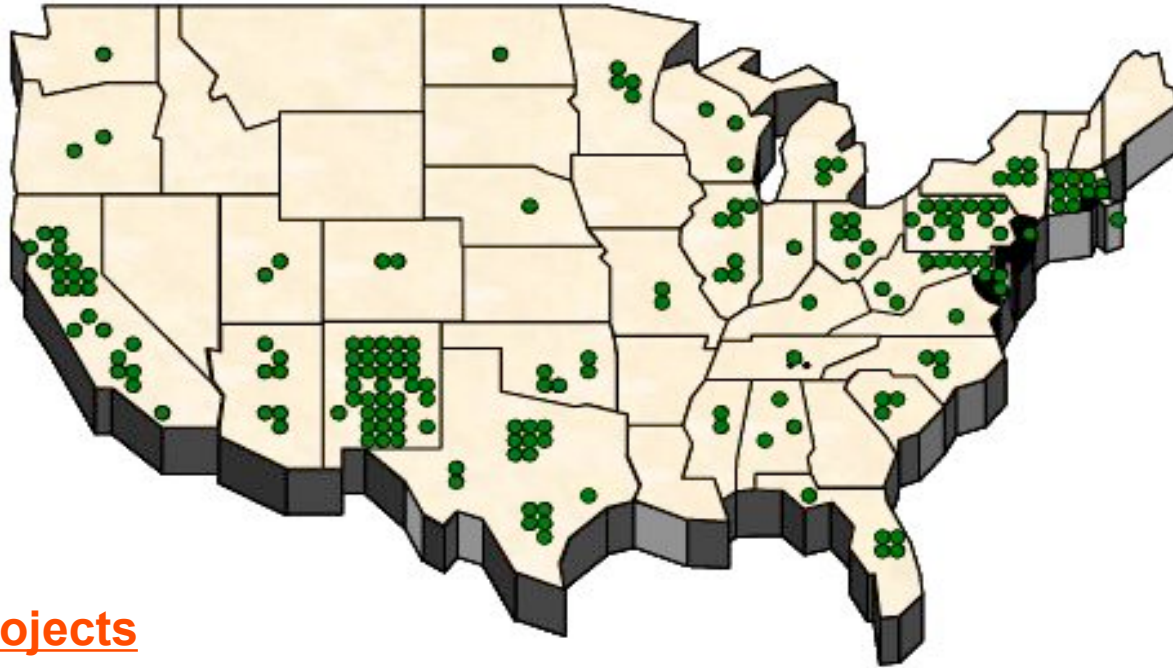
- **Universities**
  - Postdocs, students and visiting faculty researchers.
- **Industry**
  - Pre-competitive and propriety research mechanisms.
- **Other Laboratories**
  - Other Federal agencies.
- **International Science Community**
  - Open to the international science community

## **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 evaluation of proposals**
- **Mechanisms for proprietary work**
- **Normal operations start April 2006**



## ***External users are already working at CINT***



### **Jump-start Projects**

**Two rounds (2003 & 2004)**

**188 proposals submitted**

**68 projects approved**

**40 institutions (37 academic)**

**23 states, 3 foreign countries**

### **3<sup>rd</sup> Jump-start Round (2005)**

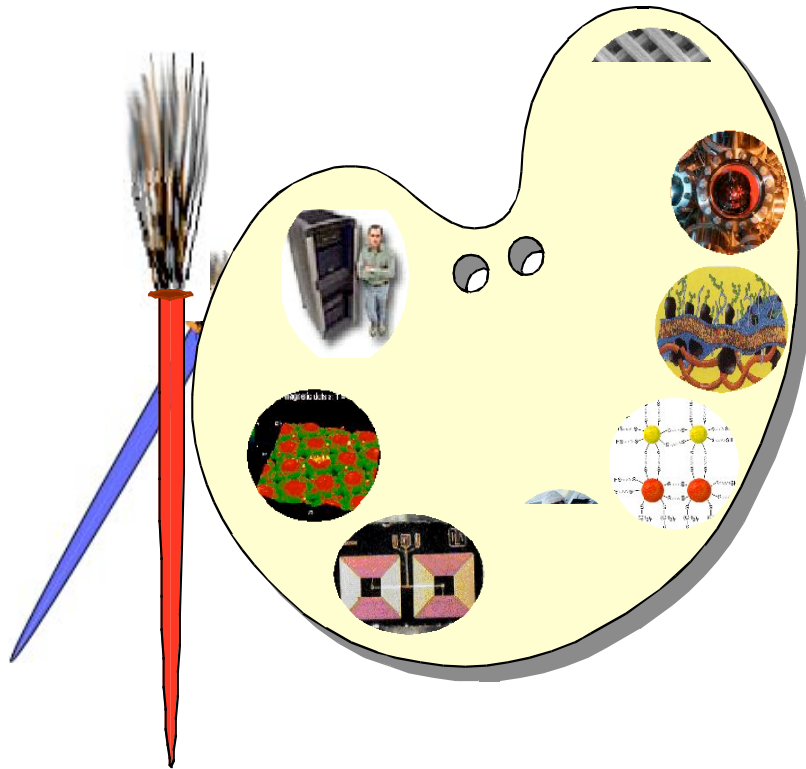
**70 proposals received**

**21 additional projects launched**



# ***CINT: A National user facility for nanoscience integration research***

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## **Upcoming Events**

**4th CINT Users Workshop  
Albuquerque, NM  
January 12-13, 2006**

**Next Call for User Proposals:  
*January 2006***