Collaboration & User Facilities: DOE Center for Integrated Nanotechnologies

Neal D. Shinn, Ph.D.
User Program Manager

DOE Center for Integrated Nanotechnologies
Sandia National Laboratories
Albuquerque, NM 87185-1315
ndshinn@sandia.gov

Sandia is a Multiprogram Laboratory Operated by Sandia Corporation,
a Lockheed Martin Company, for the United States Department of Energy
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The DOE operates many User Facilities

SYNCHROTRON RADIATION LIGHT SOURCES

National Synchrotron Light Source (NSLS) at Brookhaven National Laboratory in Upton, NY
Stanford Synchrotron Radiation Laboratory (SSRL) at Stanford Linear Accelerator Center in Stanford, CA
Advanced Light Source (ALS) at Lawrence Berkeley National Laboratory in Berkeley, CA
Advanced Photon Source (APS) at Argonne National Laboratory in Argonne, IL
Linac Coherent Light Source (LCLS)—under construction at Stanford Linear Accelerator Center in Stanford, CA

HIGH-FLUX NEUTRON SOURCES

High Flux Isotope Reactor (HFIR) Center for Neutron Scattering at ORNL in Oak Ridge, TN
Intense Pulsed Neutron Source (IPNS) at Argonne National Laboratory in Argonne, IL
Manuel Lujan Jr. Neutron Scattering Center (Lujan Center) at Los Alamos National Laboratory in Los Alamos, NM
Spallation Neutron Source (SNS) at Oak Ridge National Laboratory in Oak Ridge, TN

ELECTRON BEAM MICROCHARACTERIZATION CENTERS

Electron Microscopy Center for Materials Research (EMCMR) at Argonne National Laboratory in Argonne, IL
National Center for Electron Microscopy (NCEM) at Lawrence Berkeley National Laboratory in Berkeley, CA
Shared Research Equipment (SHaRE) Program at Oak Ridge National Laboratory in Oak Ridge, TN

NANOSCALE SCIENCE RESEARCH CENTERS

Center for Nanophase Materials Sciences at Oak Ridge National Laboratory in Oak Ridge, TN
Molecular Foundry at Lawrence Berkeley National Laboratory in Berkeley, CA
Center for Integrated Nanotechnologies at Sandia National Laboratories and Los Alamos National Laboratory
Center for Functional Nanomaterials at Brookhaven National Laboratory in Upton, NY
Center for Nanoscale Materials at Argonne National Laboratory in Argonne, IL

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http://www.sc.doe.gov/bes/BESfacilities.htm

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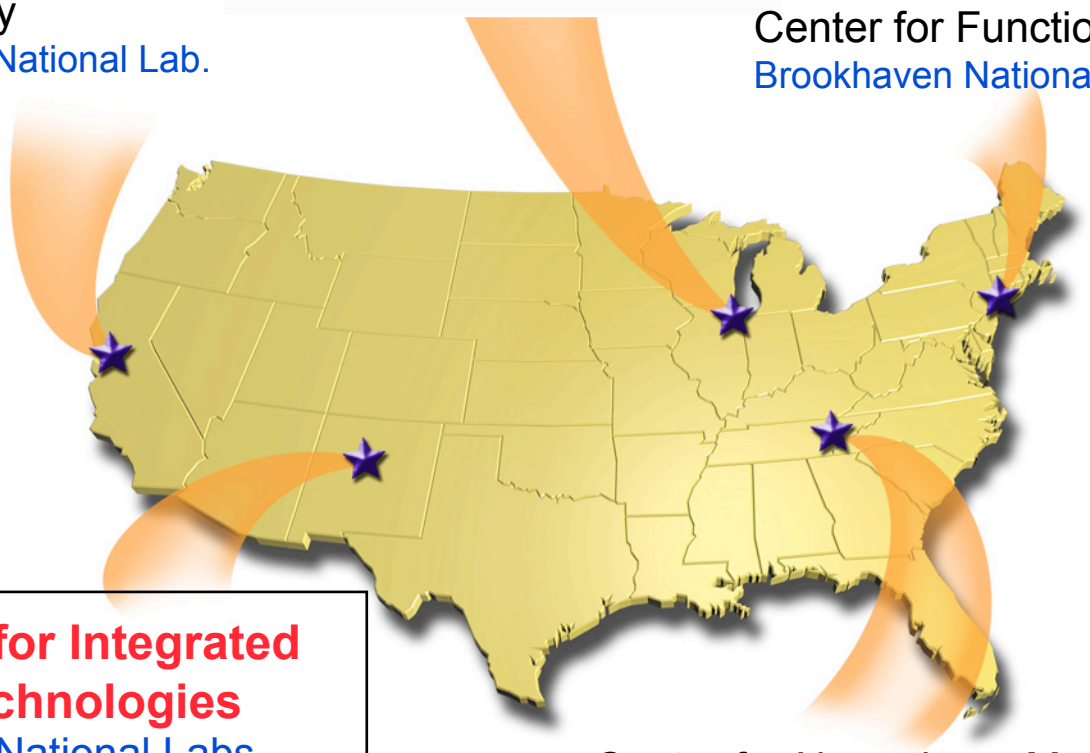
CINT is one of five Dept. of Energy Nanoscience Centers

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.

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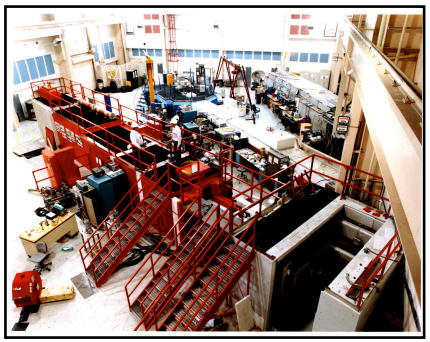
CINT Facilities and nearby resources

CINT Core Facility
(Albuquerque)

CINT Gateway to Los Alamos

Microsystems Engineering & Science Applications Complex

Lujan Neutron Scattering Center



National High Magnetic Field Lab

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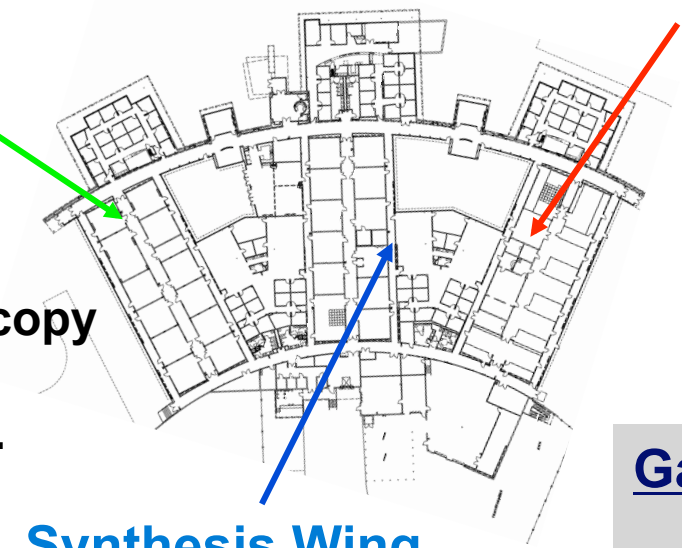
CINT users can access capabilities…

Core Facility

Characterization Wing

- TEM
- Atom tracking STM
- FTIR, UV-VIS
- Atomic Force Microscopy
- Low Temp Transport
- Ultra-fast Laser Spec.
- Interfacial Force Microscopy



Synthesis Wing

- MBE
- Wet Chemistry
- Bio labs
- Molecular films

Integration Lab

- *Class 1000 cleanroom*
- E-beam lithography
- Photolithography
- Thin Film Deposition
- Reactive Ion Etch
- Plasma Etch
- SEM/FIB

Gateway to Los Alamos

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

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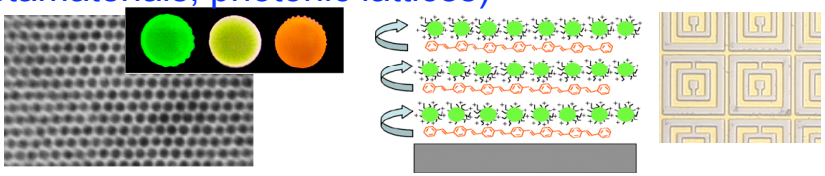
…and technical staff expertise!

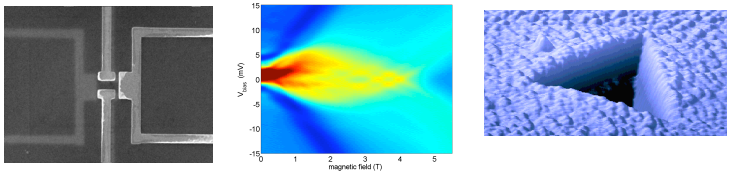
Nanophotonics & Optical Nanomaterials

Synthesis, excitation and energy transformations of optically active nanomaterials and collective or emergent electromagnetic phenomena (plasmonics, metamaterials, photonic lattices)



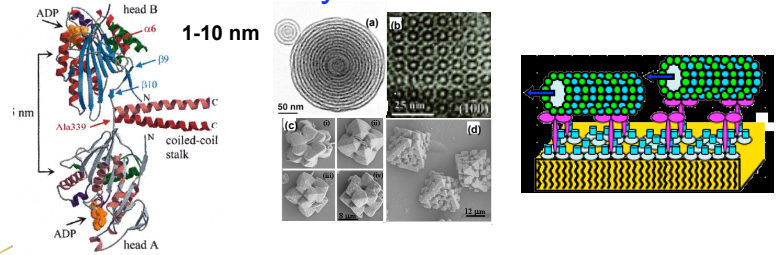
Nanoscale Electronics, Mechanics & Systems

Control of electronic transport and wavefunctions, and mechanical coupling and properties using nanomaterials and integrated nanosystems



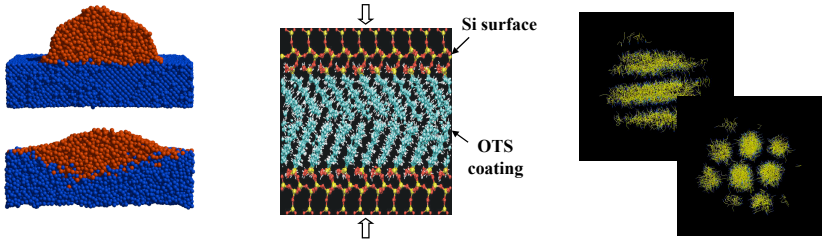
Soft, Biological, & Composite Nanomaterials

Solution-based materials synthesis and assembly of soft, composite and artificial bio-mimetic nanosystems



Theory & Simulation of Nanoscale Phenomena

Assembly, interfacial interactions, and emergent properties of nanoscale systems, including their electronic, magnetic, and optical properties



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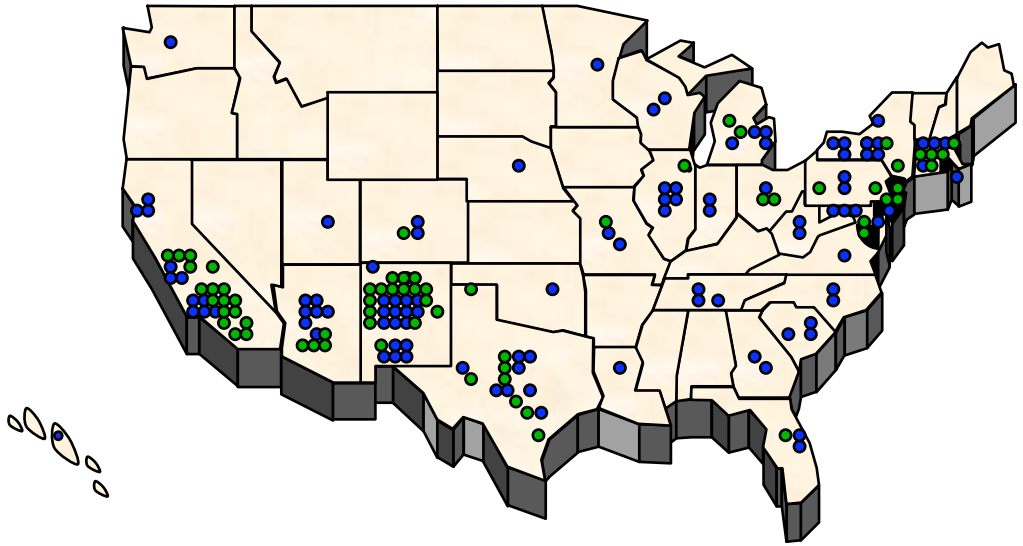
How does a "User Facility" work?

- User identifies desired capability/expertise
- User submits proposal (statement of work; *not funding!)*
- CINT verifies feasibility and safety
- External review panel prioritizes requests
- CINT approves highest priority proposals
- Publishable user project = no fee access
- Proprietary user project = full cost recovery
- User conducts independent or collaborative project

The CINT user community is growing

175 proposals submitted in 2008 (decisions pending)
101 proposal submitted; 79 accepted (78%) in 2007
175 proposals submitted; 130 accepted (74%) in 2006



> 200 researchers involved in current projects
> 95% of all user projects are collaborative

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The User Facility Model: Summary

- Driven by research community (supply & demand)
- Collaboration is:
  - Voluntary
  - More likely at “small science” facilities than at the larger “commodity” facilities
  - Regional, national, and international
- No-fee access promotes publication
- Graduate students & post-docs are often those conducting the user project on-site
- Requires stable user facility funding
- Formal application, review and tracking processes

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