

Welcome!

3rd Annual Faculty Workshop for Learning & Teaching in Nanoscale Science & Engineering*

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Higher Education/Degree
Programs, NCLT

***NSE or NSEE (education!)**

Kudos to some VIPs:

- Alabama A&M University, for its gracious invitation (especially Dean Matthew Edwards)
- Professor Mostafa Dokhanian, AAMU, local organization
 - Support staff
- Our invited speakers:
 - Prof. Eric Mazur (Harvard), Prof. Ana-Rita Mayol (UPR), Prof. Matthew Edwards (AAMU)
- Our Workshop facilitators:
 - Greg Light (NU), Denise Drane (NU), George Bodner (Purdue)
- Special kudos:
 - Dr. Negar Mansourian-Hadavi (NU)

Introductions, please!

Workshop Business:

- Workshop notebook
- Key events to anticipate
- Our agenda
- Logistics
 - Meals
 - Transportation
 - Internet access
 - etc.

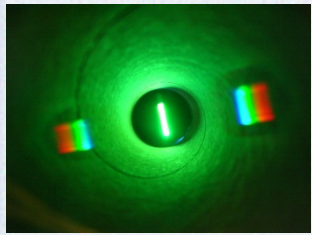
Introduction to the Workshop:

- What is the NCLT...and why?
- What do we hope to accomplish with this Workshop?
- What are the individual/group expectations for the Workshop?
- What are potential outcomes of the Workshop?

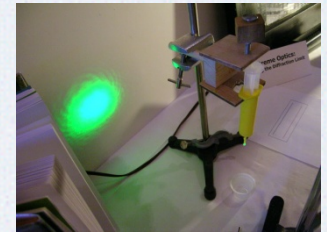
National Center for Learning & Teaching of Nanoscale Science & Engineering

Our vision is to build a *globally competitive* Nanoscale Science & Engineering (NSE) *workforce* and well-rounded NSE education leaders.

Our primary mission is to *build national capacity* in Nanoscale Science and Engineering Education (NSEE).



Learning and teaching
research in NSE and NSEE
leadership development



**NSEE Knowledge
Base**



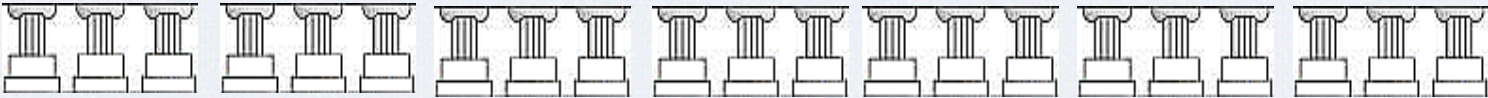
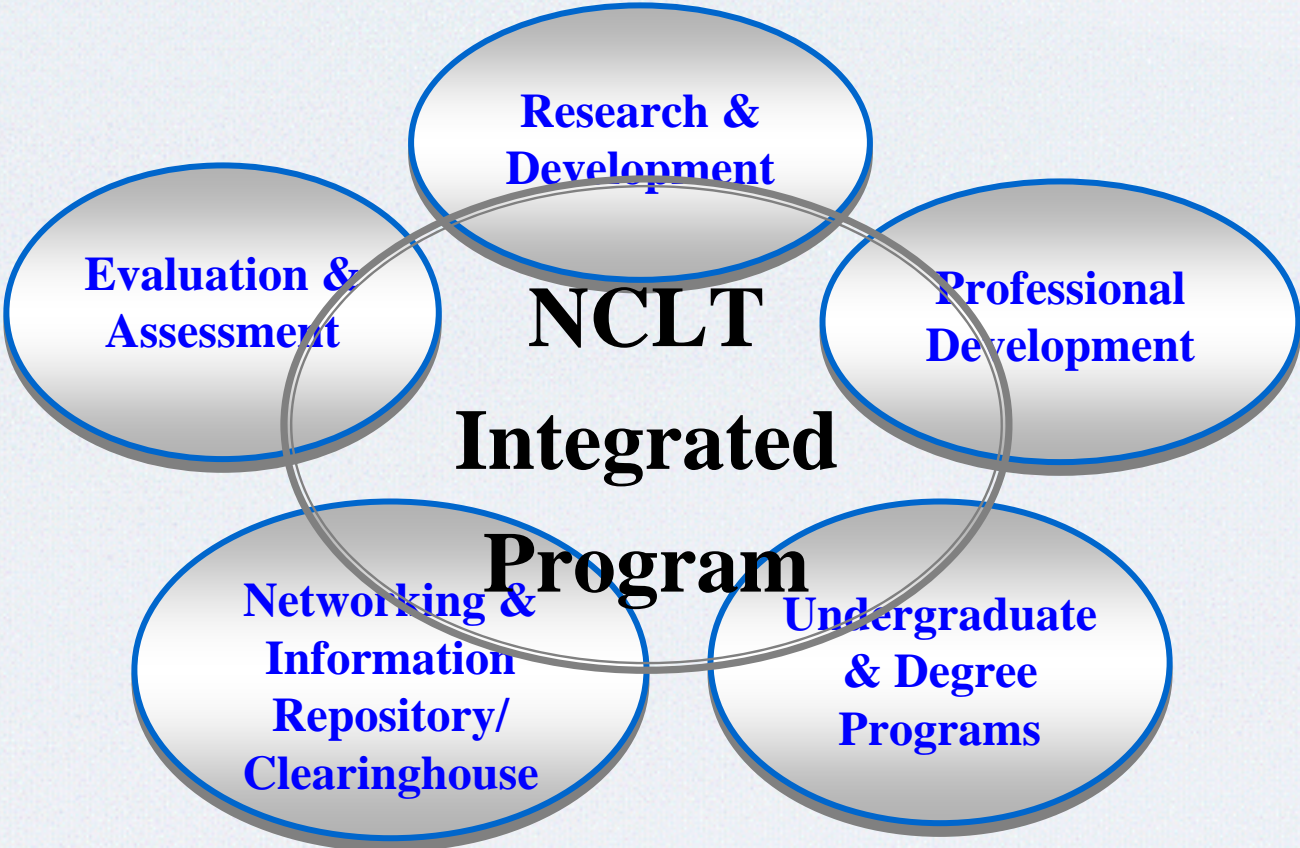
**NSE
Educators**



**Future NSEE
Researchers**

Funded by NSF from October, 2004

Center Strategy



Supported by NCLT Cyber Infrastructure

Center Goals

1. Develop fundamental research to support students in learning nano science and engineering (NSE).
2. Develop fundamental knowledge and models for teaching NSE (7-16 grades).
3. Develop courses & programs (grades 13-16) to serve as models to other universities & colleges.
4. Develop a cadre of individuals who can pursue research on the teaching and learning of NSE.

Center Goals

5. Develop of 7-16 Teachers/Instructors in NSE learning and teaching.
6. Build leadership capacity in minority institutions & at-risk populations in the learning and teaching of NSE throughout the US.
7. Establish NCLT as a national leader, building a NSE clearinghouse of information, and a network of NSEE community.

www.nclt.us

What we hope to accomplish here:

- Build a national network of NSEE faculty
- Promote “best practices” in NSEE
- Model “Construct-Centered Design” (CCD) of NSE course content at the undergraduate level
- Contribute learning & teaching resources to the NCLT NanoEd Resource Portal

Individual/Group Expectations:

- Help us identify important connections between the “big ideas” of NSEE
- Participate in “unpacking” of “big ideas” in NSEE
- Work on “Construct-Centered Design” of specific course content
 - Will show an example of such a “product” during Workshop #1

Potential Outcomes:

- Faculty development in NSE (our main goal...you!)
- NSE courses and nano-content
- NSE degree programs
- Resources for the NCLT Clearinghouse
 - Exemplars of CCD for NSE teaching/learning
 - NSE Content (courses, lectures, demos, etc.)
 - Degree programs in NSE(E)
- Research in Learning & Teaching of NSE
 - Resources (assessment/evaluation tools, findings)

The NCLT NanoEd Resource Portal:

The screenshot displays the NCLT NanoEd Resource Portal interface. The main content area features a slide titled "Problem Statement" with the following text:

Problem Statement

To determine the Lithography and Deposition Techniques that best result in the commercial production of nanoscale mesas on hard disks.

Why?

- Superparamagnetic effect occurs at about 1Tbit/in.²
- Seagate currently at 0.1Tbit/in.²

Below the text is a microscopic image of a hard disk surface showing a "PATTERNED MAGNETIC FILM" on a "SUBSTRATE".

At the bottom of the slide, it says "April 11, 2005".

To the right of the main content is a video player window titled "mse376050411g2h-4zjOtaWsj..." showing a presentation slide with the same "Problem Statement" text and a person presenting in a lecture hall.

Special talk by Dr. John Ireland at the Poster Session

Video available as high or low stream rate real media video

Slides available as pdf files

What are the “Big Ideas” in Nanoscale Science & Engineering?

(And why are they so important?)

What is a “Big Idea?”

“It is helpful to begin by defining what is meant by the term, ‘big idea.’ ‘Big ideas’ are core concepts that are critical for basic competency in a given field (e.g., nanoscience) because these concepts are the building blocks for the development of a deep understanding of other concepts in that field [17]. These core concepts are often cross-disciplinary, i.e., they are ‘big ideas’ in science rather than more narrowly conceived concepts in sub-fields such as chemistry or biology. A key question answered by a ‘big idea’ statement might be, ‘What are the fundamental ideas students need to know to understand nanoscience/nanotechnology?’”

Quoted from “A Rubric for Post-Secondary Degree Programs in Nanoscience and Nanotechnology” by Wansom et al.

The NCLT/SRI “Big Ideas in NanoEd” Workshop

- June ‘06 at SRI International
- Participants
 - Nanoscientists, nanotechnologists, science educators, informal educators
 - 40 plus
- Methods
 - Small group work to identify and elaborate big ideas and learning goals
 - Reach consensus within the working groups
 - Lots of discussion and debate!
 - Reach consensus across the working groups
 - Reach Consensus with a larger audience

2006 NCLT Faculty NSEE Workshop:

- August 6-9, 2006, Cal Poly San Luis Obispo
- 32 faculty participants from 17 colleges/universities
 - 8 from community colleges
 - 24 from 4-year institutions
- Emphasis on partnering with the NCLT for learning & teaching research in nanoscale science & engineering

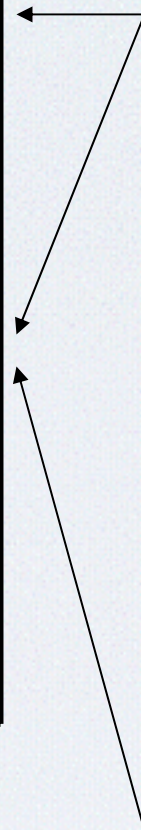


“Big Ideas in Nano-Ed” Workshop

Two Workshops: Comparison of Big Ideas

“Big Ideas in Nanoscience” Workshop (6/06)

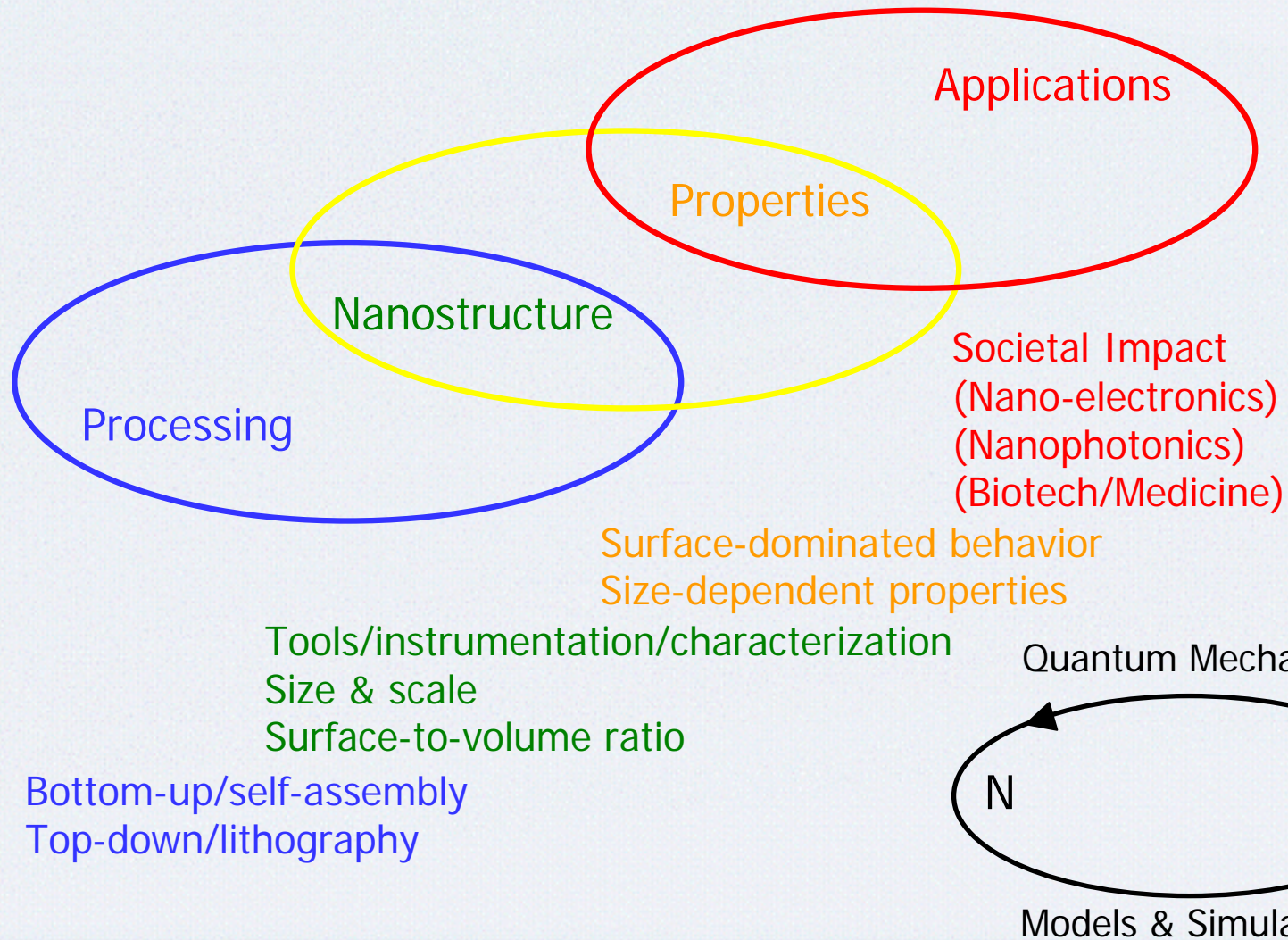
Self-Assembly
Dominant Forces
Tools
Modeling
Properties of Matter
Particulate Nature of Matter
Society
Size and Scale



Self-Assembly
Surface-Dominated Behavior
Tools/Instrumentation/ Characterization
Models/Simulation
Size-Dependent Properties
Societal Impact/Public Education
Size and Scale
Surface-to-Volume Ratio
Quantum Mechanics

NCLT Faculty NSEE Workshop (8/06)

The "P-N-P-A" Rubric for NanoEd:



What is “Construct-Centered Design”

Workshop #1:
Dr. Greg Light