



Materials Research Institute



**NORTHWESTERN
UNIVERSITY**

National Center for Learning and Teaching in Nanoscale Science (NCLT) Northwestern University

R.P.H. Chang, Director
r-chang@northwestern.edu

NCLT

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NCLT Background



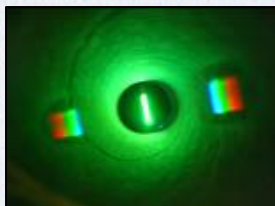
NCLT was established in 2004 to help meet the *workforce development needs* of the US National Nanotechnology Initiative

- Two million nano workers are needed worldwide - 1/3 of these in the US
- US workers must be prepared to compete in the \$2 trillion nanotechnology market

NCLT Overview

Mission: *Build national capacity* in Nanoscale Science & Engineering (NSE) Education

Vision: Develop a *globally competitive* NSE workforce and train a national cadre of leaders in NSE education



Learning and teaching through
inquiry and design of
nanoscale materials and
applications



➡ Developing
Curricula

➡ New Learning
Standards

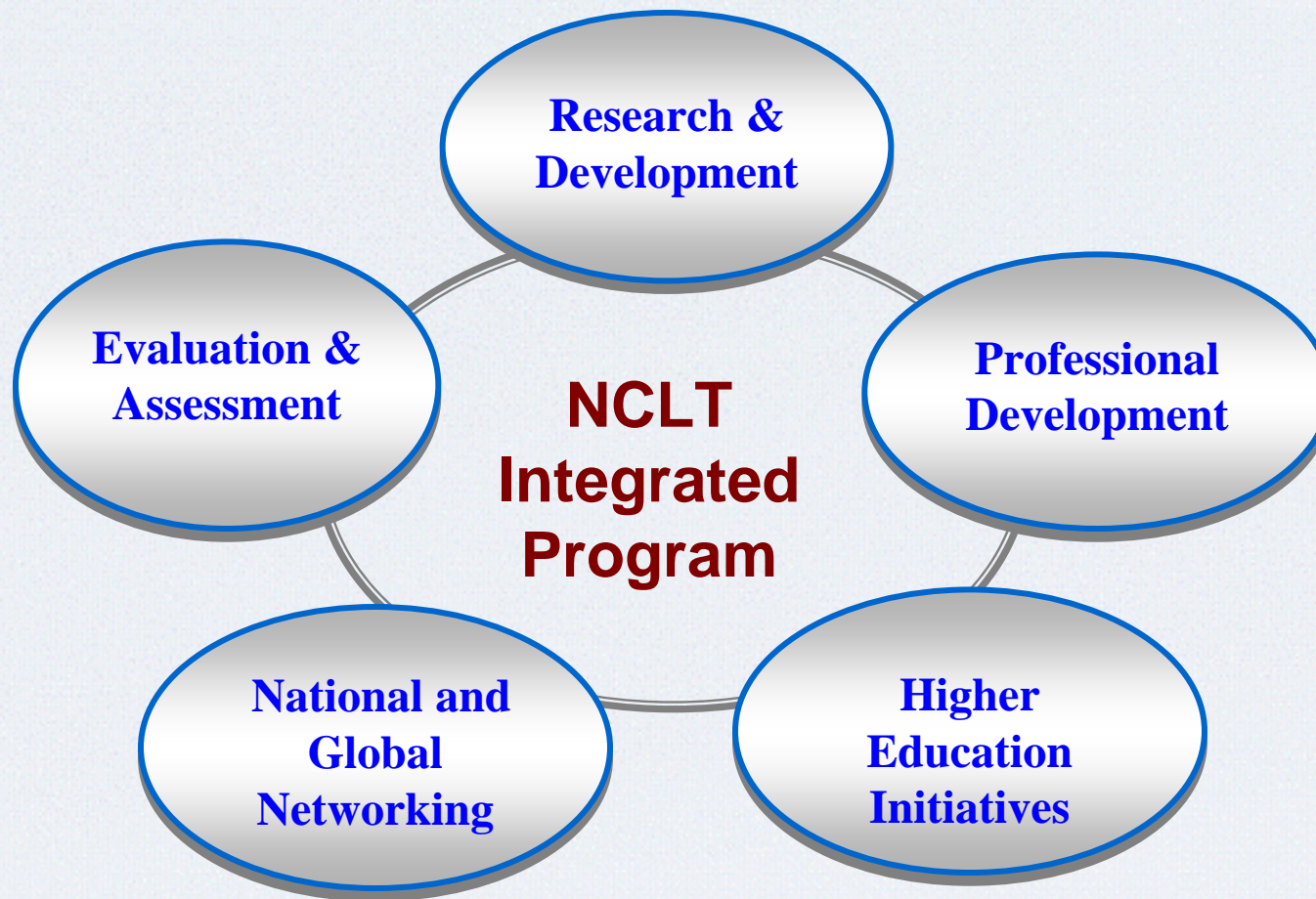
➡ NSE Education
Knowledge Base

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Integrated Research and Education



11 core partners

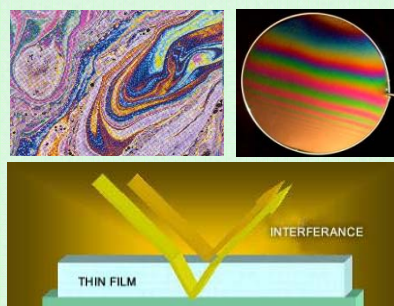
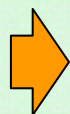
Manipulation of Light in the Nanoworld

Investigating: Light and Its Interaction with Nano Structures

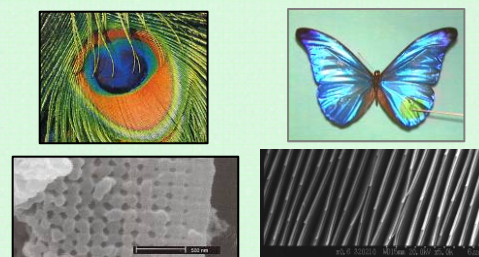
Homemade CD-ROM
spectroscope



Diffraction



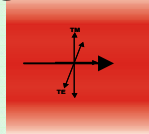
Interference



Reflection due to structure

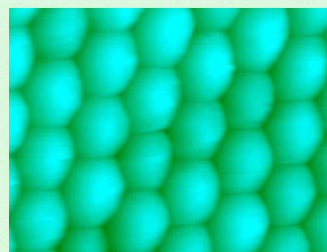
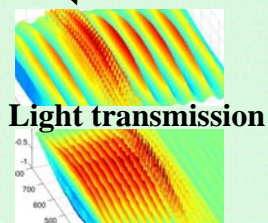
Application: Creating Opal-like, Photonic Structures

Light wave

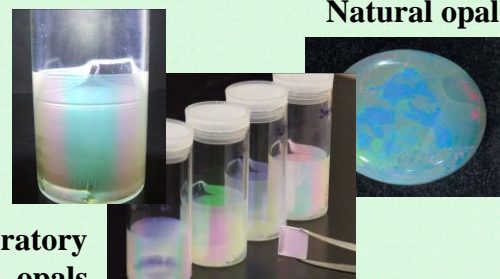


Predict
structure via simulation

Simulated opal
structure



Self-assembly of
polystyrene nanoparticles



Laboratory
opals

Artificial opal
by design

Integrating NSE into STEM Education

Evaluation & Assessment



Learning Research + NanoConcepts R&D

Developing the best practices and concepts for teaching Nanoscience (grades 7-16)

Professional Development (Teacher & Faculty Training)



Insert and link NanoConcepts to STEM Curricula & Courses (grades 7-16)

Teach students to develop new applications for nanotechnology



Impact on STEM Education, Standards & Equip next generation of Leaders in NSEE



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Networking to build an NSEE Community

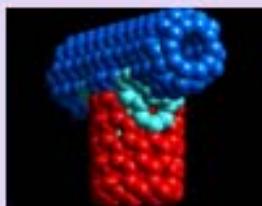
NanoEd Resource Portal

A repository for the collection and dissemination of information for the NSEE community

[HOME](#) | [ABOUT NanoEd](#) | [NETWORK MAP](#) | [SITE MAP](#) | [CONTACT US](#)

- Nano Courses
- Nanoconcepts and Applications
- Nano Learning Research
- Global Research Gallery
- Degree Programs
- Seminars
- Nano Resources
- News
- Events
- Glossary & Categories
- How to Participate

WHAT'S NEW



Nano Courses

[Introduction to Nanotechnology](#)

Dr. Meyya Meyyappan
NASA Ames Research Center
CenterMoffett Field, CA, USA



GOLD NANOPARTICLES

Nanoconcepts and Applications

[Gold Nanoparticles](#)

Interactive Computational Animations on Nanomaterials

Professor Richard D. Braatz, Li May Goh,
Effendi Rusli, John A. Washington,
Jorge Pazmino, Seyeong Im, and
Mitsuko Fujiwara
University of Illinois at Urbana-Champaign
Urbana, IL USA

www.ncit.us

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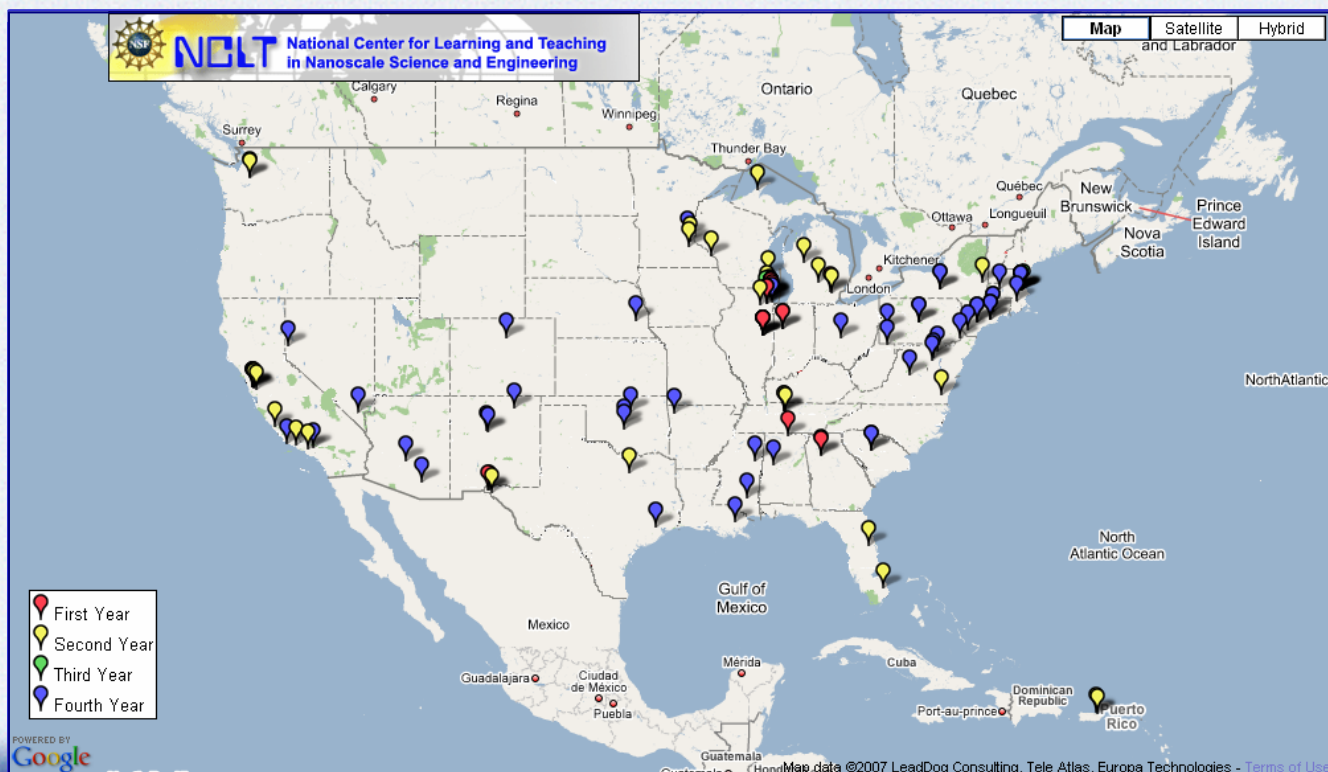
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A National Network

NCLT has a growing *network of national partners*, including:

- ➞ Other NSF-funded programs and centers (NSEC, NNIN, MRSEC, NCN, NIRT, NUE, NISE, etc.)
- ➞ Middle schools, high schools and community colleges nationwide





Los Angeles Unified School District (LAUSD) & NCLT Workshop



Taft High School
November 19 & 20, 2007
Los Angeles, CA



Enhancing STEM Education and Reforming the U.S. Curriculum

NCLT

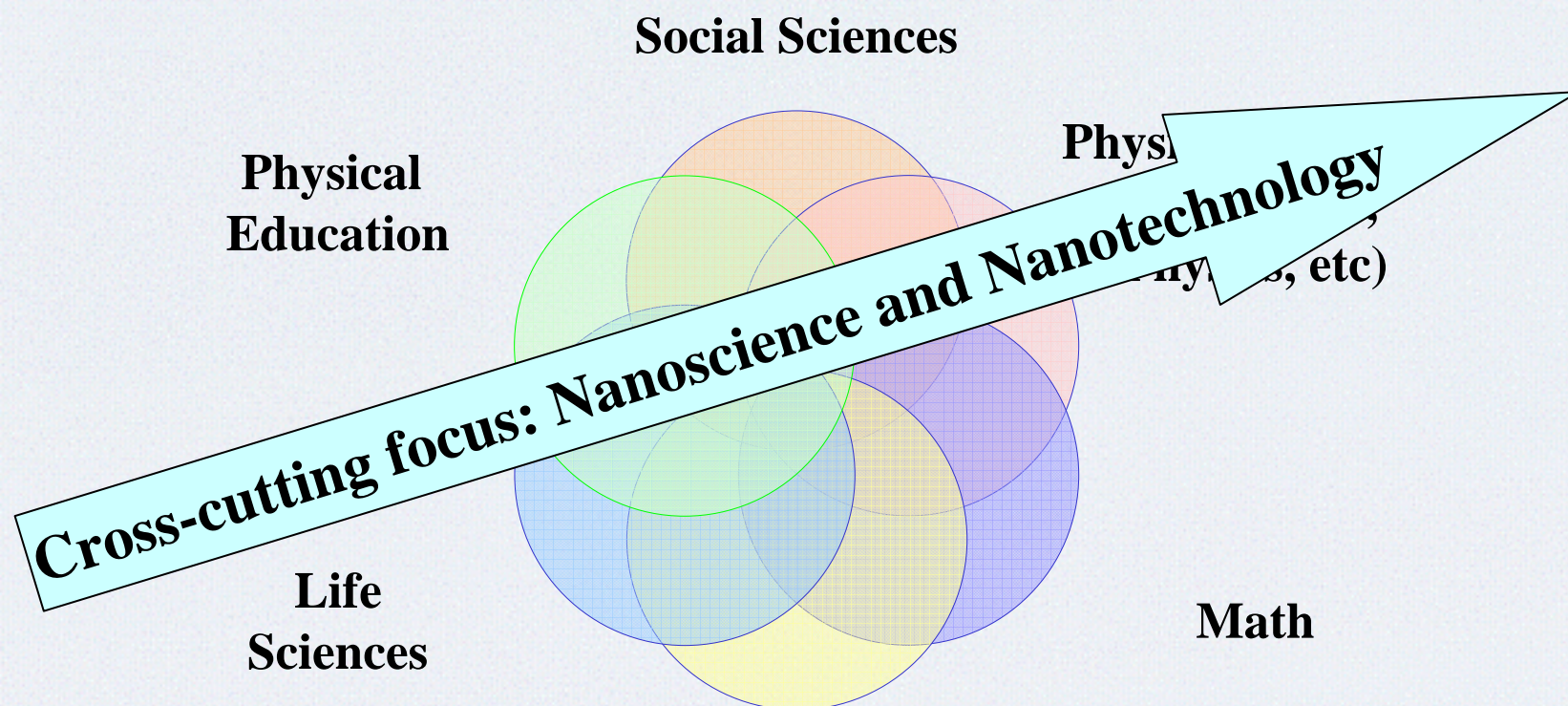
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Developing an Integrated Nano-based Curriculum at Taft High School, Los Angeles



Integrated nanoscience-based Curriculum



Size and Scale; Time and Space; Measurements, Properties of Materials (manmade and natural); and their diverse applications in Energy, Environment, Health, Communications, Security, etc.

Partnerships with other US Programs

NanoHub

- Link education resources
- Collaborating to produce archives of NCLT Seminars
- Simulations to complement the NSE activities for the classroom



NISE Net

- Collaborating to create a complete educational “package” (linking the formal and informal) to integrate NSE activities into the classroom and exhibits



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Partnerships with other US Programs

Institute for Functional Nanomaterials – Puerto Rico (EPSCoR)

- Joint Professional Development programs anchored in NSE
- Collaborate to develop NanoConcepts to integrate within the classroom at all educational levels (grades 7-16)



NNIN Education Initiatives

- Share NCLT education resources for Outreach (i.e. Nanocamps)
- Joint Professional Development efforts with Sandia National Labs
- Link Resources on the NanoEd Portal & NCLT Seminar

Partnerships with other US Programs



Rensselaer Polytechnic Institute – Puerto Rico (NSEC)

- Collaborating on the development of NSE materials for 9-12 within the professional development program at RPI
- Distributing resources on NanoEd Portal & NCLT Seminar



NCLT SEMINAR SERIES

- National exposure to researchers, teachers and educators
- ***Join us in presenting your Center's cutting-edge efforts in NSE!***

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NSEE Community Feedback

Please help us serve you better!

Over the next few months, NCLT will be contacting you to find out how our integrated program can better support your work in:

- Research
- Education
- Community outreach
- International efforts

Or contact us directly at nclt@northwestern.edu