



NSF Major Research Centers Programs

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National Science Foundation**

July 11, 2009

**Quality Education for Minorities (QEM) Network
HBCU-UP Leadership Development Institute**



NSF Centers Programs

- Science & Technology Centers: Integrative Partnerships
- Materials Research Science & Engineering Centers
- Science of Learning Centers
- Engineering Research Centers
 - http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5502&org=EEC
- Centers for Chemical Innovation
 - http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13635&org=CHE&from=home



*Science and Technology
Centers: Integrative Partnerships Program*
[http://www.nsf.gov/od/oia/programs/s
tc/](http://www.nsf.gov/od/oia/programs/s
tc/)



The STC Program supports innovation in the integrative conduct of research, education and knowledge transfer through partnerships.



History

First STC Competition - 1987

Number of Currently Operational STCs: 17 (5 are “graduating”)

**Result of Program Evaluation in 1996:
Incorporation of “Integrative Partnerships” into
the Name**

**NSB approved STC Program for competitions
every 2-3 years if budget permits**

**Annual budget/center: \$1.5 million to \$4M
(increased to \$5M current competition)**

Sixth competition currently underway



Currently Funded STCs

2006

- Center for Multiscale Modeling of Atmospheric Processes
- Center for Layered Polymeric Systems
- Center for Coastal Margin Observation & Prediction
- Center for Microbial Oceanography: Research & Education

2005

- Center for Remote Sensing of Ice Sheets
- Team for Research in Ubiquitous Secure Technology

2002

- Center for Biophotonics S&T
- Center for Embedded Networked Sensing
- Center for Integrated Space Weather Modeling
- Center of Materials & Devices for Information Technology Research
- National Center for Earth-Surface Dynamics
- Center of Advanced Materials for the Purification of Water with System



Advanced Materials for Water Purification

<http://www.watercampws.uiuc.edu/>

University of Illinois at Urbana-Champaign (Lead Institution)

Partners:

Clark Atlanta University;

MTR, Inc.;

Ohio State University;

Rose Hulman Institute;

Stanford University;

University of California at Berkeley



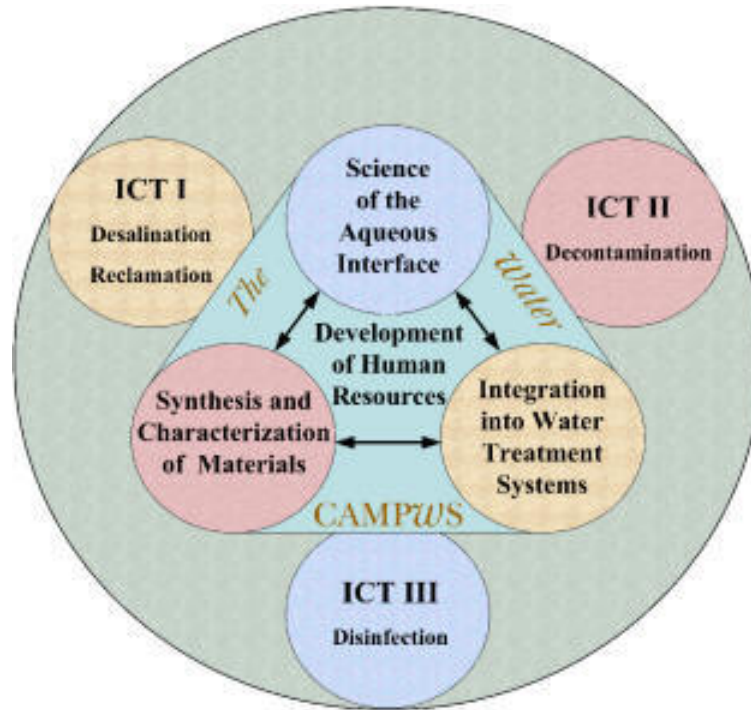
Advanced Materials for Water Purification



Information Source: <http://www.watercampws.uiuc.edu/>



Advanced Materials for Water Purification



Information Source: http://www.watercampws.uiuc.edu/index.pup?menu_item_id=3



Biophotonics

<http://cbst.ucdavis.edu/>

University of California at Davis (Lead Institution)

**Alabama A&M University; Lawrence Livermore National Laboratory; Mills College;
Stanford University; University of California at Berkeley; University of California at San
Francisco;
University of Texas at San Antonio**

Earth-surface Dynamics

<http://www.nced.umn.edu/>

University of Minnesota at Twin Cities (Lead Institution)

**Fond du Lac Tribal and Community College; Massachusetts Institute of Technology; Princeton
University;
Science Museum of Minnesota; University of California at Berkeley; University of Wyoming**



Embedded Networked Sensing

<http://www.cens.ucla.edu/>

University of California at Los Angeles (Lead Institution)

Buckley School; California Institute of Technology;
California State University at Los Angeles;
New Roads School; University of California at Merced;
University of California at Riverside;
University of Southern California



Integrated Space Weather Modeling

<http://www.bu.edu/cism/>

Boston University (Lead Institution)

**Alabama A&M University; Dartmouth College; National Center for Atmospheric Research;
Science Applications International Corporation; Space Science Institute; Stanford University;
University of California at Berkeley; University of Colorado at Boulder;
University of Texas at El Paso; William Marsh Rice University**

Materials and Devices for Information Technology Research

<http://stc-mditr.org/>

University of Washington (Lead Institution)

**California Institute of Technology; Georgia Institute of Technology; University of Arizona; University of California at
Berkeley; University of California at Santa Barbara
University of Southern California**



Remote Sensing of Ice Sheets

<http://www.cresis.ku.edu/>

University of Kansas (Lead Institution)

**Elizabeth City State University;
Haskell Indian Nations University;
Ohio State University;
Pennsylvania State University; and
University of Maine**



Remote Sensing of Ice Sheets

About CReSIS:

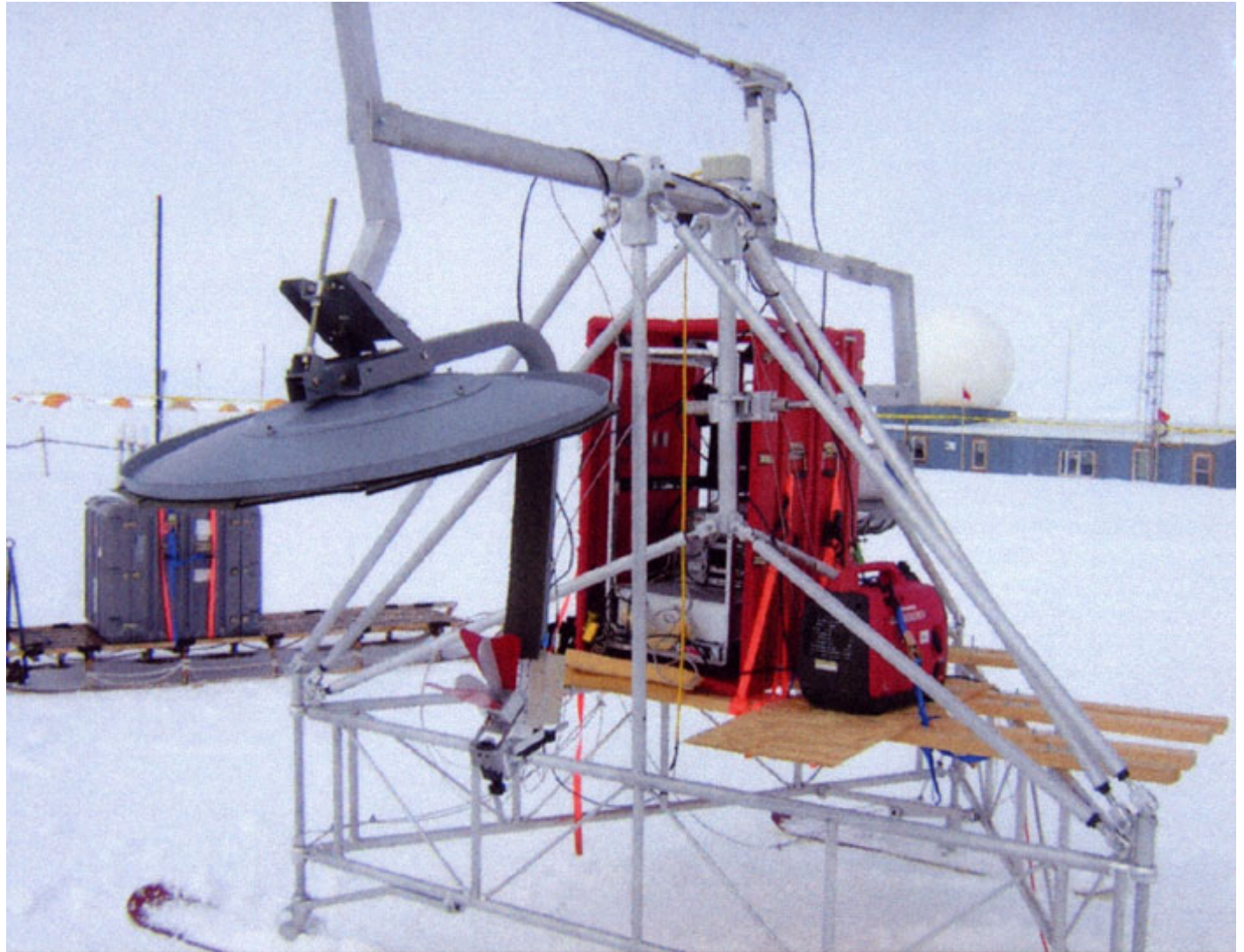
The remoteness, complex structure and vast size of the Greenland and Antarctic ice sheets call for a multidisciplinary research approach centered around remote sensing that integrates expertise in electrical engineering, information technology, aerospace engineering, glaciology and geophysics. CReSIS will establish a science-driven technology development program to advance the knowledge of ice-sheet characteristics and processes. Learn even more about us by taking the links below.

Information Source: <http://www.cresis.ku.edu/about.htm>



CReSIS Experiment: Measuring Temperature in Snowpit

Information Source: <http://www.cresis.ku.edu/HighlightsPoster1.htm>



CReSIS Experiment: Sled with Gimbaled Antenna Mount

Information Source: <http://www.cresis.ku.edu/HighlightsPoster1.htm>



Knowledge Transfer

Crucial to the CReSIS mission are activities to share what we learn with others. These "Knowledge Transfer" activities will benefit industry, advance scientific knowledge and educate policy-makers and the general public. Knowledge transfer goals also include technology assistance and providing learning opportunities for staff at partner institutions.

Through the transfer of knowledge gained as a result of CReSIS, the program participants are able to contribute to:

- Economic Development,
- Public Policy,
- Scientific Research,
- Public Education, and
- Technical Assistance.



Team for Research on Ubiquitous Secure Technology

<http://trust.eecs.berkeley.edu/>

**University of California at Berkeley (Lead
Institution)**

**Carnegie Mellon University; Cornell University;
Mills College; San Jose State University;
Smith College; Stanford University;
Vanderbilt University**



Team for Research on Ubiquitous Secure Technology

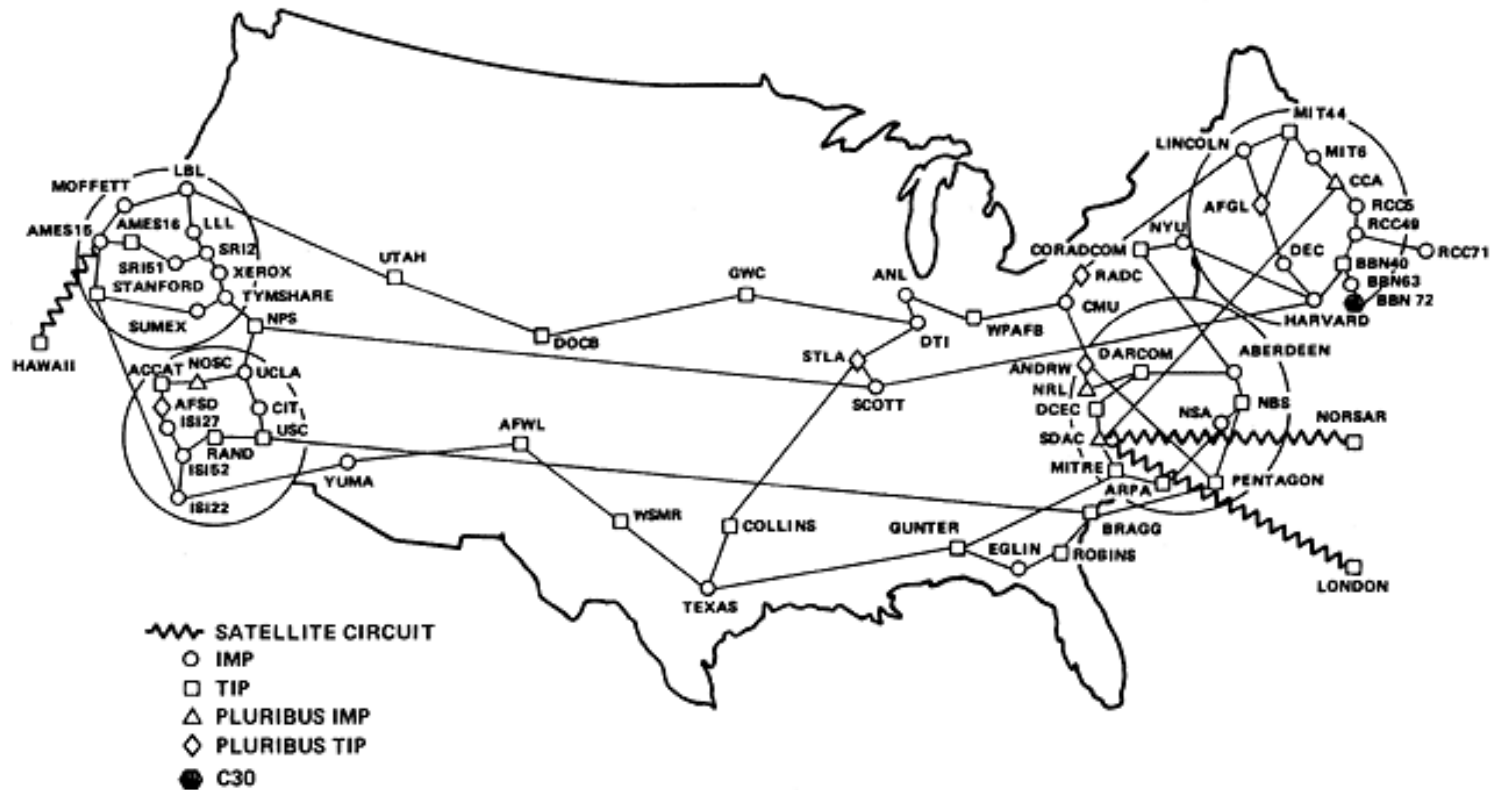
The Team for Research in Ubiquitous Secure Technology (TRUST) is devoted to the development of a new science and technology that will radically transform the ability of organizations (software vendors, operators, local and federal agencies) to design, build, and operate trustworthy information systems for our critical infrastructure.

Information Source: <http://trust.eecs.berkeley.edu/>



The Internet in 1980

ARPANET GEOGRAPHIC MAP, OCTOBER 1980

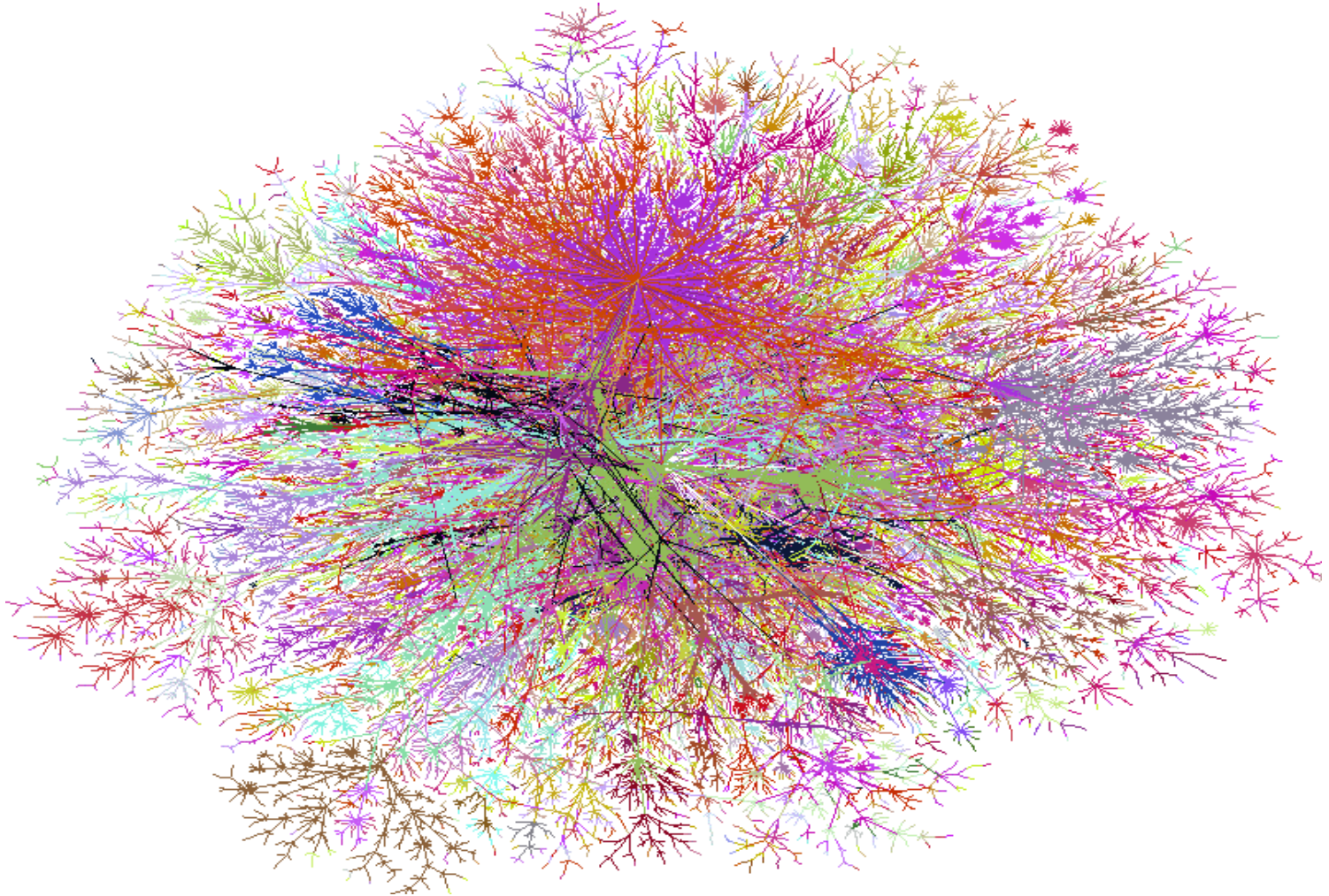


(NOTE: THIS MAP DOES NOT SHOW ARPA'S EXPERIMENTAL SATELLITE CONNECTIONS)
NAMES SHOWN ARE IMP NAMES, NOT (NECESSARILY) HOST NAMES



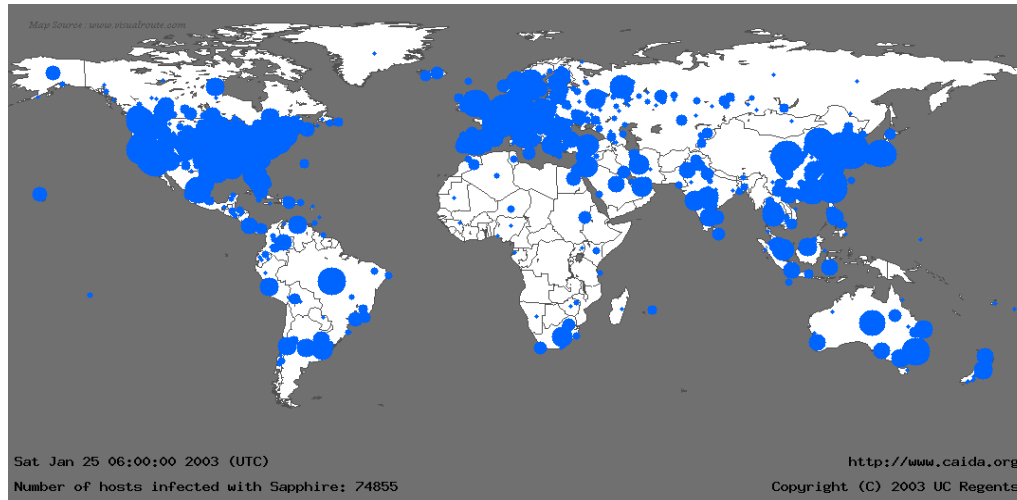
The Internet Today

<http://cm.bell-labs.com/who/ches/map/gallery/index.html>





Bad Code + Big Networks = Problems



Geographic spread
of Sapphire worm
30 minutes after
release

Source:
<http://www.caida.org>

- Code Red worm (Summer 2001)
 - Infected 360,000 hosts in 10 hours (CRv2)
- Sapphire/Slammer worm (Spring 2003)
 - 90% of Internet scanned in <10mins



STC Education Programs & Initiatives

- The STCs have graduate and post-doctoral initiatives.
- Their mission includes the recruitment & retention of underrepresented groups (women, racial/ethnic minorities, persons with disabilities);
- Their efforts are to increase awareness in the science, engineering, and education components of the STCs.



Student Programs at STCs: Making Contact

- STC-STARS Partnership: Student Transitional Alliance for Research in STEM
 - NSF funded program at the Science Diversity Center that provides faculty and students from minority-serving institutions with increased access to undergraduate & graduate research opportunities at six NSF-sponsored STCs (class of 2005/2006)
 - Three-year grant through September 2010
 - <http://www.abritekconsulting.com/rach/internship/>



Materials Research Science & Engineering Centers

Division of Materials Research

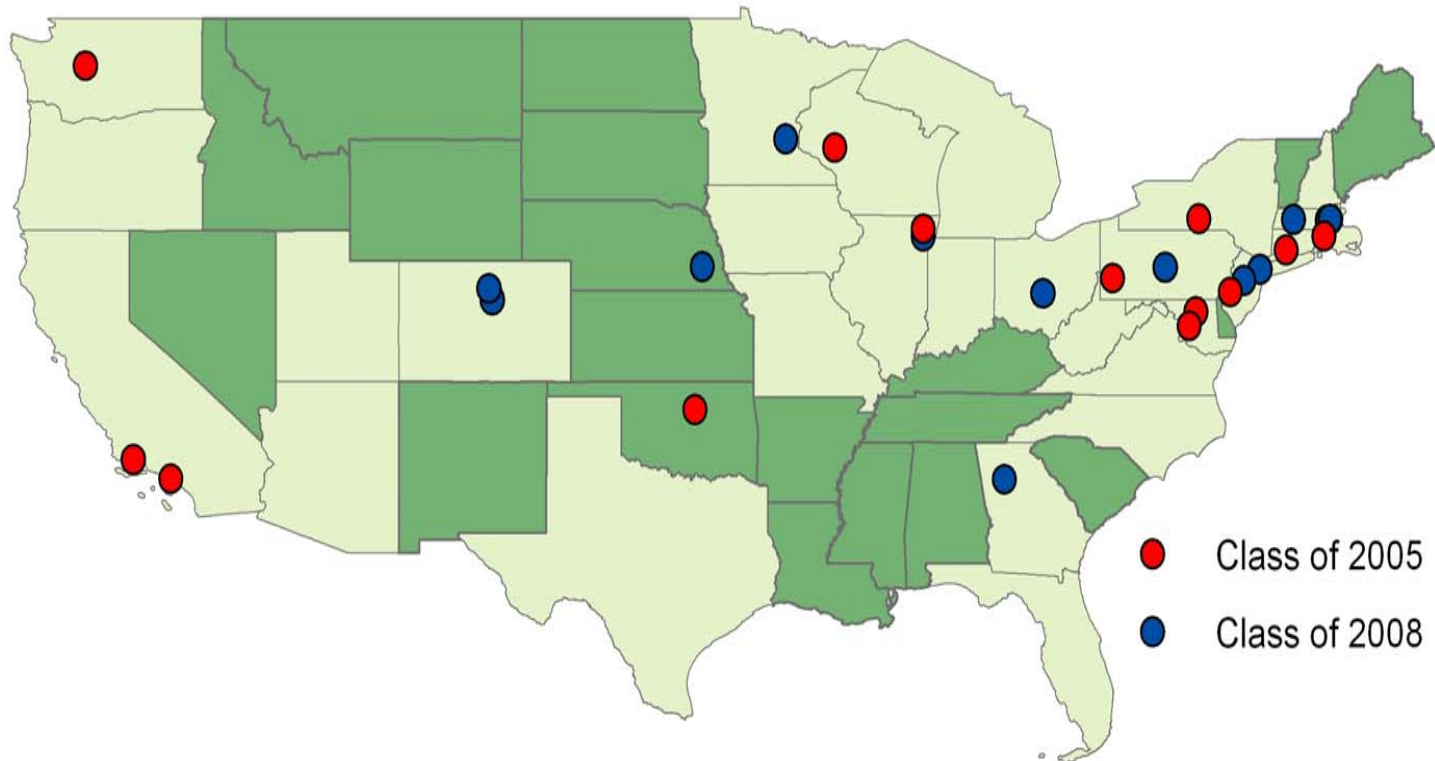
Rama Bansil, William Brittain, Sean Jones,
Thomas Rieker, and Charles Ying

MRSEC Program Directors



The MRSEC Program in 2009

MRSEC





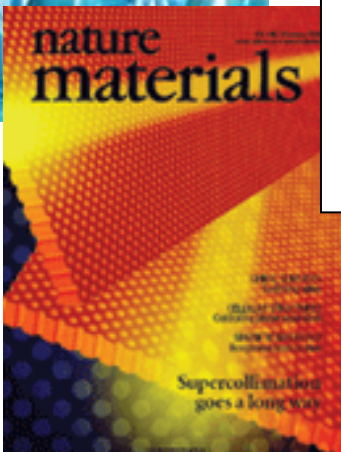
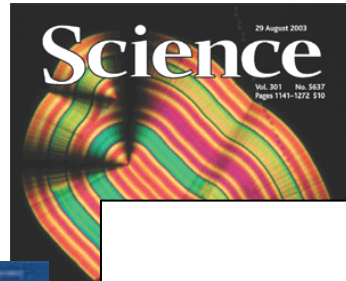
MRSEC 2009

- 27 Centers
- ~\$54M total this year
 - 13 MRSECs class of 2005
 - 14 MRSECs class of 2008
 - 5 new awards made in 2008
 - 4 MRSECs phased out after 2008 competition
- Next MRSEC competition anticipated Fall 2010



MRSEC:

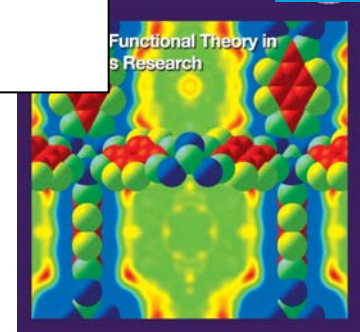
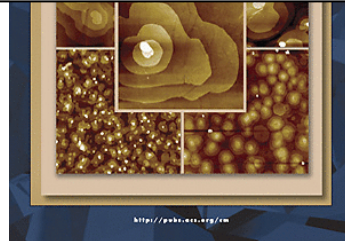
High Impact - High Visibility



Science Output

- 224 Ph.D.s awarded
- 145 Post-docs completed
- 1620 publications
- 57 patents issued

'07-'08 data





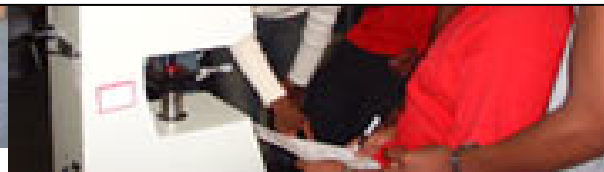
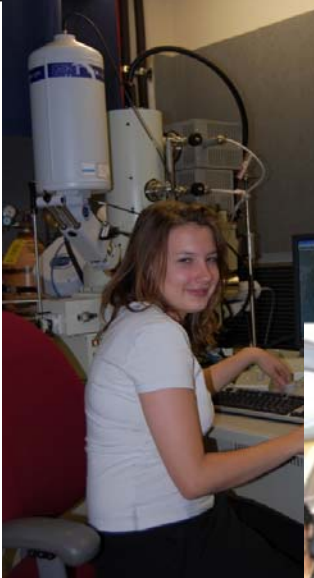
Education Outreach, Developing a Diverse Workforce



Annual Education Investment

- 921 Graduate Students
- 265 Post-docs
- 527 REU students
- 79 UG year 'round
- 117 RET
- 83 undergrad faculty
- 10 PREM partnerships

'07-'08 data





MRSECs

Support **multidisciplinary** and **interdisciplinary** materials research and education of the highest quality while addressing fundamental problems in science and engineering that are intellectually challenging and important to society.



MRSEC Program Goals

- Stimulate and support **outstanding** interdisciplinary **research and education** in materials
- Address **fundamental**, complex materials problems that are intellectually challenging and important to society
- Foster **partnerships** between academia and industry as well as other sectors
- **Broaden participation** of groups under-represented in the sciences
- Partnerships for Research & Education in Materials (PREM):
http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5439&org=DMR



Science of Learning Centers (SLC)

PRINCIPAL THEMES

- Learning as a Complex System
 - **Fundamental research on learning in humans, animals & machines: integrated, multidisciplinary, multi-level**
- SLC attention to key challenges of 21st Century
 - **EDUCATION: Bridging the chasm between theories of cognition and learning and educational practice**
 - **TECHNOLOGY: Cyber-enabled learning; brain modeling; development of artificial learning systems**
 - **WORKFORCE PREPARATION: Learning to work with technology; working in teams**
 - **LEARNING and DIVERSITY: Broadening participation; addressing learning challenges of disabled individuals**



Current SLC Portfolio

2004 Cohort

2006 Cohort

- **CELEST: Center for Cognitive & Educational Neuroscience (Boston U)**
- **LIFE: Learning in Informal & Formal Environments (U Washington)**
- **PSLC: Pittsburgh Science of Learning Center (Carnegie-Mellon)**
- **SILC: Spatial Intelligence & Learning Center (Temple)**
- **TDLC: Temporal Dynamics of Learning Center (UC-San Diego)**
- **VL2: Visual Language and Learning Center (Gallaudet U)**



Cross-Cutting Themes and Network Coherence

	CELEST	LIFE	PSLC	TDLC	SILC	VL2
Language	○	○	○	○	○	○
Visual & Spatial Processing	○		○	○	○	○
Social Interactions		○	○	○		○
Symbolic Systems	○				○	○
e-Learning Technologies	○	○	○		○	



SLC Network of Six Centers

Another Level of

Collaboration, Synergy & Synthesis

- 30 + academic institutions
- 60 + non-academic institutions
- More than 300 participants
- **Collaboration across centers in research, training, knowledge transfer & dissemination**
- **Increased access to experts, technology, facilities**
- **SLC workshops**
- **Education & career development opportunities**



Centers for Chemical Innovation (CCI)

- Address major, long-term basic chemical research challenges
- Potentially transformative research likely to lead to innovation
- Agile management strategy promoting self-assessment and evolution
- Integration of research and education
- Commitment to diversity and broadening participation
- Vigorous public outreach program to increase public appreciation for the contributions of chemistry

*New solicitation just posted: NSF 09-597
preliminary proposals due October 21, 2009*



CCI – Phased Awards

- Phase I - \$500K/yr * 3yrs
 - Initial research efforts (high risk/high impact)
 - Laying foundation for management, education, broadening participation and public outreach plans
 - Proposal due at ~24-27 months of Phase I
 - Review includes site visits (~18 and 30 months)
 - Phase up or phase out
- Phase II - \$4M/yr * 5yrs → 10 yrs



CCI Phase II Awards

- Center for Enabling New Transformations through Catalysis (2007, Karen Goldberg, U Washington)
- CCI Solar: Powering the Planet (2008, Harry Gray, Caltech)
- Chemistry at the Space-Time Limit (2009, Ara Apkarian, U California Irvine)



CCI Phase I Awards

Started in 2007

- Fueling the Future (S. Thayumanavan, U Massachusetts)
- The Origins Project (Nick Hud, Georgia Tech)

Started in 2008

- Center for Chemistry of the Universe (Brooks Pate, University of Virginia)
- Center for Green Materials Chemistry (Doug Keszler, Oregon State University)
- Center for Molecular Interfacing (Hector Abruna, Cornell University)

Started in 2009

- Not yet ready for public announcement, but 3-5 Phase I awards



Question and Answer Period