

Division of Materials Research



J. Hicks
Deputy Division Director
jhicks@nsf.gov

Division of Materials Research 2012



Ian Robertson
Division Director

Office of Materials Instrumentation
and National Facilities



Janice Hicks
Deputy Division Director

Individual investigator programs

Ceramics



Lynnette
Madsen

Electronic and Photonic Materials



Nadia El-Masry



Z. Charles Ying

Polymers



Andrew
Lovinger

Charles Bouldin
Guebre X. Tessema

Thomas P. Rieker
Large Facilities office

Office of Special Programs

Michael Scott
Carmaña Londoño

Biomaterials

Joseph Akkara
David Brant

Condensed Matter and Materials Theory

Daryl Hess
Diana Farkas
Serdar Ogut

Materials Research Centers and Teams

Sean L. Jones
Mary Galvin

John Snyder, coming on detail from OISE

AAAS Fellow

Ashley White

Metal and Metallic Nanostructures

Eric Taleff

Condensed Matter Physics

Daniele Finotello

Solid State and Materials Chemistry

Linda Sapochak

Job Opportunities in DMR

DMR Division Director - starting January 1, 2013
head of search committee - Juan de Pablo
depablo@engr.wisc.edu

Rotators:

- Biomaterials
- Electronic and Photonic materials
- Soft Matter Theory
- Condensed Matter Physics

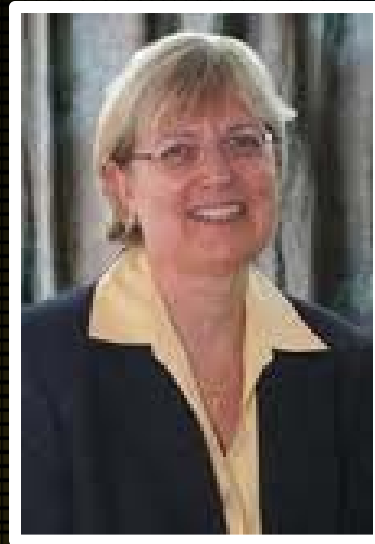
SEND A CV TO THE DIVISION DIRECTOR, iroberts@nsf.gov
And dmr-recruit@nsf.gov
See www.nsf.gov/about/career_opps/rotators/



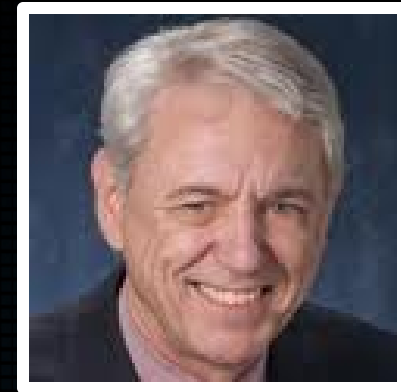
DMR Members of the Mathematical and Physical Sciences Advisory Committee 2012



Juan dePablo
Wisconsin



Elsa Reichmanis
GA Tech



George Crabtree
Argonne Nat'l Lab



Naomi Halas
Rice



Sharon Glotzer
Michigan

**CONTACT WITH YOUR IDEAS
AND SUGGESTIONS**



Mathematical and Physical Sciences FY 2013 Budget Request

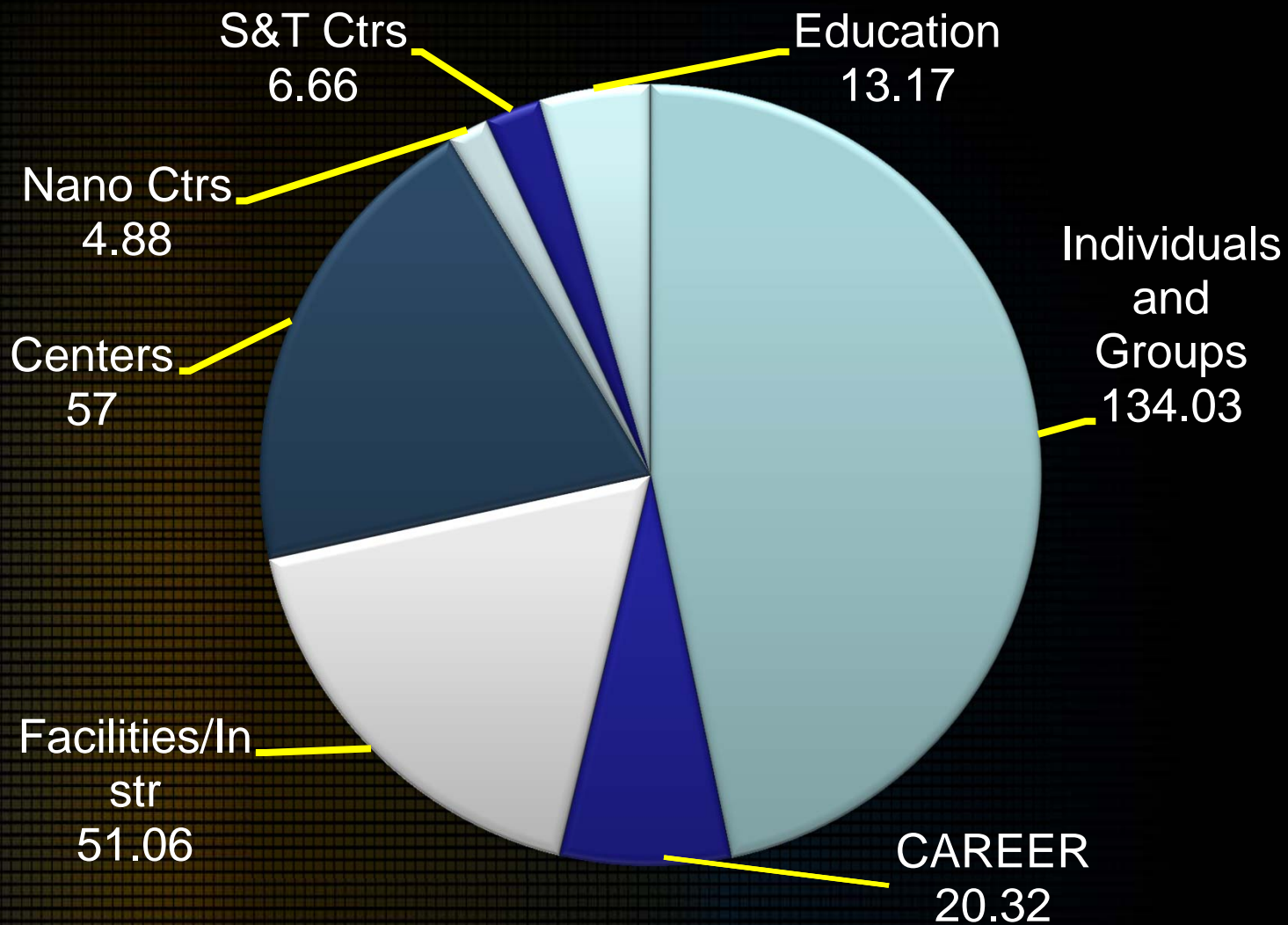
	FY 2011 Actual	FY 2012 Current Plan	FY 2013 Request	Change FY 2012 to FY 2013
Division of Astronomical Sciences (AST)	\$236.78	\$234.55	\$244.55	4.3%
Division of Chemistry (CHE)	\$233.55	\$234.06	\$243.85	4.2%
Division of Materials Research (DMR)	\$294.91	\$294.55	\$302.63	2.7%
Division of Mathematical Sciences (DMS)	\$239.79	\$237.77	\$245.00	3.0%
Division of Physics (PHY)	\$280.34	\$277.37	\$280.08	1.0%
MPS Total	\$1,312.42	\$1,308.94	\$1,345.18	2.8%

FY 2013 NSF Research and related activities

5.2%



DMR BUDGET



FY 2011: \$294 M

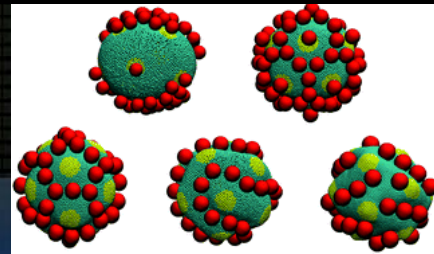
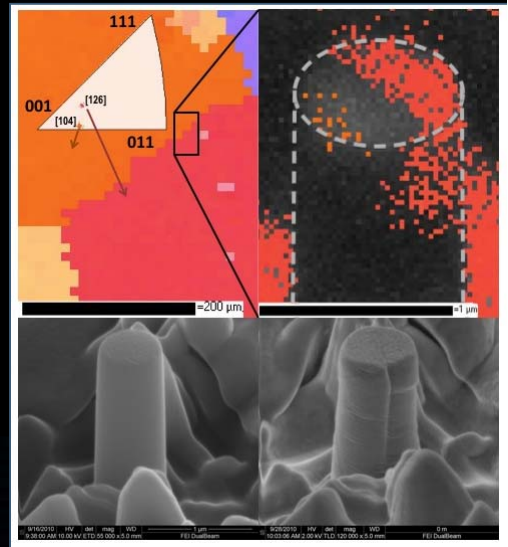
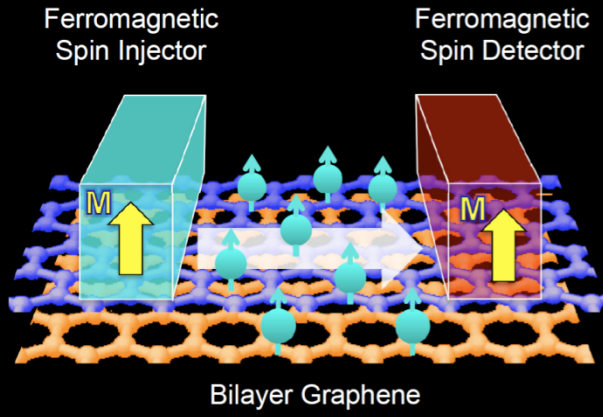
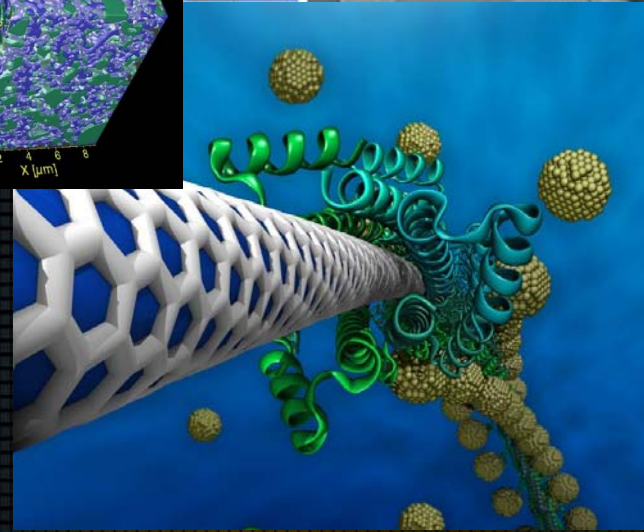
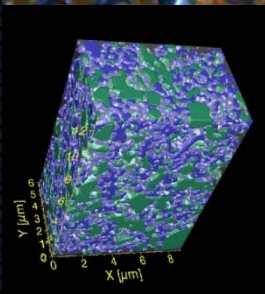
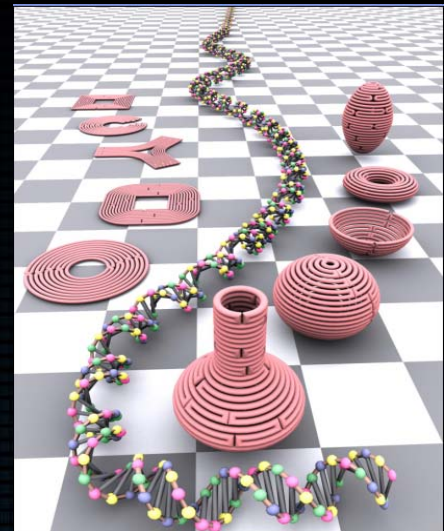
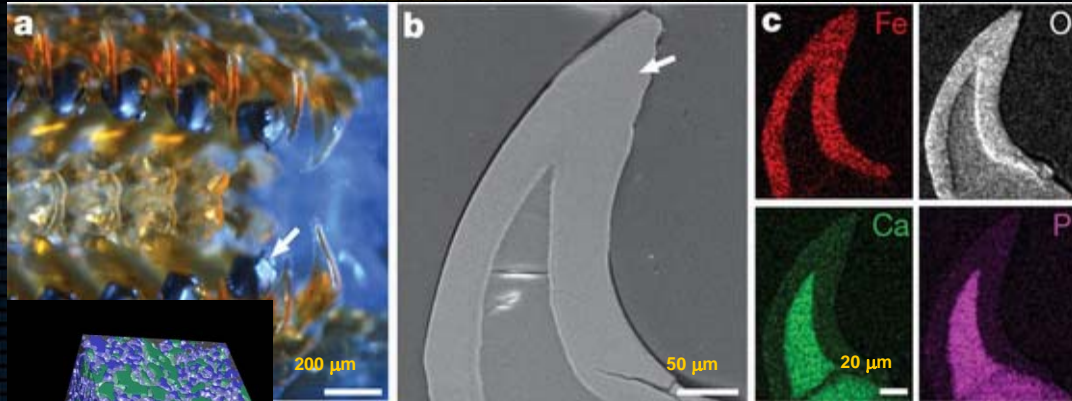
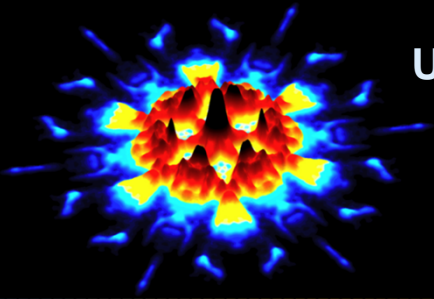


Division of Materials Research Mission

- 1. Discovery**
- 2. Interdisciplinarity**
- 3. Innovation**
- 4. Education and Public Outreach**
- 5. Infrastructure**
- 6. Stewardship**

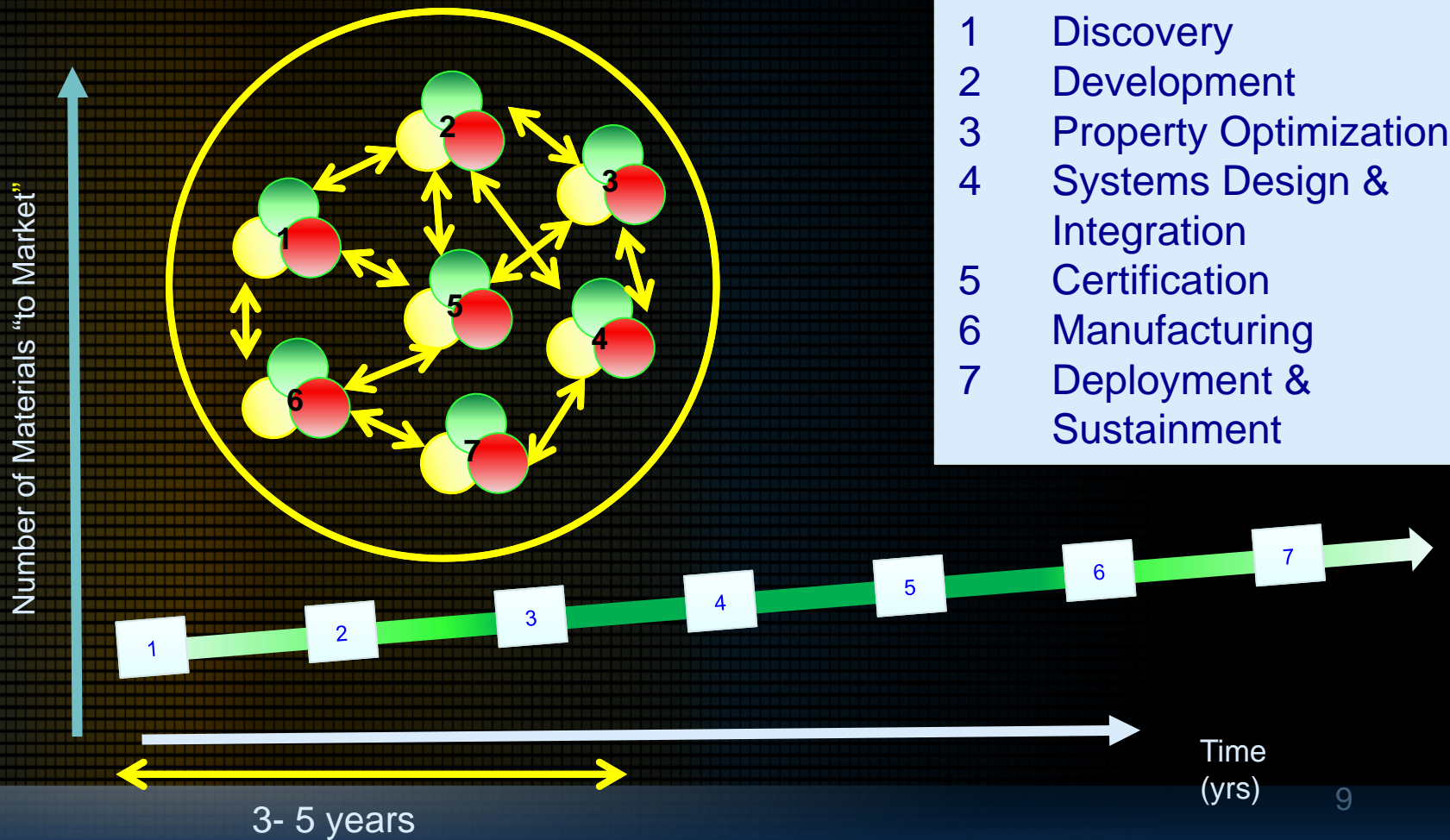


U.S. National Science Foundation: Division of Materials Research



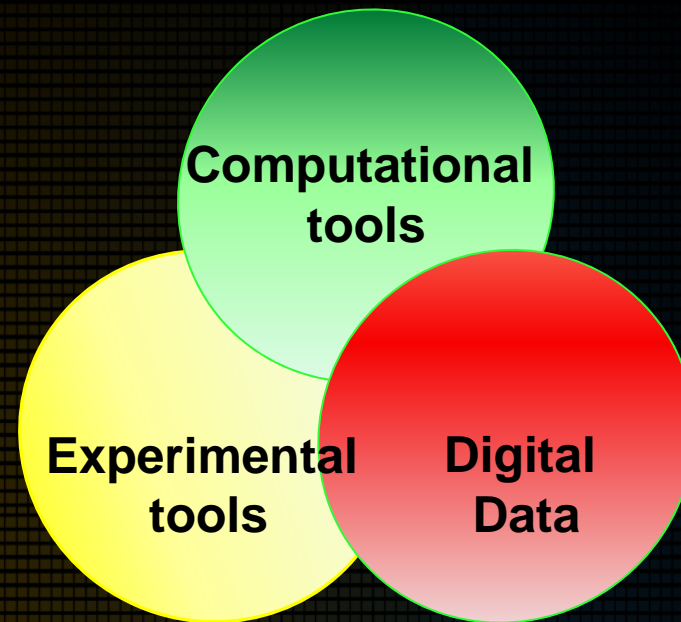
Discovery

Materials Genome Initiative for Global Competitiveness:
“twice as fast, at a fraction of the cost”



Discovery

Materials Genome Initiative



NSF Response in FY 2012: NSF 11—089 Dear Colleague Letter:
Designing Materials to Revolutionize and Engineer our Future (DMREF)

FY2013 budget request for DMREF: MPS \$20M; ENG \$15M



Interdisciplinarity

Science, Engineering, and Education for Sustainability (SEES):

Interdisciplinary basic research in science, engineering and education aimed at meeting present needs without compromising the ability of future generations to meet their own needs.

SusChEM: Sustainability Research in Chemistry, Engineering and Materials - Discovery of new materials or make materials more sustainable through improved synthesis, enhanced applications, advances in lifecycle management.

Materials for preservation and extension of natural resources

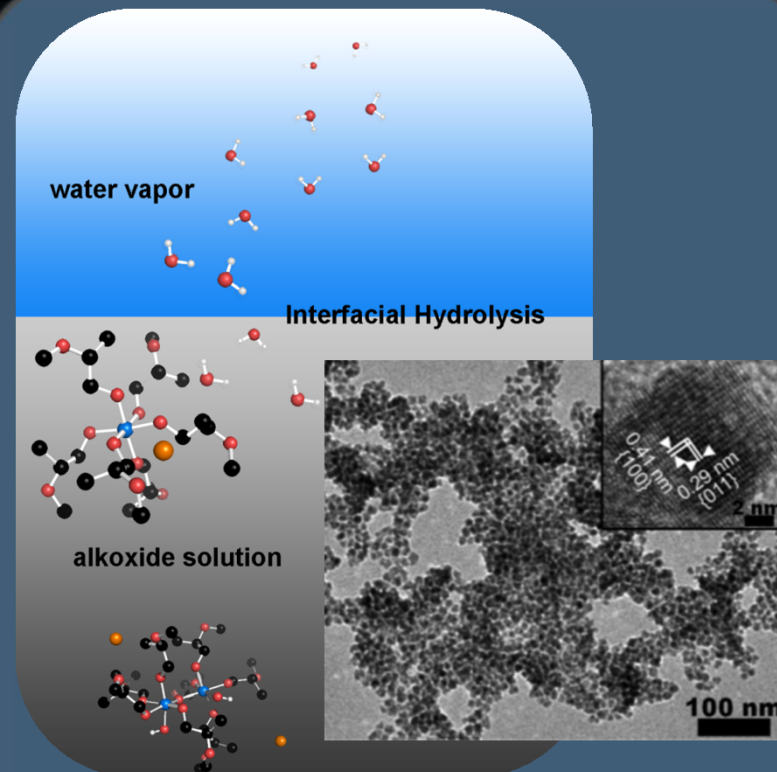
Material replacement for a safer and more secure future

Improved materials during operating conditions

Materials designed for zero waste

PAST SOLICITATIONS

- Sustainable Energy Pathways NSF 11-590 Teams of 3; address 2 main issues; \$0.5M/yr for 4 years; due to run every other year
- SEES Post-doc Fellows NSF 11-575 2 mentors in different disciplines, affiliate with a center/ind/international; due to run every year.
- Sustainability Research Networks NSF 11-574 “think tank” \$12M over 4-5 years (3-4 awards will be made)



BaZr_xTi_{1-x}O₃ nanocrystals can be prepared under ultra-benign conditions from a mixture of bimetallic alkoxydes using a kinetically controlled vapor diffusion sol-gel method.

Interdisciplinarity: Materials Research and Engineering Centers (MRSEC)

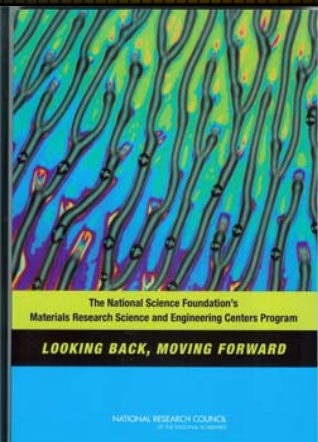
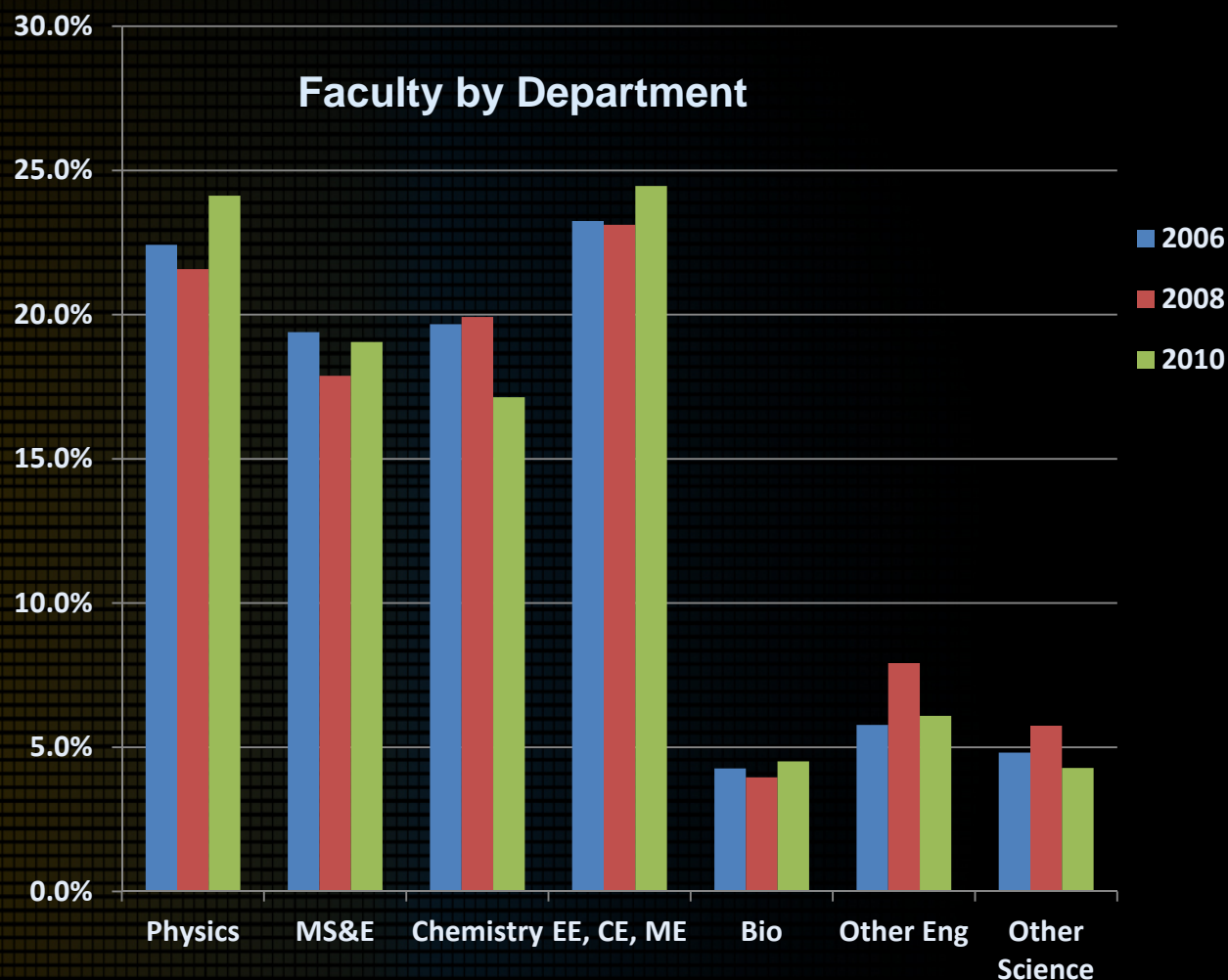
23 MRSECs & 3 MIRTs

- 58 Interdisciplinary Research Groups

2010-2011 Data for 27

Centers

- 901 Faculty participants
- 224 Ph.D.s awarded
- 129 Post-docs completed
- 1500 publications
- 76 patents issued

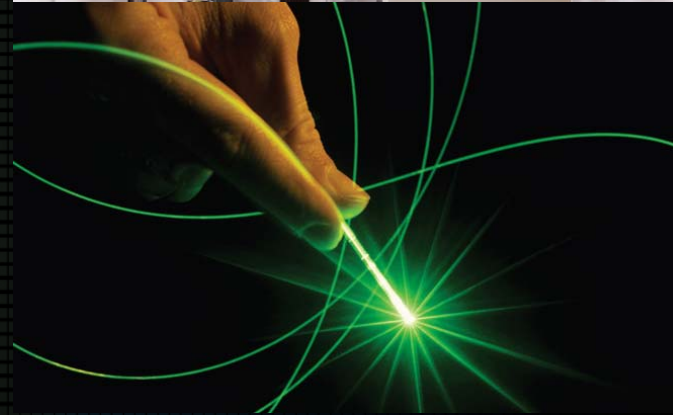


Innovation



PI, student and mentor learn aspects of developing, organizing and managing a business.

Monthly webinars



NSF 11-560: I CORPS

5 pages

\$50K for 6 mos

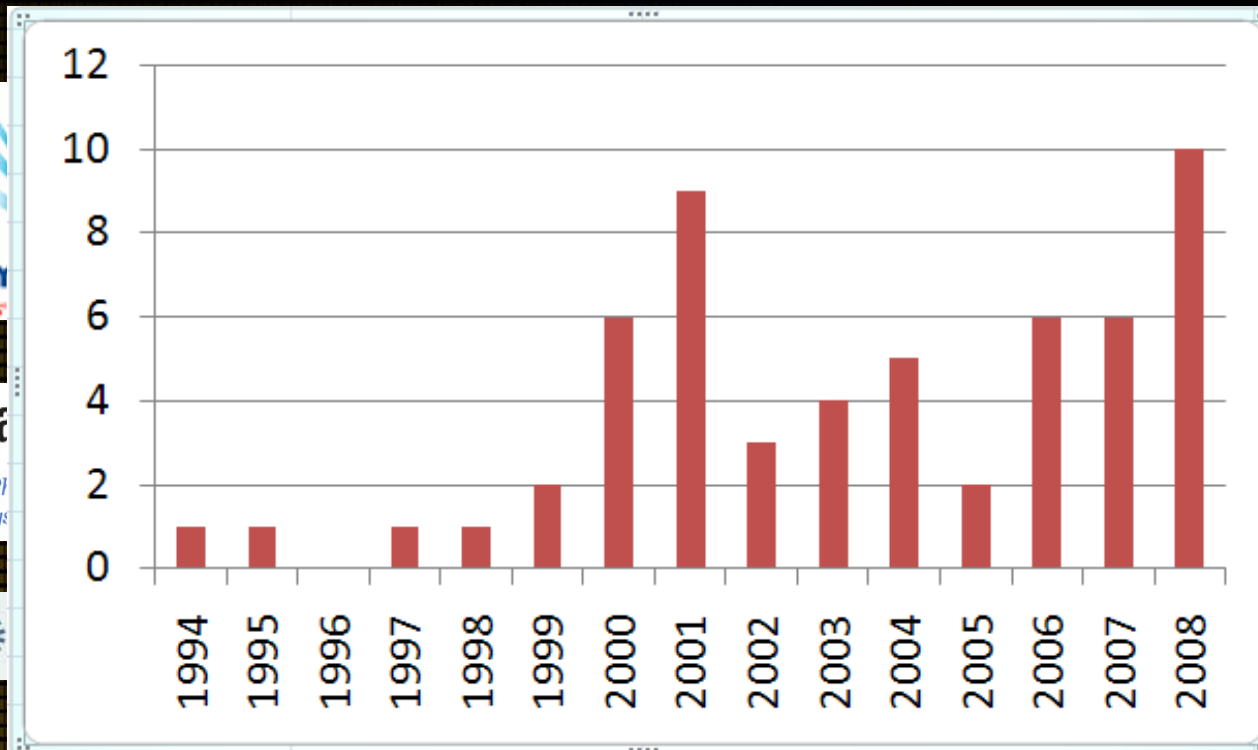
4 deadlines/year next:

15 Sept 2012

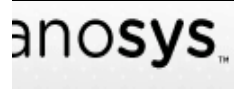


Innovation

MRSEC Startup Companies



60 companies in 13 states, employing more than 1000 people



Education

Needs:

- Materials Genome Initiative
- Sustainability
- Interdisciplinarity



Example of a MRSEC Education program:

The Renewable Energy MRSEC –Colorado School of Mines

- an undergraduate Renewable Energy minor
- a Renewable Energy elective course sequence for graduate students
- a Renewable Energy Research Experience for Undergraduates(REU) program.: includes research, seminars on energy topics, field trips to NREL, and interactions with renewable energy companies
- a K-12 Outreach Program: graduate students work directly with minority middle school mathematics and science teachers on classroom presentations and hands-on scientific experiments on Renewable Energy applications.
- a Mentoring Program for postdoctoral research associates



Education: Broadening Participation

- Partnerships for Research and Education in Materials (PREM)

- collaboration between a Minority Serving Institution and a DMR-funded center or facility
- over \$5M annually
- next competition 2014

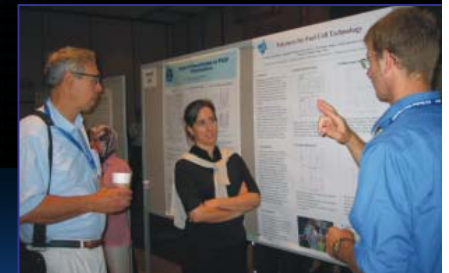
- Alliances for Graduate Education and the Professoriate (AGEP) program

(NSF 12-554): AGEP-Transformation - Strategic alliances of institutions and organizations to develop, implement, and study innovative evidence-based models and standards for STEM graduate education, postdoctoral training, and academic STEM career preparation that eliminate or mitigate negative factors and promote positive practices for URMs. DEADLINE OCT. 30. WEBINAR JUNE 18 3PM EDT see www.nsf.gov/materials for registration.

- Future faculty workshops (MIT-Tim Swager) and Ceramics program
- SACNAS – Support for Minority Physicists to attend meeting
- National Society of Black Physicists and National Society of Hispanic Physicists
- COACH – Committee on the Advancement of Women in Chemistry
- AGEP-Graduate Research Supplement (MPS) NSF 12-021 (DMR did 3)
- Career-Life Balance NSF 12-065 – hired a technician for a PI on family leave
- Research Opportunity Award (ROA) – NSF-00-144 (within RUI)
- REU supplements NSF-09-598 (watch for new solicitation, deadline early Sept 2012)
- Talk at American Physical Society LGBT Physicists



Research experience in polymers for Deaf and Hard-of-Hearing Undergraduates (Tufts U.)



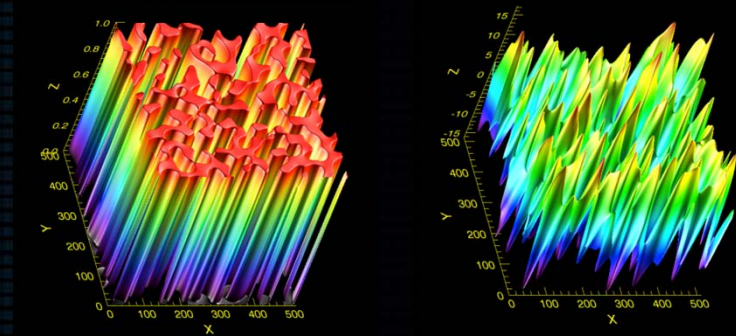
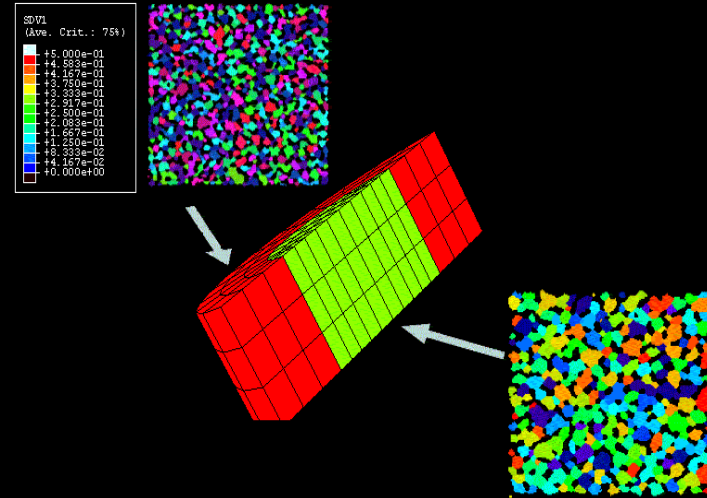
Infrastructure

Cyber-Infrastructure Framework for the 21st Century (CIF21)

- Ensure that simulations are able to capture the complexity of nature, and are physically correct, reproducible, and predictive
- Invest in MPS computational sciences, algorithm development, and software
- Provide infrastructure for sustained long-term research efforts.
- Advance data-enabled science, including fundamental mathematical algorithms, software, data services, and network infrastructure

DMR: several choices:

1. Submit to sub-disciplinary programs
2. **EAGER - EARly-concept Grants for Exploratory Research**
3. DMREF
4. Supplements to current awards



MPS FY13 request \$19.55M

Infrastructure

National High Magnetic Field Laboratory: Florida State U., U. Florida, Los Alamos

MAGNETS:

- 97.4 T non-destructive pulsed field magnet – world record
- 45 T DC hybrid – highest steady magnetic field in the world
- Split coil 25 T magnet
- 900 Mhz MRI – world's strongest MRI machine
- 21 T Ion Cyclotron Resonance Spectrometer under construction – highest field ICR in the world

USER Programs: <https://users.magnet.fsu.edu/>

- Advanced Magnetic Resonance Imaging and Spectroscopy
- DC Field
- Electron Magnetic Resonance
- High B/T (magnetic field/temperature)
- Ion Cyclotron Resonance
- Nuclear Magnetic Resonance
- Pulsed Field



Infrastructure

Major Research Instrumentation Acquisition and Development :

Electron Microscopes
X-ray Diffractometers
X-ray Photoelectron Spectroscopy
X-ray Fluorescence
Ultrafast Lasers
Atomic force microscopes
Surface Plasmon Resonance
Electron beam lithography
Cryo-systems for magnets, etc.
And many others...

<http://www.nsf.gov/od/oia/programs/mri/>



NATIONAL SCIENCE FOUNDATION
MAJOR RESEARCH INSTRUMENTATION

MRI GOALS

- Catalyzing new knowledge and discoveries
- Empowering the Nation's scientists and engineers
- Providing state-of-the-art research instrumentation
- Enabling research-intensive learning environments
- Building capacity for a diverse workforce
- Developing next generation instrumentation
- Promoting academia-private sector partnerships

MRI@NSF.GOV
www.nsf.gov/od/oia/programs/mri/

The poster features a grid of small images showing various research instruments and scientists working in laboratories. The background is a dark blue and green abstract design with glowing lines and a large gear-like shape.

Infrastructure

Materials 2022

How can the Division of Materials Research (DMR) best utilize its resources to meet national needs in instrumentation and facilities?



Matt Tirrell

Preliminary recommendations

- Consider a network of centers – to provide a “characterization suite” of instrumentation to the external community or to fulfill a specific need/expertise (i.e. X-ray, microscopy, crystal growth).
- Increase co-funding for MRI proposals - acquisition and stewardship of equipment \$100,000-\$500,000.
- Support professional staffing to manage instrumentation and train students.



Roger Falcone



Stewardship

How you can help:

Acknowledging your support from the Foundation

Support from the NSF must be appropriately acknowledged in all presentations and publications as well as web sites.

Reporting work supported by multiple agencies or programs within NSF is accepted but the contribution from each funding agency must be acknowledged appropriately.

Centers, institutes and facilities need to display the program name, for example “MRSEC”, should appear on websites, publications, and presentations. The “brand name” must be featured prominently.

We need your support to ensure NSF DMR activities receive appropriate recognition



DMR Mission

1. **Discovery**
2. **Interdisciplinary**
3. **Innovation**
4. **Education and Public Outreach**
5. **Infrastructure**
6. **Stewardship**

QUESTIONS?

