Division of Materials Research (DMR)
Administrative Workflow


Linda Sapochak, DD


Sean L. Jones, ADDD


Velma Lawson, PSM


Neila Odom-Jefferson, O.S.


Allison Smith, PS

- Recruitment Mgt. Support
- Program Budget
- CGIs
- IAAs


Denese Williams, PA

- Data Analysis
- DMR Highlights
- Refreshment Orders
- Panel Spreadsheet
- IAA


Elaine Washington, PS

- Admin Review
- DMR Highlights
- Outreach
- Program Budget
- CGIs


Meghan Ackerman, PS

- Admin Review
- Order Supplies
- Backup Timekeeper
- Program Budget
- CGIs


Benita Fair, PS

- Admin Review
- Technology Trainer
- Web Updates
- Listserv
- Outreach


Renee Ivey, PS

- Admin Review
- Timekeeper
- Order Supplies
- IAA
- Program Budget
- CGIs
- Equip. Excess


Aubrie TenEyck, Contractor

- Program Budget
- CGIs
- IAAs
- Record Retirement


Claudia Johnson,

- Program Budget
- CGIs
- IAAs
- Record Retirement

Student

- Program Budget
- CGIs
- IAAs

PA

- COV
- IT Support
- Data Analysis
- Trainer

National Facilities


Guebre Tessema


Charles Ying — MIP


Leonard Spinu — MRI

DMR Front Desk Support

Designing Materials to Revolutionize and Eng. Our Future


John Schlueter


Susan Dexheimer

DATA

REU Sites


Jose Alfredo Caro


Susan Dexheimer

Materials Research Science & Eng. Centers


Daniele Finotello


Birgit Schwenzer

May 2016

PREM

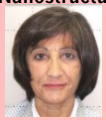

Jose Alfredo Caro

Electronic & Phonic Materials


Miriam Deutsch


Tania Paskova

Metals & Metallic Nanostructures


Diana Farkas

Condensed Matter & Materials Theory


Daryl Hess


Alex Klironomos

Condensed Matter Physics


Tomasz Durakiewicz


Paul Sokol


Susan Dexheimer

Polymers


Andrew Lovinger

Solid-State & Materials Chemistry


Birgit Schwenzer


Eugene Zubarev

Biomaterials


Joseph Akkara


Alex Simonian

Ceramics


Lynnette Madsen

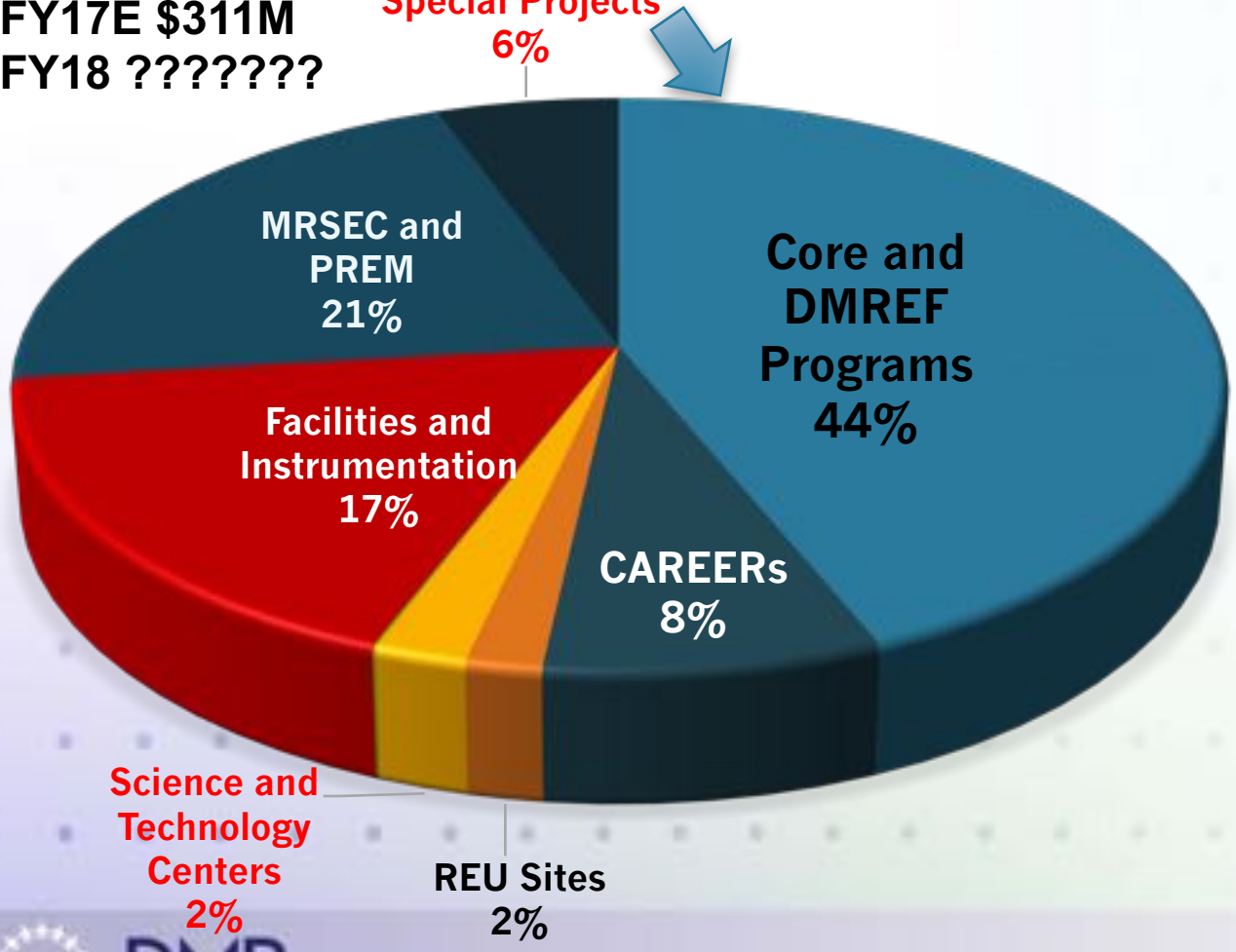
Expert


Freddy Khoury

Supports DMR-wide Programs

DMR Budget

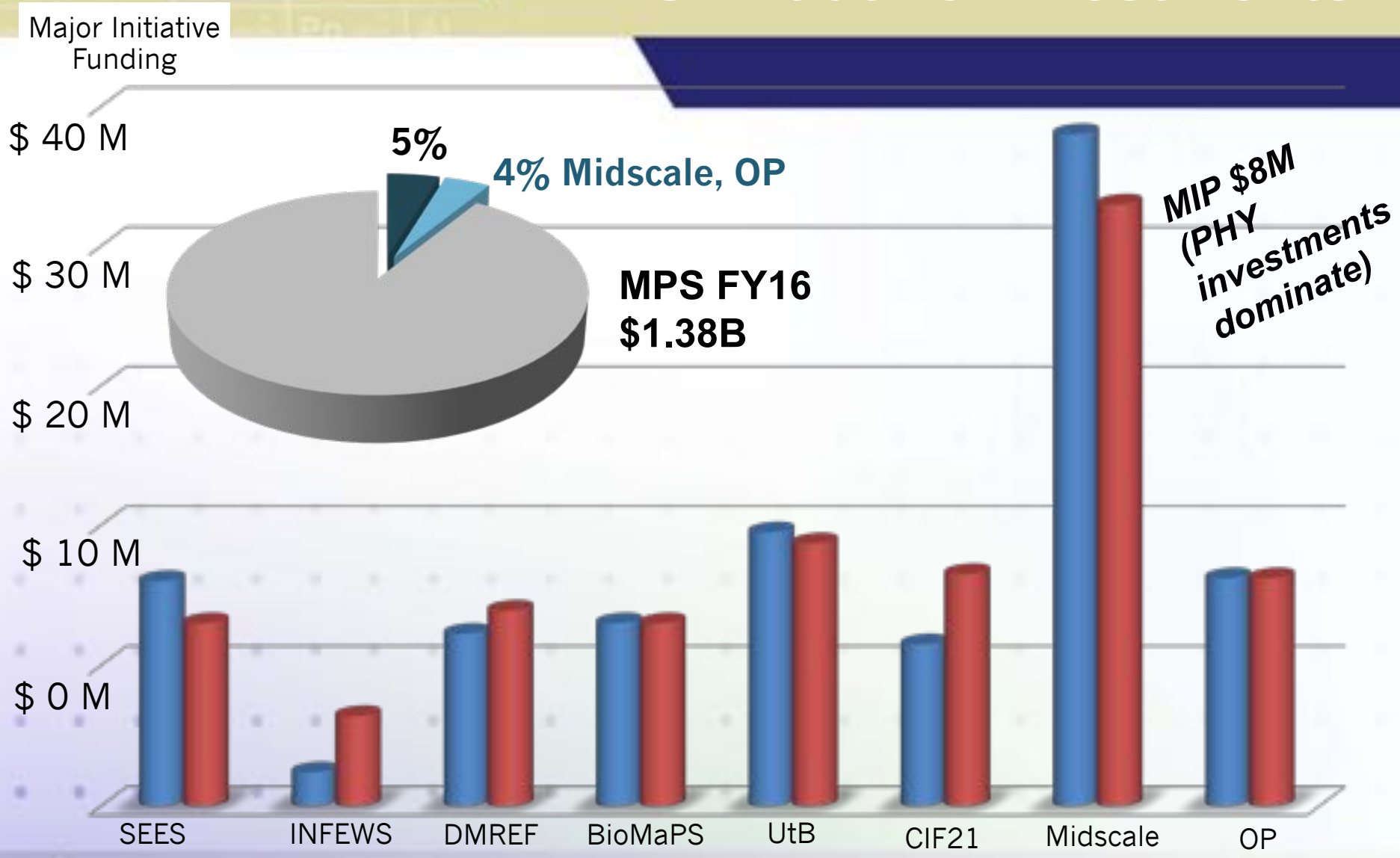
FY15 $307M
FY16 $310M
FY17E $311M
FY18 ???????



Initiatives Relevant to DMR

CIF21 - Cyberinfrastructure Framework for 21st Century
UtB – Understanding the Brain
SusChEM - Sustainable Chemistry, Eng, and Materials
INFEWS - Innovation at the Nexus of Food, Energy, and Water
MGI - Materials Genome Initiative
Mid Scale Instrumentation
OP – Optics & Photonics
BioMaps – Interface of the Biological, Mathematical and Physical Sciences & Eng

MPS Initiative Investments



Topical Materials Research Programs

Biomaterials
Ceramics
Electronic & Photonic Materials
Metals and Metallic Nanostructures
Polymers

Condensed Matter & Materials Theory
Condensed Matter Physics
Solid State and Materials Chemistry

FY2017 Solicitations for "open" unsolicited windows for selected programs

Designing Materials to Revolutionize & Engineer our Future (DMREF)

- Build the fundamental knowledge base needed to progress towards designing and making a material with a specific and desired function or property from first principles.
- Accelerate materials discovery and development.
- Collaborate and iterate "close the loop" between theory and experiment.
- **Aspire to enable "data-driven" materials research.**

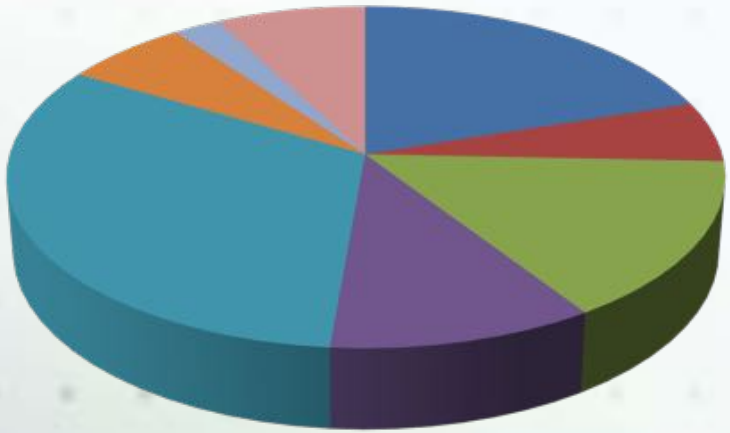
DMR FY16 budget $14M

MPS: **DMR**, CHE, DMS,
ENG: CMMI, CBET, ECCS
CISE
DMR PD: John Schlueter

FY12: $13.6M
FY13: $22.2M
FY14: $30.0M
FY15: $34.9M
FY16: $30.3M

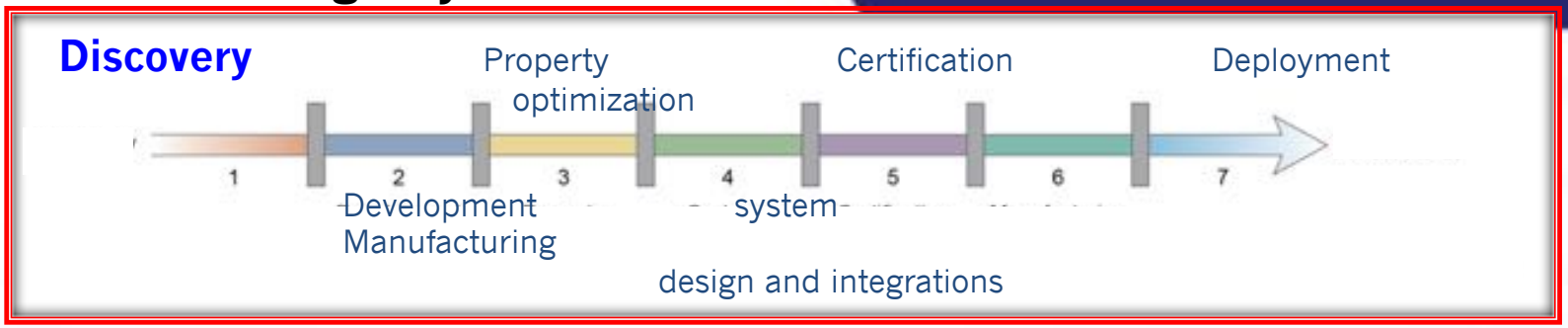
Susan Dexheimer

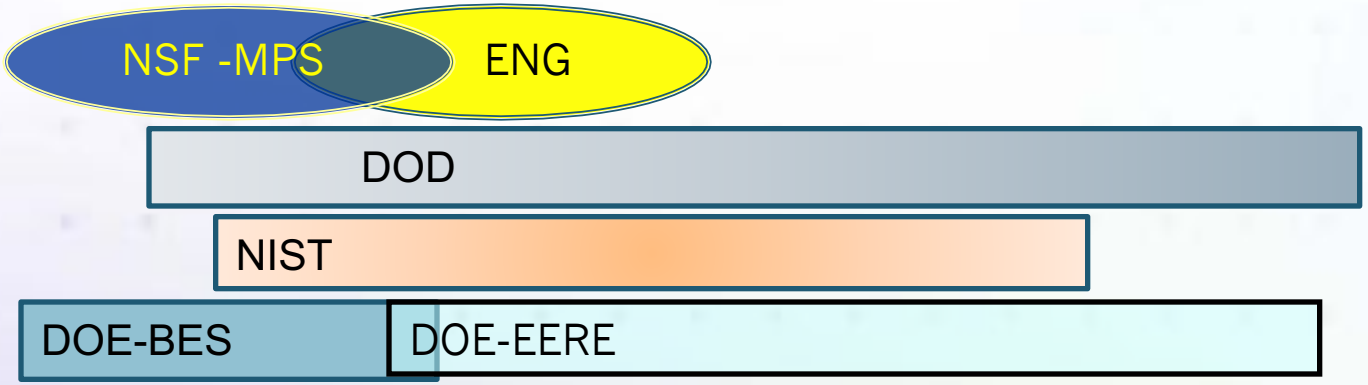
FY 15 Total: $34.9 M



Designing Materials to Revolutionize & Engineer our Future (DMREF)

MGI - Interagency Effort





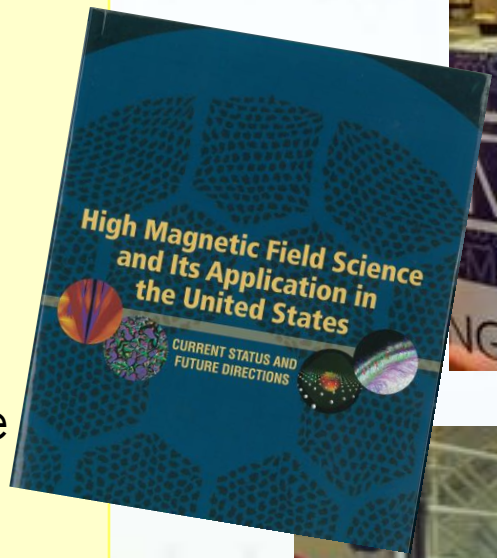
How does DMREF help our nation realize the vision of MGI?

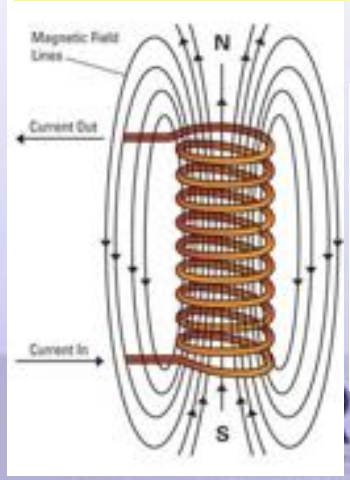
CHANGES TO DMREF:

- Solicitation annual to biennial
- Solicitation notes priority topic areas
- Off year – Build on DMREF investment with targeted interagency activities
- Guidelines for renewals

National Facilities and Instrumentation (NaFI)

- DMR successfully argued for “renewal” instead of “re-competition”.
- Renewal proposal due in June 2016.
- Science drivers influenced by user community and NAS study.
- High Priority, but flat budgets may impede sufficient investment.



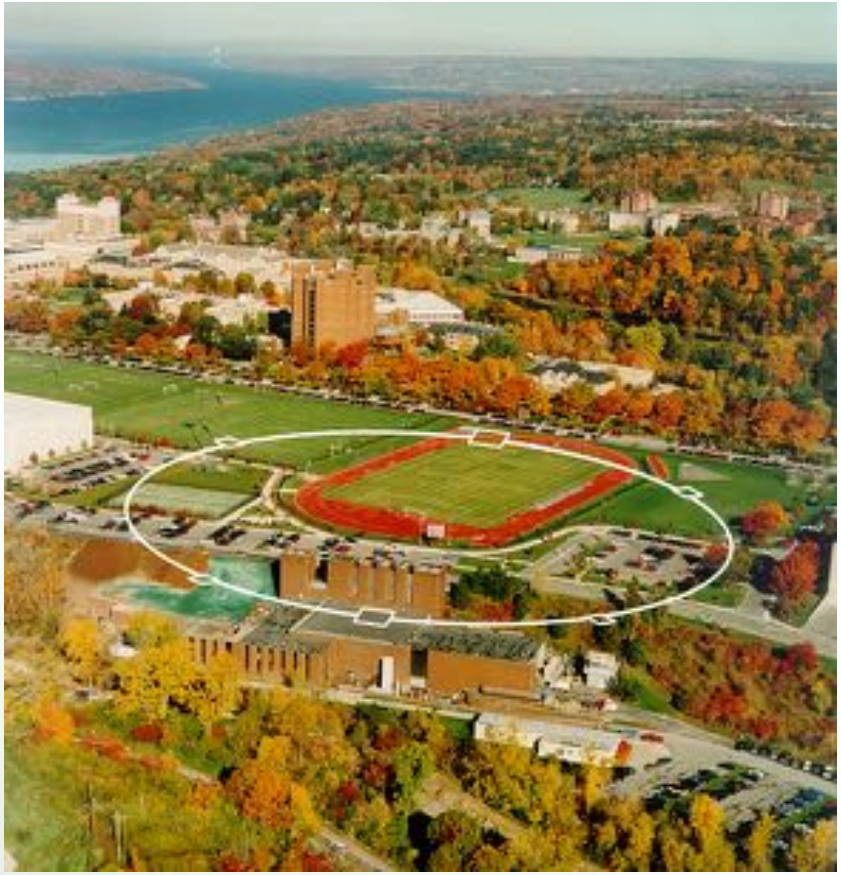


DIVISION OF MATERIALS RESEARCH

National Facilities and Instrumentation (NaFI)

The Cornell High Energy Synchrotron Source (**CHESS**) is a high energy hard X-ray source powered by the Cornell Electron Storage Ring, buried under the Cornell campus.

- Constructed in 1978-1980, beamlines added in 1988-1989 and 1999–2004
- Currently 11 beamlines in the user program. ~800 users/yr.
- NSF Stewardship shared between BIO, ENG, MPS ($20 M/yr)
- Additional support from NIH/NIGMS: $2M/yr in support for MacCHESS and $0.416M/yr for operations.
- Being upgraded by NY – high energy /high flux.
- **Site visit this week!**



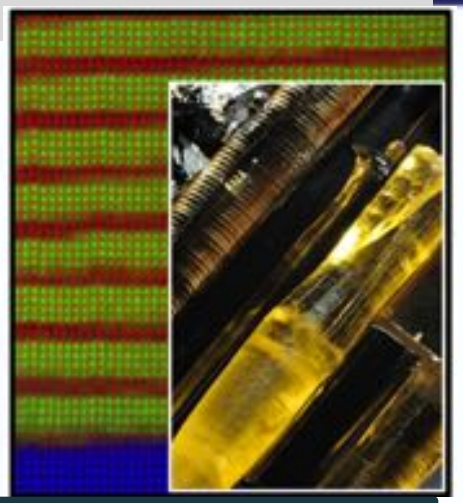
Materials Innovation Platforms (MIP)

Combines a focused research effort with a mid-scale user facility to advance a focused materials topic..

5 Aspects of a Platform:

- Area of National Importance
- Focused Research
- Mid-scale Level Tools
- "Community of Practitioners"
- Education/Outreach/Workforce Development

Next competition planned for FY18 Soft/Biomaterial focus



2 Awards have been made as of 3/4/2016:

PennState Materials Research Institute

2DCC-MIP
2 Dimensional Crystal Consortium
NSF Materials Innovation Platform

Chalcogenide 2D materials with a focus on providing new bulk crystal chalcogenides and improving existing and new 2D chalcogenide thin films for electronic applications.

https://www.mri.psu.edu/mip

Graphene and Beyond Conference, 5/9 – 10th

NSF DMR DIVISION OF MATERIALS RESEARCH

Cornell University

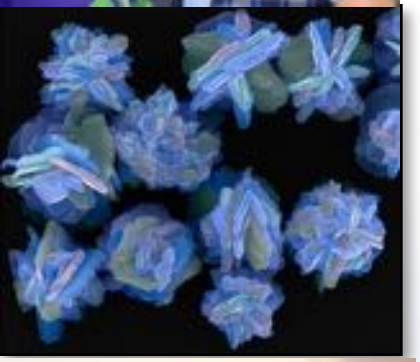
PARADIM

Oxide-based hetero-interfaces with a range of 2D material systems such as oxides, chalcogenides and graphene for novel electronic and magnetic functionality.

http://paradim.cornell.edu/

Summer School on Bulk Crystal Growth, 7/10 – 15th
Intro to DFT for Experimentalists, 7/25 - 29th

Partnership in Materials Research & Education (PREM)

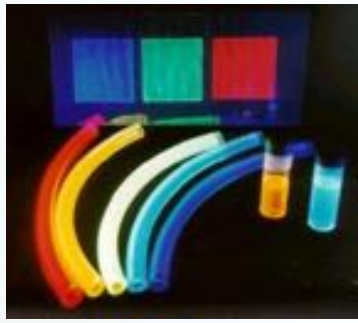


… to address the pipeline of under-represented minority materials scientists…

DMR seeks to broaden participation in materials research and education by stimulating the development of long-term, collaborative partnerships between minority serving institutions and DMR-supported groups, centers, institutes, and facilities. MRSEC major partner!

PREM Director's Meeting tomorrow! Looking at how "success" should be "defined" – will influence next solicitation.

Alfredo Cara

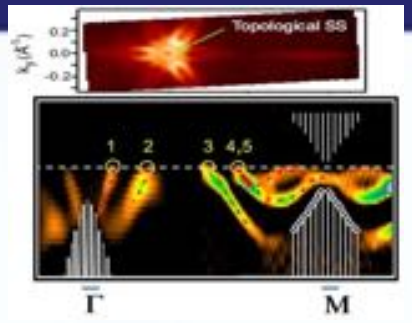


Materials Research Science & Engineering Centers (MRSEC)

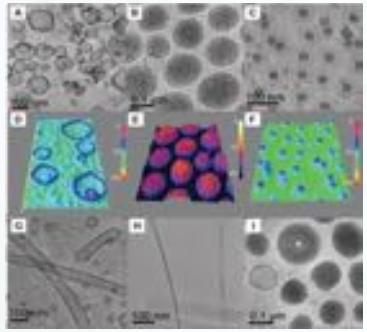
- FY17 competition began EARLY.
- Pre-proposals were due **7/1/2016**.
- Full proposal (by invitation) due **12/2/2016**.
- **Changes in solicitation NSF 16-545.**

MAJOR CHANGES:

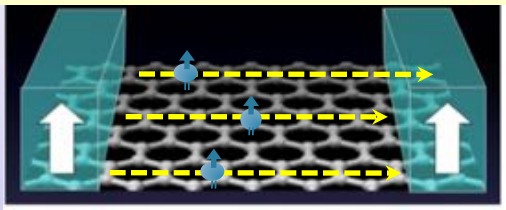
1. Minimum of 2, Maximum of 3 Interdisciplinary Research Groups (IRGs)
2. Research must align with DMR portfolio.
3. Research must broaden the MRSEC portfolio. Suggested areas are encouraged: **QIS, Sustainable Materials, Clean Energy, BRAIN**.



Princeton MRSEC: 3D Topological Dirac Insulator with a Quantum Spin Hall Phase



Penn MRSEC: Self-assembly of Janus-dendrimers into Uniform Dendrimersomes



Ohio State MRSEC: World Record Performance of Graphene Spin Valves

Dan Finotello

Alfredo Cara

Birgit Schwenzer

Miriam Deutsch

Susan Dexheimer

DMR Cross-Cutting Activities Program (XC)

- XC coordinates and supports crosscutting activities within the DMR and more broadly across NSF.
- XC activities can be co-funded with other NSF units.
- Includes: Diversity, International, Education, REU & RET. (workshops, summer schools, supplements, studies, etc.,)

Lynnette Madsen

DMR Outreach Activities

- Sustainable Materials Development
- Diversity
- PD- community interactions
- Others….

Velma Lawson, Elaine Washington

DMR-Sponsored Workshops and Studies

NAS -Materials Research Decadal Study (NSF & DOE)
TMS -Materials Data Infrastructure Study (NSF-DMR & CMMI)

Workshops

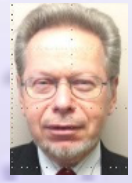
Rise of Data in Materials Research
(held June 2015) http://riseofdata.org/ Daryl Hess/CMMT

++Biomaterials Workshop: Instrumentation and Foundry to Advance Research
(August 2016) Sean Jones/MIPs

Polymers Decadal Workshop
(August 17-18, 2016) Andy Lovinger/POL

Looking Forward

Sustainable Material Development



Andy Lovinger | Sean L. Jones | Alex Klironomos

MGI Programs and Activities


John Schlueter | Susan Dexheimer

Materials Information Platforms

(Biomaterials)


Sean L. Jones | Charles Ying

Cyberinfrastructure for the 21st Century


Daryl Hess | Alex Klironomos

National Strategic Computing Initiative (NSCI)

Timeline:

July 29, 2015: President's Executive Order

Oct 20, 2015: Implementation Plan Response signed by NSF

Oct 20/21 2015: White House NSCI Workshop

Time Horizon: 15 years

Updated Implementation Plans: annually for 5 years

Lead Agencies

DOE, DOD, **NSF**

Foundational R&D Agencies

IARPA, NIST

Deployment Agencies

DHS, FBI, NASA, NIH, NOAA, ODNI

"The NSCI is a whole-of-government effort designed to create a cohesive, multi-agency strategic vision and Federal investment strategy, executed in collaboration with industry and academia, to maximize the benefits of HPC for the United States."

-President Barack Obama

NSCI Objectives

1. Accelerate delivery of a capable exascale computing system (hardware, software) to deliver approximately 100X the performance of current 10PF systems across a range of applications reflecting government needs

NSF Focus

2. ***Increase coherence between technology base used for modeling and simulation and that used for data analytic computing.***
3. ***Establish, over the next 15 years, a viable path forward for future HPC systems in the post Moore's Law …***
4. ***Increase the capacity and capability of an enduring national HPC ecosystem, employing a holistic approach … networking, workflow, downward scaling, foundational algorithms and software, and workforce development.***

CMP, CMMT, EPM, DMREF, MRSEC

5. Develop an enduring public--private partnership to assure that the benefits .. are transferred to the U.S. commercial, government, and academic sectors

Tomasz Durakiewicz

DMR DIVISION OF MATERIALS RESEARCH

Billionaires' Big Ideas

Billionaires are funding lots of grandiose plans. Welcome their ambition

Live Forever

World Peace

Space Vacations

Are we alone?

Hyperloops

The Economist April 30th 2016

NSF's Big Ideas

Understanding Rules of **LIFE**

Leading the Next **QUANTUM** Revolution

Shaping the Human-**TECH** Frontier

Harnessing **DATA**

Windows on the Universe- new era of **ASTROPHYSICS**

Navigating the New **ARCTIC**

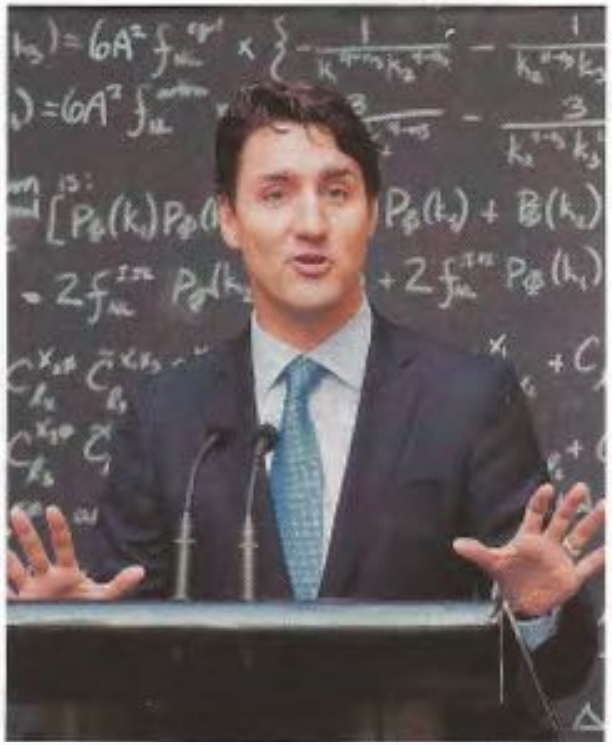
Innovation in Canada

More particle than wave

WATERLOO, ONTARIO

A geeky prime minister wants to make the country more inventive

ASKED by a journalist in April about Canada's role in fighting Islamic State, Justin Trudeau, the prime minister, came back with a pithy lecture on quantum computing. "The uncertainty around quantum states," he explained, lets quantum computers encode much more information than the conventional binary sort can. This detour into geekdom seemed natural at the Perimeter Institute for Theoretical Physics, which Mr Trudeau was visiting to proclaim his enthusiasm for basic research. The video of the impromptu lecture went viral, adding to the glamour already radiated by the snowboarding, cannabis-legalising, refugee-embracing prime minister. The assembled physicists duly cheered; Mr Trudeau then answered the question.



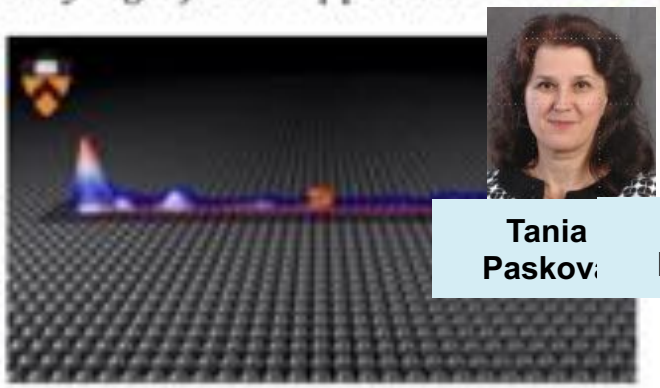
Canada does not lack scientists or good universities. Nor has its government been stingy. Public spending on research and development is higher as a share of GDP than in Europe and the United States (see chart). Where Canada falls short is in transforming ideas into marketable products. It pro-

The Economist April 30th 2016

QUANTUM LEAP

The Quantum Leap: Leading the Next Quantum Revolution

The world is on the threshold of the next quantum revolution, and the NSF has a leading role to play. The Quantum Leap is a cross-NSF approach to identifying and supporting research that answers deep questions about quantum behavior and develops the means of accessing and manipulating quantum systems. The goal is to couple together experiment, computation, and theory to attack fundamental questions, with an eye toward enabling more efficient computation, communication and simulation. NSF can drive this compelling basic research and its potentially significant applications across a broad swath of science and engineering.



Majorana fermions (Princeton University)

Tania Paskov

Tomasz Durakiewi

Susan Dexheimer

Trapped ion computation (JQI - University of Maryland)

THANK YOU!

lsapocha@nsf.gov

Ideas? Questions?
Concerns?
Please feel free to
contact me directly!