

# MGI @ NSF

Designing Materials to Revolutionize and  
Engineer our Future (DMREF)

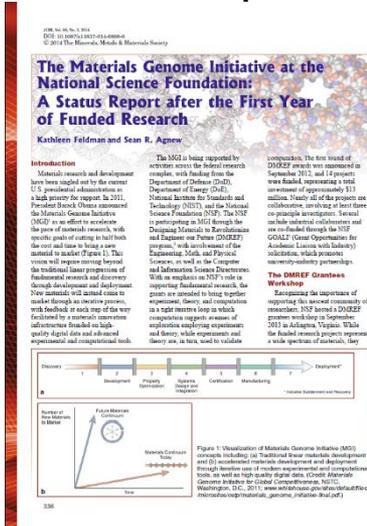
*NSF's Response to, and participation in, the  
Materials Genome Initiative*



# Annual MGI PI Meetings

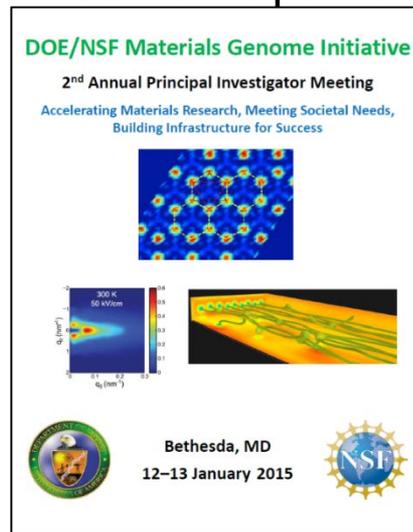
**Goal:**  
Mutually benefit from each others MGI experiences.

September 8-9, 2013  
NSF PIs  
45 Participants



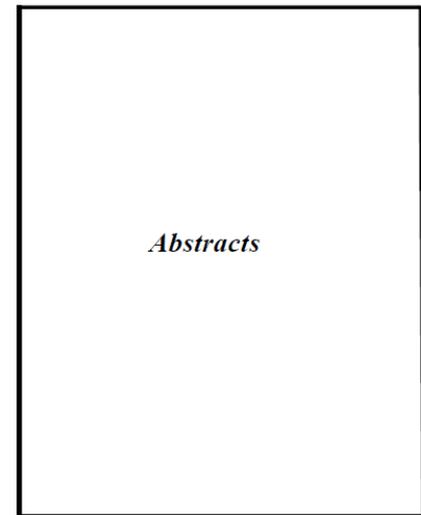
JOM 2014, 66(3), 336

January 12-13, 2015  
DOE & NSF PIs  
160 Participants



www.ora.gov/mgi2015

January 11-12, 2016  
DOE, NSF, NIST PIs  
192 Participants



www.ora.gov/mgi2016

- Further growth is anticipated in 2017.
  - Additional agencies
  - Industrial partners
  - Post-docs, students, *etc.*



# DMREF Management Team

CISE

MPS

ENG



Almadena  
Chtchelkanova  
CCF



Daniel  
Katz  
ACI



Chuck  
Gartland  
DMS



Victor  
Roytburd  
DMS



Alexis  
Lewis  
CMMI



Bob  
McCabe  
CBET



Sylvia  
Spengler  
IIS



John  
Schlueter  
DMR



Suk-Wah  
Tam-Chang  
CHE



Bill  
Olbricht  
CBET



Dimitris  
Pavlidis  
ECCS



# DMREF-DMR



Mary Galvin  
2012



Dan Finotello  
2013



Linda Sapochak  
2013



John Schlueter  
2014-



Sean Jones  
MIP



David LaVan  
NIST



# Vision



**“To help businesses discover, develop, and deploy new materials twice as fast, we’re launching what we call the **Materials Genome Initiative**.**

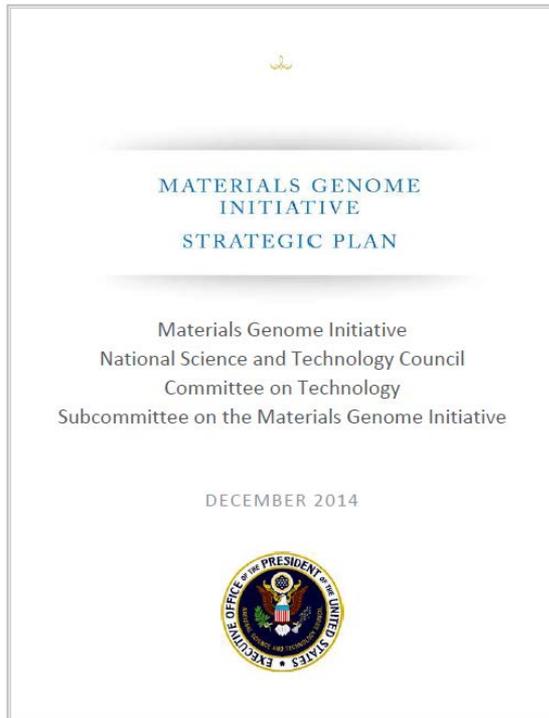
**The invention of silicon circuits and lithium ion batteries made computers and iPods and iPads possible, but it took years to get those technologies from the drawing board to the market place. **We can do it faster.**”**

**-President Obama (6/11)**



# MGI Strategic Plan - NSF

**Milestone 1.1.1:** Over a 2 year period, increase the cumulative number of researchers who have participated in MGI-related projects by 50%.  
In 2015 alone, we have increased by 43%.



**Milestone 1.1.2:** Hold regular, multiagency PI meetings to build a stronger MGI community. Include industry representatives in these meetings.

Today is the beginning of 3<sup>rd</sup> annual MGI PI Meeting. Industry representatives to be included in 2017.

**Milestone 2.1.2:** Establish a network of research groups focused on developing predictive software for structural materials. Document lessons learned and best practices for use in launching an additional network for other material and application areas.  
Addressed in breakout sessions.

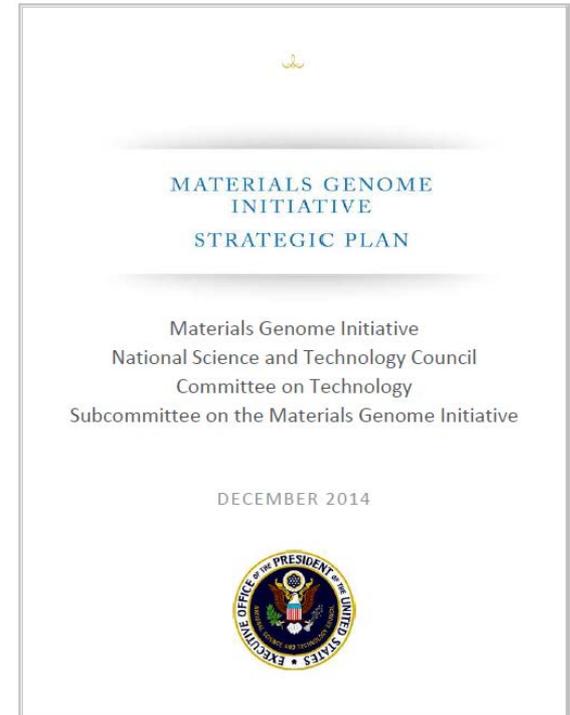


# MGI Strategic Plan - NSF

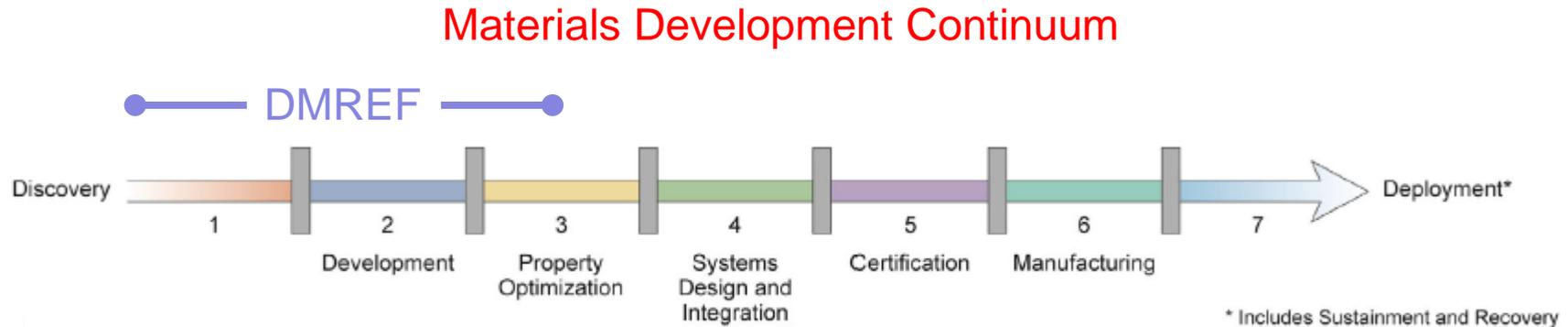
**Milestone 2.3.1:** Convene a multiagency workshop to assess the current state and future directions for characterization tools that allow *in situ* and *in operando* assessment of materials properties, synthesis, and processes.

**Milestone 2.3.2:** Convene a series of multiagency workshops to identify major scientific and technical challenges limiting the application of the integrated, collaborative MGI approach toward **advanced manufacturing** of materials and products. Conduct workshops in the first four years focusing on specific material classes and applications including lightweight metals, catalysts, batteries, and energy storage, and semiconductors and integrated circuits.

**Milestone 4.1.1:** Create opportunities, such as summer schools or laboratory internships, aimed at training faculty, postdoctoral researchers, and graduate students in the MGI approach to materials science and engineering. Topics may include familiarizing experimental materials scientists with current state-of-the-art modeling and theory and familiarizing computational materials scientists with synthesis and characterization techniques and limitations.



# Materials Genome Initiative (MGI) Approach



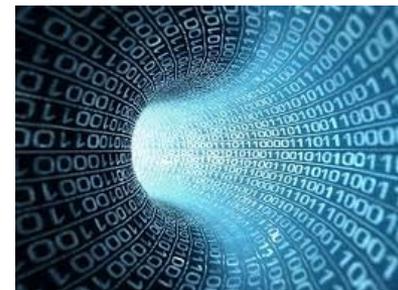
- MGI covers the full spectrum
- DMREF primarily addresses fundamental research & discovery.
- It is necessary for DMREF PIs to consider the path to deployment.
  - GOALI
  - Patents
  - Entrepreneurial activities (I-corps)
  - Follow-on funding from applied sources





# Goals

- 1) Lead a culture shift in materials science research to encourage and facilitate an **integrated team approach**.
- 2) **Synergistically integrate experiment, computation, and theory** and equip the materials community with advanced tools and techniques.
- 3) **Design** and make materials with specific and desired functions or properties from first principles.
- 4) Integrate **digital data, software, and program outputs** into community.
- 5) Create a world-class materials science and engineering workforce that is **trained for careers** in academia or industry.

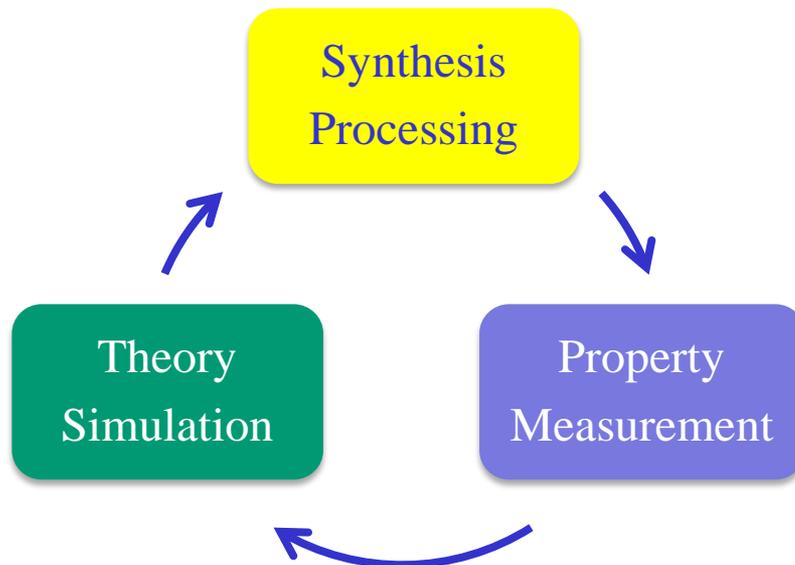


# The 'Iterative Feedback Loop'

“Traditional” approach is linear.



“Closing the loop” must advance or accelerate materials design.



Synthesis, Measurement must guide each other in an iterative fashion.

# DMREF Solicitation

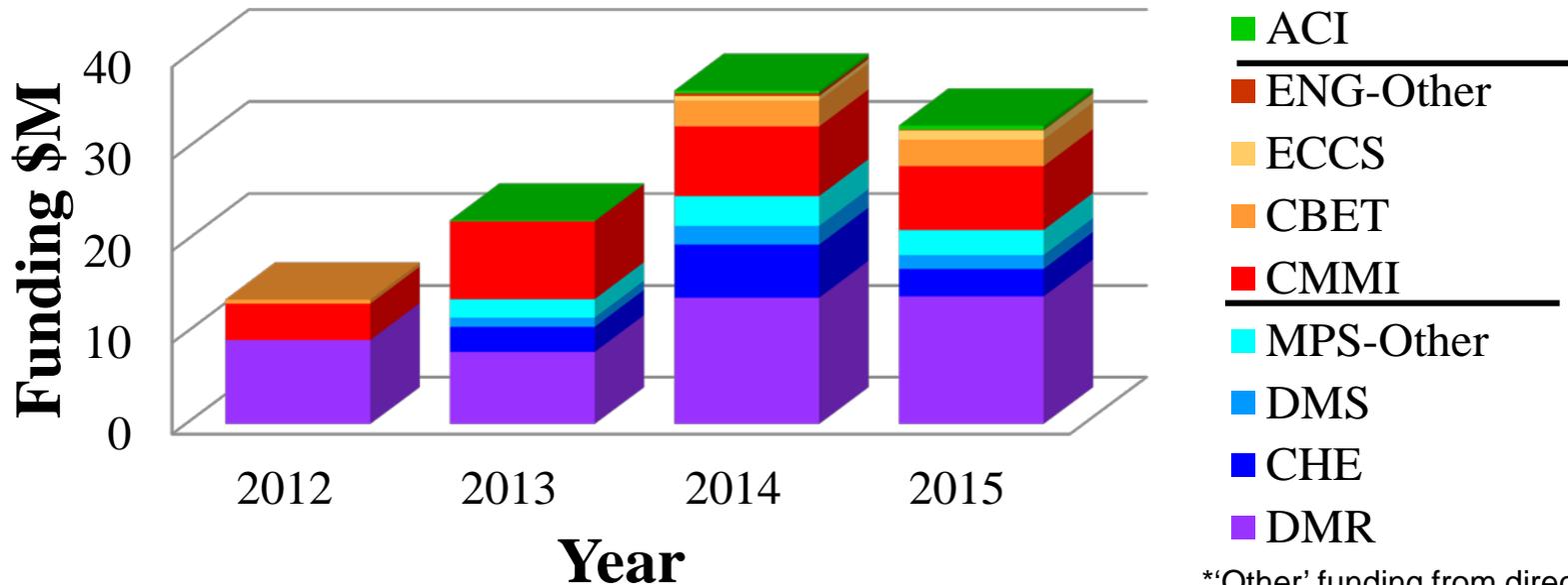
- DMREF operated under a Dear Colleague Letter in FY12, 13, 14.
- Official Solicitation issued in FY15 & FY16.

	FY15	FY16
Solicitation #	14-591	15-608
Window	Jan 5-29	Jan 4-19
Duration	3-4 years	3-4 years
Size	\$0.5 – 1.5 M	\$0.75 – 1.6 M
Est. # awards	18-25 (26 actual)	20-25
Anticipated funds	\$22 M (\$32.5 M actual)	\$29.75 M

- Ties encouraged with:
  - National laboratories, engineering partners, or other organizations.
  - Industry through Opportunities for Academic Liaisons with Industry (GOALI).
- Funding rate is 10-15%

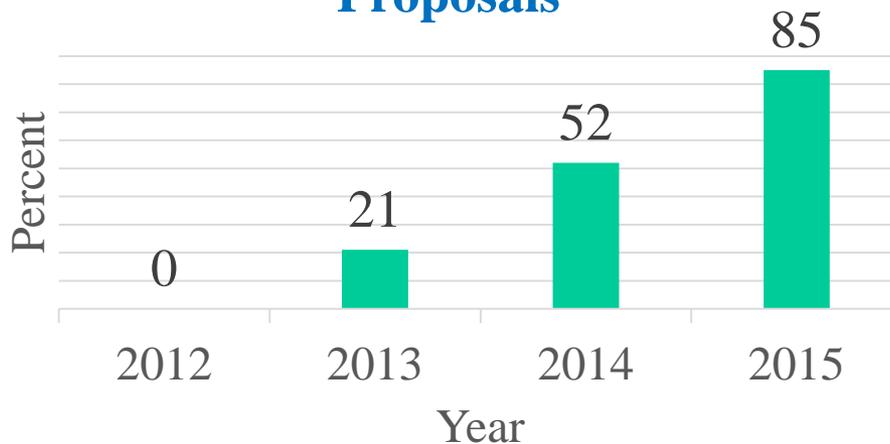


# Funding for DMREF



\*'Other' funding from directorates is from GOALI & OMA.

## Percent of Co-funded DMREF Proposals



- Co-funding has been increasing, but sum needs to be greater than parts.



# DMREF Review Criteria

- Intellectual Merit
- Broader Impact
- Does the proposed research use collaborative processes with *iterative feedback between tasks*?
- Is the proposed work likely to lead to *significant advances in all components* of the project, including materials synthesis/growth/processing, materials characterization/testing, and theory/computation/simulations?
- Does the proposed work help *accelerate materials discovery and development* by building the fundamental knowledge base needed to progress toward designing and making materials with specific, desired functions or properties?
- Does the proposed work provide *access to its outputs*, including publications, software, and data, with clear identification of what license(s) will be used?



# DMREF Annual Reports

- DMREF projects are more than Collaborative Research
- Must be coordinated among participants
- Must address same criteria as Abstracts, Posters, *etc.*
  - Relevance to MGI
  - Technical Progress
  - Broader Impact
  - Data Management
  - Accelerating Materials Discovery & Development
- Guidelines will be provided in the spring

## **Annual Reports provide:**

Opportunity for PIs to assess progress toward project goals.  
Program Managers with ammunition to strengthen program.



# Notes to DMREF PIs

- Consider connections with Mathematics & Computer Science PIs.
- Material Innovations Platforms (MIPs) are being developed for the benefit of the community.
- ‘Renewal’ proposals
  - Read solicitation.
  - What is targeted material/property?
  - What new opportunities exist?
  - Justify 4<sup>th</sup> year, if requested.
  - How will fundamental research transition to applications?
  - Don’t underestimate Broader Impacts and Data Management.



# Agenda for 2016 PI Meeting

- Monday Morning
  - Overview of MGI activities at various Agencies
  - Connecting with Mathematics & Computer Science
- Tuesday Morning
  - Insight from the Office of Science and Technology Policy (OSTP)
  - Brief oral presentations from developed projects
- Working Lunches
  - Breakout sessions to facilitate discussion of MGI topics
- Poster Sessions
  - Informal discussions among existing MGI projects



**NIST**



**U.S. AIR FORCE**

