

CMMI Overview

Steven H. McKnight

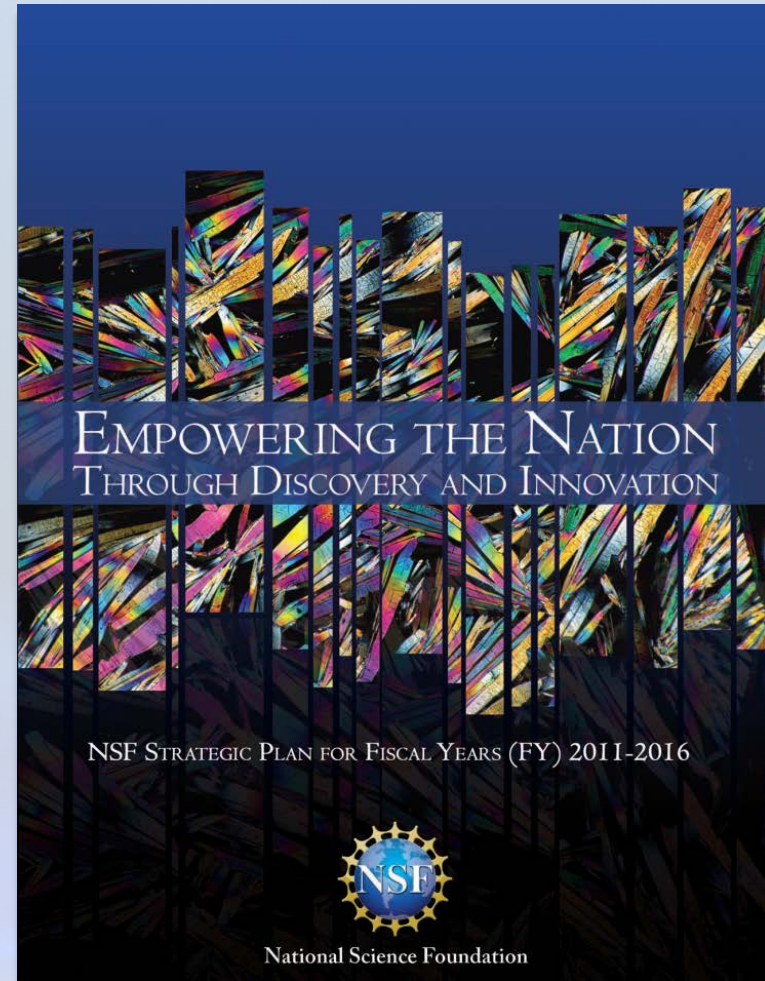
Division Director for Civil, Mechanical and
Manufacturing Innovation

George A. Hazelrigg
Acting Division Director



Context: NSF Strategic Plan

- **Transform the Frontiers --** emphasizes the seamless integration of research and education as well as the close coupling of research infrastructure and discovery.
- **Innovate for Society --** points to the tight linkage between NSF programs and societal challenges, and it highlights the role that new knowledge and creativity play in economic prosperity and society's general welfare.
- **Perform as a Model Organization --** emphasizes the importance of NSF as an exemplar of an agency that expects to attain excellence in all operational aspects.



<http://www.nsf.gov/news/strategicplan/>

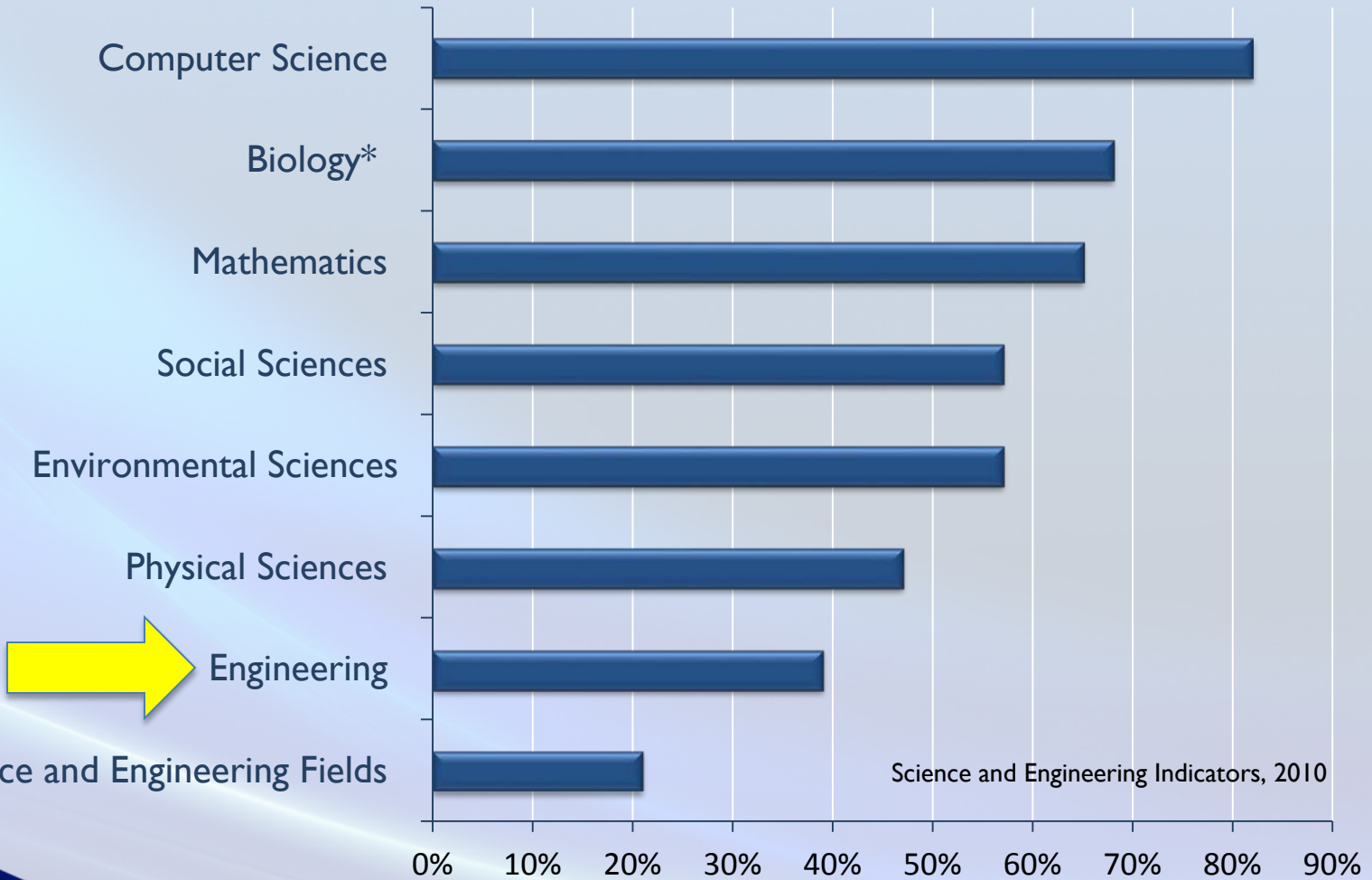


Charting the course in challenging times

- ENG Vision/Strategy grounded in core principles
 - Lead in Frontier Engineering Research
 - Cultivate an Innovation Ecosystem
 - Develop the Next-Generation Engineer
 - Broaden participation
 - Strive for Excellence in ENG Organization
 - Support cross-cutting opportunities - OneNSF



NSF Support by Research Field

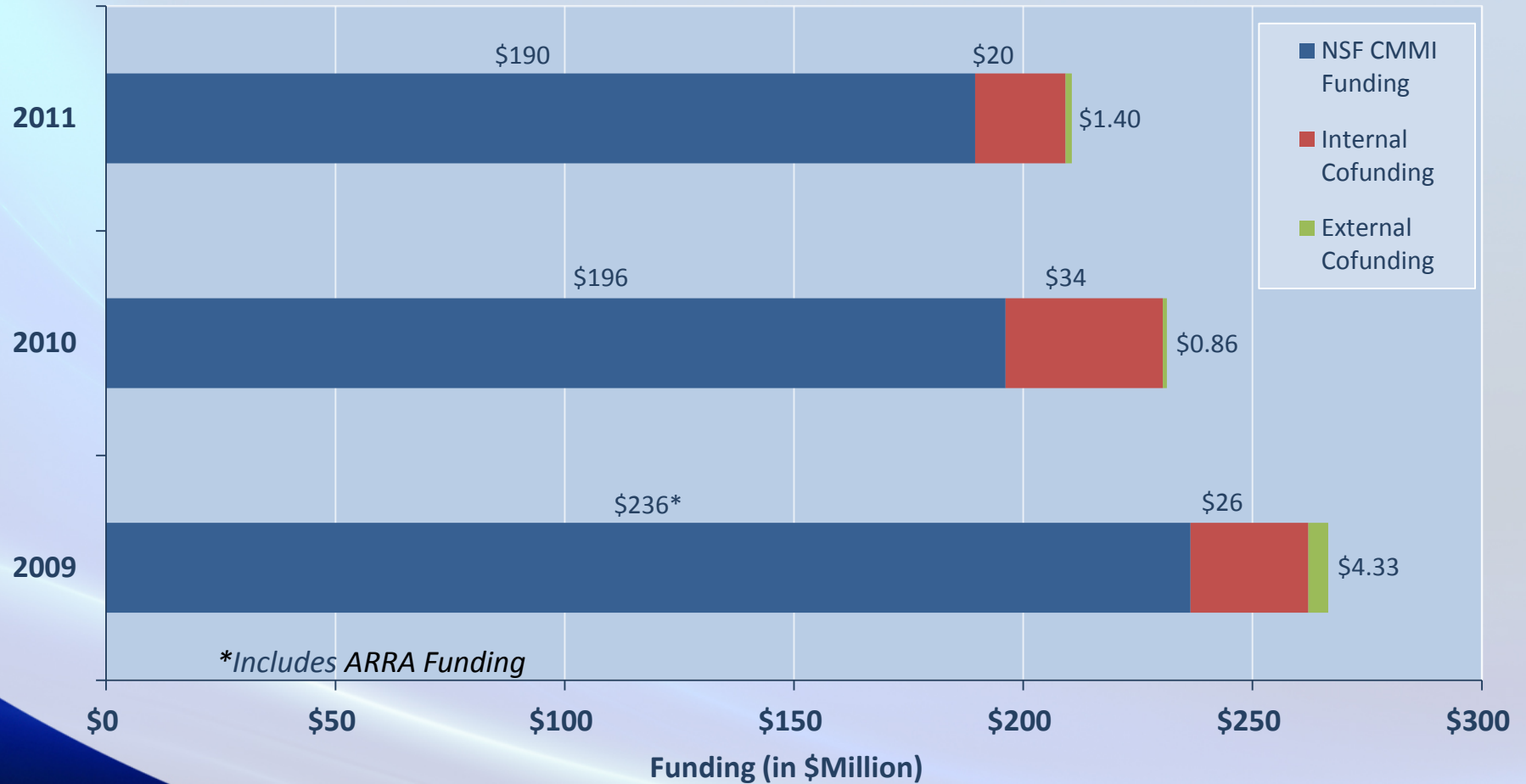


CMMI By the Numbers

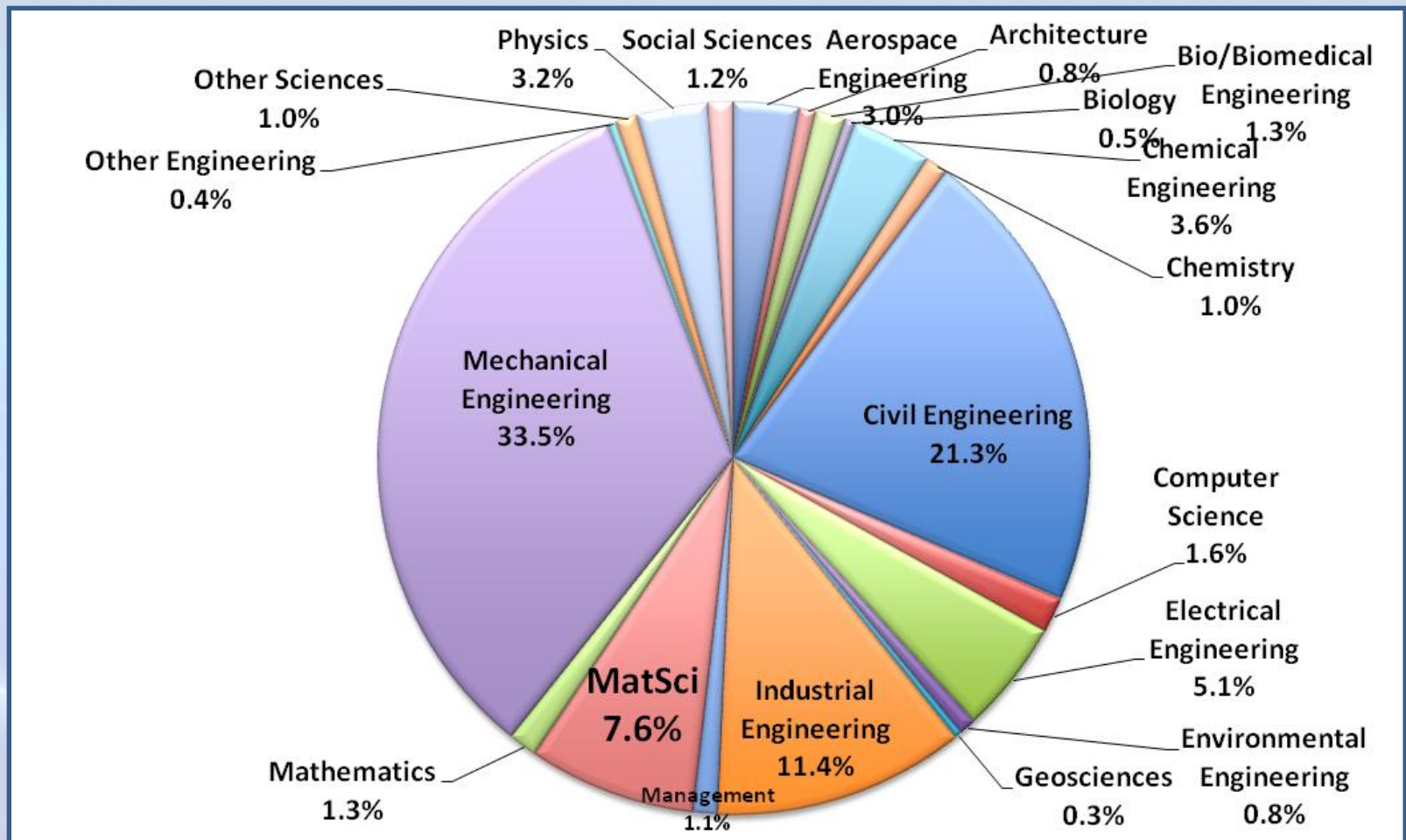
- 19 Core Research Programs accepting unsolicited proposals
- Participation in numerous cross-cutting solicitations
- The last 3 years:
 - Total Invested: **\$708 Million**
 - Proposals received & reviewed: **10,221 Proposals**
 - Of those, 9,358 were full research proposals
 - Submissions from **361 Institutions**
 - **520 Panels** with **3524 Independent Reviewers**
 - **127 from Industry & Government Agencies**
 - Awarded proposals: **1,640 Awards** to **177 Institutions**
 - This represents a 17.53% success rate
 - Median Award Size: ~\$275k over 36 months
 - 768 REU Students Funded (30% of Awards have supplements)



Resources 2009-2011

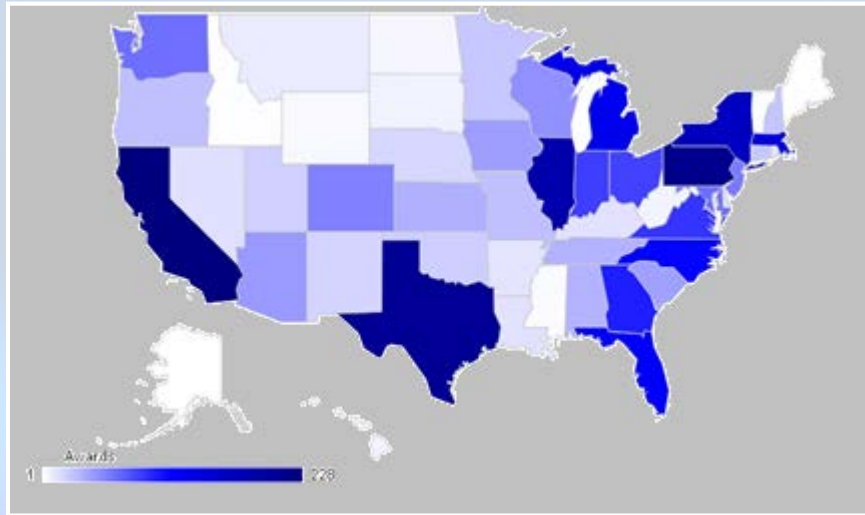


CMMI Research Community



CMMI Research Community

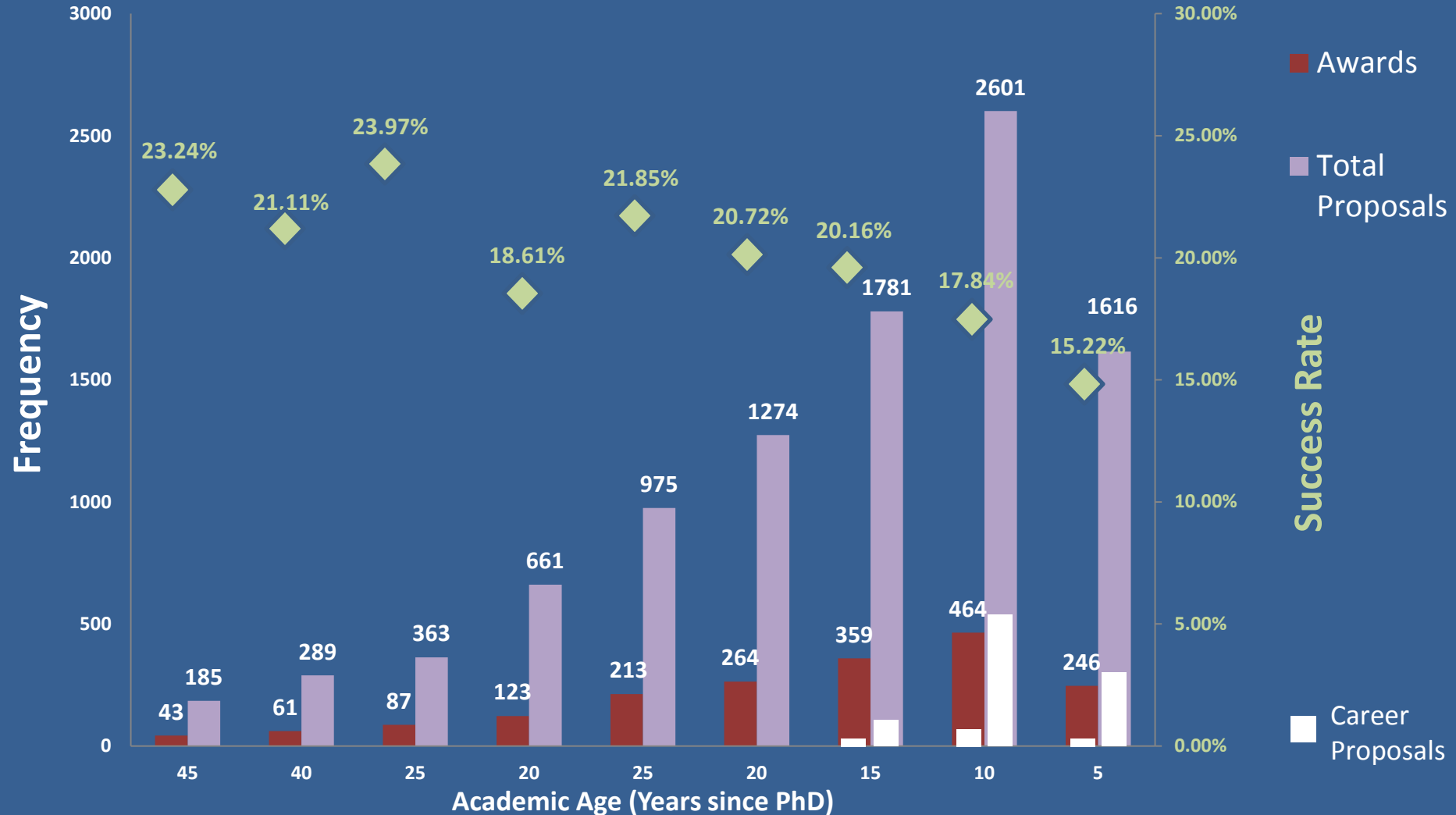
Awards by US State FY09-FY11

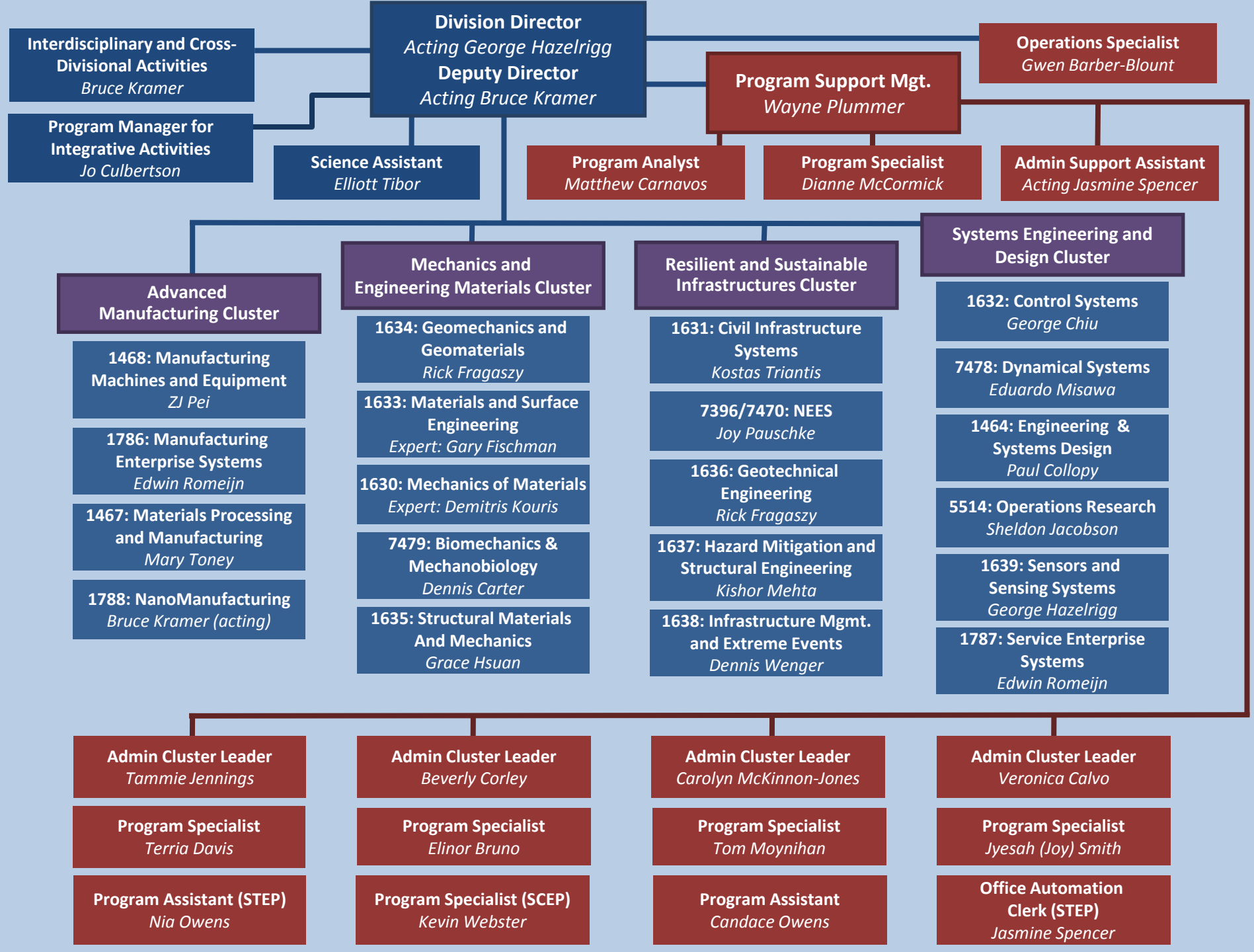


AK	1	CO	34	GA	66	IN	48	MD	44	MS	4	NH	10	OH	43	SC	31	VA	47
AL	15	CT	20	HI	5	KS	17	ME	1	MT	5	NJ	38	OK	16	SD	2	WA	31
AR	8	DC	11	IA	31	KY	9	MI	71	NC	42	NM	11	OR	10	TN	27	WI	29
AZ	32	DE	11	ID	1	LA	13	MN	17	ND	6	NV	6	PA	125	TX	125	WV	5
CA	133	FL	65	IL	116	MA	77	MO	21	NE	14	NY	117	RI	10	UT	13	WY	1

CMMI Research Community

CMMI Proposals and Success Rate 2009-2011 by Academic Age





Division Director
Acting George Hazelrigg

Deputy Director
Acting Bruce Kramer

Program Support Mgt.
Wayne Plummer

Operations Specialist
Gwen Barber-Blount

Interdisciplinary and Cross-Divisional Activities
Bruce Kramer

Program Manager for Integrative Activities
Jo Culbertson

Science Assistant
Elliott Tibor

Program Analyst
Matthew Carnavos

Program Specialist
Dianne McCormick

Admin Support Assistant
Acting Jasmine Spencer

Advanced Manufacturing Cluster

1468: Manufacturing Machines and Equipment
Zi Pei

1786: Manufacturing Enterprise Systems
Edwin Romeijn

1467: Materials Processing and Manufacturing
Mary Toney

1788: NanoManufacturing
Bruce Kramer (acting)

Mechanics and Engineering Materials Cluster

1634: Geomechanics and Geomaterials
Rick Fragaszy

1633: Materials and Surface Engineering
Expert: Gary Fischman

1630: Mechanics of Materials
Expert: Demitris Kouris

7479: Biomechanics & Mechanobiology
Dennis Carter

1635: Structural Materials And Mechanics
Grace Hsuan

Resilient and Sustainable Infrastructures Cluster

1631: Civil Infrastructure Systems
Kostas Triantis

7396/7470: NEES
Joy Pauschke

1636: Geotechnical Engineering
Rick Fragaszy

1637: Hazard Mitigation and Structural Engineering
Kishor Mehta

1638: Infrastructure Mgmt. and Extreme Events
Dennis Wenger

Systems Engineering and Design Cluster

1632: Control Systems
George Chiu

7478: Dynamical Systems
Eduardo Misawa

1464: Engineering & Systems Design
Paul Collopy

5514: Operations Research
Sheldon Jacobson

1639: Sensors and Sensing Systems
George Hazelrigg

1787: Service Enterprise Systems
Edwin Romeijn

Admin Cluster Leader
Tammie Jennings

Program Specialist
Terria Davis

Program Assistant (STEP)
Nia Owens

Admin Cluster Leader
Beverly Corley

Program Specialist
Elinor Bruno

Program Specialist (SCEP)
Kevin Webster

Admin Cluster Leader
Carolyn McKinnon-Jones

Program Specialist
Tom Moynihan

Program Assistant
Candace Owens

Admin Cluster Leader
Veronica Calvo

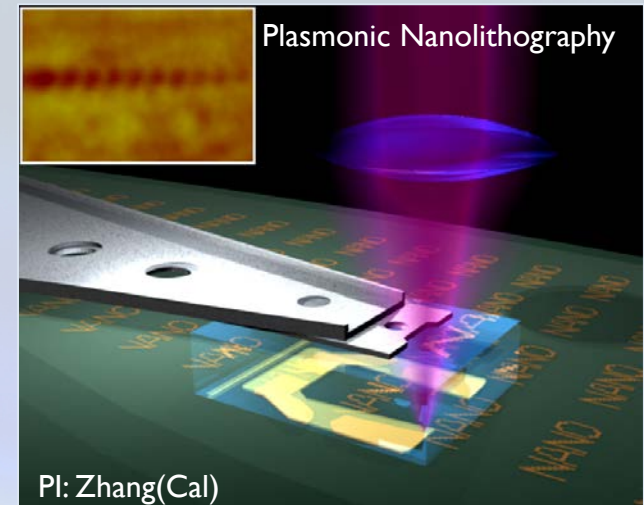
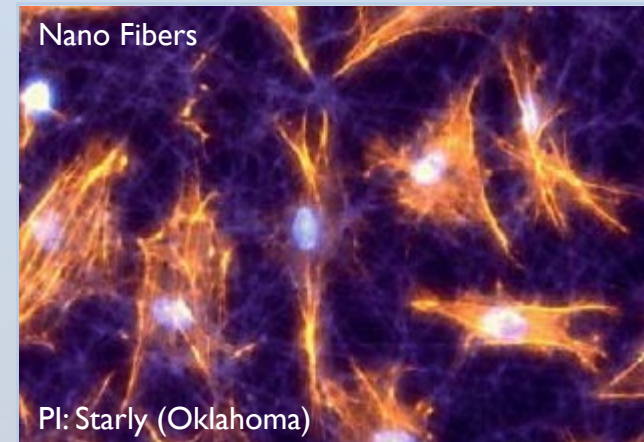
Program Specialist
Jyesah (Joy) Smith

Office Automation Clerk (STEP)
Jasmine Spencer

CMMI Research Clusters

Advanced Manufacturing

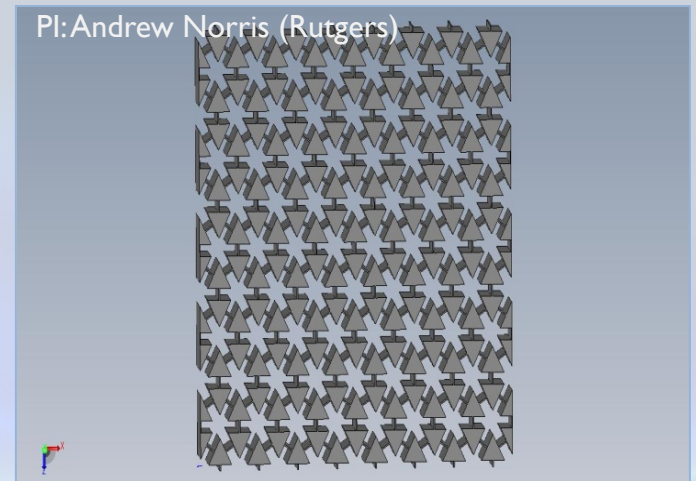
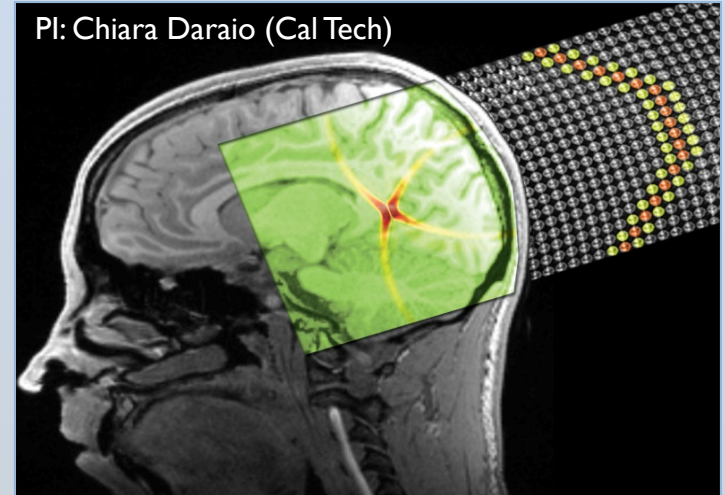
- Research leading to transformative advances in manufacturing and building technologies, with emphases on efficiency, economy, and sustainability
- Supporting programs
 - Manufacturing Machines and Equipment
 - Manufacturing Enterprise Systems
 - Materials Processing and Engineering
 - Nanomanufacturing



CMMI Research Clusters

Mechanics and Engineering Materials

- Research aimed at advances in the transformation and use of engineering materials efficiently, economically, and sustainably
- Supporting programs
 - Geomechanics and Geomaterials
 - Materials and Surface Engineering
 - Mechanics of Materials
 - Biomechanics and Mechanobiology
 - Structural Materials and Mechanics

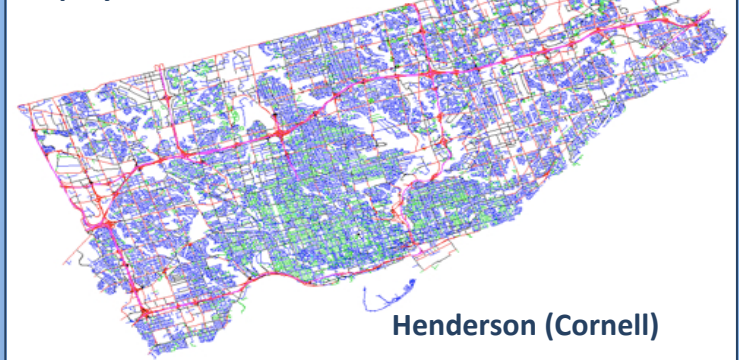


CMMI Research Clusters

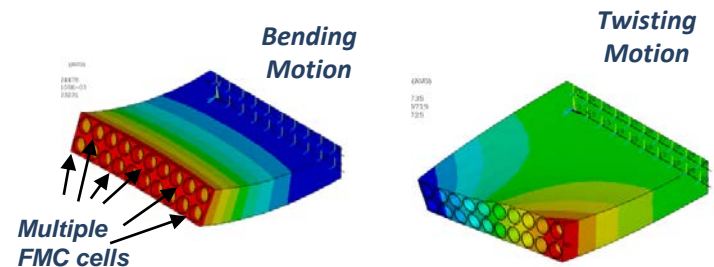
Systems Engineering and Design

- Research on the decision-making aspects of engineering, including design, control, and optimization
- Supporting programs
 - Control Systems
 - Dynamical Systems
 - Engineering and Systems Design
 - Operations Research
 - Sensors and Sensing Systems
 - Service Enterprise Systems

O.R. Methods for optimized ambulance deployment



SSS/EFRI: Learning from Plants



Wang , Mayer, Nielson (Michigan) Bakis, Rahn (PSU)

CMMI Research Clusters

Resilient and Sustainable Infrastructures

- Research to advance fundamental knowledge and innovation for resilient and sustainable civil infrastructure and distributed infrastructure networks
- Supporting programs
 - Civil Infrastructure Systems
 - NEES – Ops and Research
 - Geotechnical Engineering
 - Hazard Mitigation and Structural Engineering
 - Infrastructure Mgt. and Extreme Events



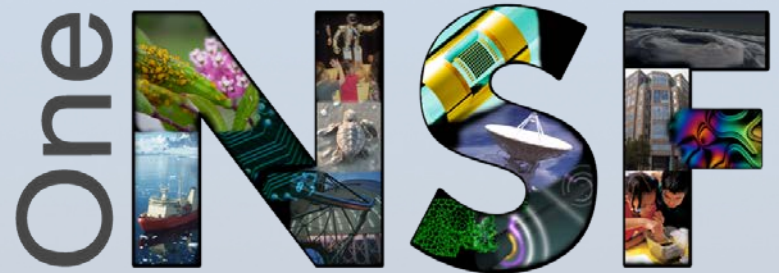
CIS/GOALI:
Mitigating
Accidents via
Advanced Active
Safety Systems

NEES: New Concepts for
Damage-Tolerant,
Self-Righting
Steel-Framed
Buildings



CMMI Research aligned to OneNSF and National Priorities

- National Priorities
 - National Nanotechnology Initiative
 - National Robotics Initiative
- OneNSF Initiatives
 - Advanced Manufacturing including Materials Genome Initiative
 - Cyber-Infrastructure for the 21st Century (CIF-21)
 - Education and Workforce
 - Innovation Ecosystem
 - Interdisciplinary Research
 - Sustainability and Clean Energy



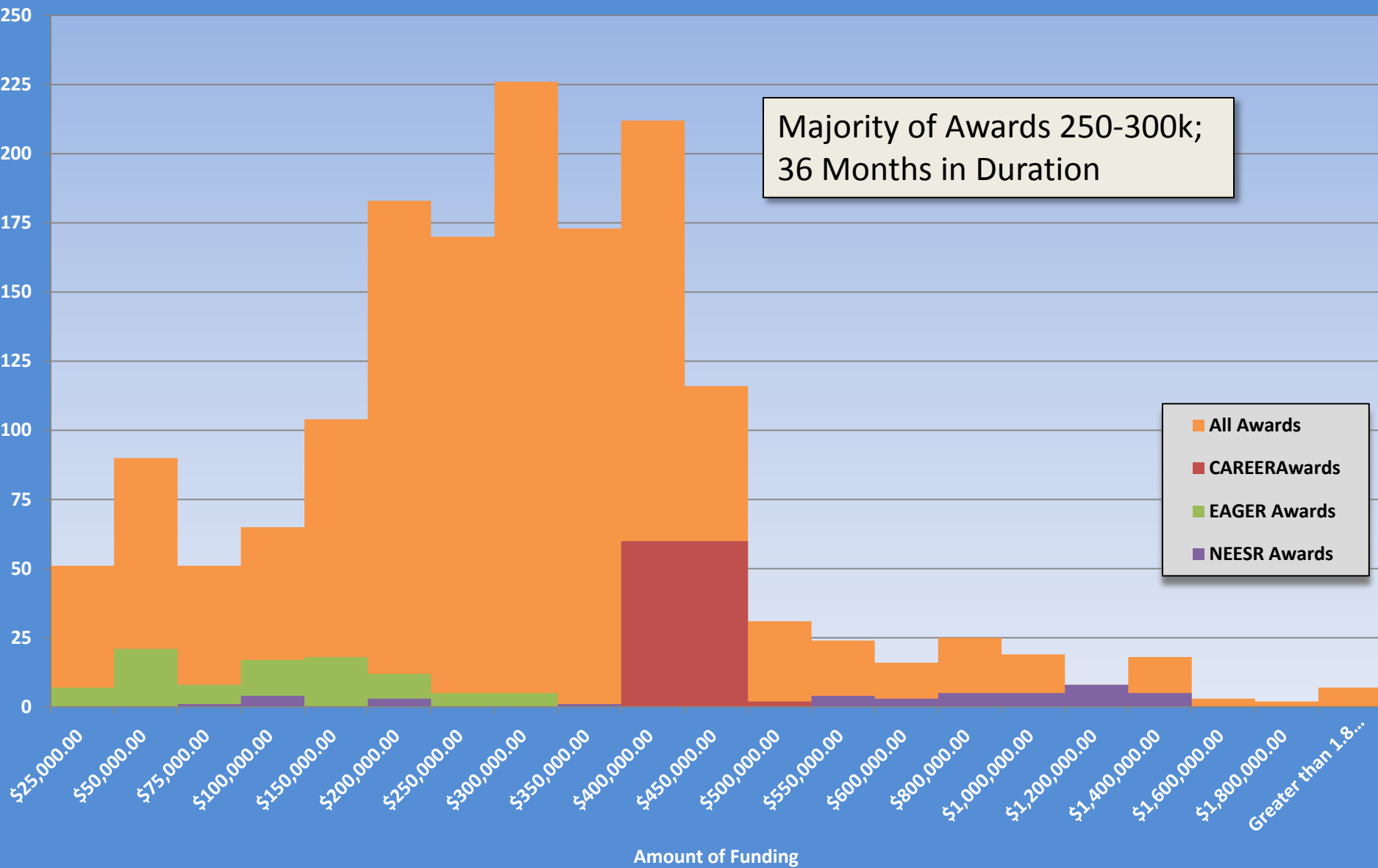
CMMI RAPID Research: Learning from Extreme Events

Japan 2011 Earthquake & Tsunami

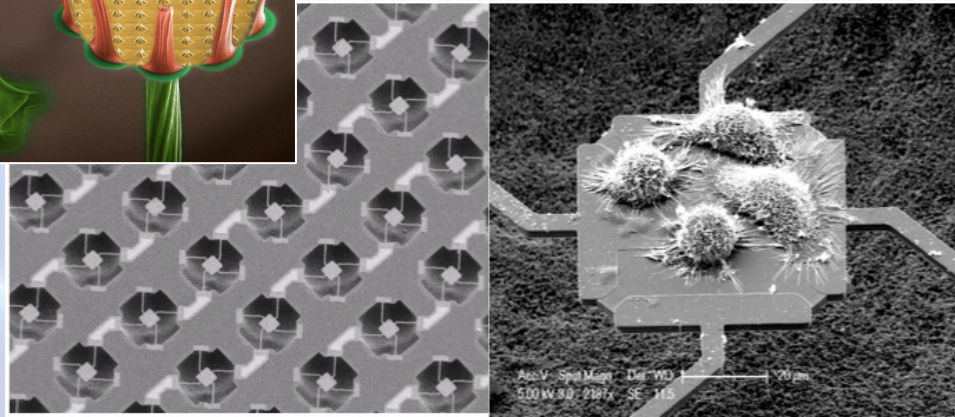
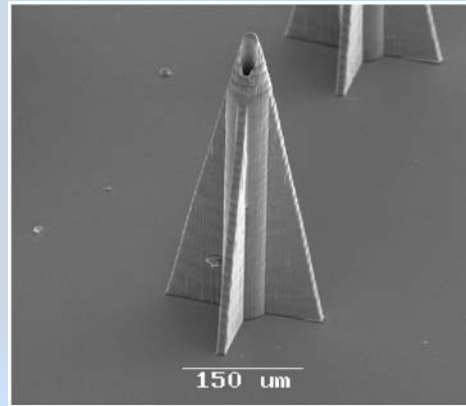
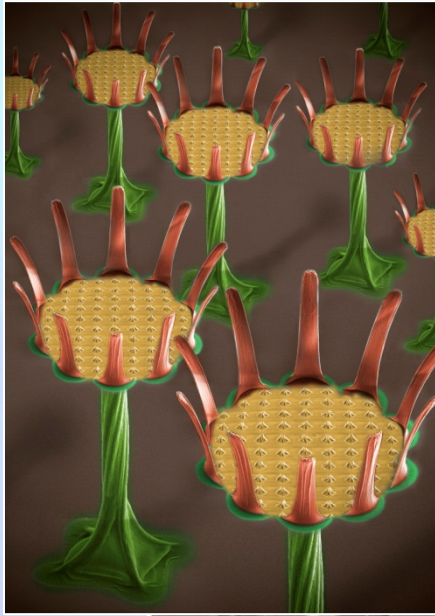
Haiti 2010 Earthquake



CMMI Award Profile



CMMI Enabling the Frontiers of Research At all Scales



Nanoscale to Infrastructure Scale Research



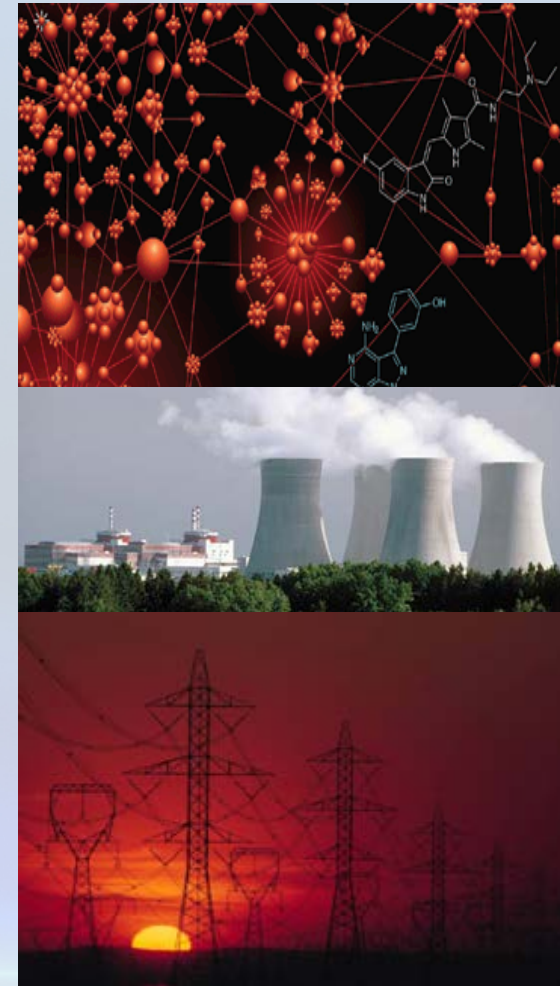
Systems Science

- Focus

- Mathematical theory of systems engineering
- Understanding the failure of current approaches
- Providing tools to implement rigorous theory

- Broad areas of opportunity:

- Design of Large-scale Engineered Systems
- Robotics and autonomous systems
- Resilient Civil Infrastructure Systems
- Advanced Manufacturing and Service Systems

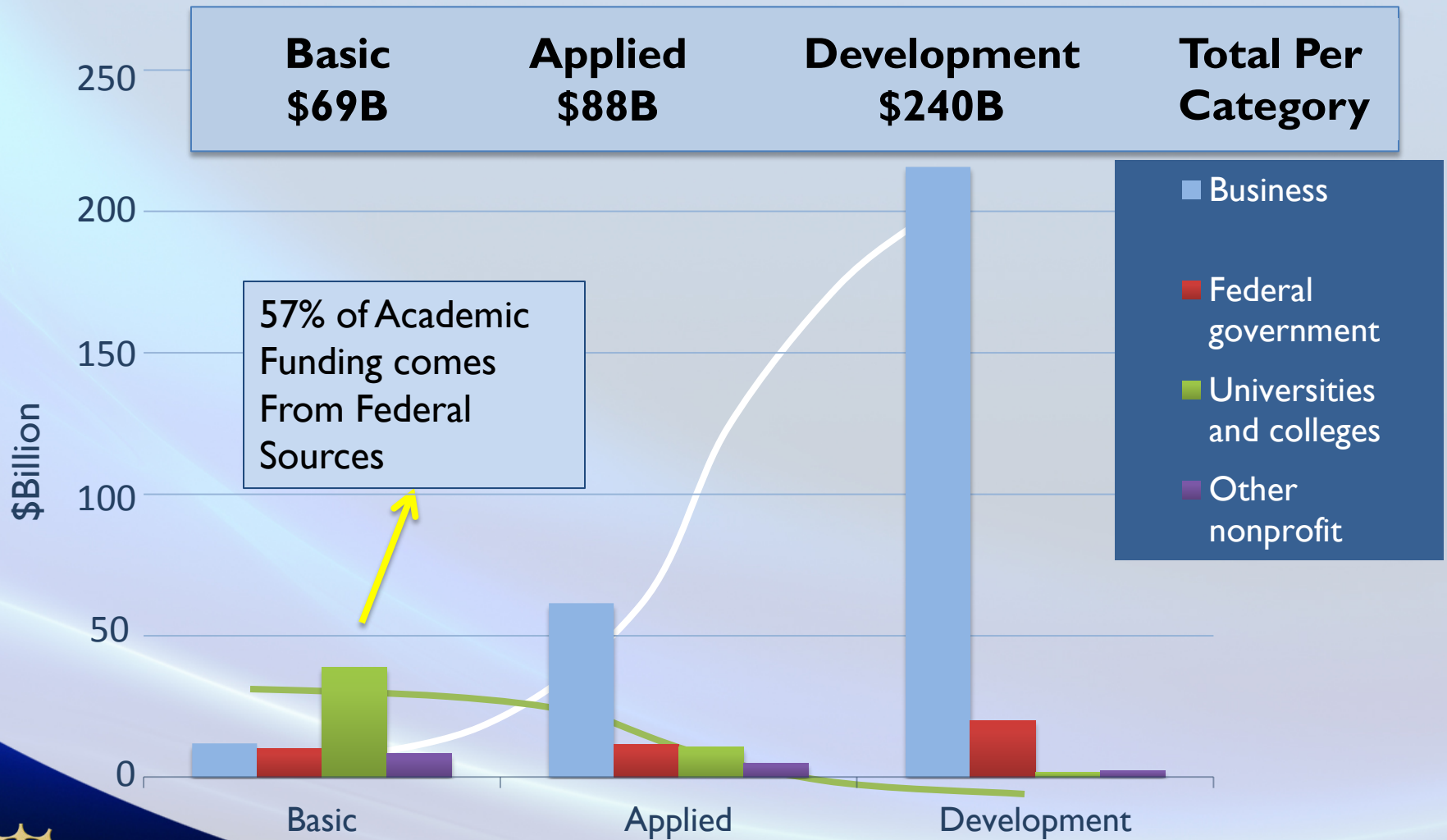


Questions?



U.S. Research and Development

Where do we fit?



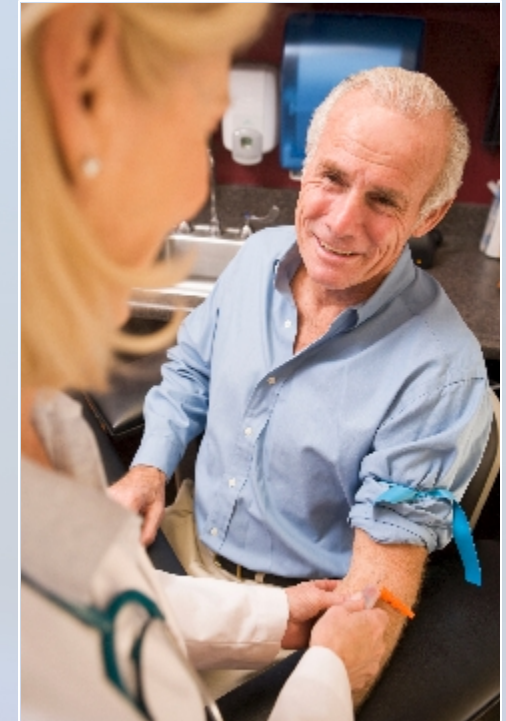
CMMI Service Research: Engineering for Society



New mathematical models for the distribution of aid after disasters



Optimizing the yearly design of the Flu Vaccine under uncertainty

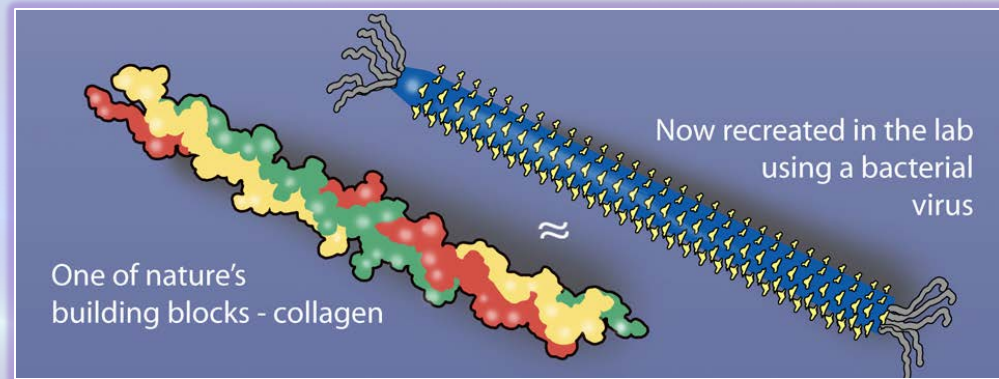


Computer-driven disease models to plan optimal Diabetes Treatment



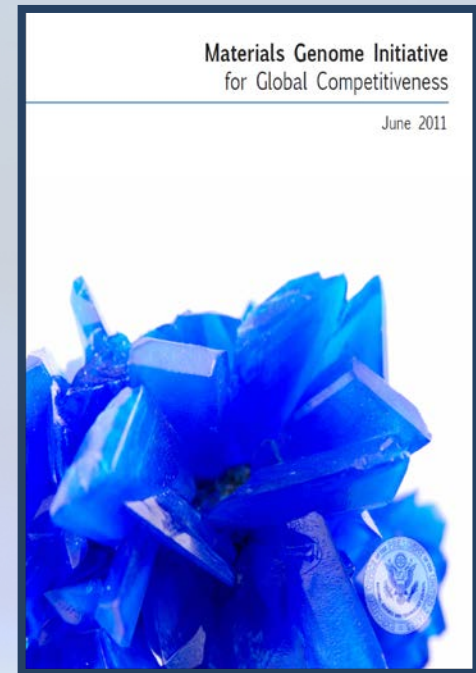
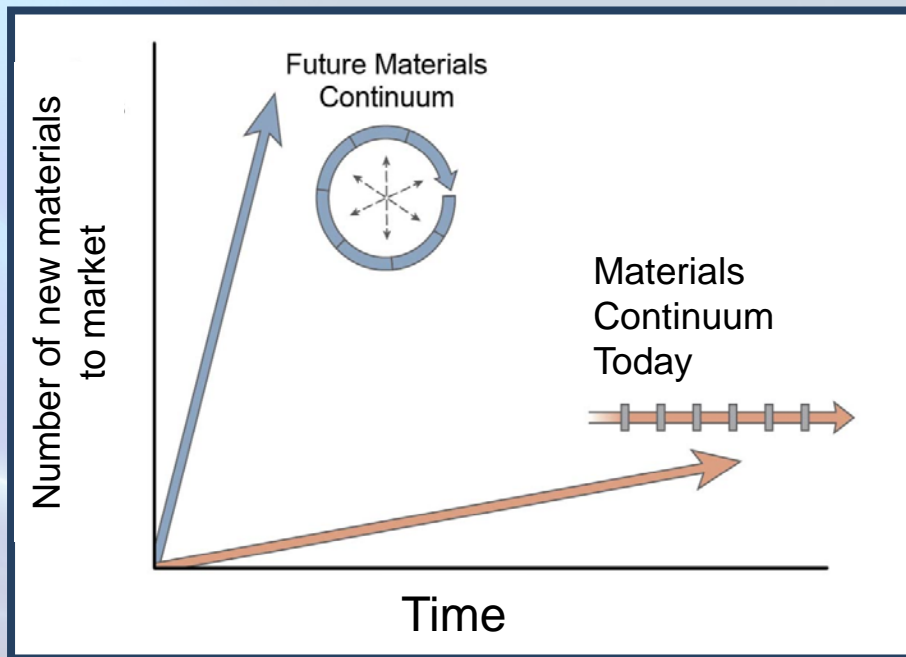
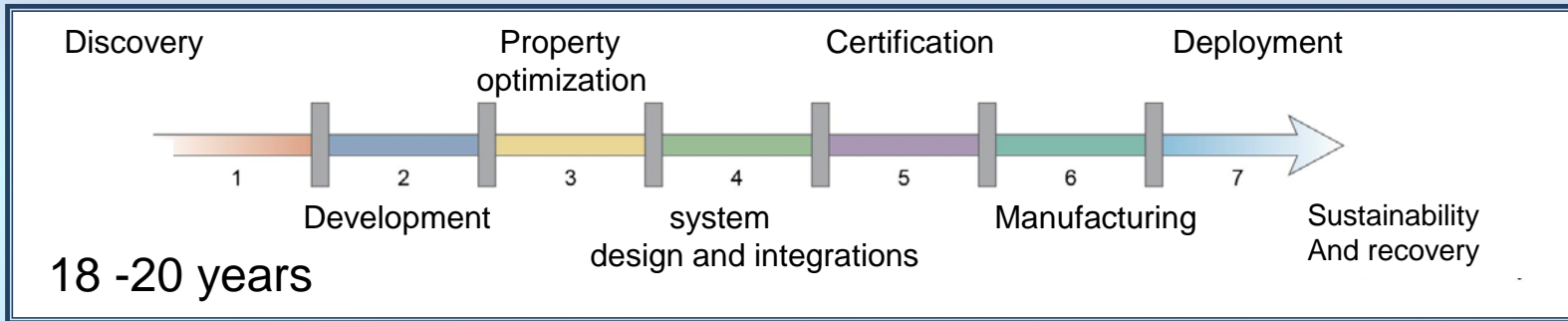
Advanced Manufacturing

- Support multi-scale modeling, nanomanufacturing, and complex engineering systems design
- Cyber-Enabled Materials, Manufacturing, and Smart-Systems (CEMMSS) – Materials Genome, Robotics, Cyber-Physical Systems
- Research at the Interface of the Biological, Mathematical, and Physical Sciences, and Engineering (BioMaPS)



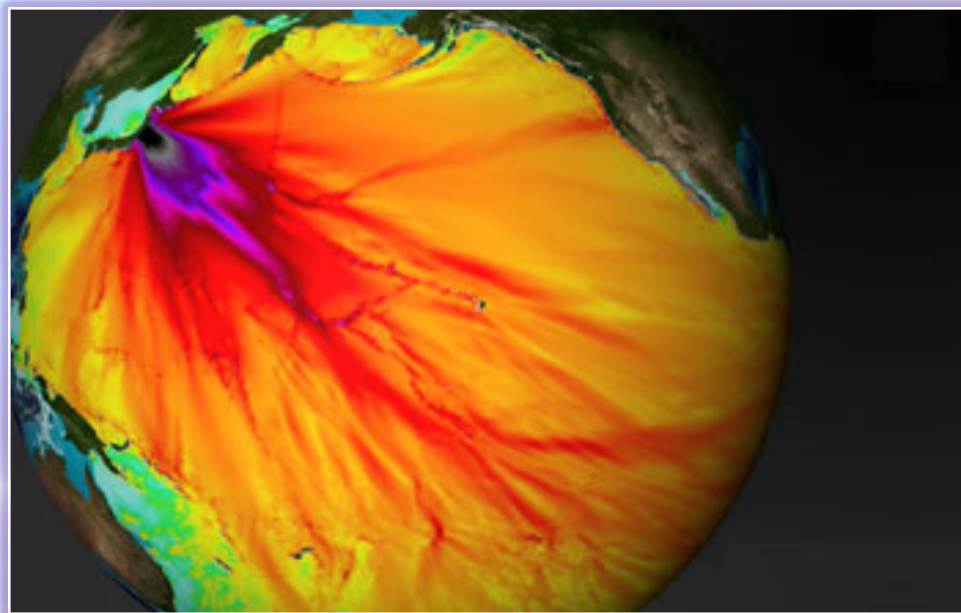
Materials Genome Initiative:

New paradigm-“twice as fast, at a fraction of the cost”



Sustainability and Clean Energy

- Science, Engineering, and Education for Sustainability (SEES)
 - ENG's investment will focus on sustainable research networks, sustainable materials, and human dimensions



CMMI Research Community

Institution Success Rate Versus Number of Submissions to CMMI, FY 2011

