



CMMI Overview

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Division Director for Civil, Mechanical
and Manufacturing Innovation

Senior Advisor
Bruce Kramer

Program Manager for
Integrative Activities
Jo Culbertson

Division of Civil, Mechanical & Manufacturing Innovation

Division Director

Steven McKnight

Deputy Director

George Hazelrigg

Advanced Manufacturing

- Manufacturing Machines and Equipment
ZJ Pei
- Manufacturing Enterprise Systems
Edwin Romeijn
- Materials Processing and Manufacturing
Mary Toney
- NanoManufacturing
Bruce Kramer (acting)

Mechanics and Engineering Materials

- Geomechanics and Geomaterials
Rick Fragaszy
- Materials and Surface Engineering
Clark Cooper
- Mechanics of Materials
Martin Dunn
- Biomechanics & Mechanobiology
Dennis Carter
- Structural Materials and Mechanics
Grace Hsuan

Resilient and Sustainable Infrastructures

- Civil Infrastructure Systems
Kostas Triantis
- NEES
Joy Pauschke
- Geotechnical Engineering
Rick Fragaszy
- Hazard Mitigation and Structural Engineering
Kishor Mehta
- Infrastructure Mgmt. and Extreme Events
Dennis Wenger

Systems Engineering and Design

- Control Systems
George Chiu
- Dynamical Systems
Eduardo Misawa
- Engineering & Systems Design
Paul Collopy
- Operations Research
Sheldon Jacobson
- Sensors and Sensing Systems
George Hazelrigg
- Service Enterprise Systems
Edwin Romeijn

Cross-Cutting Programs

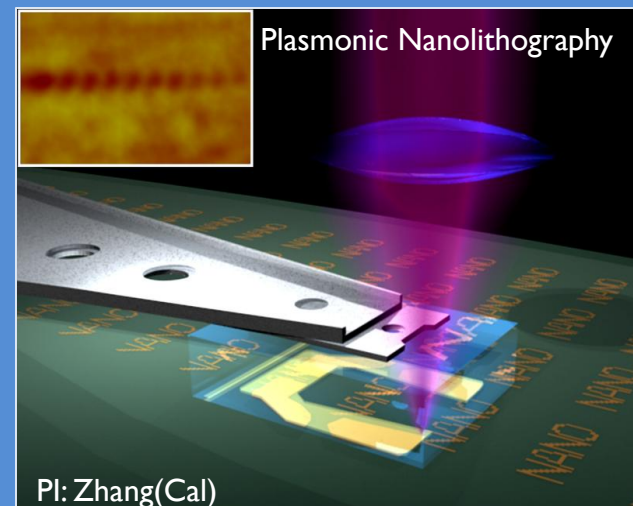
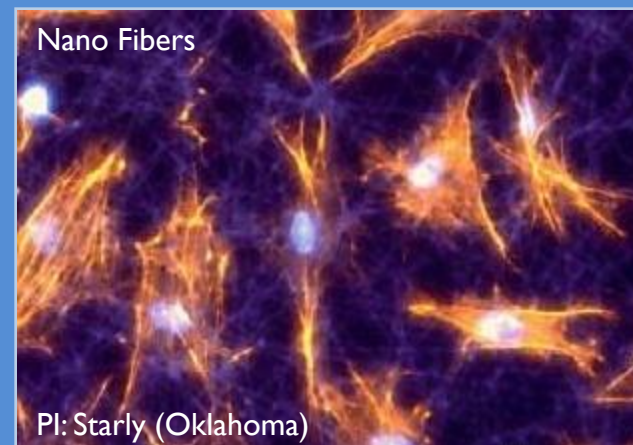
- Design of Engineering Material Systems
- Computational and Data-Enabled Science & Engineering
- Systems Science



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

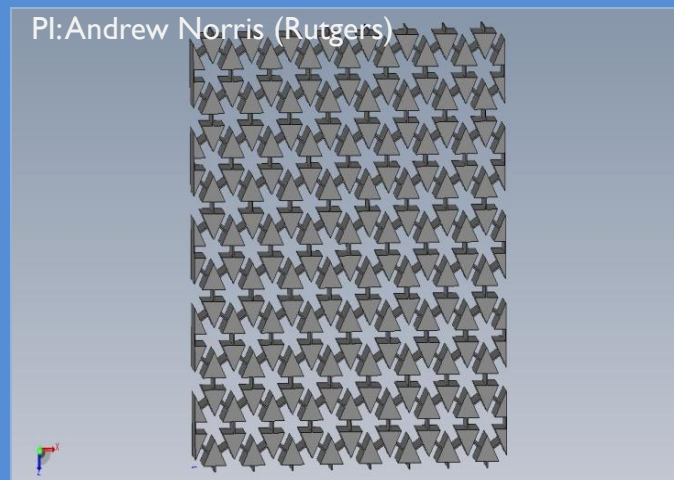
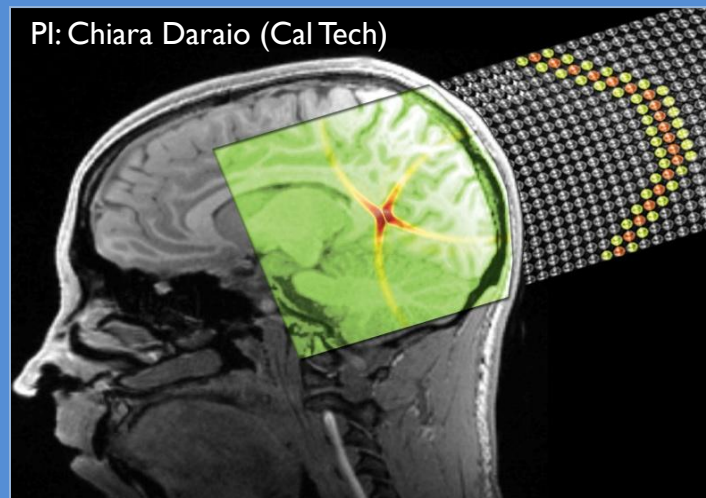




CMMI Research Clusters

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



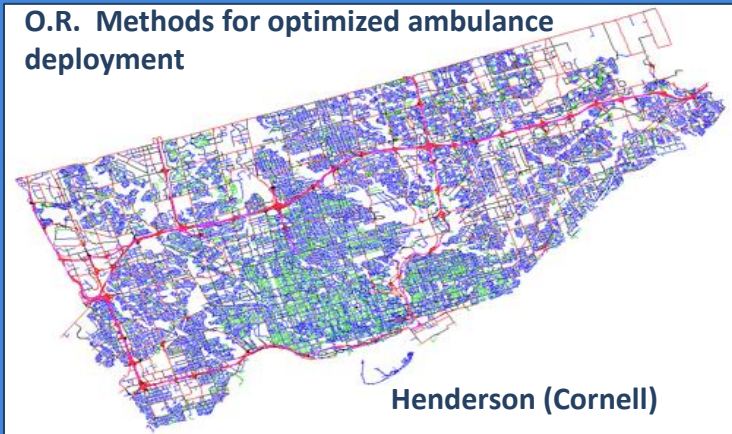


CMMI Research Clusters

Systems Engineering and Design

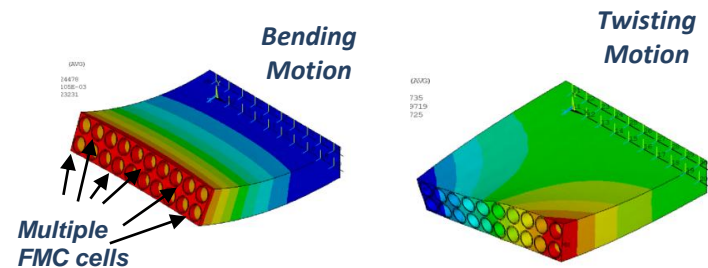
- Research on the decision-making aspects of engineering, including design, control, and optimization
- Supporting programs
 - Control Systems
 - Dynamical Systems
 - Engineering Systems Design
 - Operations Research
 - Sensors and Sensing Systems
 - Service Enterprise Systems

O.R. Methods for optimized ambulance deployment



Henderson (Cornell)

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



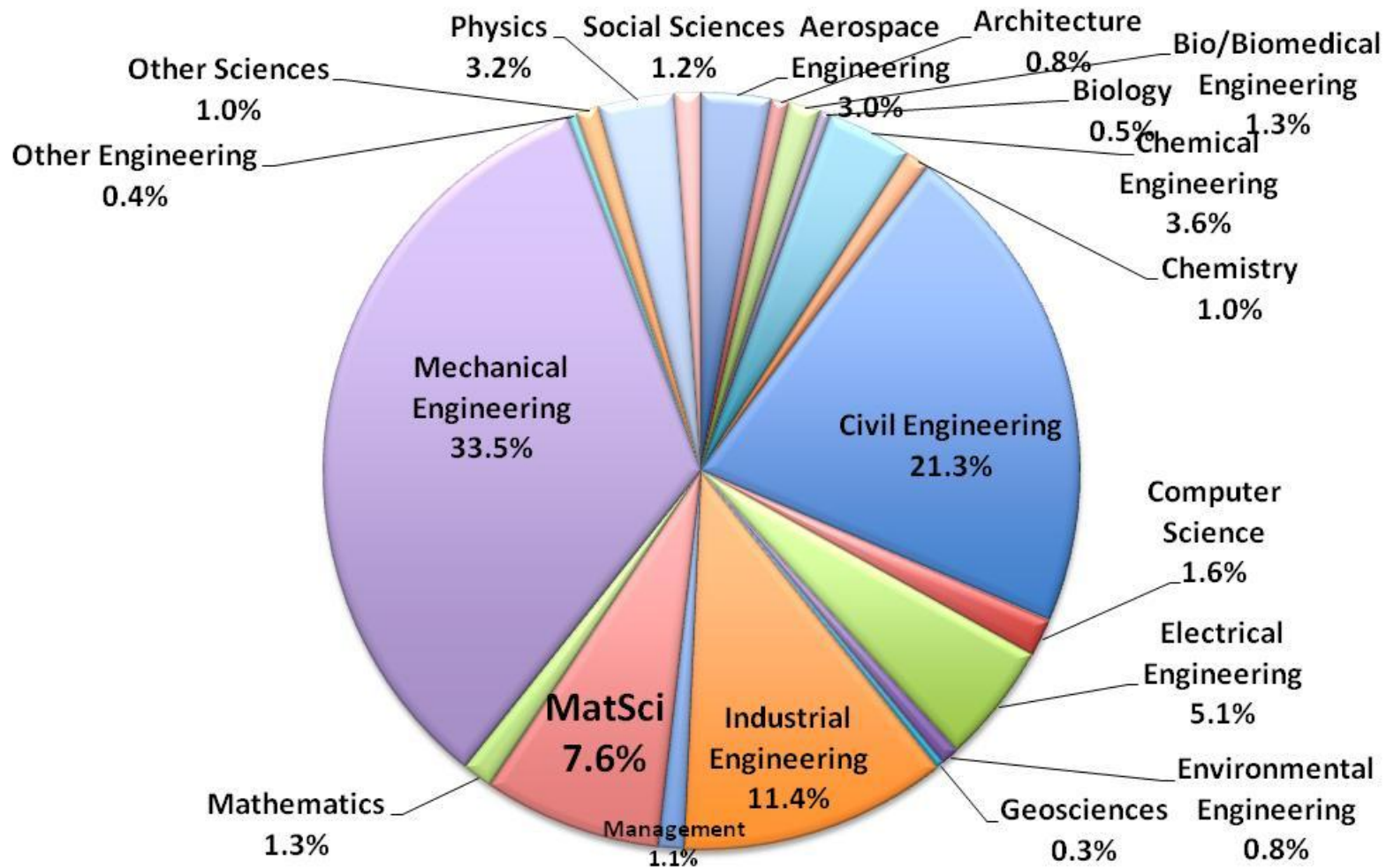


CMMI FY12 By the Numbers

- 19 Core Research Programs accepting unsolicited proposals
 - Created 3 Cross-cutting Research Programs (CDSE, DEMS, SYS)
- Participation in numerous cross-cutting solicitations
- Primary Investment in Research Awards: **\$147 Million**
- Research Proposals received & reviewed: **3355 Proposals**
 - **45 CAREERS, 7 CREATIVs, 22 EAGERS, 7 RAPIDS**
 - Submissions from **323 Institutions**
 - Awarded Research Proposals: **488 Awards** to **149 Institutions**
 - This represents a 14.5% success rate
 - Median Award Size: ~\$300k over 36 months
 - 292 REU Students Funded (40% of Awards have supplements)



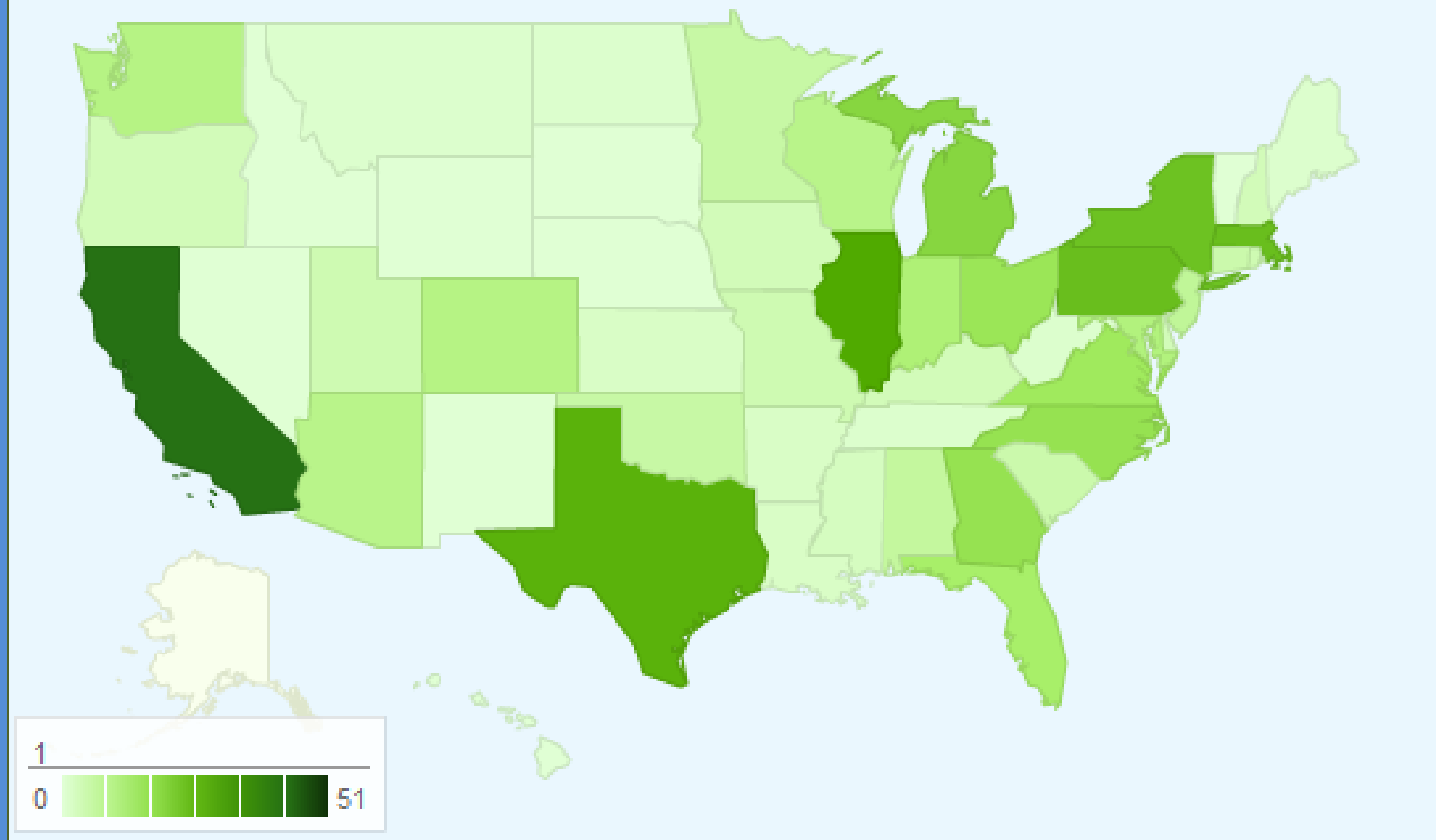
CMMI Research Community





CMMI Awards by State, FY2012

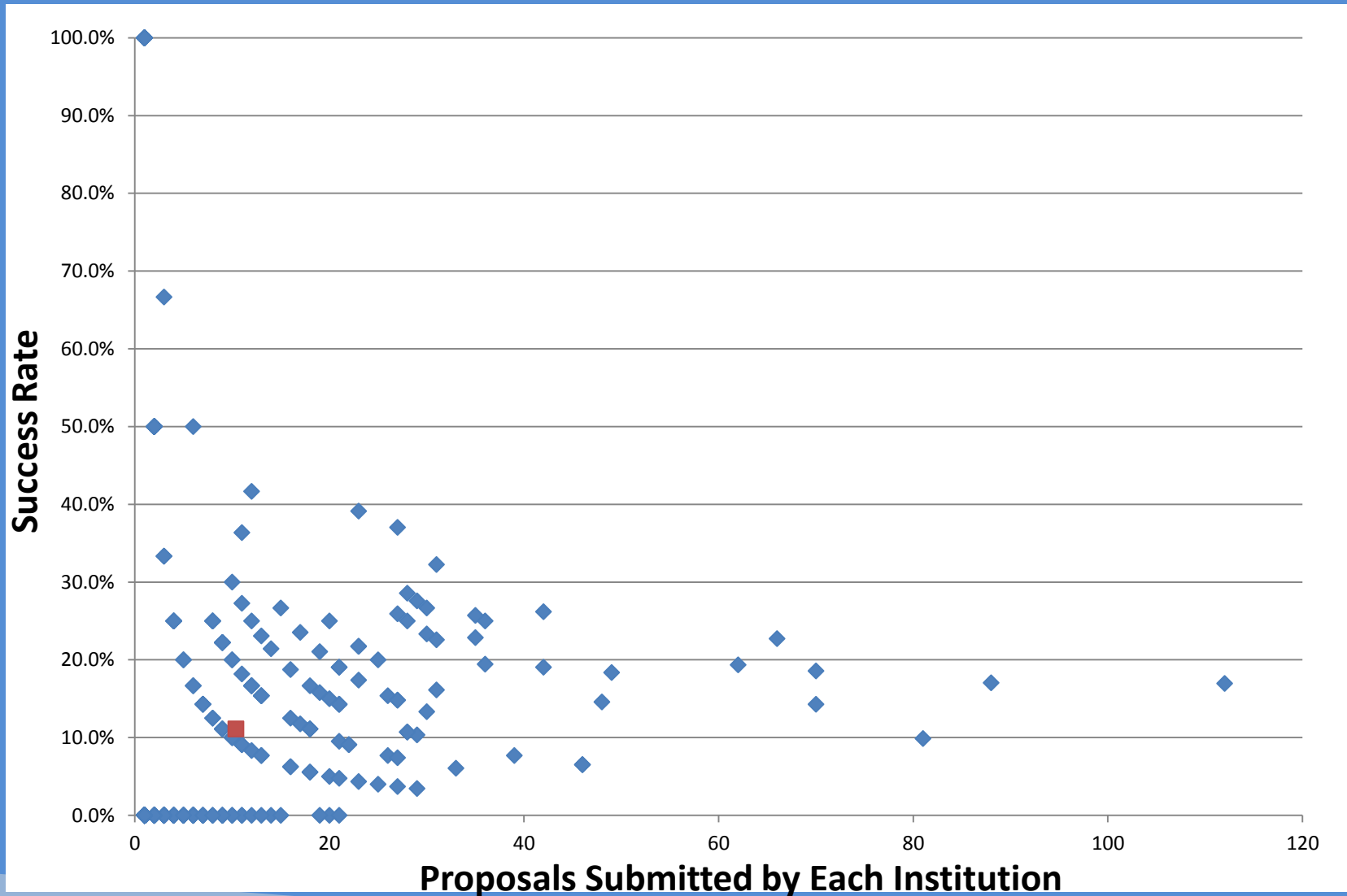
Full Research Awards to institutions in 43 States





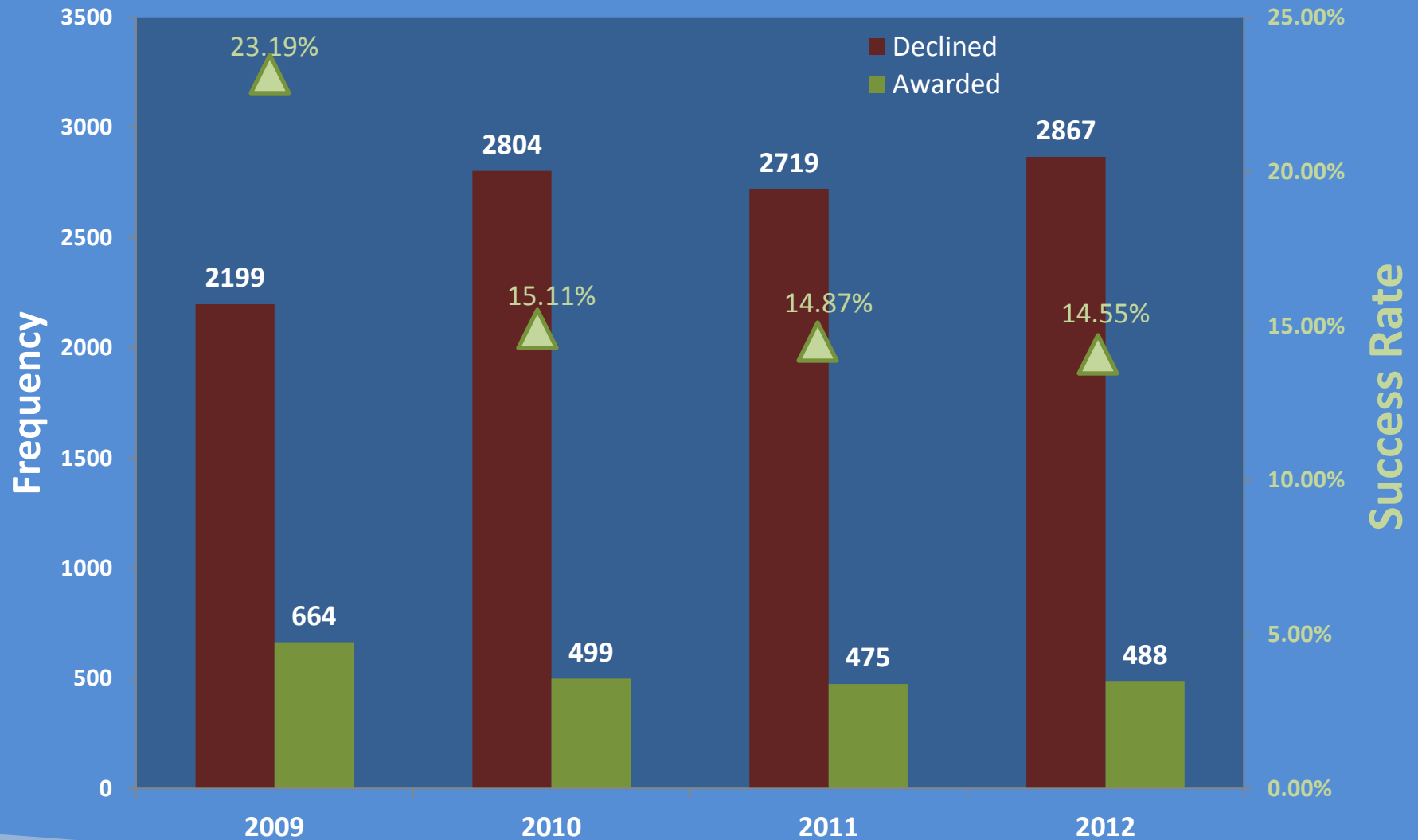
CMMI Research Community: Submissions versus Awards, 2012

10



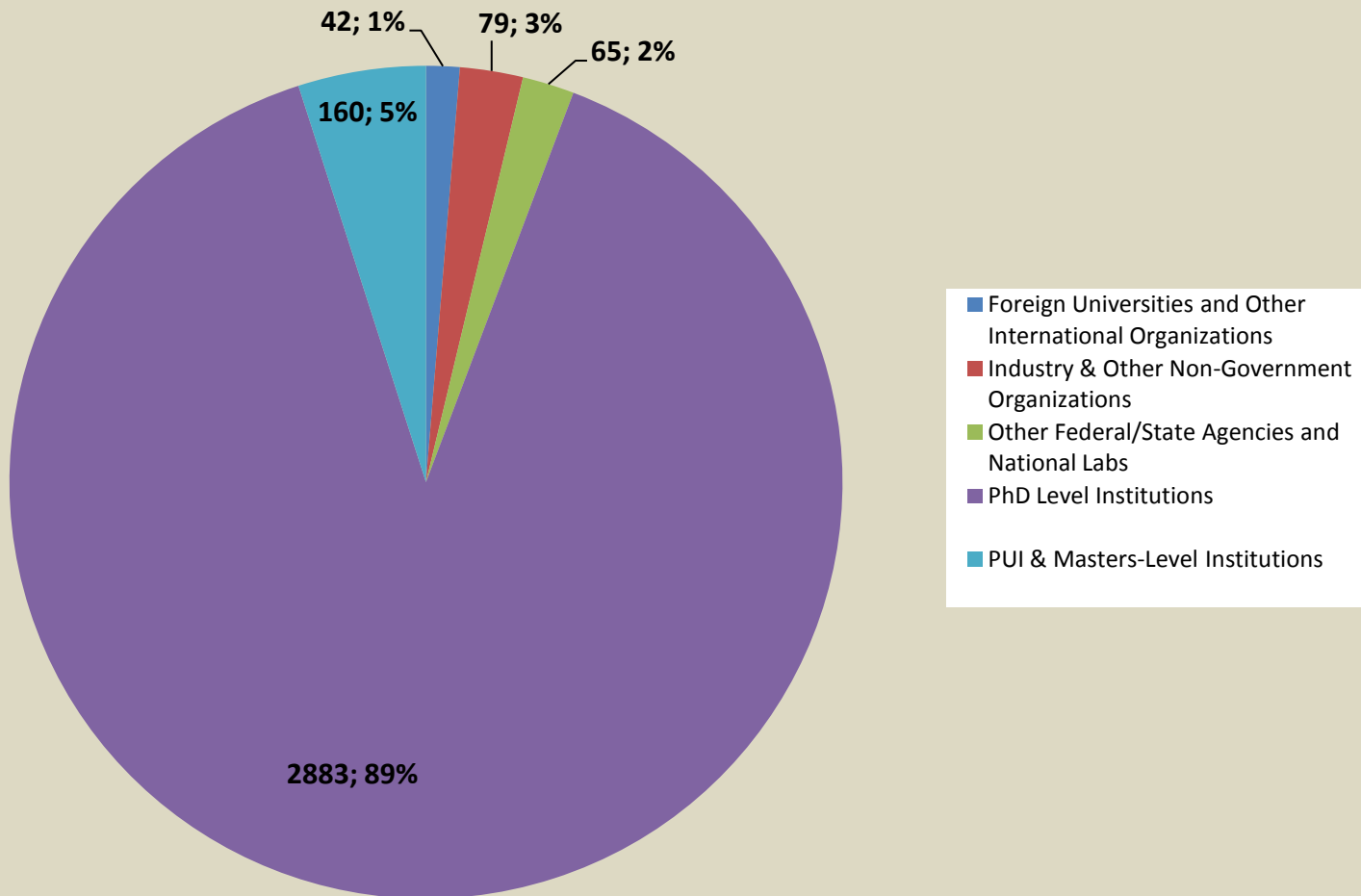


FY09-FY12 Proposal Trends





CMMI Reviewers, FY 2012 by Classification





Programmatic Changes of Note

- Cross-cutting programs “Virtual”
 - Participation in CDS&E
 - DEMS
 - SYS
- Sensors and Sensing Systems – refocused
- NEES – Path Forward briefed to NSB



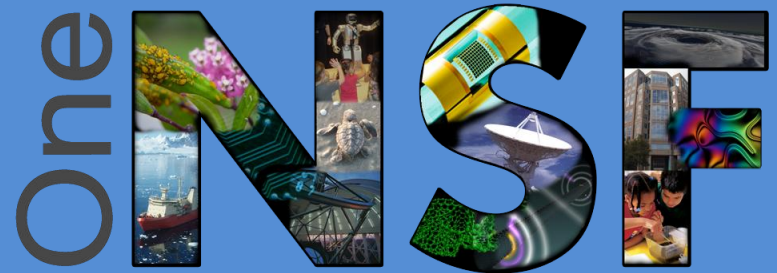
CMMI Research aligned to OneNSF and National Priorities

➤ 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





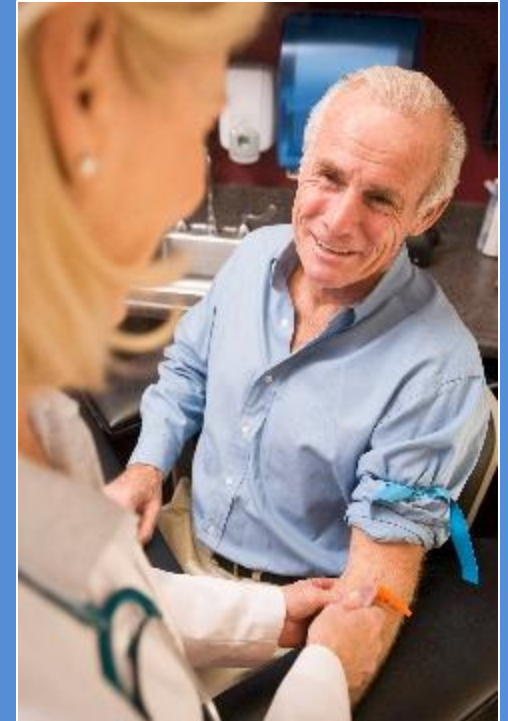
CMMI Service Research: Engineering for Society



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



CMMI RAPID Research: Learning from Extreme Events

Japan 2011 Earthquake & Tsunami



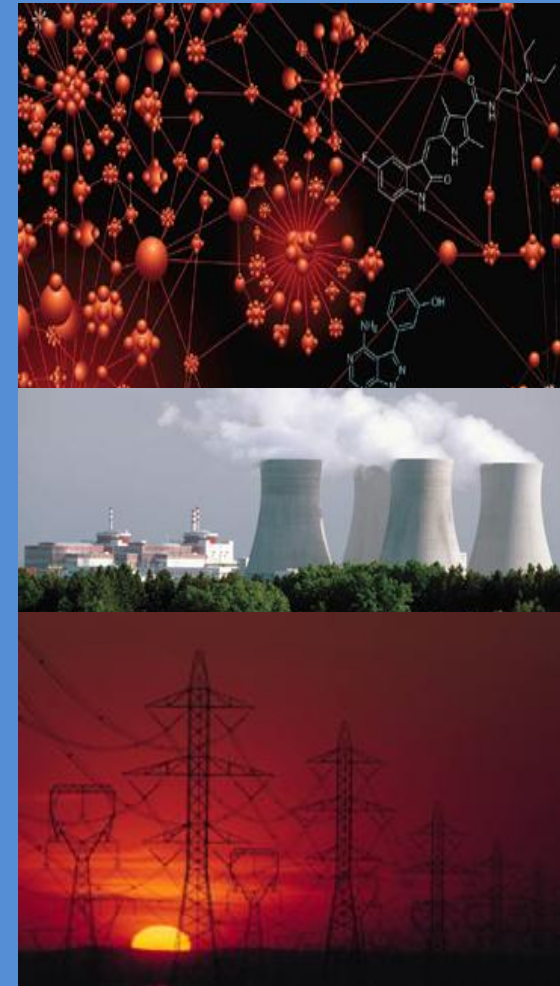
Haiti 2010 Earthquake





Systems Approaches in CMMI Research:

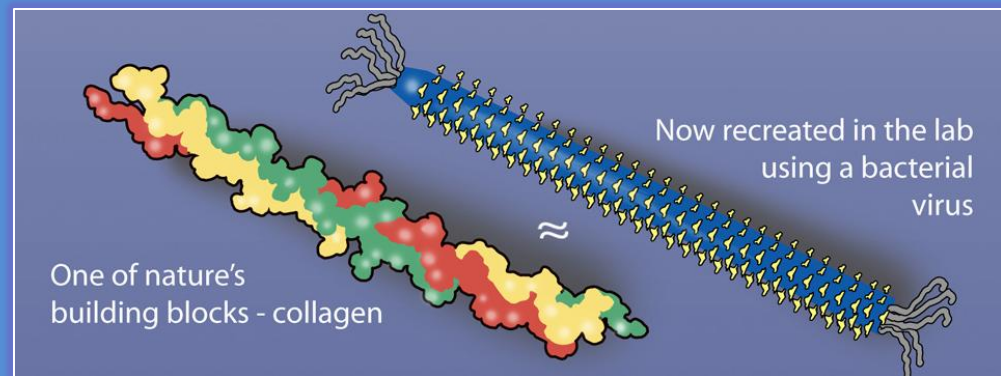
- Infrastructure, Defense, Economy...
- Overcoming the grand challenges at the interfaces can yield unprecedented opportunities for discovery and strengthen U.S. scientific and engineering leadership.
- Broad areas of opportunity:
 - Design of Large-scale Engineered Systems
 - Robotics and autonomous systems
 - Resilient Civil Infrastructure Systems
 - Advanced Manufacturing and Service Systems





Advanced Manufacturing

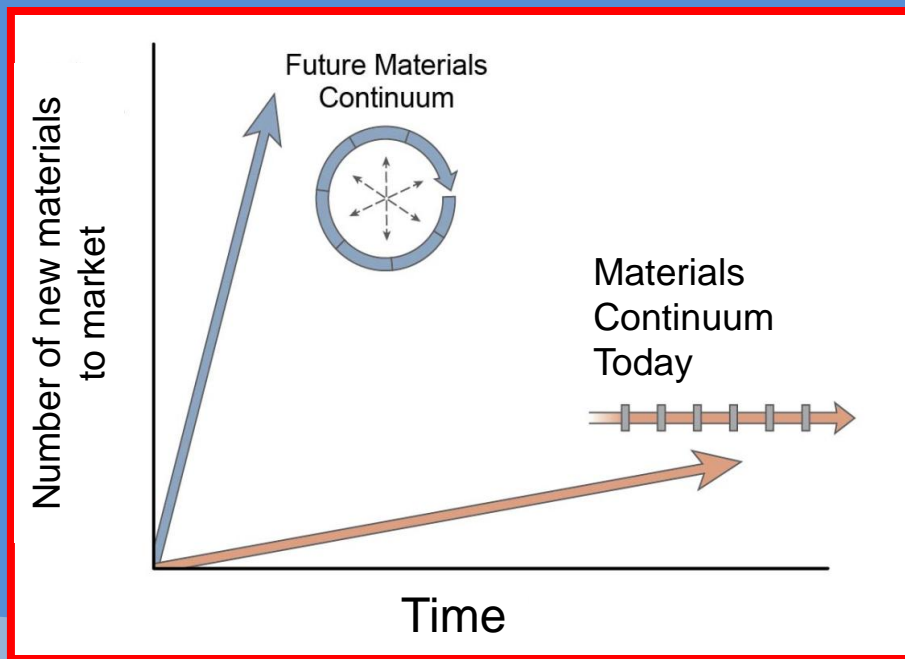
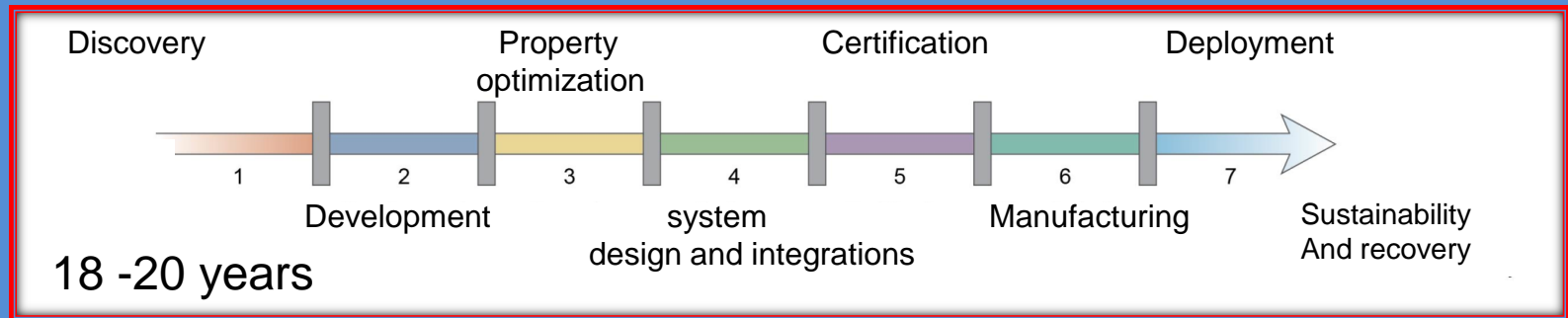
- Support multi-scale modeling, nanomanufacturing, and complex engineering systems design
- Cyber-Enabled Materials, Manufacturing, and Smart-Systems (CEMMSS) – Materials Genome, Robotics, Cyber-Physical Systems
- Research at the Interface of the Biological, Mathematical, and Physical Sciences, and Engineering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





Materials Genome Initiative:

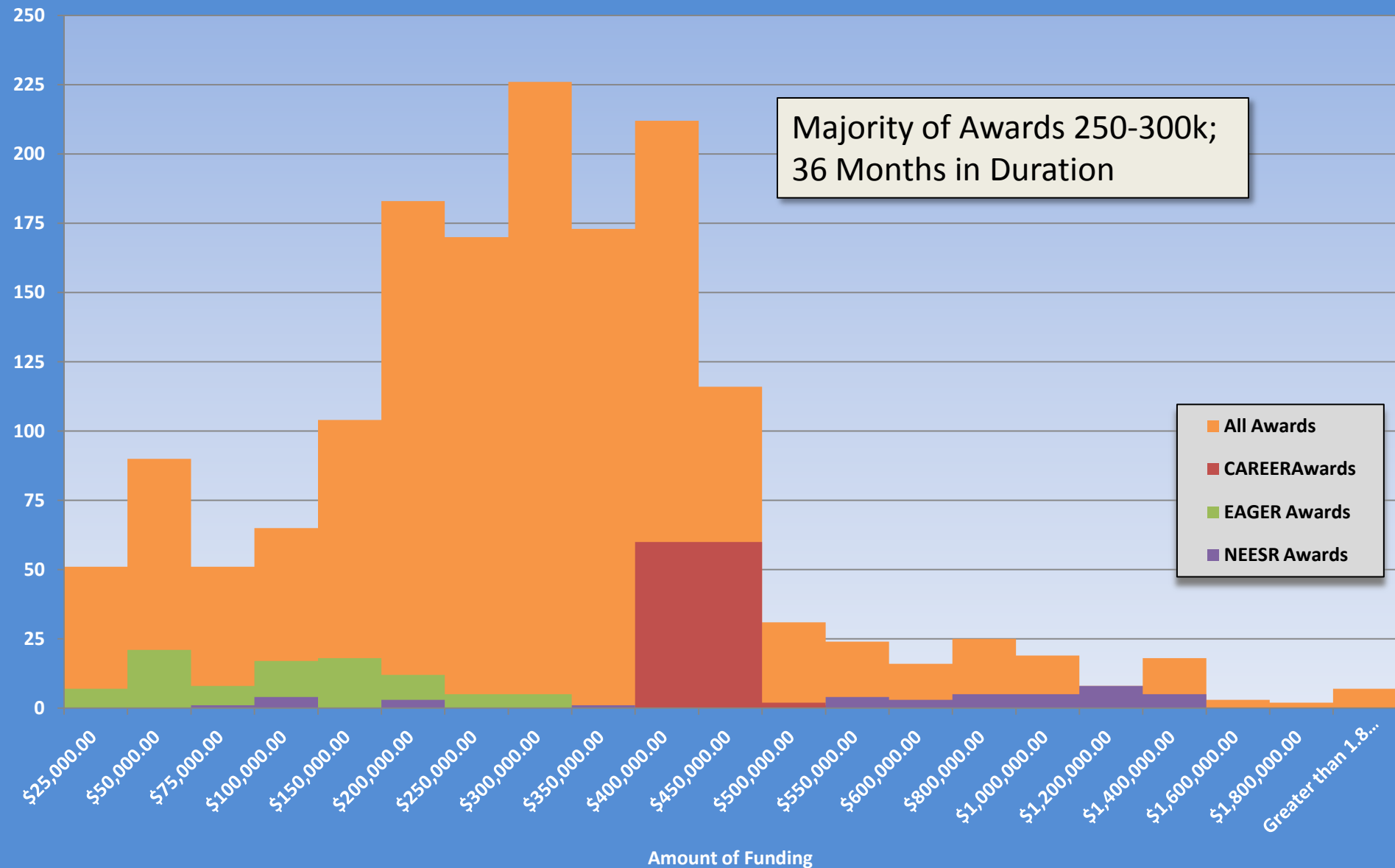
New paradigm-“twice as fast, at a fraction of the cost”





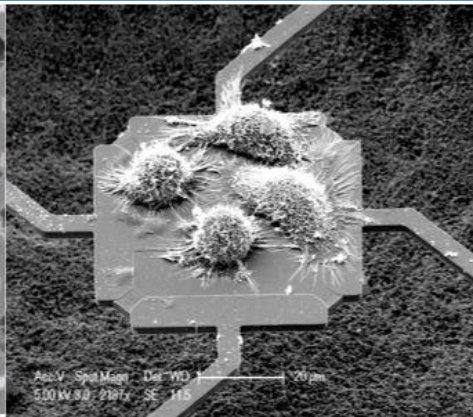
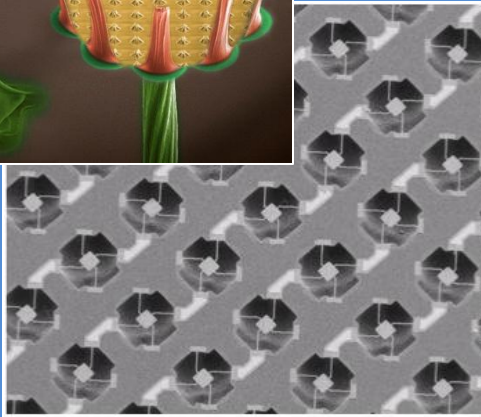
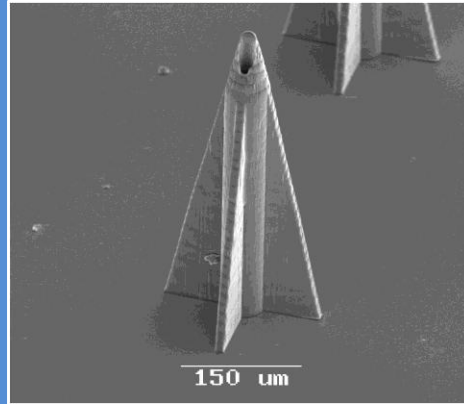
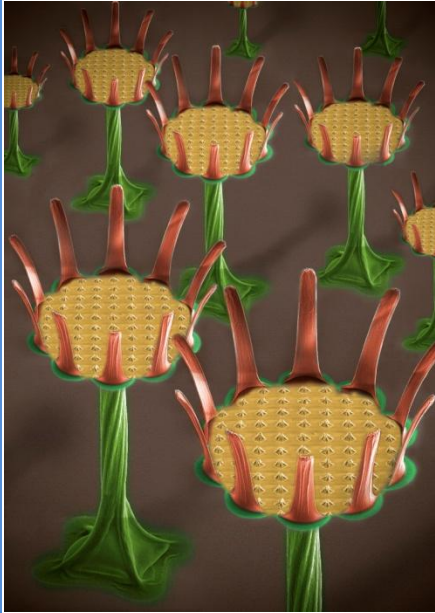
Thanks!!

CMMI Award Profile





CMMI Enabling the Frontiers of Research At all Scales



Nanoscale to Infrastructure Scale Research



CMMI Organization

