Civil, Mechanical and Manufacturing Innovation
An Overview

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CMMI Division Director
Engineering Advisory Committee Meeting

CMMI Research Focus and ACI

Cross-cutting frontier research in:

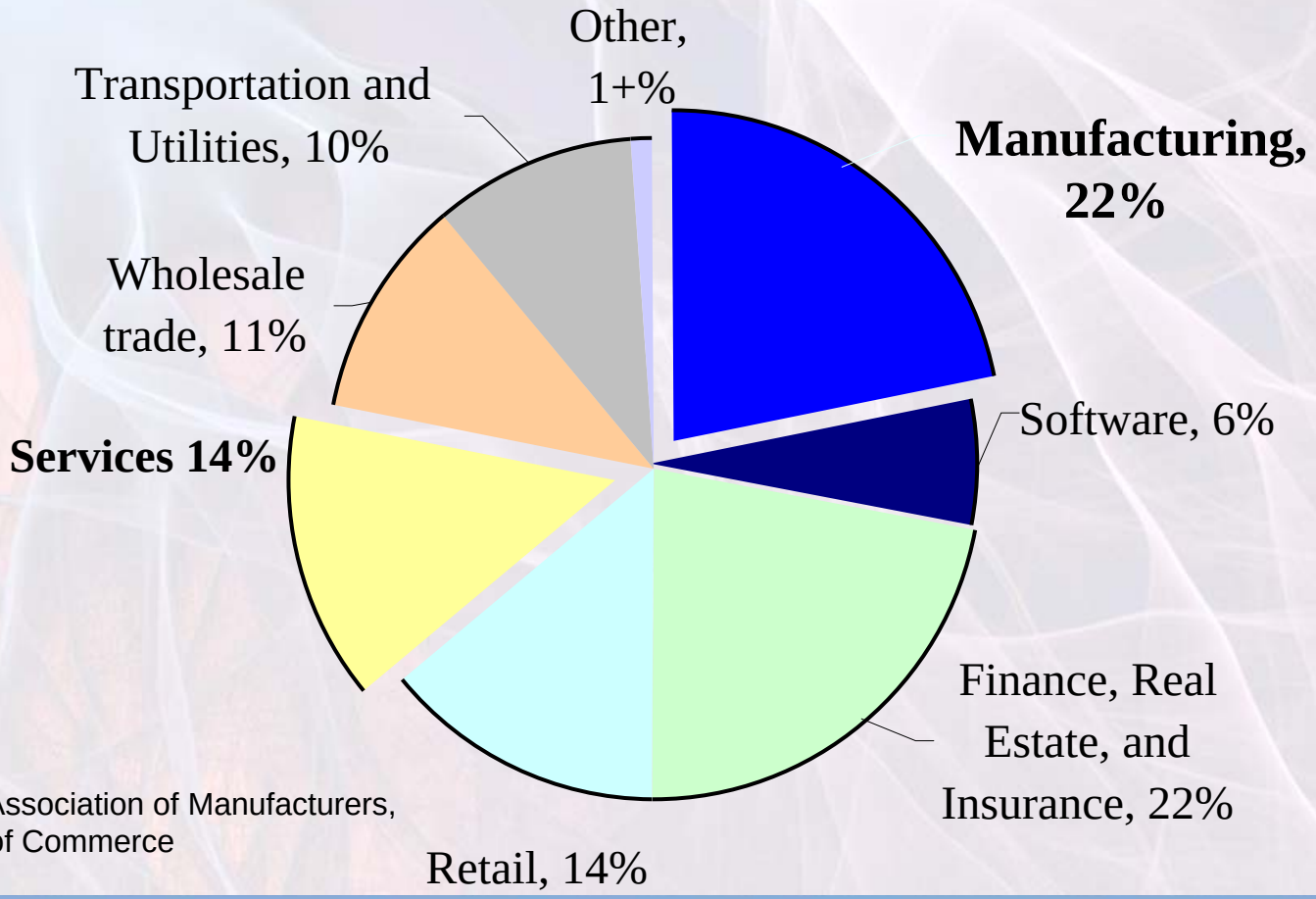
- *Manufacturing and Service Enterprises*
- *Resilient and Sustainable Infrastructure*

Investment in engineering education

- Graduate education
- Research/activities that engage engineering students
- Lead to new engineering pedagogy

CMMI Research Focus & ACI

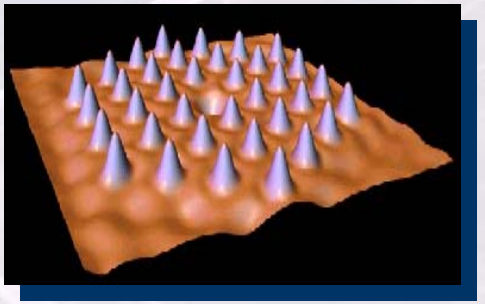
Contribution to US GDP
Manufacturing & Service Enterprises

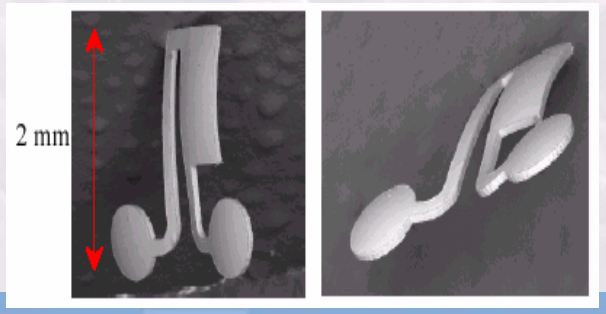


Source: National Association of Manufacturers, U.S. Department of Commerce

Research Trends in Manufacturing

- Nanomanufacturing
  - Emphasis on 3-D systems up-scaling integration across dimensional scales
- Manufacturing Miniaturization Trends
- Composites, Coatings, Biomaterials
- Sensors, Actuators, Controls
- Manufacturing Technologies for Energy





Critical Infrastructures

Transportation

Potable & Waste Water

Telecom-munications

Banking & Insurance

Electricity

Government

Buildings

Oil & Gas

Emergency Response

Resilient and Sustainable Infrastructure

Challenge: Minimize cascading effects multiple-impact catastrophic natural, technological, and human-induced disasters

- Understanding the natural processes that produce hazards;
- Developing hazard mitigation strategies and technologies;
- Recognizing and reducing vulnerability of interdependent critical infrastructures;
- Assessing disaster resilience using innovative methods;
- Identifying effective design of CI operations in dynamic, uncertain and adversarial environments
- Providing hazard and disaster information where and when needed;

CMMI

Division Director

Administrative & Budget

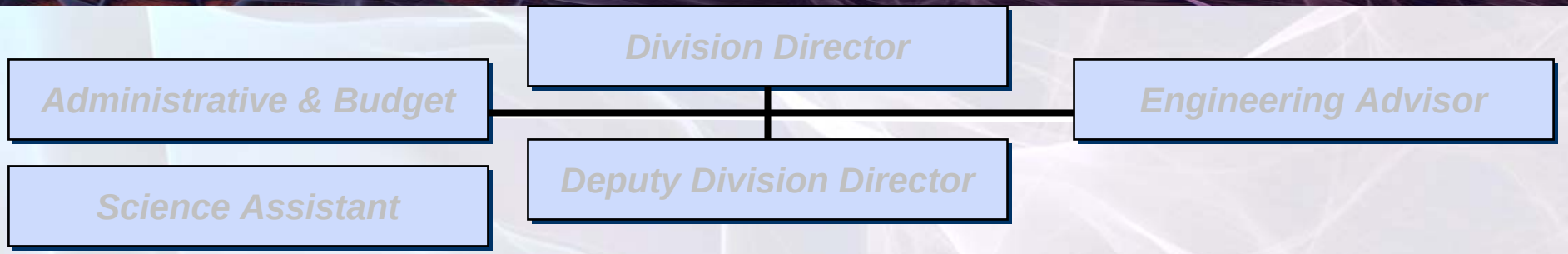
Science Assistant

Deputy Division Director

Engineering Advisor

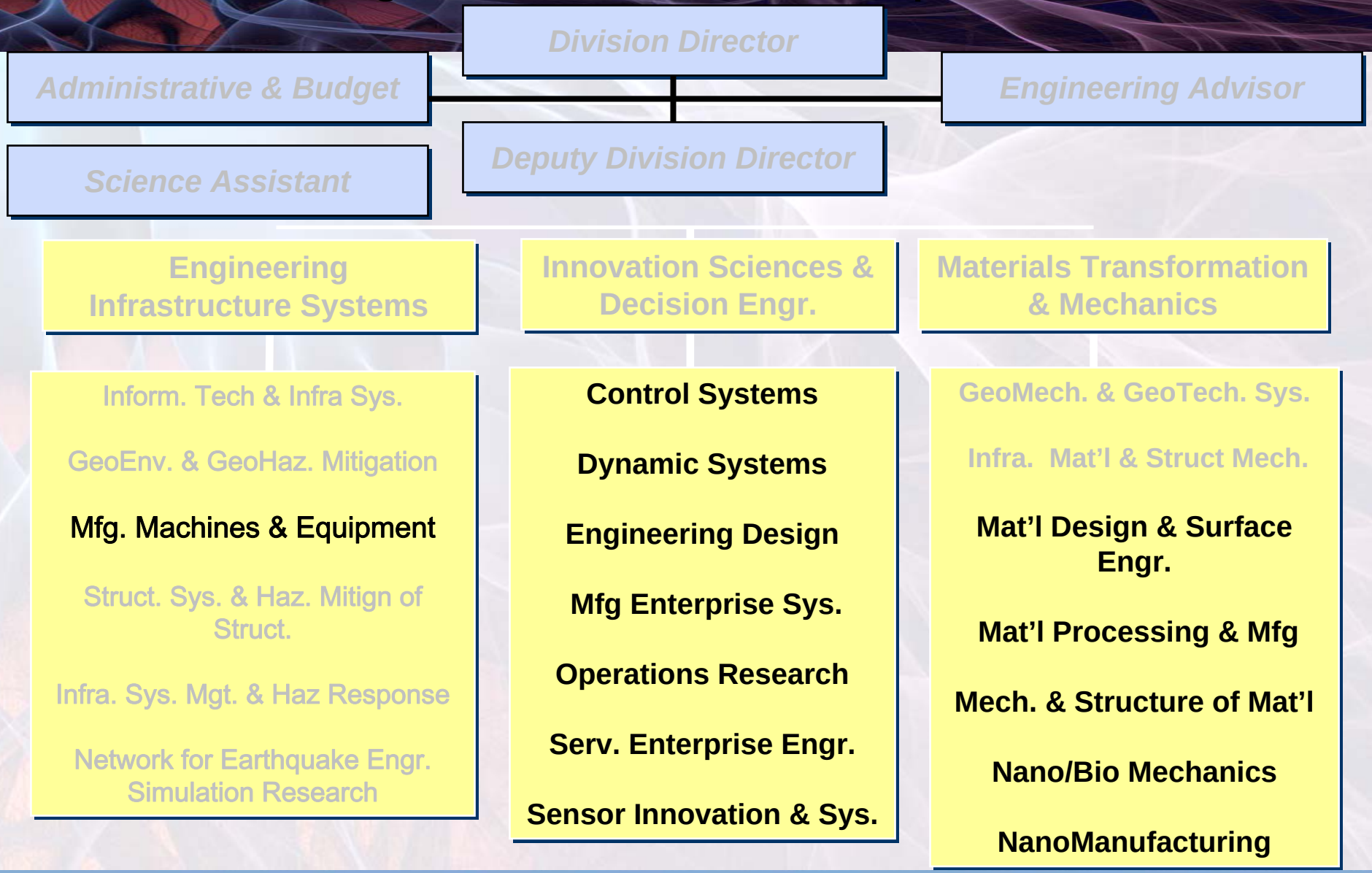
Engineering Infrastructure Systems	Innovation Sciences & Decision Engr.	Materials Transformation & Mechanics
Inform. Tech & Infra Sys.	Control Systems	GeoMech. & GeoTech. Sys.
GeoEnv. & GeoHaz. Mitigation	Dynamic Systems	Infra. Mat'l & Struct Mech.
Mfg. Machines & Equipment	Engineering Design	Mat'l Design & Surface Engr.
Struct. Sys. & Haz. Mitign of Struct.	Mfg Enterprise Sys.	Mat'l Processing & Mfg
Infra. Sys. Mgt. & Haz Response	Operations Research	Mech. & Structure of Mat'l
Network for Earthquake Engr. Simulation Research	Serv. Enterprise Engr.	Nano/Bio Mechanics
	Sensor Innovation & Sys.	NanoManufacturing

Resilient and Sustainable Infrastructures

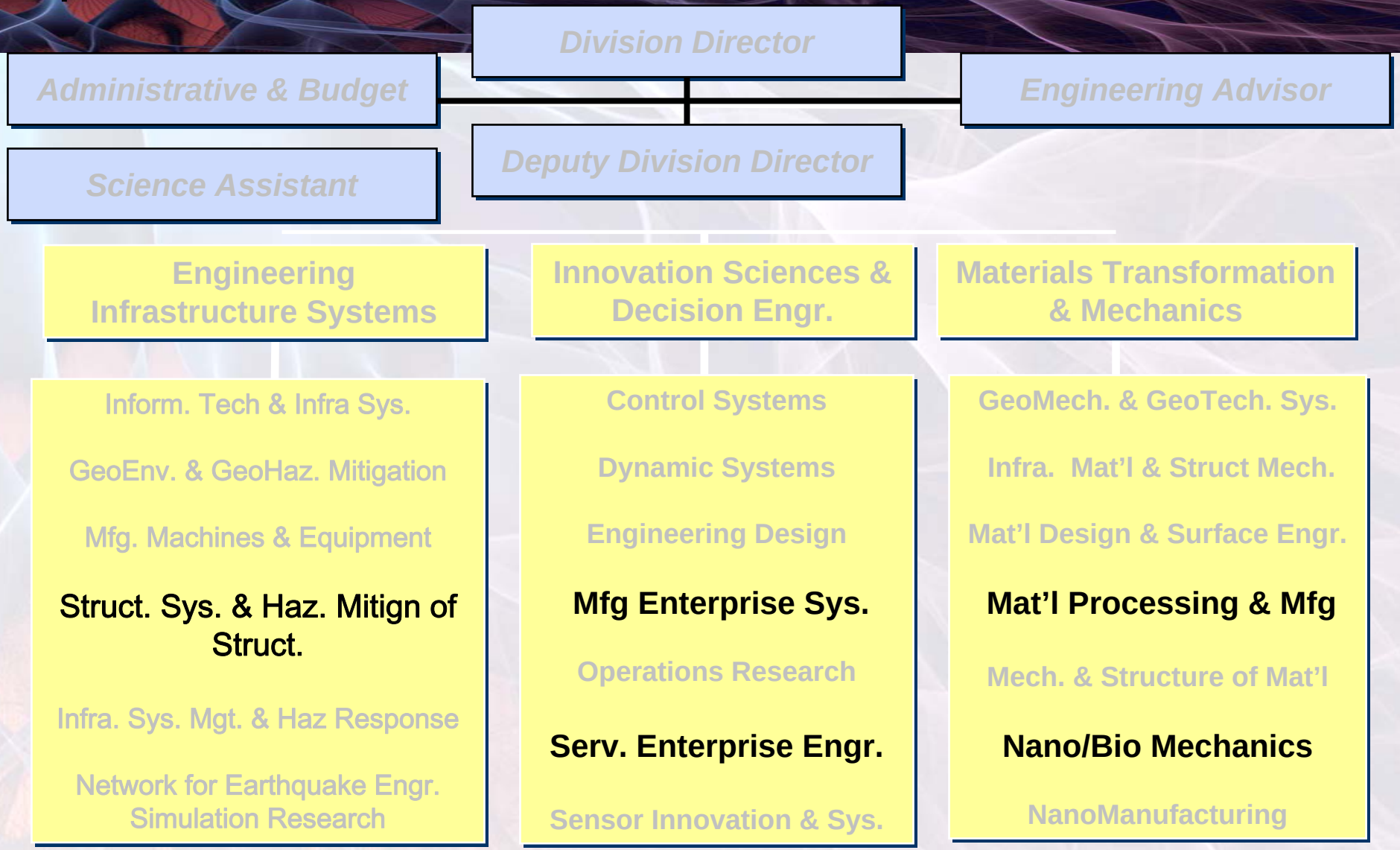


Engineering Infrastructure Systems	Innovation Sciences & Decision Engr.	Materials Transformation & Mechanics
Inform. Tech & Infra Sys.	**Control Systems**	**GeoMech. & GeoTech. Sys.**
GeoEnv. & GeoHaz. Mitigation	Dynamic Systems	**Infra. Mat'l & Struct Mech.**
Mfg. Machines & Equipment	Engineering Design	Mat'l Design & Surface Engr.
Struct. Sys. & Haz. Mitign of Struct.	Mfg Enterprise Sys.	Mat'l Processing & Mfg
Infra. Sys. Mgt. & Haz Response	Operations Research	Mech. & Structure of Mat'l
Network for Earthquake Engr. Simulation Research	Serv. Enterprise Engr.	Nano/Bio Mechanics
	Sensor Innovation & Sys.	NanoManufacturing

Manufacturing and Service Enterprises



Open PD Positions – Fall 2007

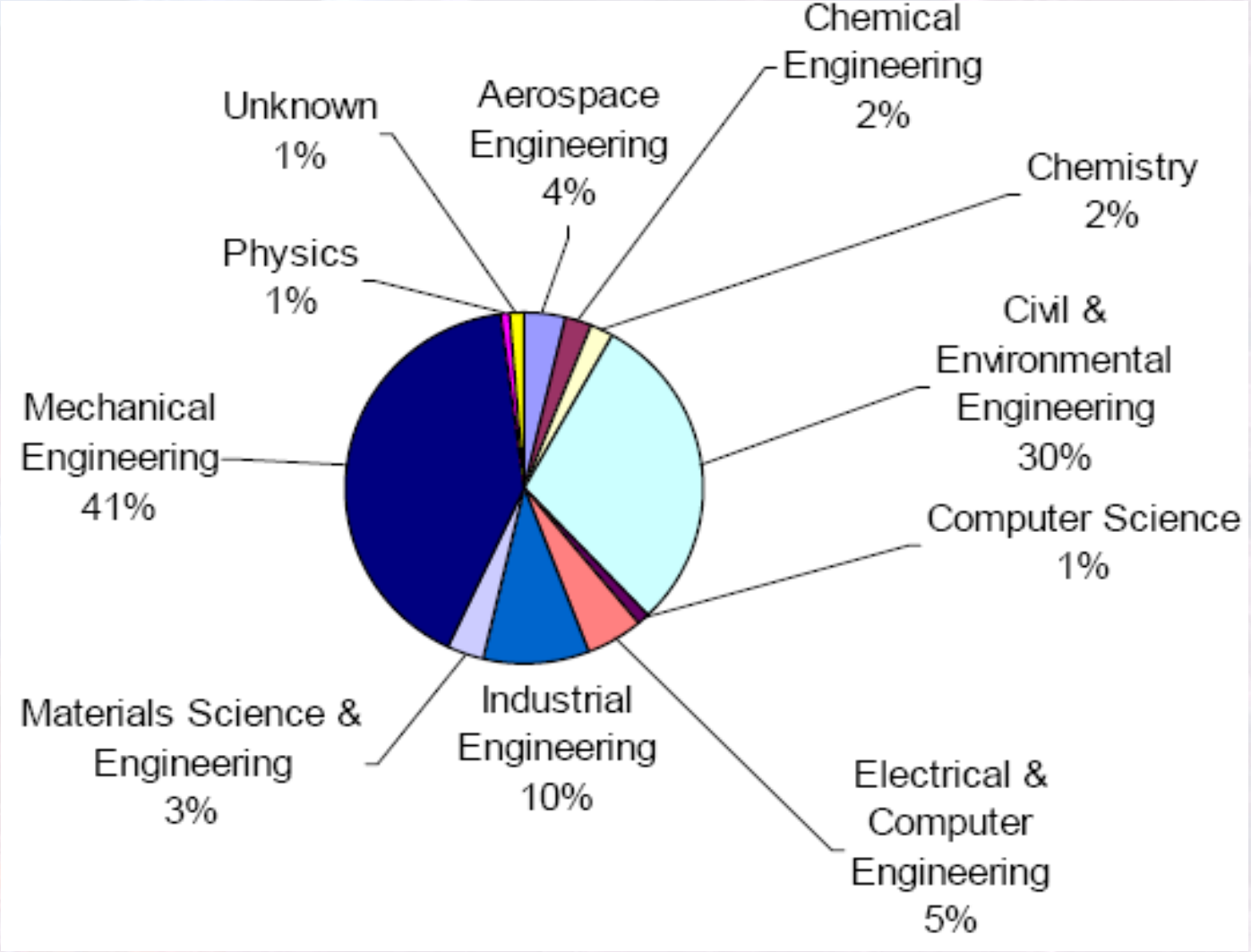


CMMI Research Communities

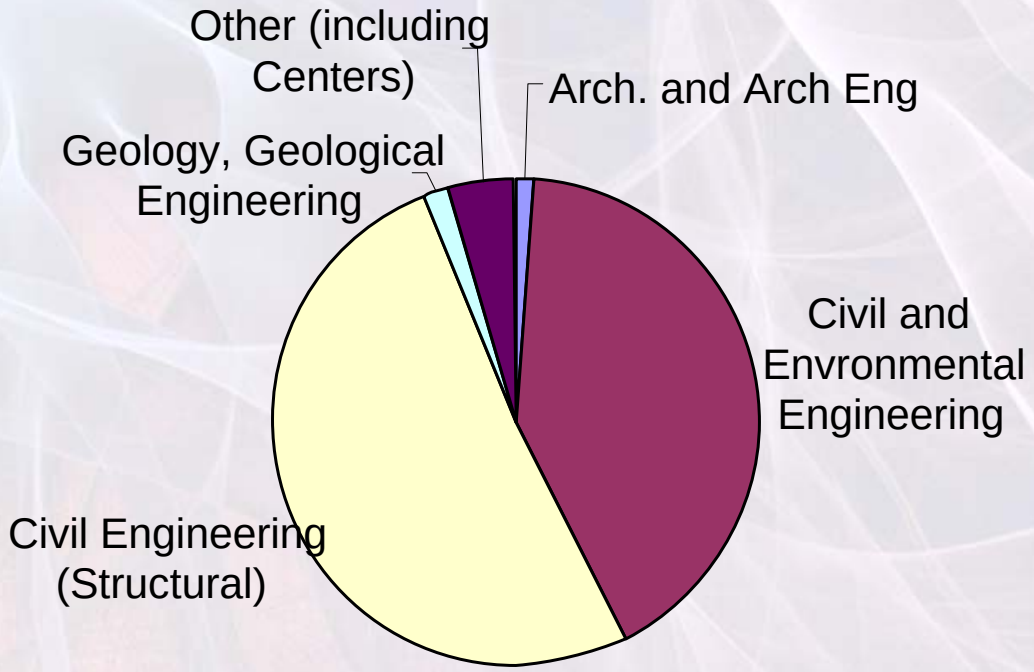
- CMMI's programs serve a diverse community
  - Associated Disciplines of PIs funded by CMMI in FY 2006
    - Mechanical Engineering
    - Civil Engineering (Structural & Environmental)
    - Industrial & Manufacturing Engineering
    - Materials Engineering/Science

CMMI Research Community

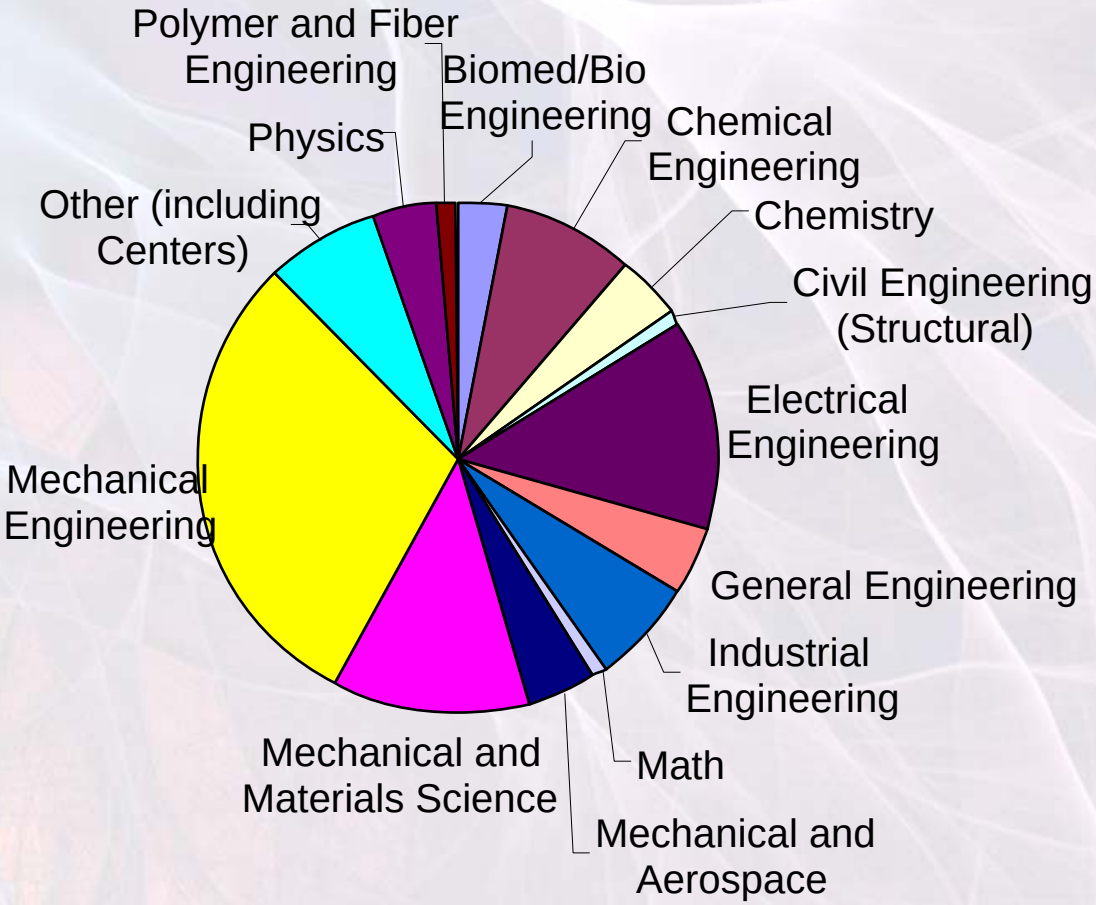
- Distribution of community based on submitted proposals



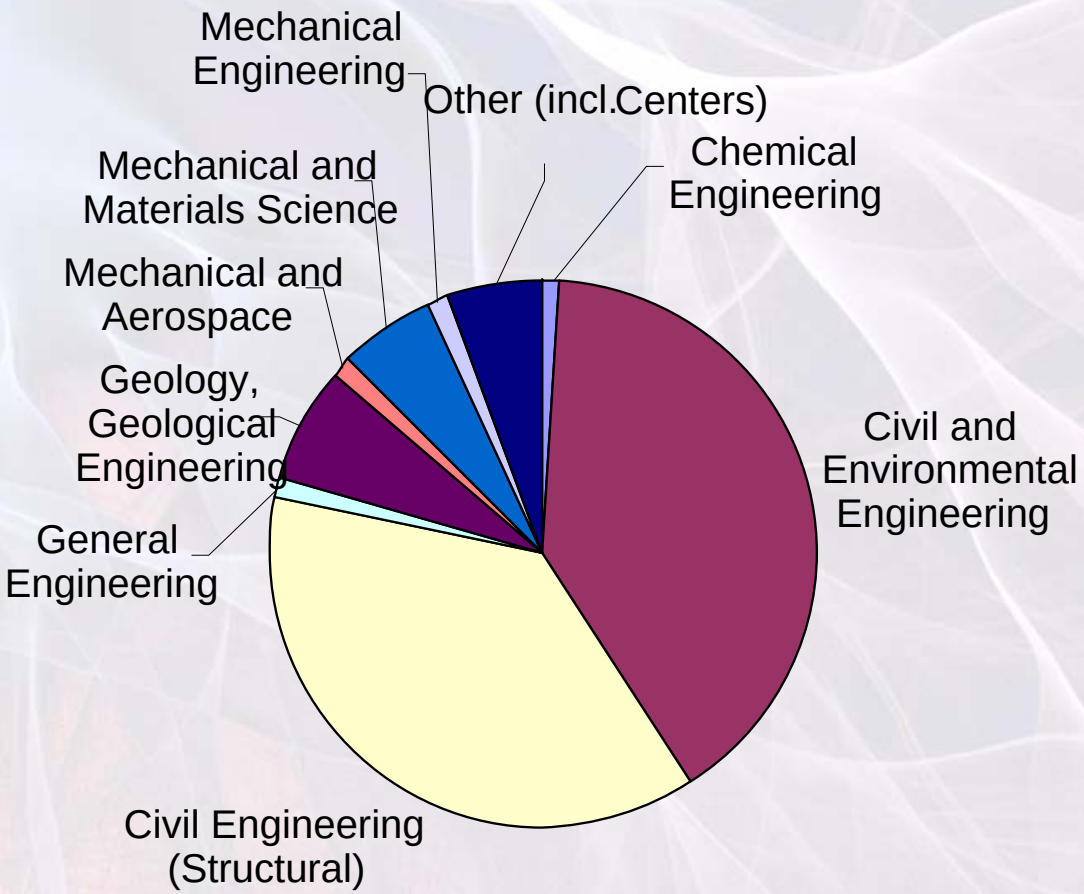
CMMI Program Communities - NEES



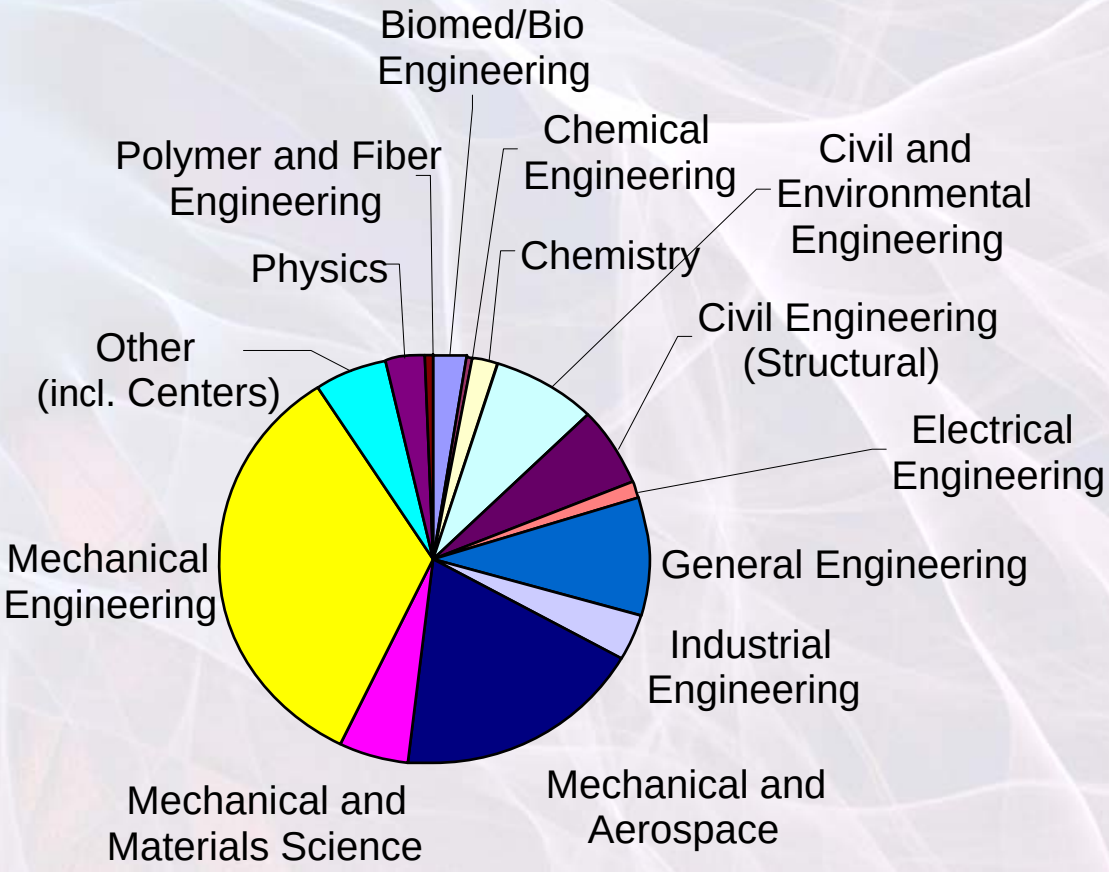
CMMI Program Communities - Nanomanufacturing



CMMI Program Communities
Geomechanics and Geotechnical Systems



CMMI Program Communities
Mechanics & Structures of Materials



CMMI Objectives: Discovery

- Foster emergence of new areas of research in fields of relevance to the Division
  - Conduct agenda-setting workshops each year
  - Choose emphasis areas annually
  - Invest in research in emphasis areas
  - Invest in research collaborations across disciplinary and geographical boundaries
  - Collaboration in Directorate/Foundation wide initiatives

CMMI Objectives: Learning

- Supporting REU/RET supplements
  - Will support REU supplements to have two students per grant provided one is a woman/minority/disabled
- Conducting proposal and research program development workshops
  - Emphasis given to outreach to EPSCoR states and underrepresented groups
- Mentoring of young faculty members
  - CMMI proposal review panels will strive to have at least 20 percent young faculty members
  - One biannual workshop to mentor minority faculty members
  - CMMI PDs: engage in day-to-day contact with PIs and prospective PIs
- Summer institutes for emerging technologies

CMMI Objectives: Research Infrastructure

- Maintain and further develop the George E. Brown Jr. Network for Earthquake Engineering Simulation (NEES) research
  - Supports operation of NEES facilities
  - Adheres to NSF objectives for large scale research infrastructure
- Support the establishment of extreme event databases
  - CMMI will provide funds for collection of perishable data on all important extreme events
    - e.g., post hurricanes, earthquakes, other catastrophic events

Dissemination & Outreach

- CMMI Grantees Conference
  - At CMMI Grantees Conference, all PIs will have opportunity to:
    - Display research
    - Make connections with other grantees
    - Hear about CMMI plans and initiatives
  - Sponsored every 18 months
  - Offers PIs Opportunity to meet the rest of the CMMI supported research community
  - Allows PDs to meet PIs that they support
  - Next conference January 2008 in Knoxville, TN

Summary & Next Steps

- Institutionalize processes & best practices
  - Web-based Knowledge Management – local policies, best practices
  - Training & mentoring for PDs
  - Recruitment and Succession plans
  - Workshop – integrate recommendations to strategy
- Programs & allocations
  - Constructed infrastructure (resilient and sustainable; multi-hazard)
  - Competitive manufacturing & service enterprises
  - Discipline-based frontier research
  - Cross-cutting frontier research (Complexity, SBES,..)
- Help advance research methodology & graduate student education
  - Innovative and disruptive technology development
  - Workshops for young faculty on how to develop research programs
- Develop metrics & leading indicators of success