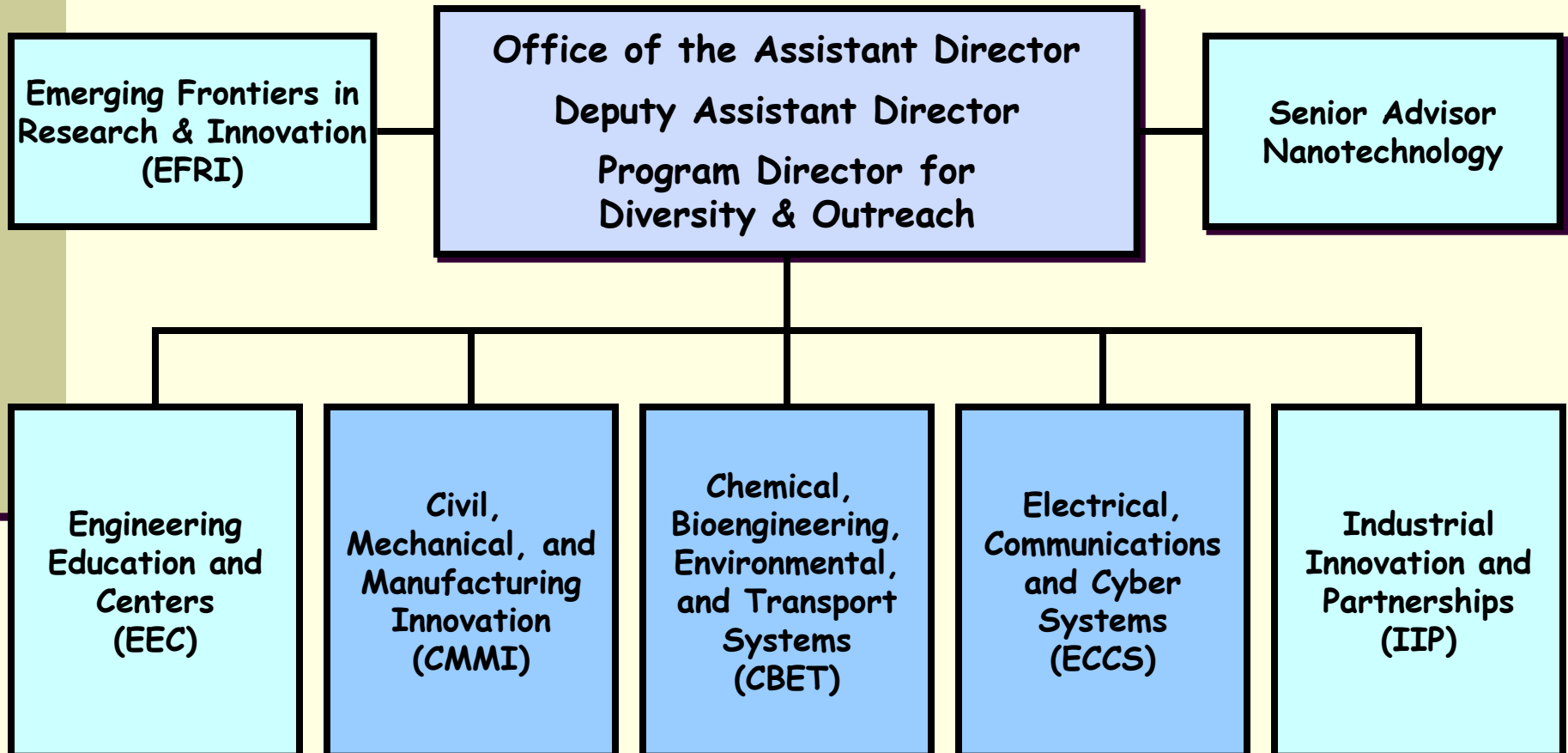


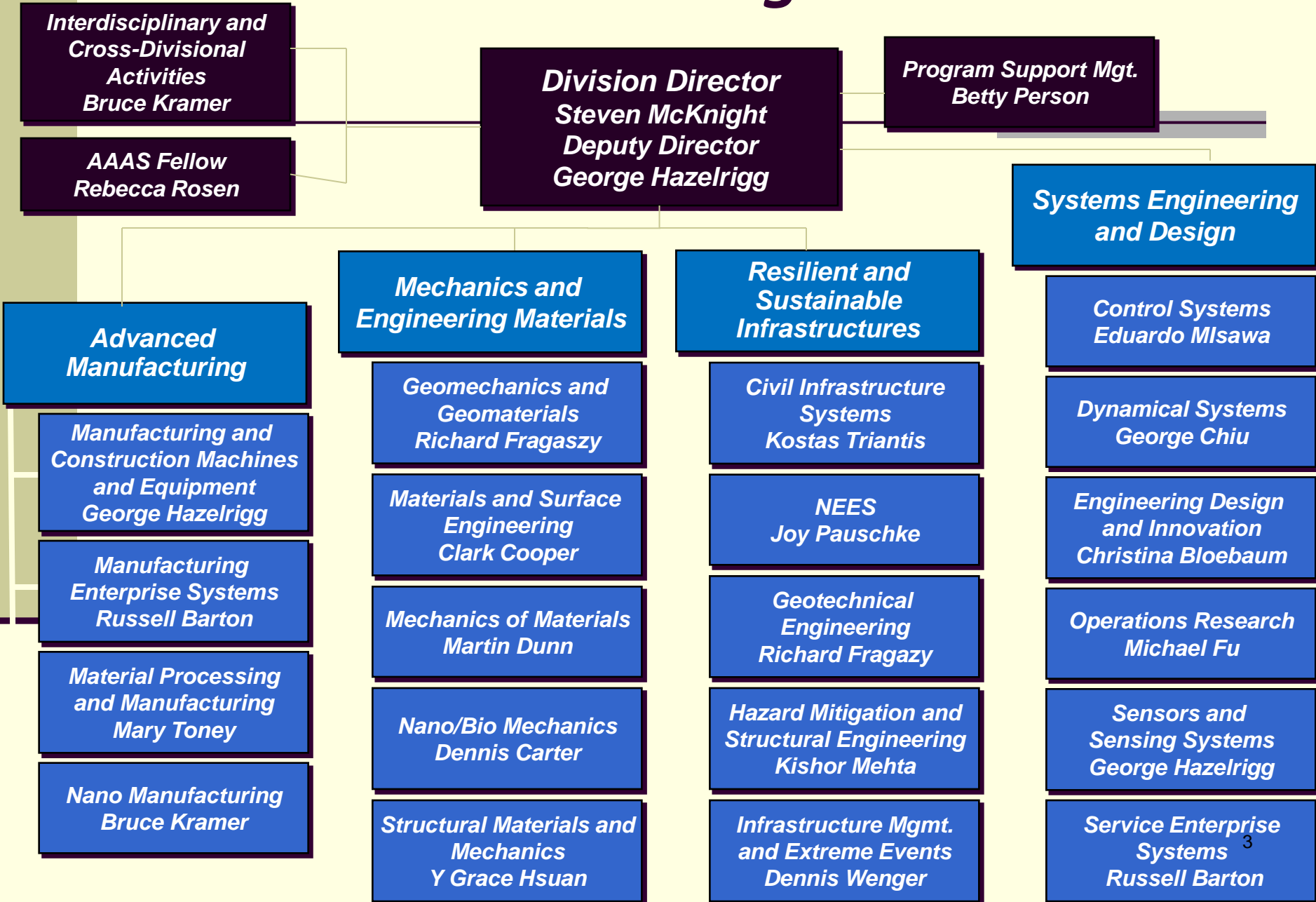
# Civil Infrastructure Systems Program (CIS)1631

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# Current CMMI Organization





# **CIVIL INFRASTRUCTURE SYSTEMS PROGRAM**

# Program Role and Priorities

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- The Civil Infrastructure Systems (CIS) program supports research to advance the engineering of high performing, resilient, and sustainable infrastructure systems and develop a diverse, young, multi-disciplinary research and education community.

# Program Role and Priorities

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- The program emphasizes the design, construction, operation, and improvement of infrastructure networks, with a focus on systems engineering and design, performance management, risk analysis, life-cycle analysis, modeling and simulation, with a key understanding of behavioral and social considerations not excluding other methodological areas or the integration of methods.

# Broader Context for Support of the Research Areas

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- Research in infrastructure systems is supported by a wide range of organizations. The applied research initiatives are provided by a wide range of federal (e.g., US DOT), state (State DOTs) and industry organizations (e.g., Ford Motor Company) support applied research initiatives.

# Broader Context for Support of the Research Areas

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- The CIS program focuses on basic research, which enables more effective system design and decision making. What makes this program unique among other federal agencies is that it is the only program that supports basic research and science in transportation and construction engineering.



# Major Topics Funded

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- ***Construction engineering*** that includes topics based on the application of information technology to construction operations, construction site safety, automation of construction processes, data modeling and visualization in construction operations, among others.

# Major Topics Funded

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- ***Infrastructure management*** that includes topics in life-cycle cost analysis, infrastructure resilience, infrastructure maintenance, network dynamics of civil engineering network systems, improvisational decisions and actions of construction workers, among others.

# Major Topics Funded

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- ***Transportation science and systems*** that includes transportation network modeling, transportation safety, intelligent transportation systems (ITS), traffic flow theory, traffic congestion mitigation, among others.

# Program Changes

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- Prior to 2010, the focus of the program was on information technology as it pertained to construction engineering and management and transportation systems.
- The current program officer has broadened the scope of the program considerably to encompass all civil infrastructure and has shifted the focus back to the fundamentals of science and engineering to enable the design and operation of high performing infrastructure systems.
- The program is in the initial stages of working with the community to define the fundamental knowledge gaps and emerging research opportunities.

# Key Collaborations

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- Within the RSI cluster (Infrastructure Management and Extreme Events (IMEE))
- Within CMMI
  - Structural Materials and Mechanics (SMM)
  - Service Enterprise Systems (SES)
  - Operations Research (OR)
  - Engineering Design and Innovation (EDI)
  - Dynamical Systems (DS)
  - Sensors and Sensing Systems (SSS)
- With CBET
  - Environmental Engineering (EE)
  - Environmental Sustainability (ES)
- With SBE
  - Economics
  - Decision, Risk and Management Science (DRMS)
- With CISE

# Future Directions and Program Strategy

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- Workshops
  - **Workshop on Complexity Science Applied to Coupled Infrastructure Systems; Workshop Dates:** June 3-4, 2012; **PI:** Terry L. Friesz. This workshop will employ new ideas from a branch of complexity science called “network science,” which describes the evolution of networks, including social networks, over time to inform infrastructure design.

# Future Directions and Program Strategy

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- Emerging Research Questions
  - For example:
    - How does the theory of systems engineering inform infrastructure design?
    - Does this lead to a further evolution of the science of infrastructure management?
    - How should uncertainty be considered and incorporated?

# Future Directions and Program Strategy

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- Program Assessment
  - Three workshops on defining research outcomes in Infrastructure Systems: Construction Engineering, Transportation Systems, and Infrastructure Management (Grantees Conference in July)



# Future Directions and Program Strategy

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- Broaden the research base of the program.
  - The infrastructure management area is given significant attention. With deteriorating infrastructure having risen rapidly on the national agenda, this component of the program will be enhanced.
  - Engineering solutions that emphasize systems solutions that are supported by measurement science along with behavioral/social science considerations are being sought.

# Future Directions and Program Strategy

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- Broaden the research community by soliciting involvement from other engineering disciplines along with the participation of the social, behavioral and economic sciences.
- Encourage participation of research programs that cut across NSF.
- Initiate and invest in joint research efforts with other government agencies (e.g. HUD, US DOT, other).

# Backup Slides

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# Program Description

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- The Civil Infrastructure Systems (CIS) program supports research leading to the engineering of infrastructure systems for ***resilience and sustainability*** without excluding other key performance issues.

# Program Description

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- Areas of interest include intra- and inter- physical, information and behavioral dependencies of infrastructure systems, ***infrastructure management, construction engineering, and transportation systems.***

# Program Description

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- Special emphasis is on the design, construction, operation, and improvement of infrastructure networks with a focus on systems engineering and design, performance management, risk analysis, life-cycle analysis, modeling and simulation, behavioral and social considerations not excluding other methodological areas or the integration of methods.

# Program Description

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- This program does not encourage research proposals primarily focused on structural engineering, materials or sensors that support infrastructure system design, extreme event modeling, hydrological engineering, and climate modeling, since they do not fall within the core of the CIS program.

# Program Description

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- Researchers focused in these areas are encouraged to contact the Infrastructure Management and Extreme Events (IMEE), Geotechnical Engineering (GTE), Hazard Mitigation and Structural Engineering (HSME), Structural Materials and Mechanics (SMM), or the Sensors and Sensing Systems (SSS) program within CMMI. Additionally, researchers may consider contacting the Hydrologic Sciences program in the Earth Sciences Division (EAR) or the Physical and Dynamic Meteorology (PDM) program in the Atmospheric and Geospace Sciences Division (AGS) of the Directorate for Geosciences.