Engineering Investments
at the
National Science Foundation

George A. Hazelrigg
Acting Division Director
Division of Civil, Mechanical and Manufacturing Innovation
Directorate for Engineering
ASEE – ERC Meeting, March 5, 2013
ENG recognizes Director Subra Suresh

- New models for global engagement (SAVI, GROW..)
- OneNSF philosophy and new paradigms for cross-disciplinary interactions (INSPIRE)
- Addressing national priorities and global challenges
- Support of major infrastructure projects
- Nurturing and expanding the innovation ecosystem
- Principled commitment to human capital development and broadening participation
ENG welcomes Pramod Khargonekar as Assistant Director

- Department of Energy Advanced Research Projects Agency-Energy (ARPA-E)
  - Deputy Director for Technology
- University of Florida
  - Eckis Professor of Electrical and Computer Engineering
  - Dean, College of Engineering
- University of Michigan
  - Claude E. Shannon Professor of Engineering Science
  - Chair, Department of Electrical Engineering and Computer Science
NSF is creating a New Strategic Plan

- Strategic planning cycle
  - Plan for 5 years
  - Revise in 3 years
- Community input in spring 2013
Engineering Strategic Goals

• Lead in frontier engineering research
• Cultivate an innovation ecosystem
• Develop the next-generation engineer
• Strive for organizational excellence
NSF Principles for Budget Planning

• Protect commitments to NSF’s core mission and existing awards
• Protect NSF workforce
• Protect STEM human capital development
Engineering prioritizes research critical to the Nation’s Challenges

- National Priorities
  - National Nanotechnology Initiative
  - National Robotics Initiative

- OneNSF Initiatives
  - Advanced Manufacturing
  - Communications and Cyberinfrastructure
  - Education and Workforce
  - Interdisciplinary Research
  - Sustainability and Clean Energy
  - Innovation Ecosystem
National Nanotechnology Initiative

• The directorate will continue support for
  – nanomaterials and nanodevices
  – nanosystems
  – nanomanufacturing
  – environment, health, and safety

• ENG will direct additional funds towards three Signature Initiatives
  – Nanoelectronics for 2020 and Beyond
  – Sustainable Nanomanufacturing
  – Nanotechnology for Solar Energy Collection and Conversion

FY 2013 Request
$174 M
National Robotics Initiative

- ENG will support
  - Assistive mechanisms for those with physical disabilities and/or cognitive impairments
  - Systems integration that enables ubiquitous, advanced robotics to be realized
  - Next-generation robotics for manufacturing, healthcare and rehabilitation, surveillance and security, education and training, and transportation

FY 2013 Request
$10 M
ENG collaborates through OneNSF
ENG will be a major contributor to Advanced Manufacturing

- **Advanced Manufacturing**
  ENG will support multi-scale modeling, nanomanufacturing, and complex engineering systems design

- **Cyber-Enabled Materials, Manufacturing, and Smart-Systems (CEMMSS)**
  ENG will invest in breakthrough materials and design, advanced techniques and processes, and smart systems

- **Research at the Interface of the Biological, Mathematical, and Physical Sciences, and Engineering (BioMaPS)**
  ENG will focus on nanoscale biosensing, neuro-engineering, cellular biomechanics, metabolic engineering, and engineering aspects of synthetic biology

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<td>FY 2013 Request</td>
<td>$110 M for CEMMSS</td>
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<td>FY 2013 Request</td>
<td>$5 M for BioMaPS</td>
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ENG will strategically support better Communications and Cyberinfrastructure

- **Enhancing Access to the Radio Spectrum (EARS)**
  ENG will prioritize research on more efficient radio spectrum use and energy-conserving device technologies

- **Cyberinfrastructure for the 21st Century (CIF21)**
  The ENG investment will focus on cyber–physical systems, engineering modeling and simulation, smart networks, and sensors

- **Secure and Trustworthy Cyberspace (SaTC)**
  ENG support will focus on the engineering aspects of the Networking and Information Technology Research and Development (NITRD) strategic plan

- **FY 2013 Request**
  - $14 M for EARS
  - $11 M for CIF21
  - $4 M for SaTC
Education and Workforce

• The directorate emphasizes support for
  – Expeditions in Education (E²)
  – CAREER awards
  – Activities that promote the entry and retention of veterans and other non-traditional students in engineering programs
  • STEP awards through public-private partnership in FY 2013

FY 2013 Request
$1 M for E²

FY 2013 Request
$53 M for CAREER
NSF Investments in Workforce

Primary focus: Enhancements to Flow

• K-12 pre-college programs
  – EHR, EEC, RET

• Recruitment of undergraduates
  – GI Bill, PEEC, STEP awards for retention

• Encouragement to pursue graduate degrees
  – REU

• Support during graduate studies
  – GRF, IGERT

• Support for transition to career
  – BRIGE, CAREER
Graduate Research Opportunities Worldwide (GROW)

- Launched December 5, 2012
- Expands opportunities for U.S. graduate students to engage in international research collaboration
- Hosted by a science agency in a partner country in Europe or Asia for a period of three to 12 months
- Currently open only to active Fellows of the Graduate Research Fellowship Program (GRFP)
Science Across Virtual Institutes (SAVI)

• Create a uniform platform for International Collaborations between NSF-funded US researchers and other institutions around the world.

• Facilitate collaboration among scientists, engineers and educators across the globe to help solve society's most vexing problems.

• New ENG Virtual Institution in FY 2013
  – Disciplinary Engagement in Demanding STEM Learning Environments across Cultures and Settings
  – Oregon State University, University of Washington, and Finland
ENG will continue its long-standing support for Interdisciplinary Research

- **INSPIRE (Integrated NSF Support Promoting Interdisciplinary Research and Education)**
  ENG will support creative, important research collaborations between disciplines that may lead to new opportunities

- **Emerging Frontiers of Research and Innovation (EFRI)**
  ENG will provide strategic support for fundamental research that may overcome scientific and/or national challenges and lead to breakthrough technologies

FY 2013 Request
$6 M for INSPIRE

FY 2013 Request
$32 M for EFRI
ENG will invest heavily in Sustainability and Clean Energy

• Science, Engineering, and Education for Sustainability (SEES)
  ENG’s investment will focus on sustainable research networks, sustainable chemistry, and human dimensions

• Clean Energy Technologies
  ENG will support novel research for smart grid technologies, solar energy technologies, biofuels and bioenergy, wind energy generation, and renewable energy storage

FY 2013 Request
- $20 M for SEES
- $128 M for Clean Energy
ENG will invest strategically in the Innovation Ecosystem

- **Innovation Corps (I-Corps)**
  The ENG investment will provide mentoring and resources to help determine the commercial readiness of technology built on NSF-funded basic research

- **Partnerships for Innovation**
  - ENG support for Accelerating Innovation Research (AIR) will foster connections with an existing NSF innovation research alliance
  - ENG support for Building Innovation Capacity (BIC) will enable collaboration between academia and business to advance basic research for market-accepted innovations

FY 2013 Request
- $6 M for I-Corps
- $23 M for PFI
Research Centers

• Engineering Research Centers (ERCs)
  – First Nanosystems ERCs joined 17 other ERCs

• Science and Technology Centers (STCs)
  – CBET will continue supporting the Center on Emergent Behaviors of Integrated Cellular Systems
  – ECCS will continue supporting the Center for Energy Efficient Electronics Science

FY 2013 Request
$69 M for ERCs

FY 2013 Request
$10 M for STCs
NSF ENG Organization, at present

Emerging Frontiers in Research and Innovation (EFRI)
Rose Wesson

Senior Advisor for Nanotechnology
Mihail Roco

Office of the Assistant Director
Kesh Narayanan, Assistant Director (Acting)
Steven McKnight, Deputy Assistant Director (Acting)

Strategic Planning and Operations
Cheryl Albus

Evaluation & Assessment
Alexandra Medina-Borja

Engineering Education and Centers (EEC)
Theresa Maldonado

Chemical, Bioengineering, Environmental, and Transport Systems (CBET)
Sohi Rastegar (Acting)

Civil, Mechanical, and Manufacturing Innovation (CMMI)
George Hazelrigg (Acting)

Electrical, Communications, and Cyber Systems (ECCS)
Robert Trew

Industrial Innovation and Partnerships (IIP)
Grace Wang
NSF ENG Organization, on March 11

Office of the Assistant Director
Pramod Khargonekar, Assistant Director
Kesh Narayanan, Deputy Assistant Director

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ENG and SBIR/STTR Budgets ($M)
OneNSF

catalyze human capital development

improve organizational efficiency

create networks and infrastructure for the nation

spark greater innovation and opportunity for scientific discoveries

address multidisciplinary challenges of national/global significance

support fundamental research in all disciplines
Questions