

**Engineering Investments
at the
National Science Foundation**

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Acting Division Director

Division of Civil, Mechanical and Manufacturing Innovation

Directorate for Engineering

ASEE – ERC Meeting, March 5, 2013



ENG recognizes Director Subra Suresh

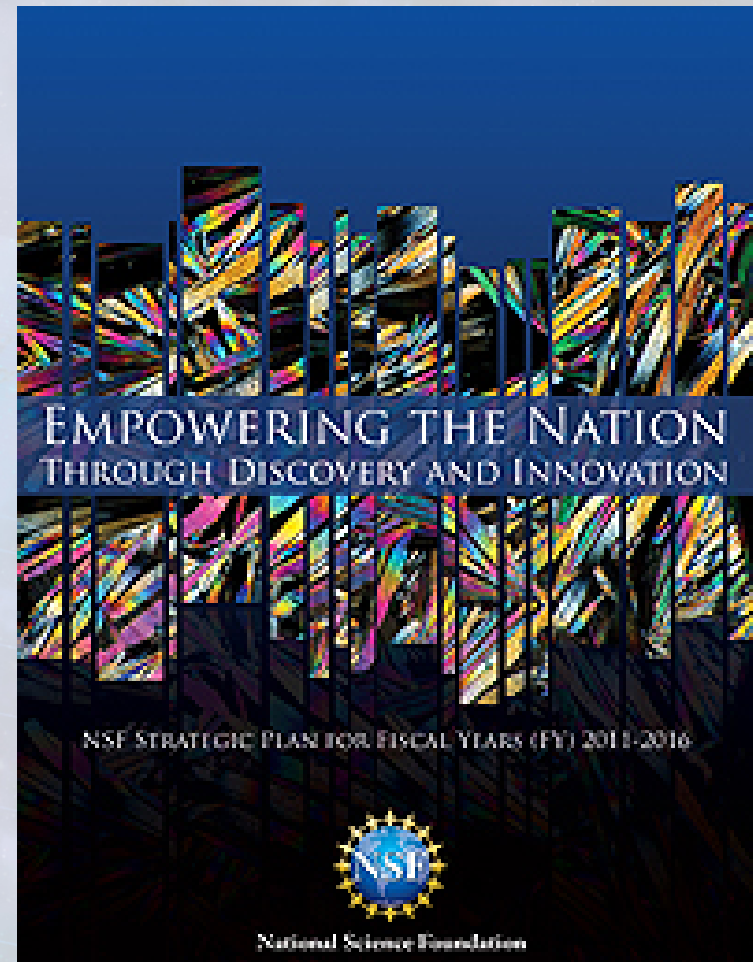
- New models for global engagement (SAVI, GROW..)
- OneNSF philosophy and new paradigms for cross-disciplinary interactions (INSPIRE)
- Addressing national priorities and global challenges
- Support of major infrastructure projects
- Nurturing and expanding the innovation ecosystem
- Principled commitment 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

FY 2013 Request
\$68 M for Adv.
Manu.

- **Cyber-Enabled Materials, Manufacturing, and Smart-Systems (CEMMSS)**

ENG will invest in breakthrough materials and design, advanced techniques and processes, and smart systems

FY 2013 Request
\$110 M for
CEMMSS

- **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

FY 2013 Request
\$5 M for
BioMaPS

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

FY 2013 Request
\$14 M for EARS

- **Cyberinfrastructure for the 21st Century (CIF21)**

The ENG investment will focus on cyber–physical systems, engineering modeling and simulation, smart networks, and sensors

FY 2013 Request
\$11 M for CIF21

- **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
\$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

FY 2013 Request
\$6 M for
INSPIRE

- **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
\$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

FY 2013 Request
\$20 M for SEES

- **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
\$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

FY 2013 Request
\$6 M for I-Corps

- **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
\$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**

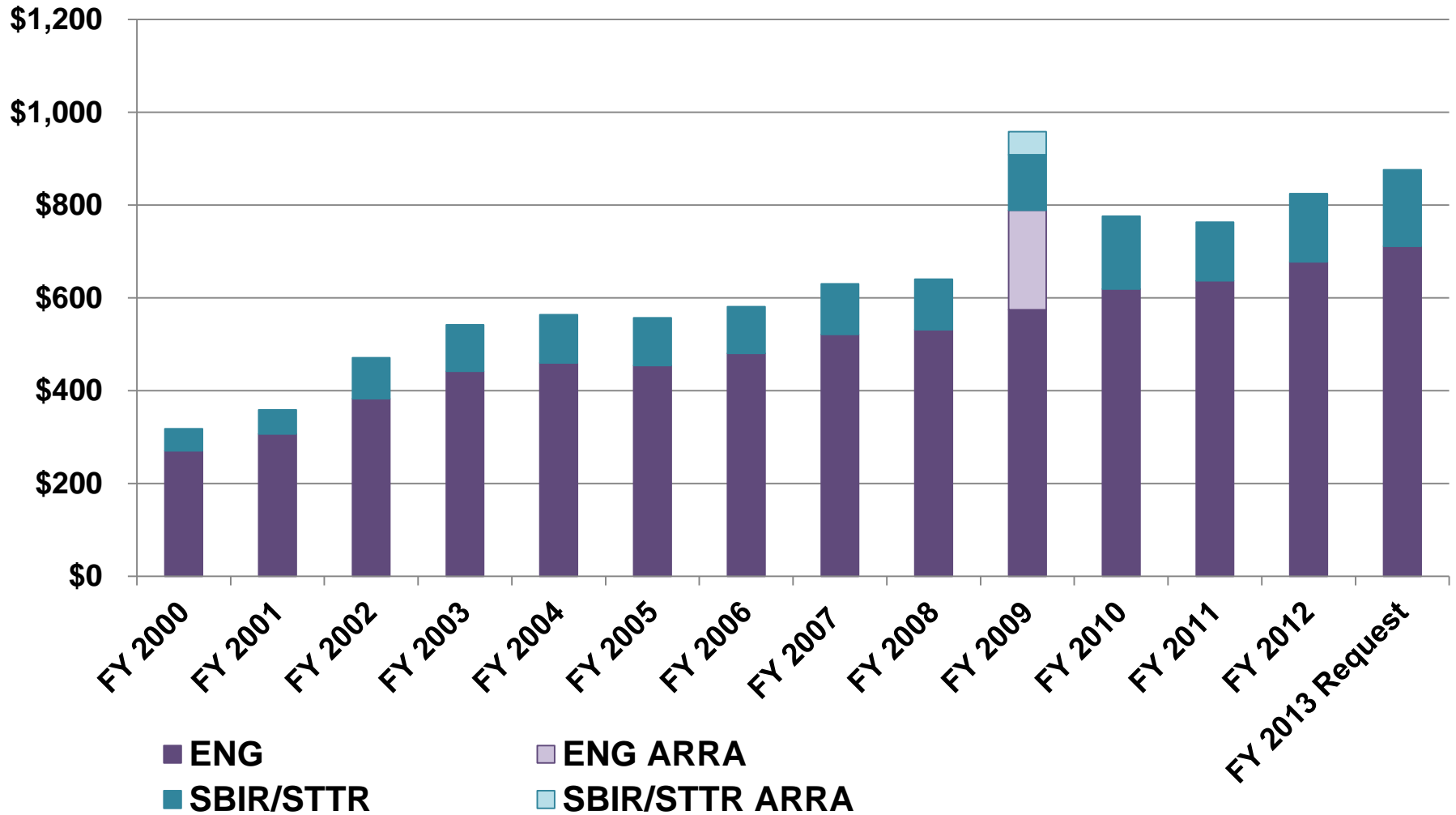
NSF ENG Organization, at present



NSF ENG Organization, on March 11



ENG and SBIR/STTR Budgets (\$M)





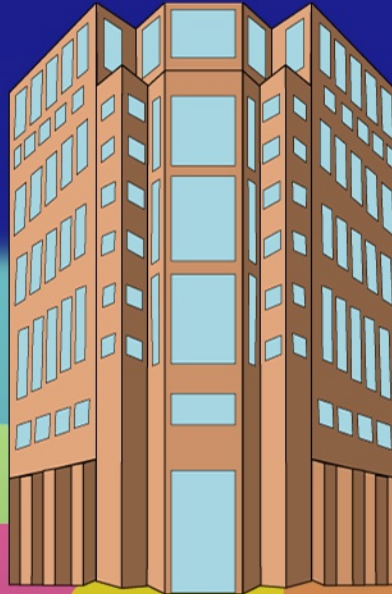
OneNSF



catalyze human capital development



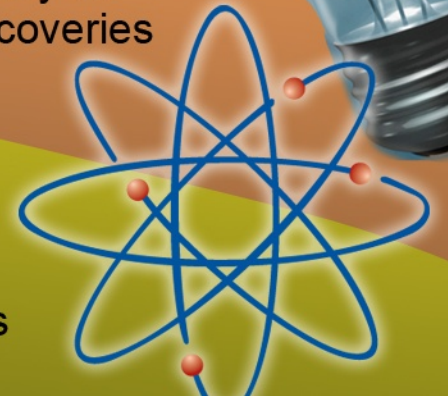
improve
organizational
efficiency



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