

NATIONAL
SCIENCE
FOUNDATION

FISCAL
YEAR
2016

BUDGET
REQUEST



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Assistant Director for Engineering

February 2, 2015

The Directorate for Engineering

Investing in
engineering research
and education and
fostering innovations
for benefit to society

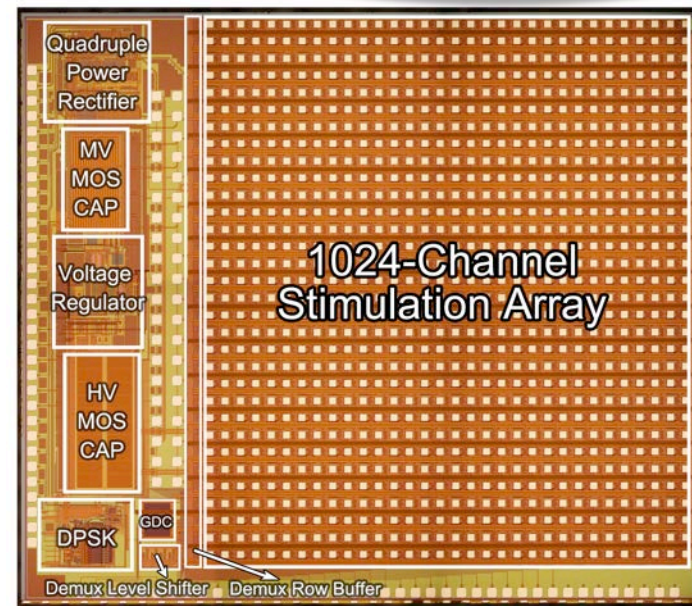
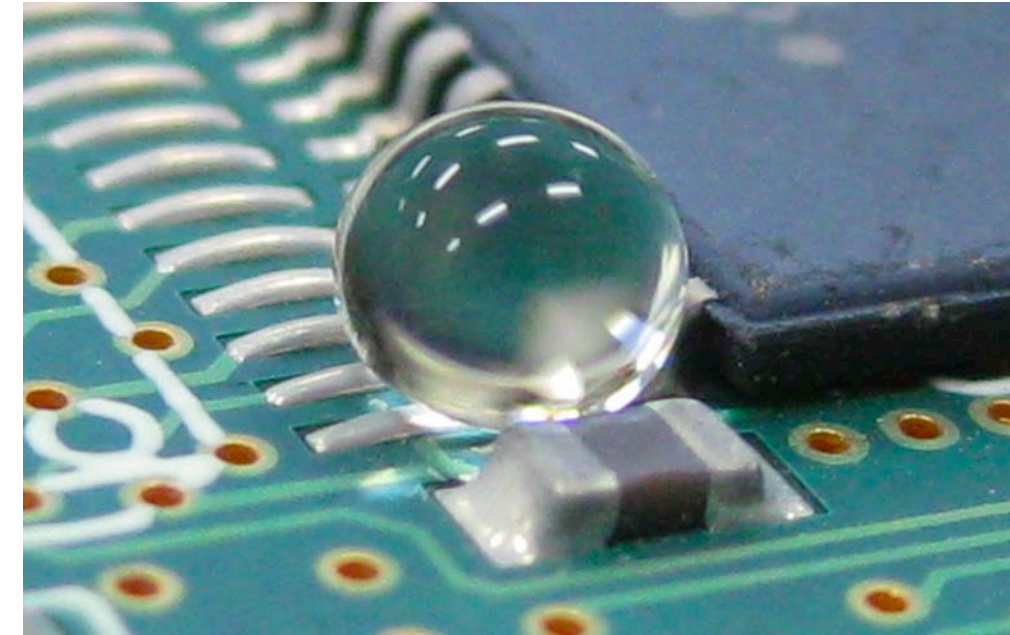
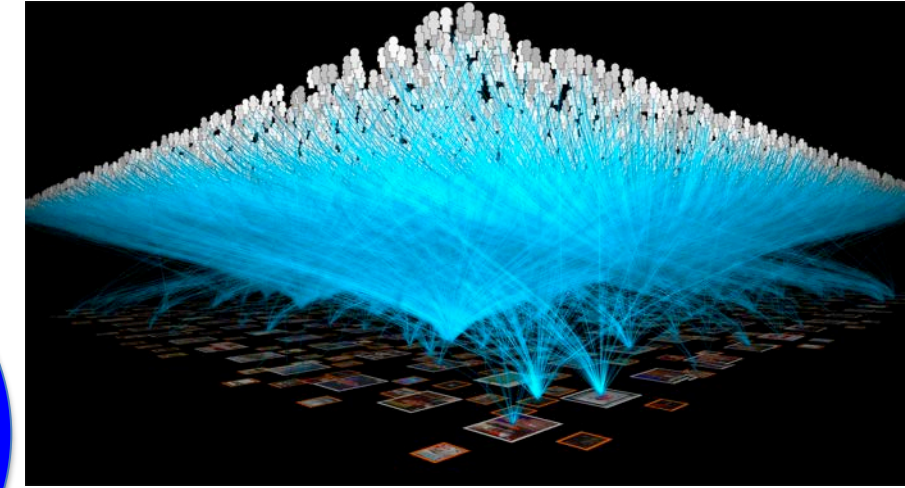
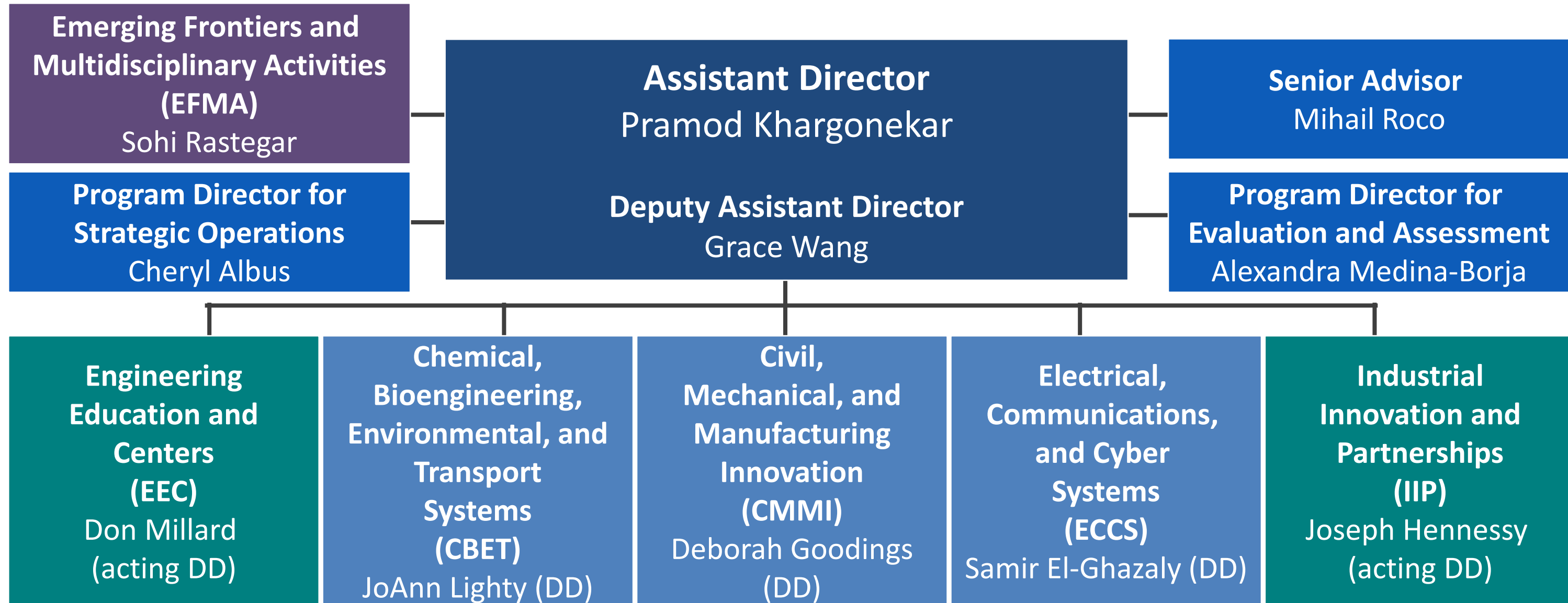


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Directorate for Engineering (ENG)



ENG R&RA Budget (\$M)

	FY 2014 Actual*	FY 2015 Estimate	FY 2016 Request	Change over FY 2015 Estimate	
				Amount	Percent
CBET	\$167.76	\$177.82	\$192.26	\$14.44	8.1%
CMMI	195.23	209.52	222.73	13.21	6.3%
ECCS	100.37	110.43	119.24	8.81	8.0%
EEC	119.50	117.49	110.39	-7.10	-6.0%
IIP	205.99	226.98	248.11	21.13	9.3%
<i>SBIR/STTR</i>	159.99	177.11	194.36	17.25	9.7%
EFMA	44.27	50.07	56.49	6.42	12.8%
ENG TOTAL	\$833.12	\$892.31	\$949.22	\$56.91	6.4%

* FY 2014 actuals were adjusted to reflect EFMA reallocations in order to facilitate comparison across fiscal years.



ENG Initiatives and Priorities Address National Interests

- **Innovations at the Nexus of Food, Energy, and Water Systems**
- **Risk and Resilience**
- Cyber-Enabled Materials, Manufacturing, and Smart Systems
 - Advanced Manufacturing
- **Understanding the Brain**
- National Nanotechnology Initiative
- Optics and Photonics
- Education and Broadening Participation
 - IUSE: Improving Undergraduate Science and Engineering
 - **INCLUDES: Inclusion across the Nation of Communities of Learners that have been Underrepresented for Diversity in Engineering and Science**
- Innovation Corps

Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS)

\$13M

Supports fundamental engineering research to

- Understand, model, and design coupled food-energy-water systems
- Create and advance engineering solutions for more efficient use of resources within the water-food-energy nexus
- Advance the sustainability, safety and security of food, energy, and water resources, and the systems that facilitate their generation, distribution, and consumption

Risk and Resilience

\$17M

- Critical Resilient Interdependent Infrastructure Systems and Processes (CRISP)

- Improves the resilience, interoperation, performance, and readiness of critical infrastructure
 - Advances knowledge of risk assessment and predictability
 - Supports the creation of novel tools, technologies, and engineered systems solutions for increased resilience
- CRISP: jointly supported by ENG, CISE, and SBE
 - Enhances the understanding and design of interdependent critical infrastructure systems and processes that provide essential goods and services, both under normal conditions and despite disruptions and failures from any cause

Advanced Manufacturing

\$80M

- Enables new capacity for U.S. manufacturing by emphasizing research on:
 - Cyber-enabled, adaptive, agile, and distributed manufacturing for the “Factory of the Future”
 - Nanosystems design and scalable nanomanufacturing
 - Advanced biomanufacturing

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

\$108M

- ENG will focus on breakthrough materials, advanced manufacturing, robotics, and cyber-physical systems
 - materials discovery, property optimization, systems design and optimization, certification, manufacturing and deployment
 - research on the networked integration of manufacturing machines, equipment, and systems into an increasingly accessible manufacturing service infrastructure
 - electronic, mechanical, computing, sensing devices and systems, controls, and intelligent systems that enable ubiquitous, advanced robotics to be realized
 - intelligent decision-making algorithms and hardware into physical systems

Understanding the Brain

\$17M

- Focuses on the President's BRAIN Initiative
 - Drives integration across scales and disciplines
 - Accelerates the development of novel experimental and analytical approaches, including computational and data-enabled modeling, and new neurotechnologies
- Advances optogenetic mapping and stimulation of the brain, noninvasive or minimally invasive imaging and sensing technologies, neuroprosethetics for neuron repair or regeneration, and brain-inspired devices and technologies

National Nanotechnology Initiative (NNI)

\$169M

- Foundational nanotechnology research in electronics and photonics, advanced materials and manufacturing, bio- and neurotechnology, and nano-EHS.
- Emerging research areas: controlled self-assembly; nanomodular materials and systems by design; novel aspects of semiconductors, nanophotonics and plasmonics; and nanotechnology for water-energy-food processes
- NNI Signature Initiatives: sustainable nanomanufacturing, nanoelectronics for 2020, nanotechnology for energy, knowledge infrastructure, and sensors
- Research infrastructure including the National Nanotechnology Coordinated Infrastructure (NNCI) and Network for Computational Nanotechnology (NCN)
- Technology translation and collaboration with industry, especially in nanomanufacturing, through partnership activities

Optics and Photonics

\$114M

- Advances in optical communication devices, novel optical sources and photodetectors, photonic integrated circuits, single-photon quantum devices, and nanophotonics
- Research in high-speed optical communications for environmental and biomedical research
- Collaboration with MPS

Clean Energy Technology

\$141M

- Invests in fundamental research related to clean energy technologies, including:
 - Solar energy, wind energy, energy harvesting, and other forms of sustainable energy generation
 - Biofuels and bioenergy
 - Energy storage and smart grid technologies
 - Energy efficiency, systems engineering and optimization for energy
- A significant portion of the NSF SBIR/STTR portfolio is related to clean energy technology

Education and Career Development

- The Directorate strategically invests in
 - CAREER awards
 - NSF Research Traineeship (NRT) and Integrative Graduate Education and Research Traineeships (IGERT) programs
 - New approaches to address engineering education challenges, in connection with Improving Undergraduate STEM Education (IUSE)
 - ENG Professional Formation of Engineers (PFE) supports research and development for interventions that improve both the quality and quantity of engineering graduates

**\$52M for
CAREER**

**\$3M for
NRT**

**\$6M for
IUSE**

INCLUDES: Inclusion across the Nation of Communities of Learners that have been Underrepresented for Diversity in Engineering and Science

- Goal: To mobilize STEM research and education communities for scalable solutions to broadening participation challenges
 - Specific inspirational targets - community-driven selection
 - Two evidence based pilots:
 - Networks for STEM Excellence
 - Empowering ALL Youth for STEM
 - Coherent expansion of discipline-based BP efforts
 - Engagement of other stakeholders
- ENG will align its investments to increase participation of underrepresented groups with the NSF-wide INCLUDES effort

**\$1.4M for
INCLUDES**

Innovation Corps (I-Corps™)

- Provides experiential entrepreneurial education to capitalize on NSF investments in basic research
- Supports I-Corps™ Teams, Sites, and Nodes to further build, utilize, and sustain a national innovation ecosystem
- Plans to support approximately 220 new I-Corps™ Teams, up to 20 active Sites, and up to 7 active Nodes

**\$30M from
NSF**

**\$13M from
ENG**

The Directorate for Engineering

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