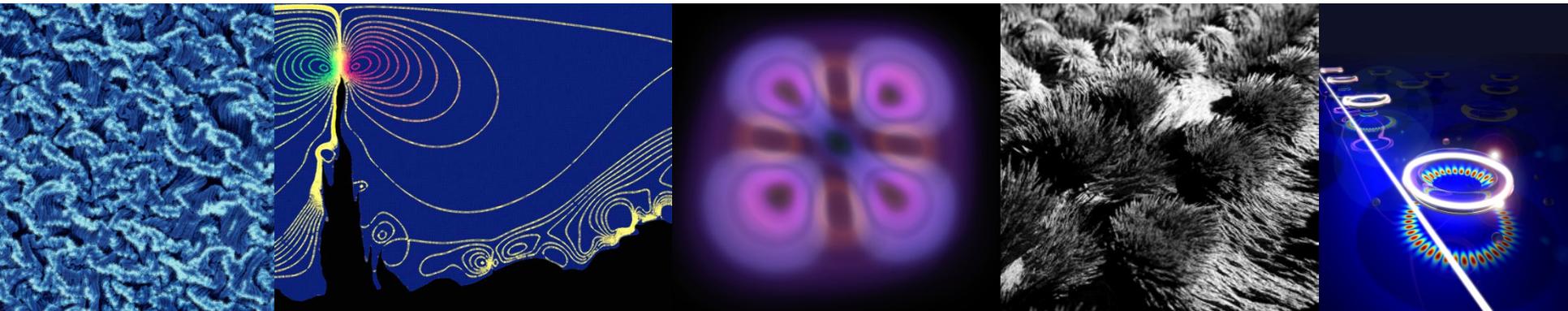


# NSF Directorate for Engineering

Hao Ling

NSF Grants Conference  
November 14 – 15, 2016

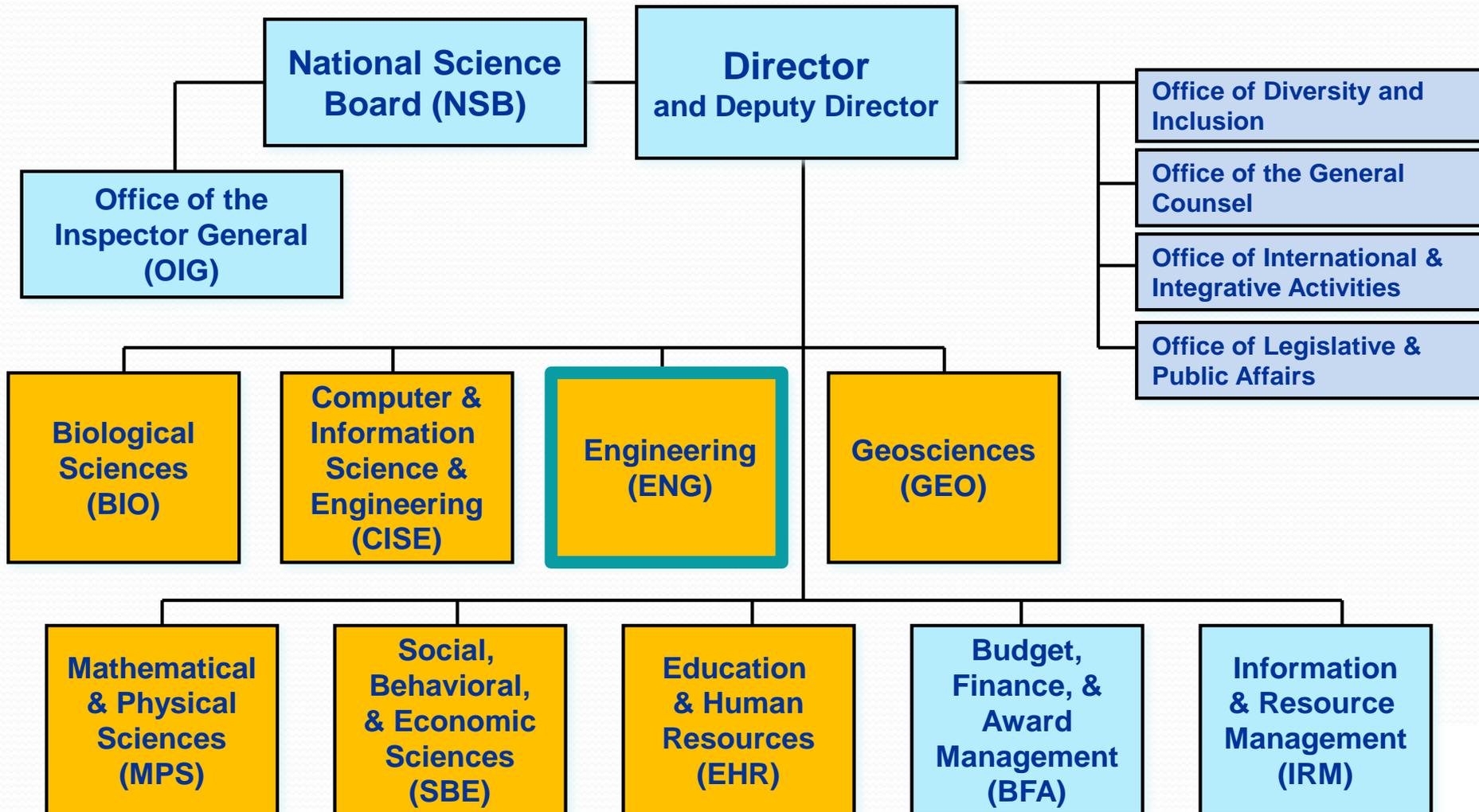


# Presentation Outline

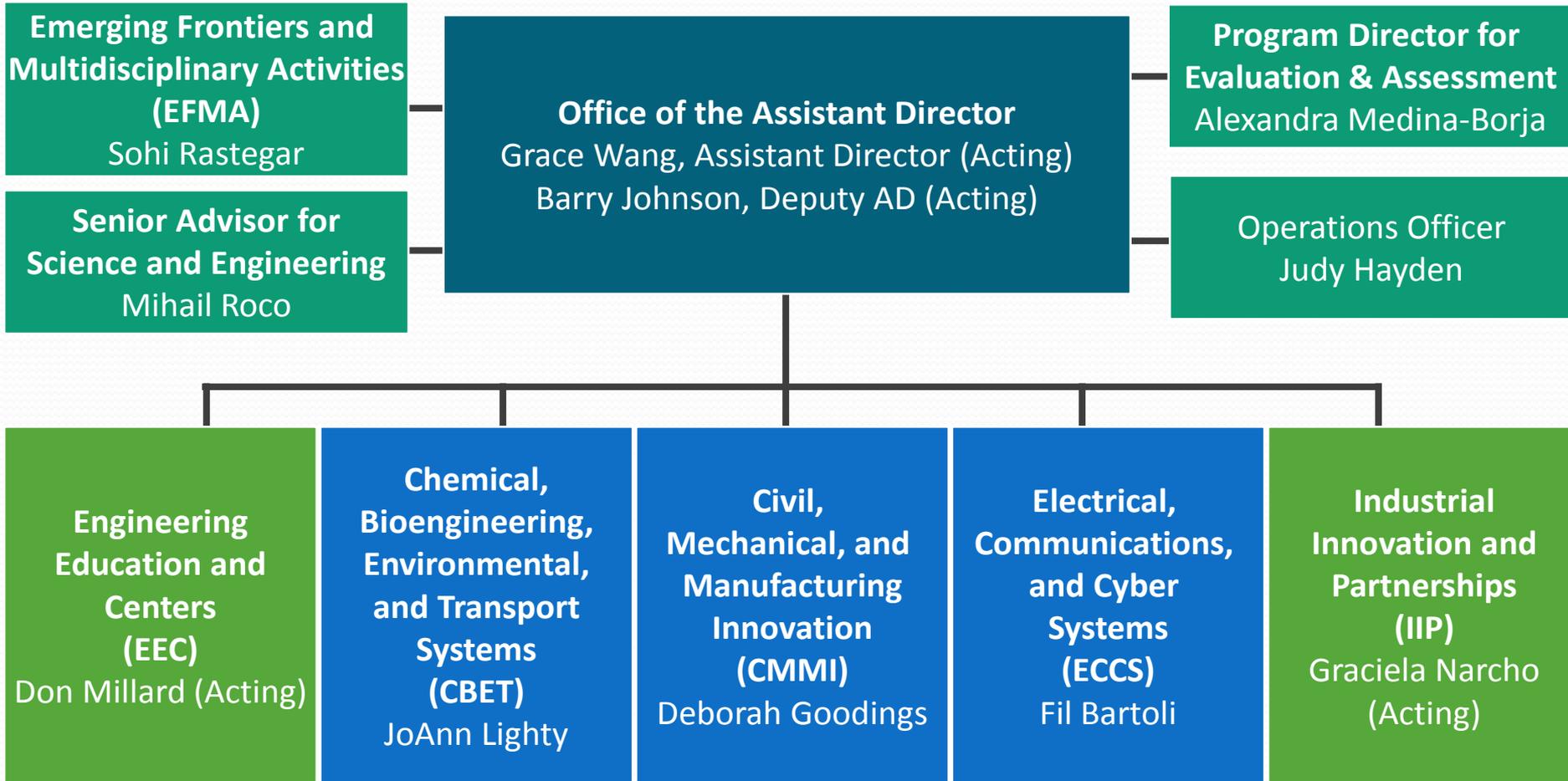
- NSF Organization Charts and Data
- Proposal Opportunities in ENG
- Advice on Proposal Writing
- Q/A



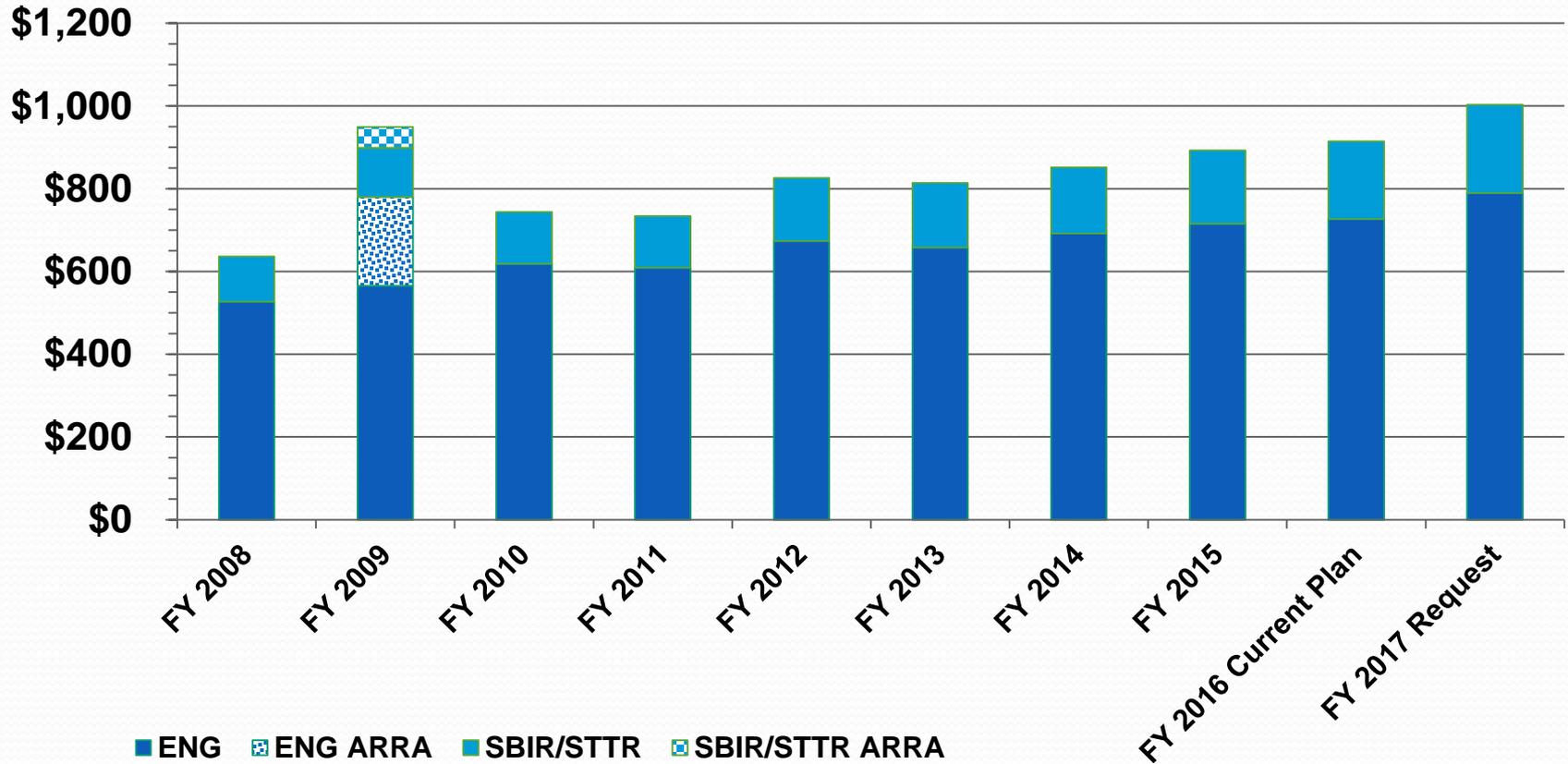
# National Science Foundation



# NSF Directorate for Engineering (ENG)



# ENG and SBIR/STTR R&RA Budgets (\$M)

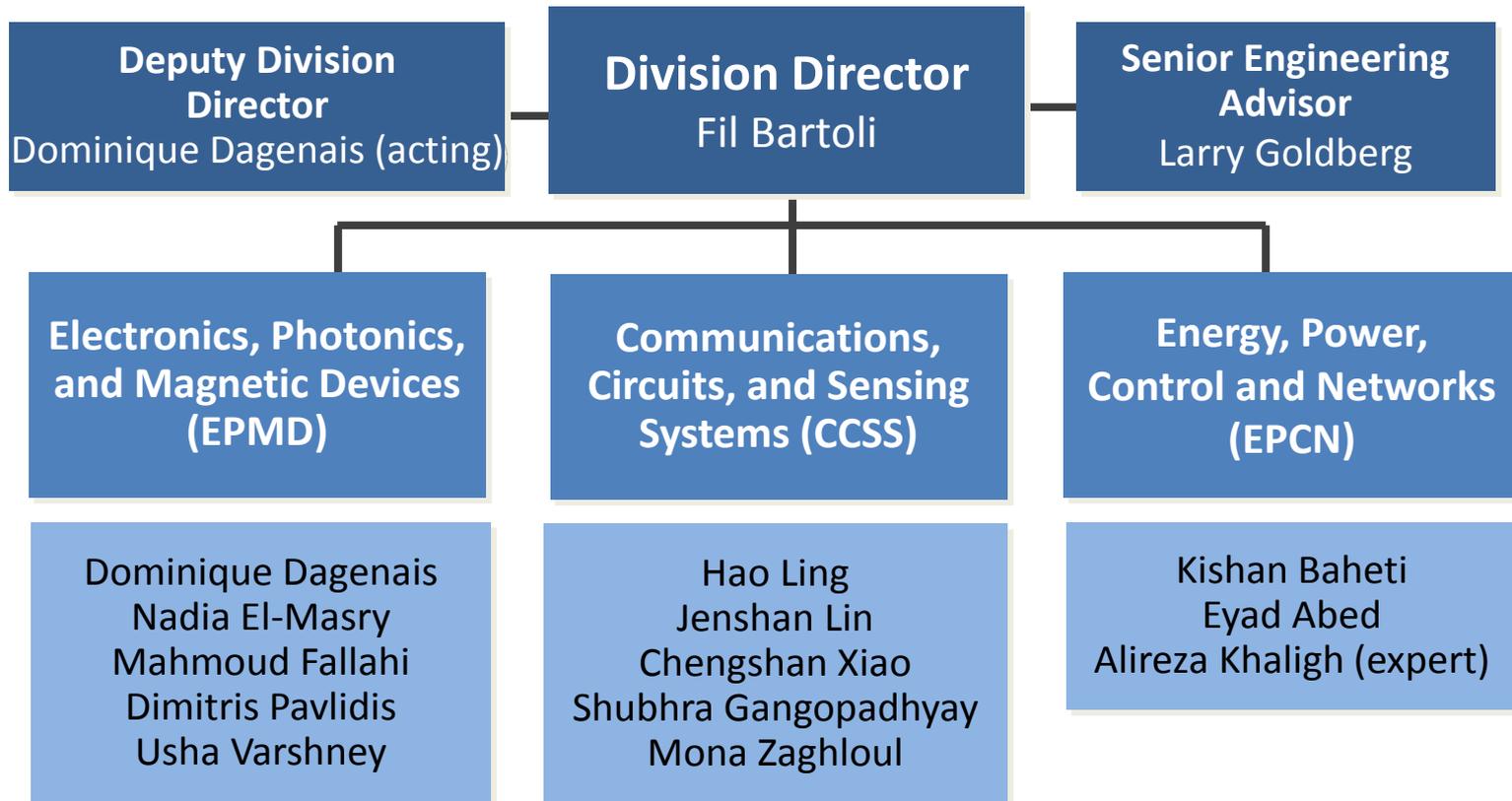


# ENG by the Numbers: FY 2016

- Total number of proposals: **12,574**
- Total number of new awards: **2,502**
- Total number of research proposals (excludes SBIR/STTR and I-Corps Teams): **9,614**
- ENG funding rate (excludes SBIR/STTR and I-Corps Teams): **16%**
  
- Estimated number of researchers and students supported: **23,350**
- Supported 19 ERCs, 3 STCs, 75 I/UCRCs, and 3 research facility networks



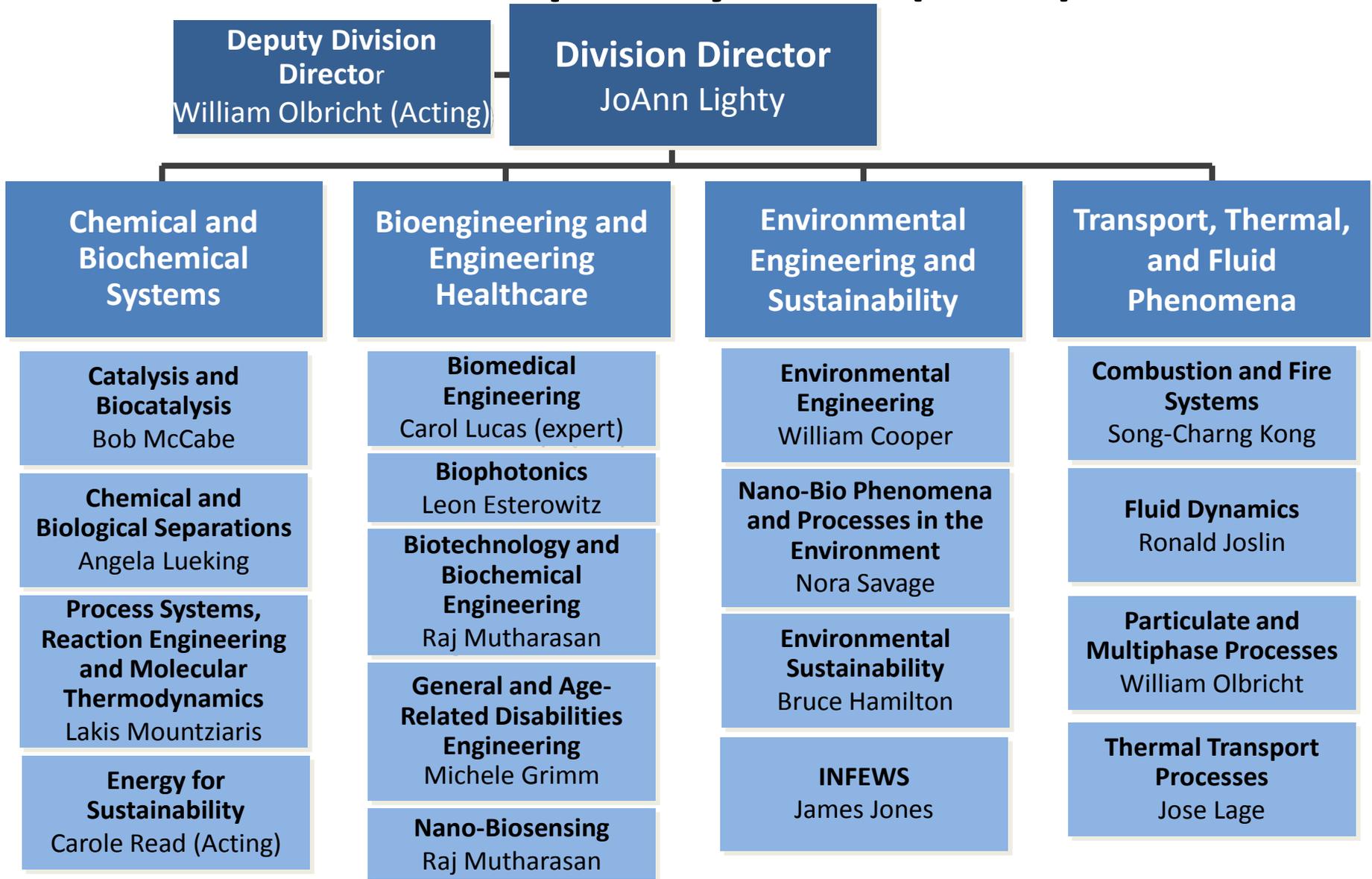
# Electrical, Communications, and Cyber Systems (ECCS)



# Civil, Mechanical, and Manufacturing Innovation (CMMI)



# Chemical, Bioengineering, Environmental, and Transport Systems (CBET)



# Engineering Education and Centers (EEC)

- **Large-scale research investments in ENG**
- **Supports collaboration with industry and other stakeholders** to promote innovative research and education
- **Engineering Research Centers (ERC)**
  - Three generations (50 centers total) since 1985
  - New Nano-Systems ERCs (NERCs) in FY12
- **Nanoscale Science and Engineering Centers (NSEC)**
  - 19 NSECs since 2001
  - 3 graduated NSECs from FY01 class
- **Network for Computational Nanotechnology**
  - Cyber-resource for nanotechnology theory, modeling and simulation
  - nanoHUB.org gateway for nanotechnology research and education
  - > 180k users globally



# Industrial Innovation and Partnerships (IIP)

- Fostering partnerships to advance technological innovation
- For small business: SBIR/STTR
  - small business research proposals aimed at pursuing opportunities to commercialize products and services
  - Solicitations only
- For academia: I-Corps, GOALI, I/UCRC



# ENG Investments

## *NSF ENG MISSION*

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



# Presentation Outline

- NSF Organization Charts and Data
- **Proposal Opportunities in ENG**
- Advice on Proposal Writing
- Q/A



# ENG Funding Opportunities

- I. Core Programs
- II. Crosscutting and NSF-Wide Solicitations



# 1. Core Programs

- Unsolicited proposals
  - **Submission Window:** *Once or Twice a Year*
  - **Award Size for Unsolicited:** *~ \$360K for three years*
  - **Funding Rate:** *~ 16%*



# ECCS Areas of Interest

- Fundamental research issues underlying electronic and photonic device and component technologies, power, controls, computation, communications, sensing and cyber technologies
- The integration and networking of intelligent systems at the nano, micro and macro scales
  - for healthcare, homeland security, disaster mitigation, energy, telecommunications, environment, transportation, manufacturing, and other systems-related areas
- ONE submission window per year: **Oct. 1 – Nov. 1**



# CBET Areas of Interest

## **Chemical and biochemical systems**

- processing and manufacturing of products with chemical and renewable resources

## **Bioengineering and engineering healthcare**

- integration of engineering and life science to solve biomedical problems

## **Environmental engineering and sustainability**

- reduction of adverse effects of solid, liquid, and gaseous discharges into land, waters, and air that result from human activity

## **Transport, thermal and fluids phenomena**

- thermal, mass, and momentum transport that enable new technological solutions (energy, environment, manufacturing, health care, ...)

ONE submission window per year: **October 1 – 20**



# CMMI Areas of Interest

## **Advanced Manufacturing**

- transformative advances in manufacturing and materials processing, with emphases on efficiency, economy, sustainability and scalability

## **Mechanics and Engineering Materials**

- understanding the properties and use of materials in engineered and natural systems

## **Resilient and Sustainable Infrastructures**

- innovation to advance resilience and sustainability of civil infrastructure and distributed infrastructure networks

## **Operations, Design and Dynamic Systems**

- decision-making aspects of engineering, including design, control, optimization and systems science

TWO submission windows: **September 1 – 15, 2016.** **Dec. 30 – Jan. 13, 2017.**



# 1. Core Programs

- Unsolicited proposals
  - **Submission Window:** *Once or Twice a Year*
  - **Award Size for Unsolicited:** *~ \$360K for three years*
  - **Funding Rate:** *~ 16%*
- CAREER awards
  - **Submission Deadline:** *July 21, 2016*
  - **Award Size:** *\$500K for five years*



# CAREER

- Foundation-wide activity that offers NSF's most prestigious awards for faculty members beginning their independent careers
- Provides stable support at a sufficient level and duration to enable awardees to **develop careers as outstanding researchers and educators** who effectively integrate teaching, learning, and discovery
- Be employed as an assistant professor as of October 1 following submission.
- Have not competed more than two times previously in the CAREER program.



# FY16 CAREER RECIPIENTS



- Supports early-career investigators who exemplify the role of teacher-scholar
- Stimulates breakthrough research ideas and encourages risk-taking and innovative thinking among young investigators
- 160 ENG CAREER awards in FY 2016, <http://1.usa.gov/1SQ1BmJ>

# 1. Core Programs Cont'd

- Major Research Instrumentation (MRI)
  - **Deadline:** *Second Wednesday in January (1/11/2017)*
  - **Award Size:** *~ \$100K to \$4M*
  
- Supplements
  - **Research Experience for Undergraduates (REU)**
  - **Research Experience for Teachers (RET)**
  - **Industry-university collaboration (GOALI)**
  - **International (co-funding with OISE)**



## 2. Crosscutting and NSF-Wide Solicitations

- Enhancing Access to the Radio Spectrum (EARS)
- Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS)
- Understanding the Brain (UtB)
- Cyber-Physical Systems (CPS)
- Critical Techniques and Technologies for Advancing Big Data Science & Engineering (BIGDATA)
- National Nanotechnology Infrastructure Network (NNIN)
- National Robotics Initiative (NRI)
- Cyber Science, Engineering and Education for Sustainability (Cyber SEES)
- Designing Materials to Revolutionize and Engineer our Future Program (DMREF)
- Scalable Nanomanufacturing (SNM)
- Failure-Resistant Systems (FRS)



# Enhancing Access to the Radio Spectrum (EARS)

- Presidential memo (2010): *Unleashing the Wireless Broadband Revolution*  
“NSF, in consultation with the FCC and NTIA, should fund wireless research and development that will advance the science of spectrum sharing.”
- Enhancing radio spectrum efficiency and leading to greater access to wireless services for all Americans
- FY 2012-2016: **ENG, CISE, and MPS** investment in EARS totals nearly \$67 million
- FY 2017: New **SpecEES** (Spectrum Efficiency, Energy Efficiency, and Security) program, jointly supported by ENG and CISE, to build on EARS investment

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

- Advance understanding of the FEW system through quantitative and computational modeling
- Develop real-time, cyber-enabled interfaces that improve understanding of the behavior of FEW systems and increase decision support capability
- Enable research that will lead to innovative solutions to critical FEW problems
- Grow the scientific workforce capable of studying and managing the FEW systems



*Illustration credit: Nicolle R. Fuller, Sayo-Art LLC*

**NSF-wide initiative (led by GEO  
and ENG/CBET) in collaboration  
with USDA/NIFA**



# Critical Resilient Interdependent Infrastructure Systems and Processes (CRISP)

- Improves the resilience, interoperation, performance, and readiness of critical infrastructure
- **Jointly supported by ENG, CISE, and SBE** to enhance understanding, design, and innovation of Interdependent Critical Infrastructure (ICI) systems and processes to deliver essential goods and services despite disruptions, whether human-induced or natural



*Credit: ©Fotolia/ collage N. Hanacek*

# Emerging Frontiers in Research and Innovation (EFRI)

- **Supports higher-risk, higher-payoff opportunities that:**
  - Are potentially transformative
  - Address a national need or grand challenge
- **Recent topic areas:**
  - 2-D Atomic-Layer Research and Engineering (FY14-15)
  - Advancing Communication Quantum Information Research in Engineering (ACQUIRE) (FY16-17)
  - New Light and Acoustic Wave Propagation: Breaking Reciprocity and Time-Reversal Symmetry (NewLAW) (FY16-17)
- **4-year awards at ~\$500K per year**
- **Letters of Intent → Preliminary Proposal → Full Proposal**



# These solicitations typically have

- Targeted program goals
- Specified budget limit
- PI requirements
  - Minimum no. of PIs per proposal
  - Limit on no. of proposals per PI
- Solicitation-specific review criteria



# How to find a complete list of solicitations?

NSF | Research Areas | Funding | Awards | Document Library | News | About NSF

Home > Research Areas > Engineering

Engineering (ENG)

Engineering (ENG) Home >

Chemical, Bioengineering, Environmental and Transport Systems (CBET) >

Civil, Mechanical and Manufacturing Innovation (CMMI) >

Electrical, Communications and Cyber Systems (ECCS) >

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Engineering Education and Centers (EEC) >

Emerging Frontiers and Multidisciplinary Activities (EFMA) >

Industrial Innovation and Partnerships (IIP)

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Electrical, Communications and Cyber Systems (ECCS)

Promotes fundamental research in device and component technologies, power, controls, computation, networking, communications, and cyber technologies to support integration and networking of intelligent systems.

Read More

Announcements

ECCS Proposal Window and Submission Information [Read More >](#)

ECCS Program Management Chart [Read More >](#)

ECCS News & Events [Read More >](#)

See All >

News

NSF awards \$12 million for radio spectrum research  
OCTOBER 11, 2016

New kind of supercapacitor made without carbon  
OCTOBER 12, 2016

Omnidirectional mobile robot has just 2 moving parts  
OCTOBER 5, 2016

See All >

Funding Opportunities

EPSCoR Research Infrastructure Improvement Program: Track-2 Focused EPSCoR Collaborations (RII Track-2 FEC)  
(NSF 17-503) POSTED OCTOBER 11, 2016

IUSE / Professional Formation of Engineers: REvolutionizing engineering and computer science Departments  
(NSF 17-501) POSTED OCTOBER 4, 2016

Critical Resilient Interdependent Infrastructure Systems and Processes FY17

Upcoming Due Dates

Developing a National Research Infrastructure for Neuroscience  
(NSF 16-569) FULL PROPOSAL: OCTOBER 21, 2016

NSF/DOE Partnership in Basic Plasma Science and Engineering  
(NSF 16-564) FULL PROPOSAL: OCTOBER 21, 2016

Graduate Research Fellowship Program  
(NSF 16-538) FULL PROPOSAL: OCTOBER 24, 2016, LIFE SCIENCES, GEOSCIENCES

See All >

Popular Links

Career Opportunities

See All Additional Resources >

## Electrical, Communications and Cyber Systems (ECCS) Active Funding Opportunities

Click Column Headings to Sort by Title or Due Dates or Guidelines.  
Sorted by Due Dates.

Status:  GO

Key: ■ Crosscutting | ■ NSF-wide | ■ Grants.gov submission required

Page: [Previous](#) | [Next](#) (Showing: 16-30 of 91)

Title	Program Guidelines	Due Dates
Computational and Data-Enabled Science and Engineering (CDS&E)		Full Proposal: December 9, 2016
IUSE / Professional Formation of Engineers: REvolutionizing engineering and computer science Departments (IUSE/PFE: RED)	17-501	Letter of Intent: December 9, 2016
National Science Foundation Research Traineeship (NRT) Program	16-503	Letter of Intent: December 9, 2016
ADVANCE: Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers	16-594	Letter of Intent: December 14, 2016
Innovation Corps Teams Program (I-Corps Teams)	12-602	Full Proposal: December 15, 2016
Secure and Trustworthy Cyberspace (SaTC)	16-580	Full Proposal: December 15, 2016
EPSCoR Research Infrastructure Improvement Program: Track-2 Focused EPSCoR Collaborations (RII Track-2 FEC)	17-503	Letter of Intent: January 10, 2017
ADVANCE: Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers	16-594	Full Proposal: January 11, 2017
Major Research Instrumentation Program (MRI)	15-504	Full Proposal: January 11, 2017
Scalable Nanomanufacturing for Integrated Systems (SNM-IS)	16-604	Full Proposal: January 13, 2017
Designing Materials to Revolutionize and Engineer our Future (DMREF)	16-613	Full Proposal: January 17, 2017
IUSE / Professional Formation of Engineers: REvolutionizing engineering and computer science Departments (IUSE/PFE: RED)	17-501	Full Proposal: January 18, 2017
Spectrum Efficiency, Energy Efficiency, and Security (SpecEES): Enabling Spectrum for All	16-616	Full Proposal: January 19, 2017

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# Before You Start

- Identify the most appropriate program for your proposal.
- Volunteer to serve on proposal review panels to learn where the bar is.



# When You Write

- NSF supports basic research, not development. Start by asking a scientific question.
- Clearly describe the current state-of-the-art. Then show how your proposed work will significantly exceed the SOA.



# Aftermath

- Try, try and try again, even if you don't succeed the first 6 times.
- However, do take reviewers' comments to heart to improve your proposal.



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