



Influencing Innovation in Education

Samir El-Ghazaly

Division Director

Electrical, Communications and Cyber Systems (ECCS)
Division

Engineering Directorate
National Science Foundation
Arlington, VA



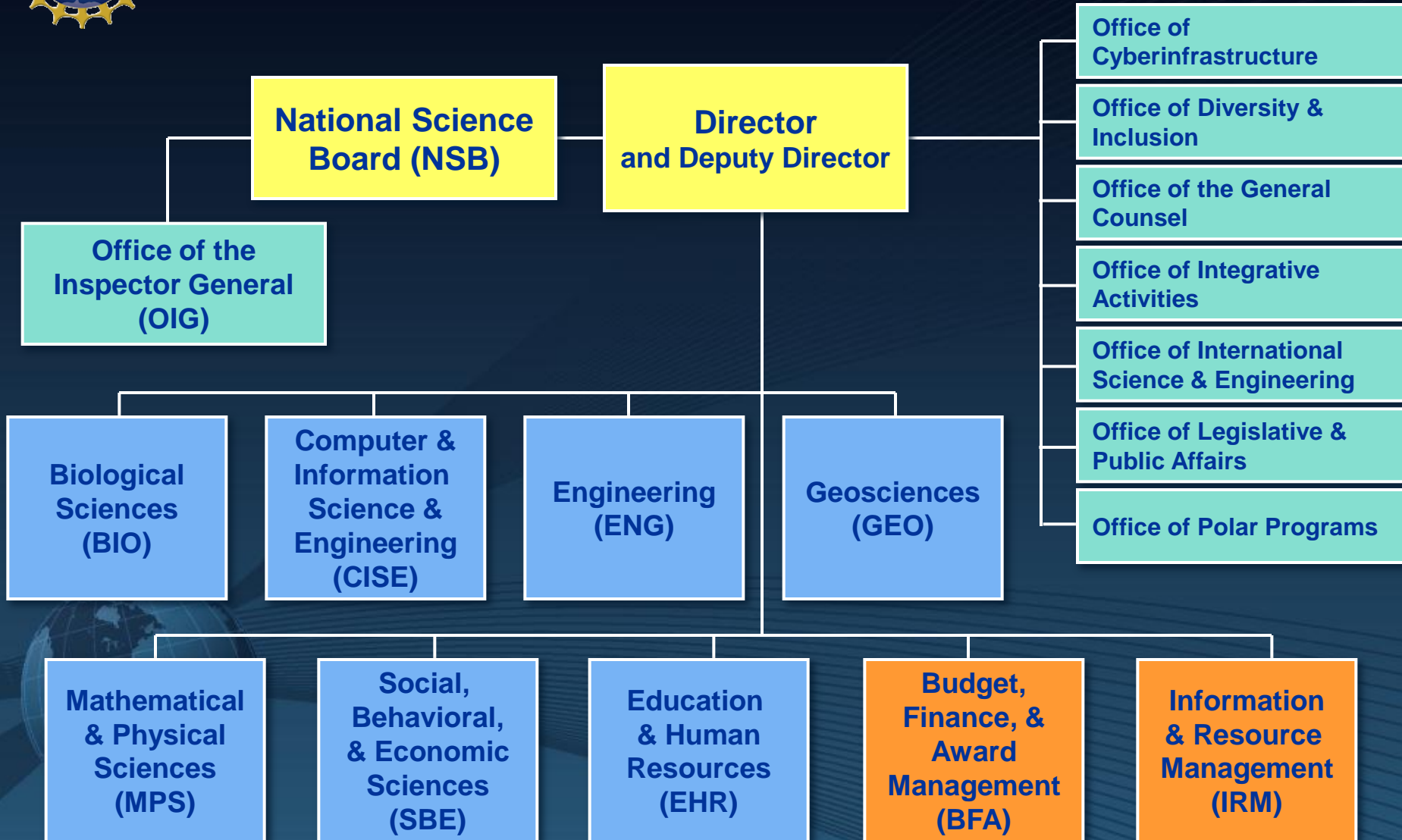


NSF's Origin, Mission, and Structure

- Independent federal agency established by Congress in the NSF Act of 1950
 - *“To Promote Progress of Science,” and “Advance National Health, Prosperity, and Welfare,” and “Secure the National Defense”*
- Supports fundamental research and education across all fields of science and engineering
- Sponsors research primarily through grant mechanism, but operates no laboratories
- Discipline-based structure with cross-disciplinary mechanisms
- Uses “rotators” or IPAs primarily from universities
- FY2013 budget of \$5.6 billion for Research and Related Activities (R&RA) – FY2014 Budget Request for R&RA at \$6.2 billion (\$7.626 Billion Operating Plan Request). 8.4% over FY2012 enacted level.

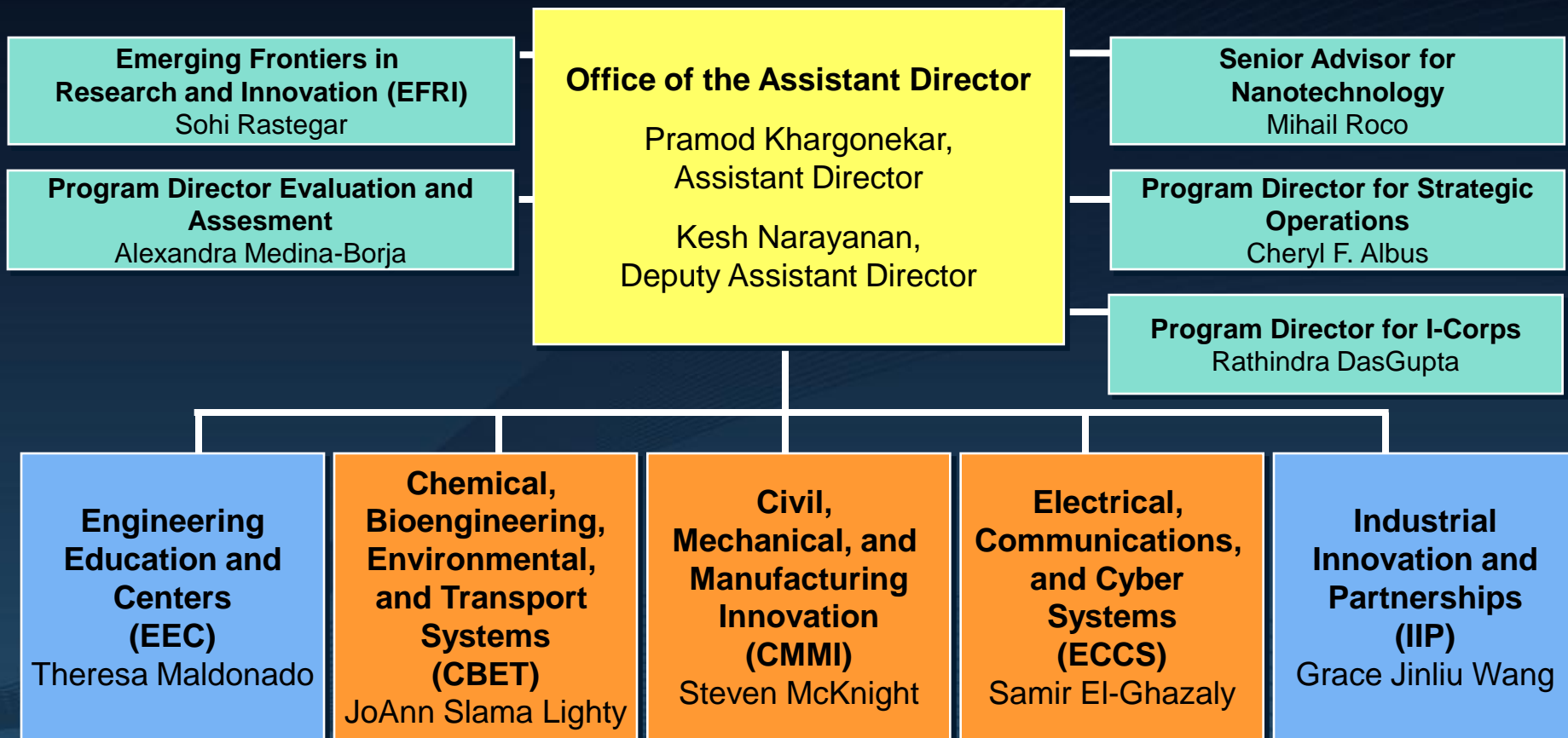


National Science Foundation





NSF ENG Organization





Electrical, Communications, and Cyber Systems Division (ECCS) Clusters

Lawrence Goldberg
Senior Science Advisor

Samir El-Ghazaly
Division Director

Susan Kemnitzer
Deputy Division Director

Electronics, Photonics, and Magnetic Devices (EPMD)

Energy, Power, and Adaptive Systems (EPAS)

Communications, Circuits, and Sensing-Systems (CCSS)

Usha Varshney
Program Director

Kishan Baheti
Program Director

Zhi Tian
Program Director

John Zavada
Program Director

Paul Werbos
Program Director

George Haddad
Program Director

Dimitris Pavlidis
Program Director

Eyad Abed
Program Director

Mona Zaghloul
Expert Appointment

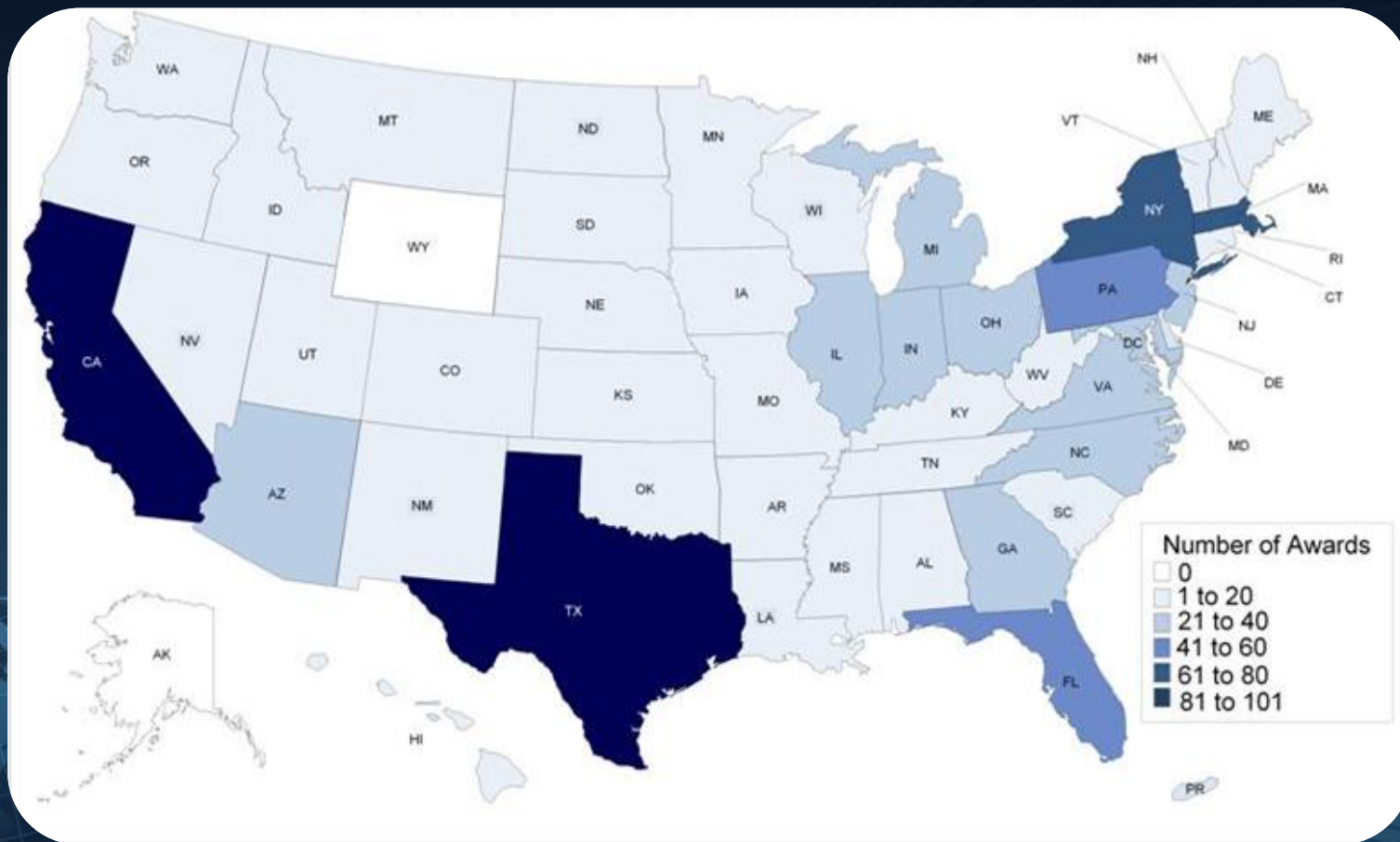
Anupama Kaul
Program Director

Dominique Dagenais
Associate Program Director

- Fundamental research at the nano, micro, and macro scales *underlying device and component technologies, energy and power, controls, networks, communications, computation, sensing and cyber systems*
- Integration of systems principles *in complex engineering systems and networks for a variety of applications areas*



Geographic Distribution of ECCS Awards FYs 2011-2013



Electrical, Communications and Cyber Systems (ECCS)

Samir El-Ghazaly, Division Director • Susan C. Kemnitzer, Division Deputy Director • Lawrence Goldberg, Senior Engineering Advisor

Electronics, Photonics, and Magnetic Devices (EPMD)

Dimitris Pavlidis

- Microwave/mm-Wave/THz Devices & Components
- Nanoelectronics & Next Generation Devices
- Vacuum Devices & Electronics
- Electromagnetic Propagation & Scattering
- Metamaterials-Based Devices & Components
- Device/Circuit Simulation & Modeling

Anupama Kaul

- Flexible & Printed Electronics
- Organic Light Emitting Devices & Displays
- Molecular/ Organic Electronics & Photonics
- Carbon-based Electronics
- Micro and Nanoelectronics
- Energy-Efficient Green Electronics

Usha Varshney

- Bioelectronics & Biomagnetics Devices
- Science & Engineering Beyond Moore's Law
- Quantum Devices
- Magnetics, Multiferroics, & Spintronics
- Sensor Devices & Technologies
- Next Generation Memories

John Zavada

- Nanophotonics and Plasmonics
- Advanced Sources and Detectors
- Optical Devices and Components
- Optical Devices based on Metamaterials
- Optical Imaging and Sensing

Dominique Dagenais

- Fiber Optic Components and Devices
- Nonlinear and Ultrafast Photonics
- Photonic Integrated Circuits
- Optical Communications and Computing
- Quantum Optics and Optical Modeling

Communications, Circuits, and Sensing-Systems (CCSS)

Zhi (Gerry) Tian

- Cyber-Physical Systems
- RF/Wireless, Optical, & Hybrid Communications & Networking
- Integrated Sensing, Communications, & Computational Systems
- Spectrum Access and Spectrum Sharing
- Signal Processing and Compressive Sampling
- Cyber Security
- Cognitive Radio

George Haddad

- Low Power, Low Noise, High Efficiency Communications, Sensing and Imaging Systems
- RF/Microwave & mm-Wave Circuits for Imaging and Sensing Systems
- Inter- and Intra-Chip Communications & Networking
- Wireless Integrated Sensors
- Submm-Wave/THz Imaging & Sensing Systems
- Integrated Circuit Design (Fault Tolerant, Self Test & Repair, Stochastic Design)
- Mixed Signal Circuits & Systems
- Interconnects & Packaging Techniques

Mona Zaghloul (Expert Appointment)

- Micro, Nano, and Bio Systems
- MEMS/NEMS Systems-on-a-Chip
- Sensors, Actuators, and Electronic Interfaces
- Diagnostic and Implantable Systems
- Chemical, Biological, and Physical Diagnostics
- Environmental Sensing and Monitoring
- Infrastructure Monitoring
- Micro Power and Energy Scavenging
- System-Level Fabrication, Packaging, and Assembly

Energy, Power, and Adaptive Systems (EPAS)

Kishan Baheti

- Control Theory & Hybrid Dynamical Systems
- Distributed & Mobile Networked Control
- Networked Sensing & Imaging Systems
- Control Aspects of Cyber-Physical Systems
- Cyber Secure Control of Power Systems
- Systems Theory in Molecular, Cellular, & Synthetic Biology
- Networked Robotics & Transportation Networks

Eyad Abed

- Energy Collection & Harvesting Devices and Systems
- Energy Storage
- Advanced Power Electronics
- Electric Grid Interfaces
- Electric & Hybrid Vehicles
- Energy/Power Sensing
- Local Distributed Power Systems

Paul Werbos

- Adaptive & Intelligent Systems
- Transmission & Distributed Systems
- Intelligent Power Grid & Economics
- Quantum Systems & Modeling
- Theory and Modeling for Systems & Devices
- Neuromorphic Engineering
- Cognitive Optimization & Prediction
- Intelligent Vehicles
- Learning & Intelligence for Robotics

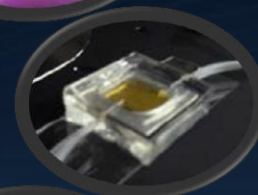
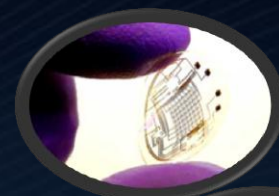




ECCS Research Areas by Cluster

➤ **Electronics, Photonics, and Magnetic Devices (EPMD)**

- Nanoelectronics & Nanophotonics
- Bioelectronics & Biomagnetics Devices
- Quantum Devices, Optics and Photonics
- Magnetics, Multiferroics & Spintronics
- Sensor Devices & Technologies
- Next Generation Memories



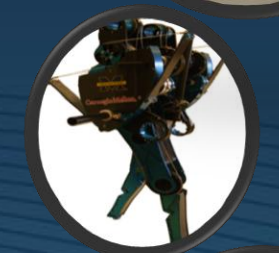
➤ **Communications, Circuits, and Sensing Systems (CCSS)**

- Wireless Communications, Networks, Signal Processing, Cognitive Radios
- Spectrum Access & Spectrum Sharing
- Micro, Nano, and Bio Systems, Sensors, Actuators
- Low-Power, Low-Noise, High Efficiency, Communications, Sensing/Imaging



➤ **Energy, Power, and Adaptive Systems (EPAS)**

- Electric Grid, Renewable Energy, Energy Storage
- Power electronics
- Controls and networks
- Intelligent systems, neural networks
- Cyber-Physical Systems, Cybersecurity



One submission window each year between: Oct. 1 - Nov. 1



Funding Opportunities

- ◎ **Core programs**

- > Unsolicited: One window (October 1 – November 1 Annually)
- > Eager (Early Concept, Can be submitted anytime)

- ◎ **Directed programs (Special CFP's)**

- > CAREER
- > Emerging Frontiers in Research and Innovation (EFRI)
- > Interdisciplinary Research (IDR)
- > Cyber-Physical Systems (CPS)
- > Major Research Instrumentation (MRI)
- > Broadening Participation Research Initiation Grants in Engineering (BRIGE)
- > REU, RET Supplements
- > Others....





ECCS Transition to One Core Solicitation Window in FY13

- Prior to FY13, ECCS Core Solicitation Windows occurred in Fall and Spring
- In FY13, ECCS transitioned to one Solicitation window from October 1st - November 1st annually. Due to Hurricane Sandy, window was extended.

<i>ECCS Core Program</i>	<i>Number of Proposals in FY13</i>	<i>3 Year Average (FY10-FY12)</i>	<i>FY13 Dwell Time Average (Months)</i>	<i>3 Year Dwell Time Average (FY10-FY12)</i>	<i>FY13 Funding Rate</i>	<i>3 Year Average (FY10-FY12)</i>
1517 Electronics, Photonics and Magnetic Devices	486	558	5.69	5.09	21%	20%
7564 Communications, Circuits and Sensing Systems	350	375	5.41	5.11	23%	17%
7607 Energy, Power and Adaptive Systems	326	369	6.23	6.13	20%	19%
TOTAL	1,162	1,301	5.78	5.44	21%	19%

- **Outcomes of transition in year one:**

- *No significant change in dwell times for core or initiative programs*
- *Fortunately, no significant drop in proposals submitted*
- *Slight increase in funding rate, despite budget cut backs*
- *Significant benefit of processing all proposals within the same time frame:*
 - *90% of all ECCS Core Panels completed by March 2013, affording more time and effort for ECCS Initiatives (the majority of which occur in the Spring and Summer)*
 - *With panel obligations made in the earlier part of the year, ECCS could navigate more smoothly through the uncertainty of FY13 final allocations towards the end of the year*
 - *Funds were available to obligate and hold next year's CAREER panels*





EDUCATION

Directorate for Education and Human Resources (EHR)

- ◉ Division of Research on Learning in Formal and Informal Settings
- ◉ Division of Graduate Education
- ◉ Division of Human Resource Development
- ◉ Division of Undergraduate Education



ECCS AND EDUCATION

Funding Mechanisms

- Supplements
- Integrated with traditional research
- Co-funding with other divisions





Expectations

- ⦿ Innovation
- ⦿ Impact
- ⦿ Assessment
- ⦿ Sustainability
- ⦿ Reasonable and justified budget

Review Criteria

- ⦿ Intellectual Merits
- ⦿ Broader Impact



ECCS Investments in Education and Research Community Outreach

◎ Recent Research Workshops funded by ECCS

- > NSF Workshop on Micro, Nano, Bio Systems: Building on the Past and Planning for the Future
- > NSF Workshop 2D Materials and Devices
- > Workshop on Next-Generation High-Efficiency Organic Solar Cells: Opportunities and Challenges
- > NSF SEP (Sustainable Energy Pathways) Grantees Meeting
- > NSF Workshop on US-Czech Frontiers in Photonics
- > NSF Workshop on US- Japan Frontiers in Novel Photonic-Magnetic Devices
- > Workshop on Big Data: From Signal Processing to Systems Engineering

◎ ECCS Curriculum and Student Support

- > Workshops on Reforming Graduate/Undergraduate Curriculum in Electric Energy Systems with Emphasis on Sustainability. To be held in 2015, 2016 and 2017.
- > STEM Student Travel Grants for Bioelectronics Training
- > Funded over \$150K for student travel to conferences and workshops in FY12-FY13
- > Over \$3M in ECCS REU, RET Supplements in FY12-FY13



Follow Up

- ◉ Visit the ENG and Divisions web sites
- ◉ Contact the Program Officer in your area of interest
- ◉ Volunteer to serve as an NSF panel or mail reviewer (Enroll: <http://www.nsf.gov/eng/eccs/reviewer/>)
- ◉ If your proposal doesn't succeed at first, don't give up
- ◉ Consider spending 2 years at NSF as a Program Officer



NSF Web Sites

- National Science Foundation (NSF)
<http://www.nsf.gov>
- Directorate for Engineering (ENG)
<http://www.nsf.gov/dir/index.jsp?org=ENG>
- Electrical, Communications and Cyber Systems (ECCS)
<http://www.nsf.gov/div/index.jsp?div=ECCS>
- Division of Engineering Education & Centers (EEC)
<http://www.nsf.gov/div/index.jsp?div=eec>
- Directorate for Education & Human Resources (HER)
<http://www.nsf.gov/dir/index.jsp?org=EHR>



Thank you!

Questions?

