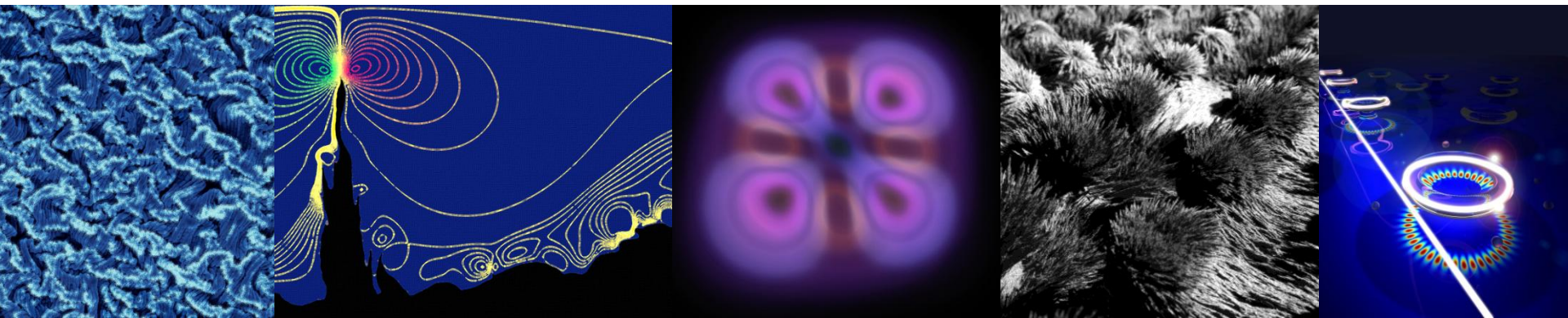


# Directorate for Engineering Update

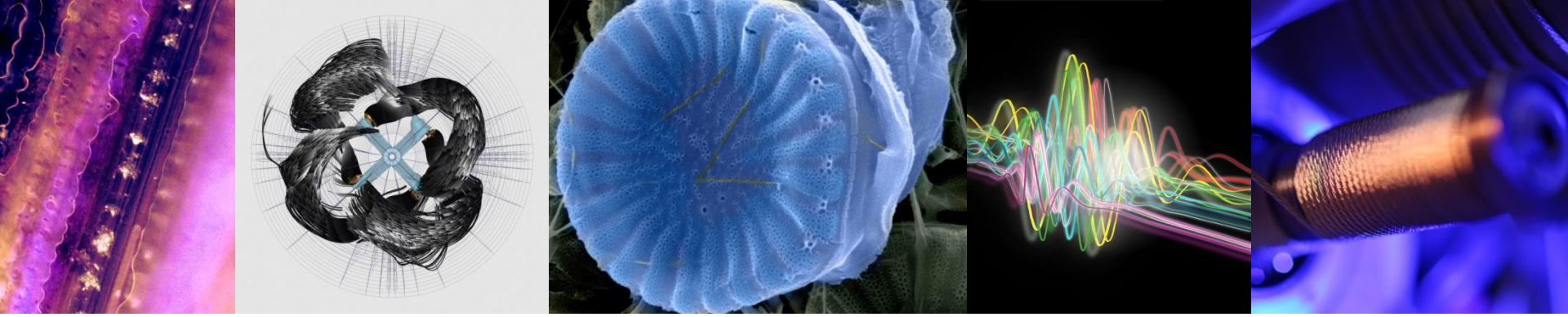
Thomas W. Peterson  
Assistant Director for Engineering  
October 26, 2011



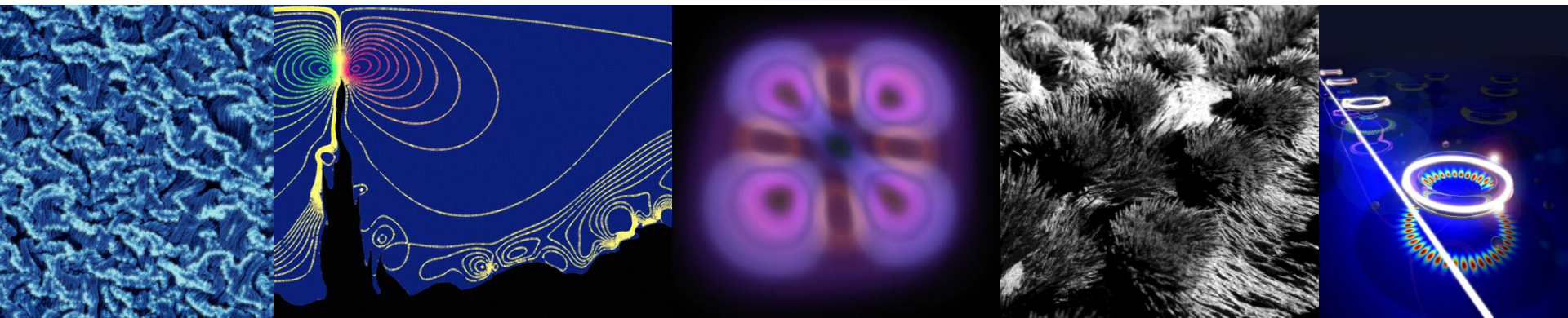
# ENG Update

- AdCom business
- New ENG staff
- ENG Responses to Strategic Planning – Priority Investments
  - Flagship Activities
  - Beacon Activities
- Budget and trends





# AdCom Business



# Future Meeting Dates

- April 11–12, 2012
- October 17–18, 2012

# NSF Communications Survey

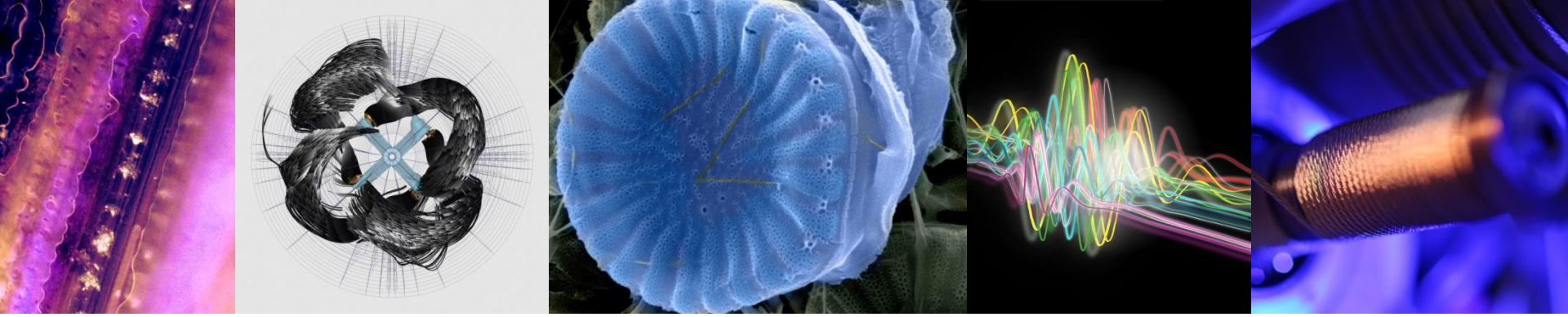
- Currently reviewing NSF internal and external communications
- Seeking ways to improve effectiveness and efficiency of communications
- Survey sent for input from AdCom members
  - What works well?
  - What does not work so well?
  - How can NSF improve communications with external stakeholders?
- Survey deadline is Friday, Nov. 11

# Fall 2011 Meeting Agenda

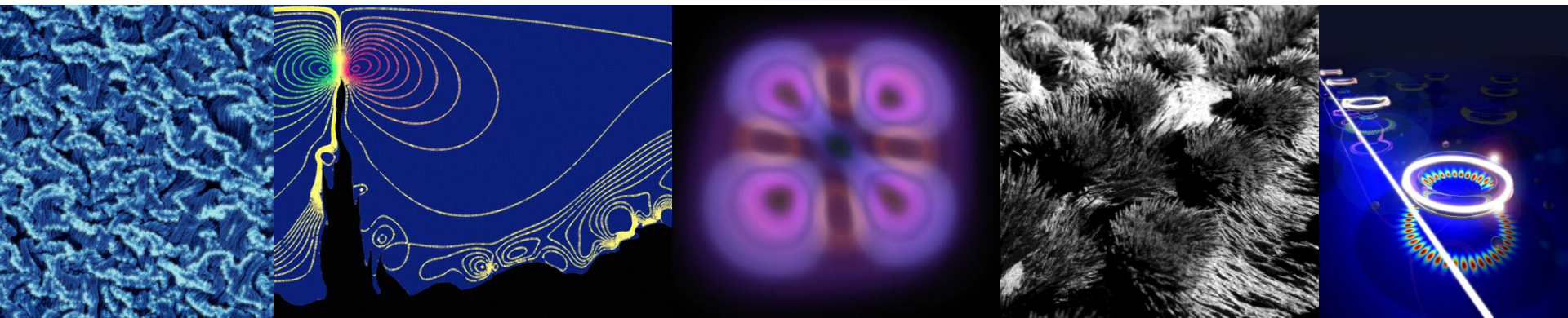
- Directorate Update
- ENG Strategic Activities
  - Accelerating Innovation Research
  - Innovation Corps
  - Program Alignment with Strategic Directions\*
- ECCS Update and COV Report
- NSF Merit Review

\*focus of breakout groups

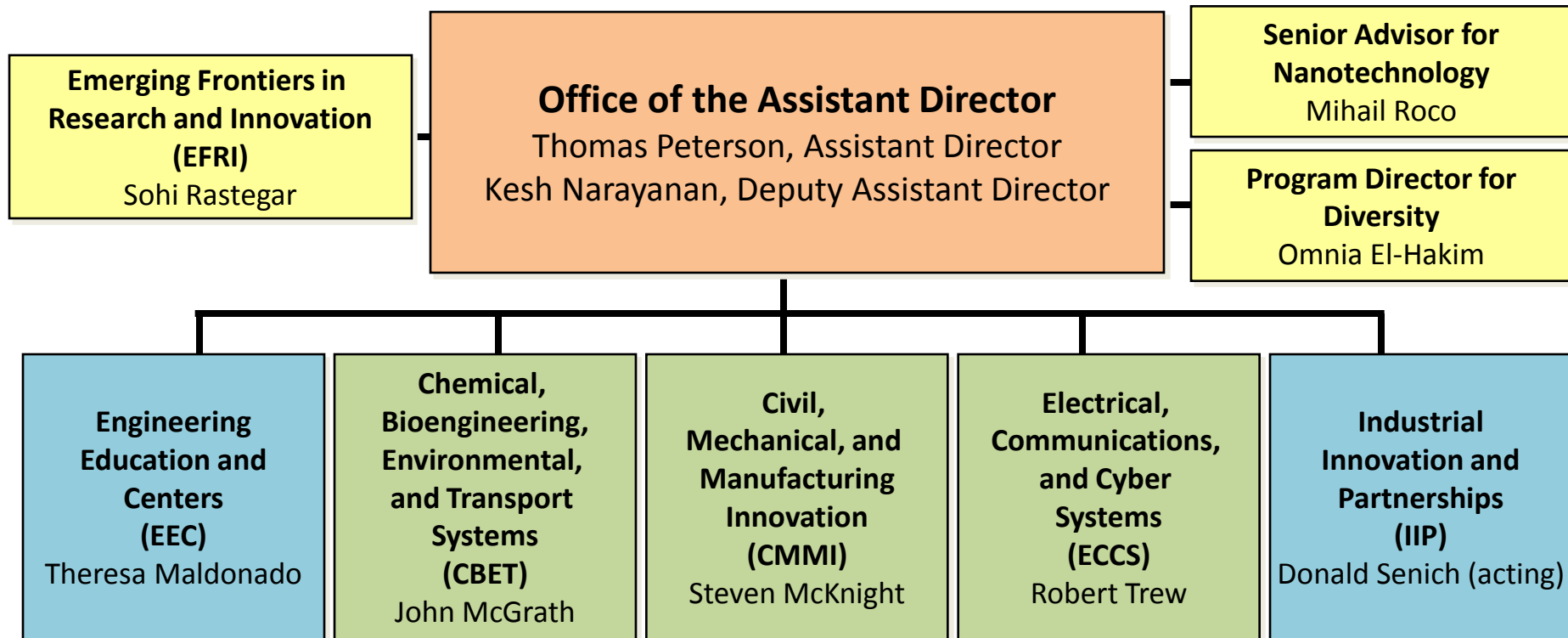




# New ENG Staff



# Directorate for Engineering (ENG)





# OAD

- Kesh Narayanan – Deputy Assistant Director (IIP Division Director)
- Reeshemah Burrell – AAAS Fellow (Diversity)
- TJ Donahue – AAAS Fellow (EFRI)
- Garie Fordyce – Program Manager (EFRI)
- Alexandra Medina-Borja – Program Director for Evaluation and Assessment (University of Puerto Rico at Mayagüez) *starting in December*
- Evette Rollins – Program Specialist
- Rebecca Rosen – AAAS Fellow (Evaluation and Assessment)

# CBET

- Derika Fallings – Program Specialist
- Jessica Foley – AAAS Fellow
- Ram Gupta – Program Director for Energy for Sustainability (Auburn University)
- Barbara Karn – Program Director for Environmental Health and Safety of Nanotechnology (EPA)
- Debra Reinhart – Program Director for Environmental Engineering (University of Central Florida)
- Kaiming Ye – Associate Program Director for Biomedical Engineering (University of Arkansas)

# CMMI

- George Chui – Program Director for Control Systems (Purdue University)
- Joanne Culbertson – Staff Associate (OAD)
- Martin Dunn – Program Director for Mechanics of Materials (University of Colorado)
- Kishor Mehta – Program Director for Hazard Mitigation and Structural Engineering (Texas Tech)

# ECCS

- Crystal Adkins – Operations Specialist
- Anupama Kaul – Program Director for Electronics, Photonics, and Magnetic Devices (JPL)
- Kerstin Mukerji – Science Assistant
- Ganella Williams – Secretary



# EEC

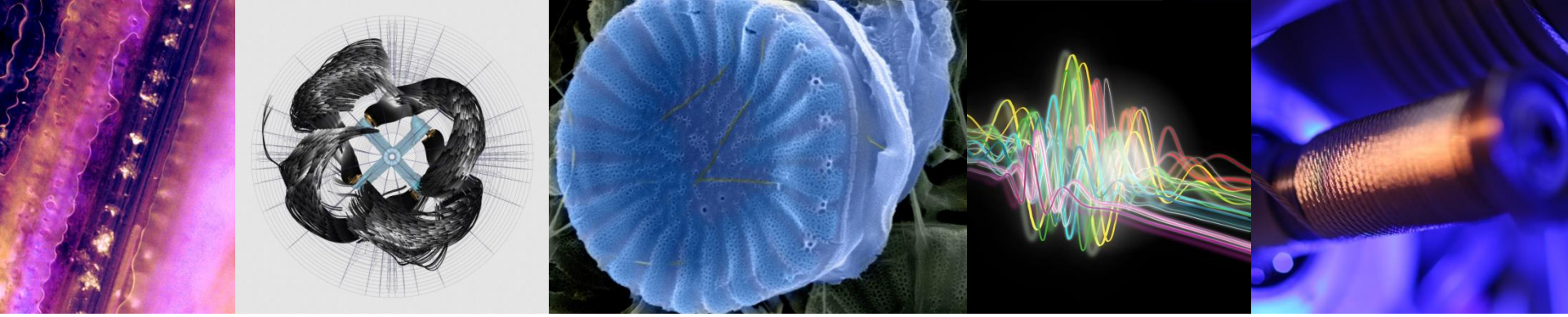
- Rebecca Bates – AAAS Fellow
- Carole Read – Program Director for Engineering Research Centers (DOE)
- Pamela Truesdell – Einstein Fellow

# IIP

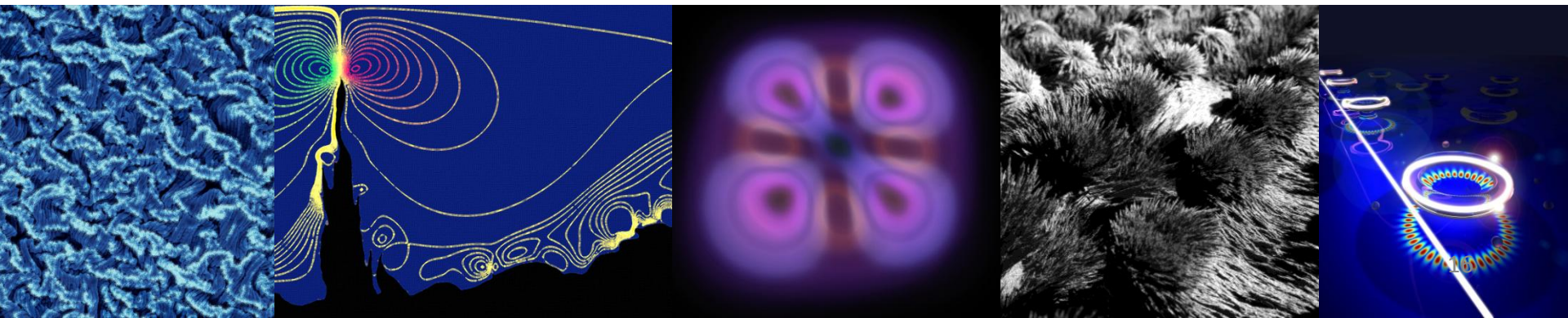
- Alexandra Hall – Program Specialist
- Karlene Hoo – Program Director for Accelerating Innovation Research (Texas Tech)
- Bob Pauley – Einstein Fellow
- Mark Supal – Einstein Fellow

# Open Recruitments

- CBET Program Director
  - Process and Reaction Engineering
- CMMI Program Director
  - NanoManufacturing
- ECCS Program Directors
  - Communications, Circuits, and Sensing Systems (2 positions)
- IIP Program Director
  - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) in the area of biotechnology and chemical technologies



# ENG Responses to Strategic Planning





# Strategic Planning 2009-10

## Five Working Groups

- Strategic Thinking Group
  - *Considered ENG Directorate Organization*
  - *Coordinated with NSF Strategic Plan*
- Awards and Solicitations
- Assessment and Evaluation
- Public Understanding of Engineering
- Engineering Education and Workforce

# Recap of Fall '10 and Spring '11 Meetings

## Fall 2010

- Summary of Strategic Planning Activities

## Spring 2011

- Discussion of CIF21, SEES Initiatives

## Fall 2011

- NSF and ENG Initiatives in Response to Strategic Directions

# Flagship Activities

Research that is:

- Fundamental – supported by core programs
- Frontier – integrated with education, addressing grand challenges
- Potentially Transformative – high risk, high reward

Research *Teams* that are:

- Interdisciplinary
- International

# Beacon Activities

- Innovation
  - Cultivate an ecosystem
  - Accelerate the process
  - Support translational activities
- Next-generation Engineers
  - Are innovative, entrepreneurial, globally aware
  - Represent a diverse country
  - Support alternative pathways
- Public understanding of engineering



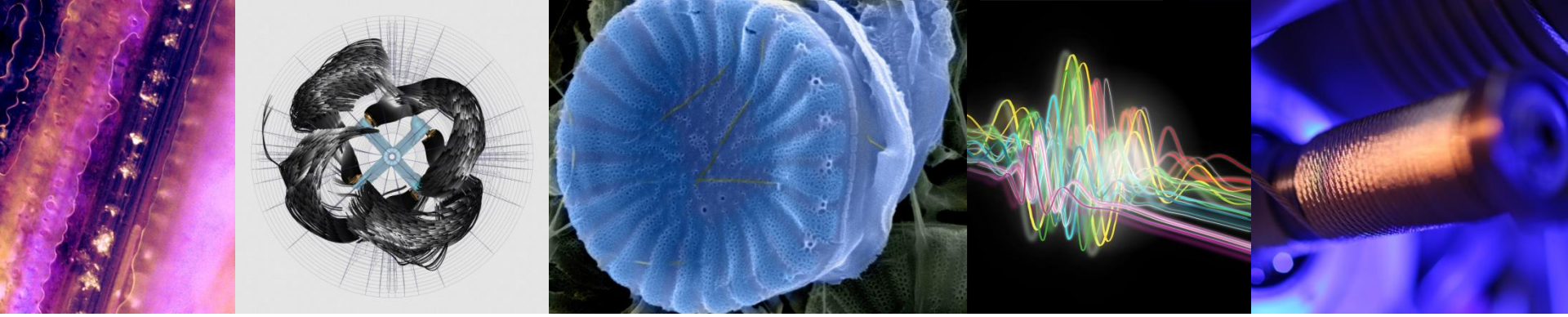
# Flagship Activities

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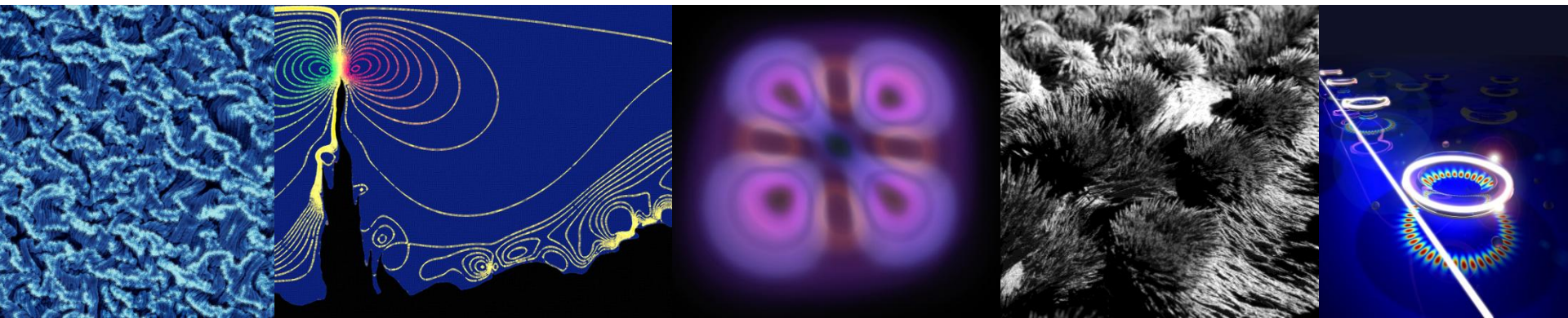
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Research *Teams* that are:

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# Basic Research Portfolio

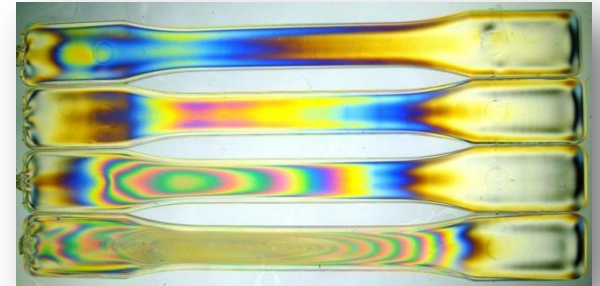


# Advanced Manufacturing

- ENG will invest in transformative manufacturing technologies, including:
  - Multi-scale modeling for simulation-based design and manufacturing across the supply chain
  - Nanomanufacturing
  - Innovative materials and manufacturing processes
  - Energy manufacturing
  - Complex engineering systems design and manufacturing
  - Science and Engineering Beyond Moore's Law (SEBML)
  - BioMaPS

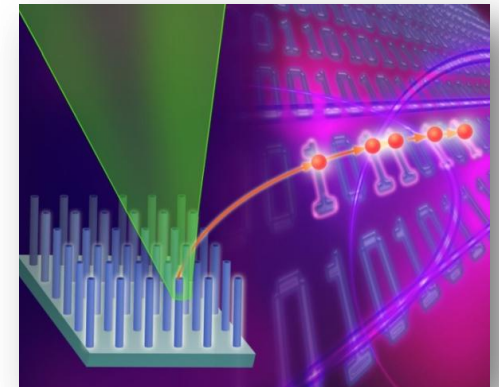
A novel, dynamic injection molding process controls molecular orientation.

*Credit: John P. Coulter, Lehigh Univ.*



# Science and Engineering Beyond Moore's Law (SEBML)

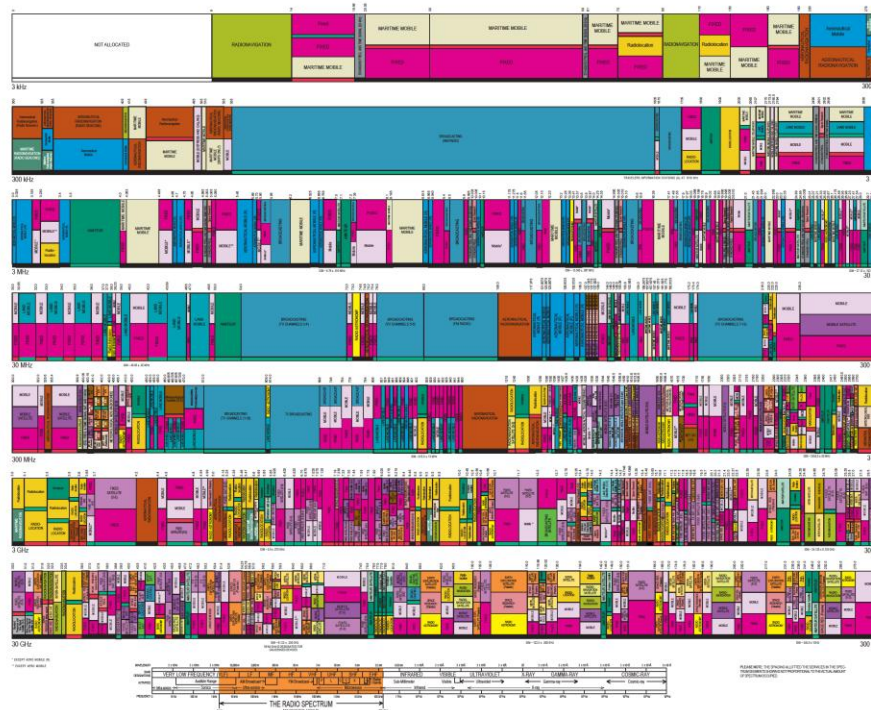
- ENG will support investigations into:
  - Devices, systems and architecture
  - Multi-scale modeling and simulation research
  - Quantum information science and engineering
  - Design of efficient and sustainable manufacturing equipment, processes, and facilities



A diamond nanowire matrix with defects called nitrogen vacancies. When stimulated with green light, these defects emit one red photon at a time. *Credit: Zina Deretsky, NSF*

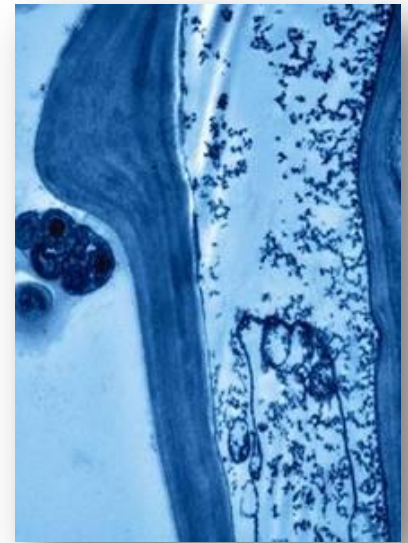


- The ENG investment will support research on
  - more efficient radio spectrum use
  - energy-conserving device technologies



# 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



Uptake of C70 nanoparticles and their aggregation within a rice plant leaf cell.

*Credit: JoAn Hudson, Sijie Lin, and Pu Chun Ke, Clemson University*

# 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

# NSF-wide and ENG-wide activities

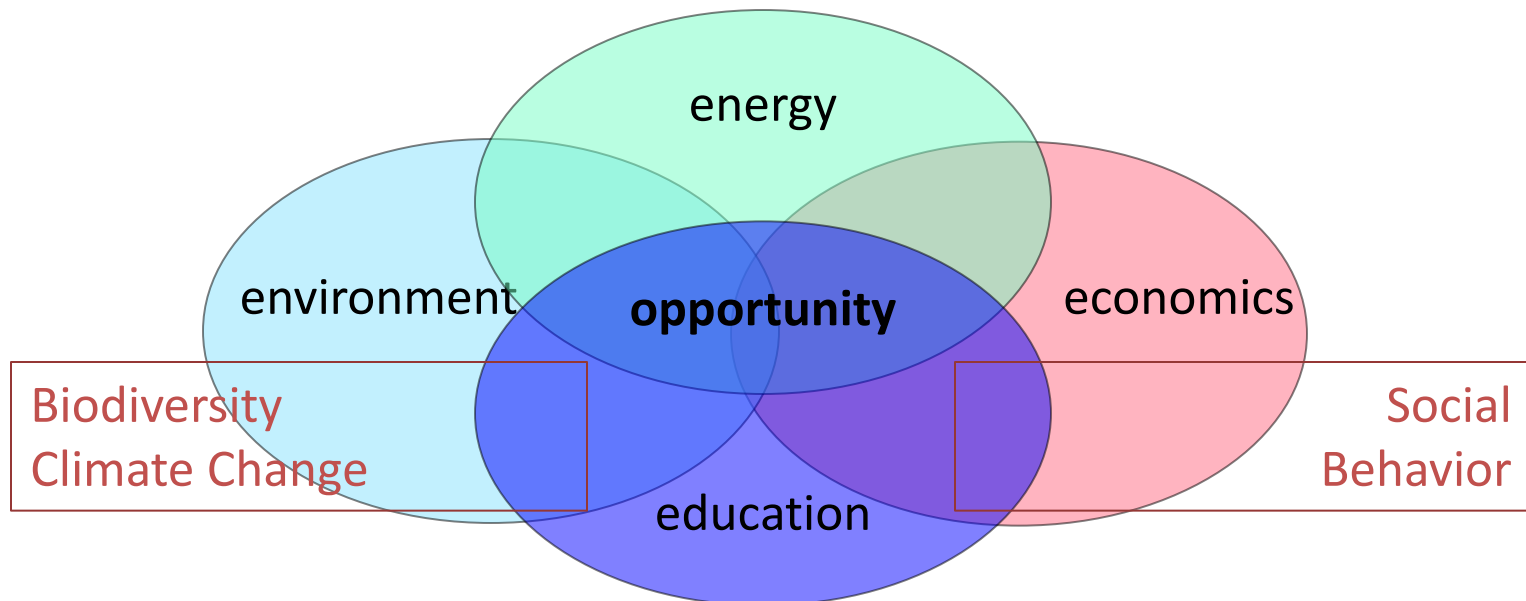
- SEES
  - CIF21
- } Major Foundation-Wide Initiatives
- ERCs
  - EFRI
  - INSPIRE
- } Multi-disciplinary Initiatives
- SAVI



# SEES and the NSF Mission

(Science, Engineering, and Education for Sustainability)

- NSF's mission is *to support the progress of science (education); to advance the national health, prosperity, and welfare; and to secure the national defense.*
- NSF has the capability to address the full depth and breadth of research and education for sustainable development.



# SEES FY 2011 and 2012 Activities

- Dear Colleague Letter (NSF 11-022)
- Research Coordination Networks–SEES track (NSF 11-531)
- SEES submission encouraged in Dynamics of Coupled Natural & Human Systems (NSF 10-612)
- **New: Sustainability Research Networks (NSF 11-574)**
- **New: SEES Fellows (NSF 11-575)**
- **New: Sustainable Energy Pathways (NSF 11-590)**
- Exclusive SEES focus in Partnerships for International Research and Education (PIRE) solicitation (NSF 11-564)
- Climate-related competitions continue
- SEES Summit planned for March 2012

# ENG Support for SEES and Clean Energy

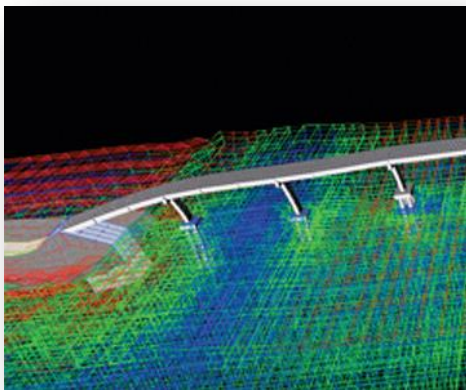
- ENG will invest in research and education for technologies that mitigate against, and adapt to, environmental change that threatens sustainability.
  - Sustainable Energy Pathways
  - Sustainable Chemistry
- ENG will support smart grid and solar energy technologies, biofuels and bioenergy, wind energy generation, and renewable energy storage.
  - BioMaPS



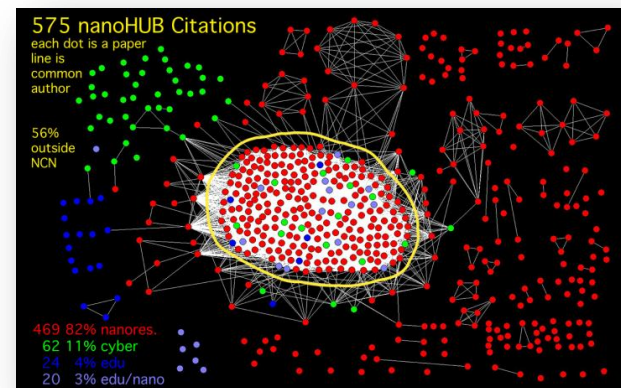
Solar array. Credit: NREL

# Cyber Infrastructure for the 21st Century (CIF21)

- The ENG investment will focus on
  - Data-enabled science
  - New computational infrastructure
  - Access/connections to cyberinfrastructure facilities



Pacific Earthquake Research Center,  
UC Berkeley



NanoHUB Citation Map in the Scientific  
Literature, Purdue University

# Research Centers

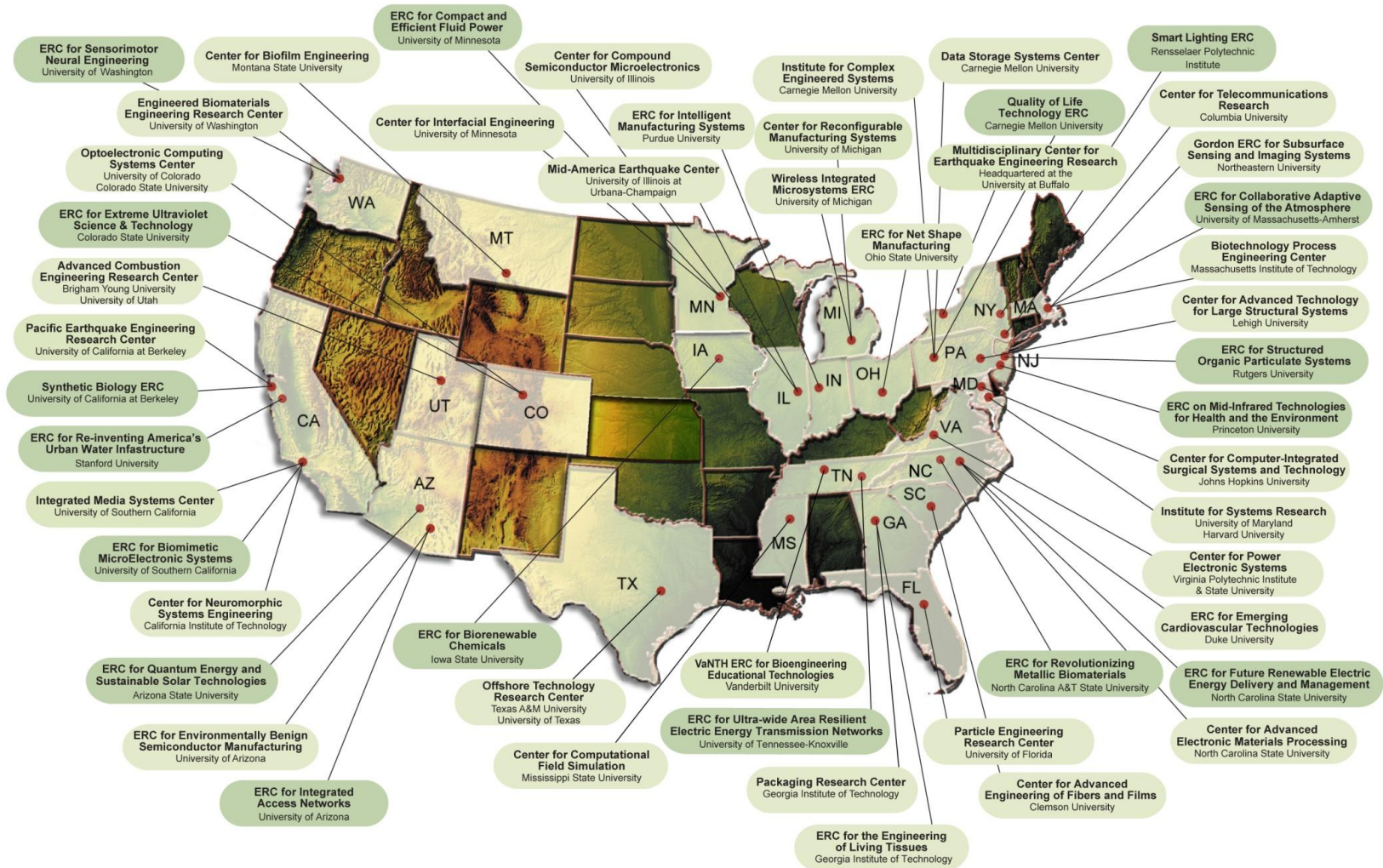
- Science and Technology Centers (STCs)
  - CBET will support the Center on Emergent Behaviors of Integrated Cellular Systems
  - ECCS will support the Center for Energy Efficient Electronics Science
- Engineering Research Centers (ERCs)
  - Four new ERCs (two with DOE)
  - New NanoSystems ERC solicitation

# New Engineering Research Centers (ERCs)

- ENG established 4 ERCs in FY 2011 with \$74M over 5 years:
  - The **NSF ERC for Re-inventing America's Urban Water Infrastructure**, led by Stanford Univ., will seek sustainable urban water systems to supply, treat, and reuse water.
  - The **NSF ERC for Sensorimotor Neural Engineering**, led by the Univ. of Washington, will pursue the ideal mind-machine interface and other devices to restore and augment health.
  - The **NSF-DOE ERC for Quantum Energy and Sustainable Solar Technologies** (QESST), led by Arizona State Univ., will aim to make solar energy technologies sustainable, ubiquitous, and multifunctional.
  - The **NSF-DOE ERC for Ultra-wide-area Resilient Electric Energy Transmission Networks** (CURENT), led by the Univ. of Tennessee, Knoxville, will create transforming technologies to allow reliable, secure, and efficient operation of the electricity transmission infrastructure across vast distances.



# NSF Engineering Research Centers



Notes: (1) Darker labels denote current ERCs. Lighter labels denote graduated centers.  
(2) Most centers are multi-university partnerships. University shown is lead institution.

# NanoSystems ERCs

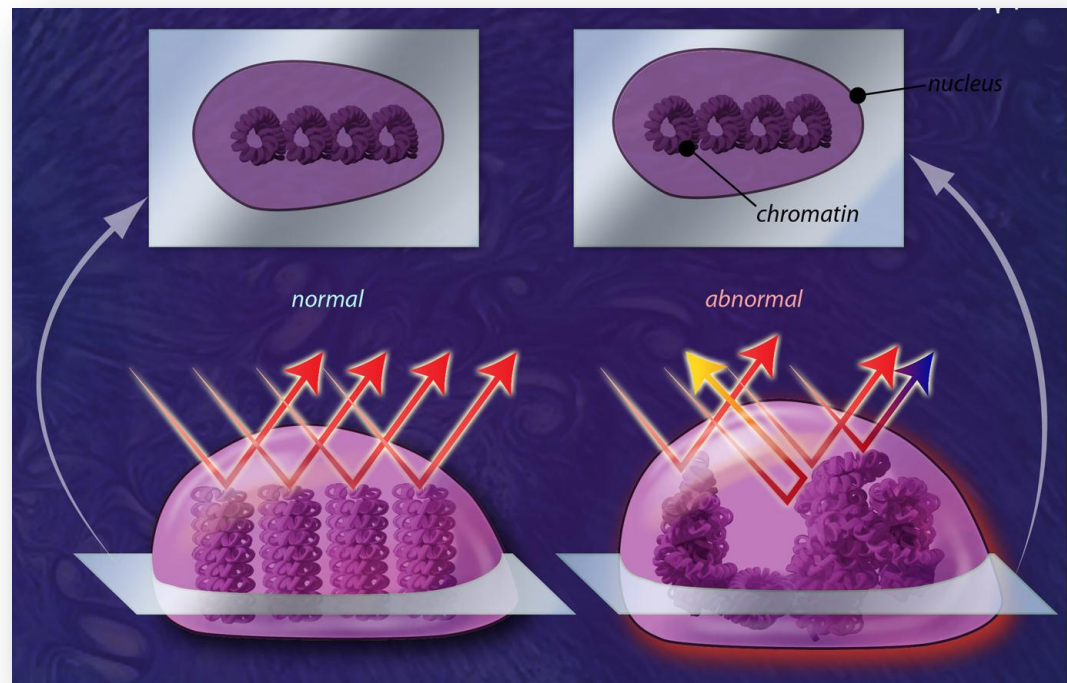
- NNI investment in fundamental research has revealed new phenomena and resulted in numerous advances.
- Some discoveries are ready to be integrated into nanosystems, thus leading to adoption in applications critical for their commercial use
- NSF competition now underway for Transformational Nanotechnology of Engineered Systems Centers or NanoSystems ERCs (NERCs)
  - Up to three new NanoSystems ERC awards in FY 2012



# Potentially Transformative Research

- Disciplinary research
- Interdisciplinary research
- Emerging Frontiers of Research and Innovation

Nanoscale disturbances in cheek cells indicate the presence of lung cancer. A new technique called partial wave spectroscopic microscopy (PWS) zeroes in on nano-level disturbances. The development of PWS has been led by Vadim Backman of Northwestern University. *Credit: Zina Deretsky, NSF.*

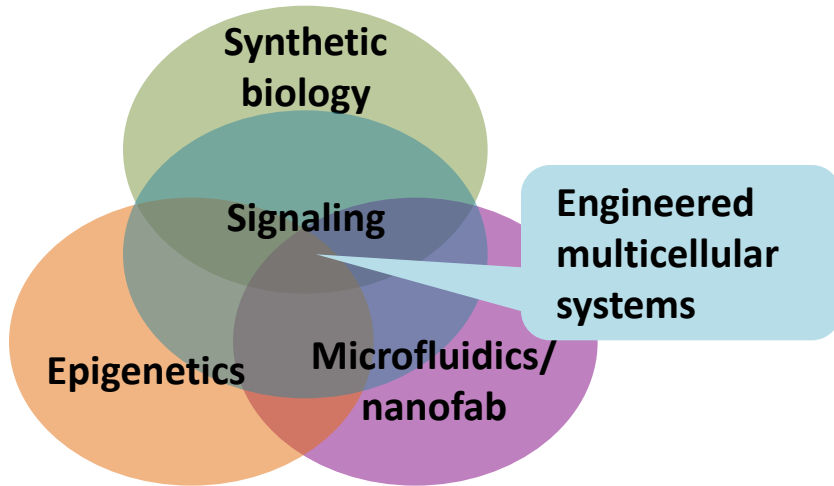


# EFRI Update

- **COV REPORT AND RESPONSE** – COV Report was presented at the Advisory Committee last Spring. The report and response are posted at <http://www.nsf.gov/od/oia/activities/cov/covs.jsp#eng>
- **TOPIC SELECTION FREQUENCY** – Based on recommendation of EFRI Committee of Visitors (COV), Topic Selection Frequency has changed to *every other year*.
- **EFRI TOPICS**

FY 2007	Auto-Reconfigurable Engineered Systems ( <b>ARES</b> ) Cellular and Biomolecular Engineering ( <b>CBE</b> )
FY 2008	Cognitive Optimization ( <b>COPN</b> ) Resilient and Sustainable Infrastructures ( <b>RESIN</b> )
FY 2009	Biosensing and Bioactuation ( <b>BSBA</b> ) Hydrocarbon from Biomass ( <b>HyBi</b> )
FY 2010	Science in Energy and Environmental Design: Engineering Sustainable Buildings ( <b>SEED</b> ) Renewable Energy Storage ( <b>RESTOR</b> )
FY 2011	Engineering Multicellular and Interkingdom Signaling ( <b>MIKS</b> ) Mind, Machines, and Motor Control ( <b>M3C</b> )

# MIKS: Engineering New Technologies Based on Multicellular and Inter-Kingdom Signaling



**Goal:** Use molecular tools to understand multicellular and inter-kingdom signaling and engineer new multicellular systems to solve problems in energy, health, food safety and environment.

## Expected Transformative Impacts:

- Fundamental knowledge in multi-cellular systems and bacteria–eukaryote interactions
- Basic sciences, including developmental biology, stem cells, bacteria–eukaryote interactions
- Enabling technologies including synthetic biology, high-throughput tools
- Novel engineered multicellular systems
- New collaborations between different research communities

# MIKS: Learning from Termites

- The project “Creation and Manipulation of an Artificial Termite Gut through Control of the Microenvironment” ([1137249](#)) will be led by Ranjan Srivastava, with colleagues Daniel Gage, Joerg Graf, William Mustain, and Leslie Shor, all from the University of Connecticut.
- This project will investigate the capabilities of the termite gut community of microbes to break down carbon sources, such as lignocelluloses, and its self-regulation through signaling.
- They will systematically replicate physical and chemical features of a lower termite gut using engineered microhabitats.
- With new understanding, it may be possible to manipulate microbial communities and harness their capabilities for chemical production on an industrial scale.



*Credit: Gary Alpert, Harvard Univ., Bugwood.org*

# M3C: Mind, Machines and Motor Control

**Goal:** To establish experimentally verified, mathematical theories of M3C that can serve as predictive tools for the design of machines that involve forceful, physical interaction with humans.

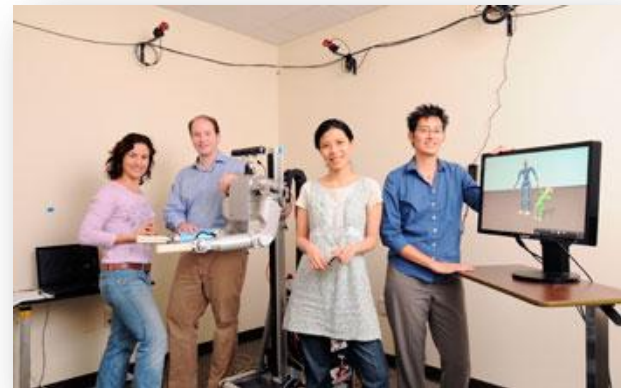
## **Expected Transformative Impacts:**

- Mathematical foundations and principles of optimality that govern M3C
- Dynamics of learning and skill acquisition
- Benchmarking systematic biomechanical function & rehabilitation
- Reverse-engineering sensory motor neuroscience
- Superior machines that work with humans

# M3C: Dancing with Robots

- The project “Partnered Rehabilitative Movement: Cooperative Human-robot Interactions for Motor Assistance, Learning, and Communication” ([1137229](#)) will be led by Lena H. Ting of Emory University, with colleagues Madeleine E. Hackney of Emory, and Charles C. Kemp and C. Karen Liu of the Georgia Institute of Technology.
- The researchers will use the paradigm of rehabilitative partner dance, which requires improvisational, collaborative movement toward particular goals. It also involves long-term motor skill acquisition and short-term motor adaptation.
- This project will use human and robot dancers to experimentally verify a theory of human sensory-motor control and learning, and to develop predictive models of whole-body human movement for cooperative physical interactions with machines.

*Credit: Georgia Tech/Gary Meek*



# EFRI for FY 2012

- Selected topics
  - Flexible Bioelectronics Systems (BioFlex)
  - Origami Design for Integration of Self-assembling Systems for Engineering Innovation (ODISSEI)
  - Photosynthetic Biorefineries (PSBR)
- Received 247 Letters of Intent by September 30, 2011
  - BioFlex 91
  - ODISSEI 101
  - PSBR 55
- Engaged partners
  - External: AFOSR
  - Internal: BIO, CISE, MPS

# EFRI TOPIC SELECTION

- Continuous Community Input (publications, conferences, advisory committee, committees of visitors, panels, workshops, ...)
- Explicit Community Input through Website (Dear Colleague Letter; Sept deadline) **90 RECEIVED**
- Fall Advisory Committee (October)
- EFRI Community Series (Nov/Dec) **10 PRESENTATIONS at NSF**
- Program Directors' Retreat (Jan)
- ENG Leadership Retreat (March)
  - **TOPICS ARE FINALIZED**
- Spring Advisory Committee (April)
  - **TOPICS ARE ANNOUNCED AND MADE PUBLIC**



*Program Directors are the Kernel of Integration and  
Leaders for EFRI Topics*



# EFRI Activities

- Formative Evaluation: external evaluation of EFRI processes is underway.
- Broadening Participation Plan: AAAS Fellow is developing a plan with COV report in mind.
- For more information:
  - EFRI Website: [www.nsf.gov/eng/efri](http://www.nsf.gov/eng/efri)
  - Grantee Meetings: [www.abecker.com](http://www.abecker.com)

# **Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE)**

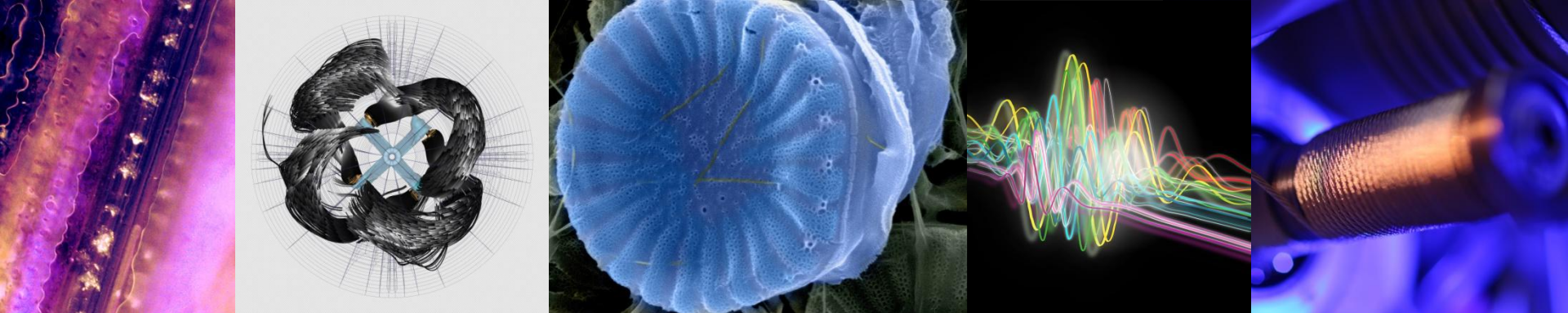
- New program designed to catalyze transformative, interdisciplinary research by integrating a suite of new activities with existing efforts and other NSF investments.
- Awards will support single investigators and small groups.
- \$12.35 million requested for FY 2012

# Science Across Virtual Institutes (SAVI)

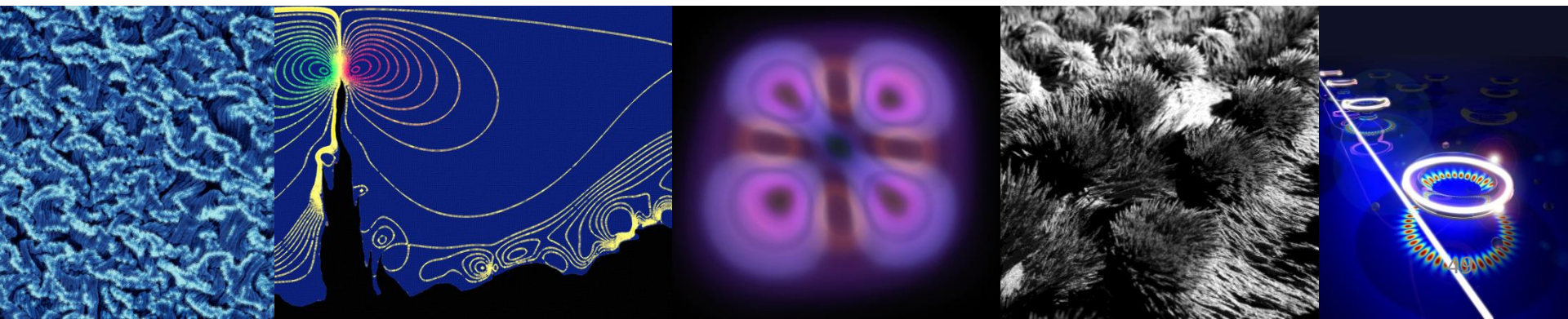
- Create a uniform platform for International Collaborations between NSF funded US researchers and other institutions around the world.
- Facilitate collaboration among scientists, engineers and educators across the globe to help solve society's most vexing problems.
- Early pilot Virtual Institutes (VIs):
  - Mathematical and Statistical Sciences (VI-MSS) with India
  - Physics of Living Systems Student Research Network (PoLS SRN) with Israel and others
  - Wireless Innovation (WiFiUS) with Finland

# Collaborative Research with Ireland

- The United States, Northern Ireland, and the Republic of Ireland renewed a partnership to increase the level of collaborative R&D
  - Aims to generate innovation and lead to improvements in society.
  - Focuses on nanotechnology, telecommunications, sensors, and energy and sustainability.
- Workshop on Collaborative Research Opportunities in Telecommunications Technologies in Dublin, Nov. 1-2, 2011



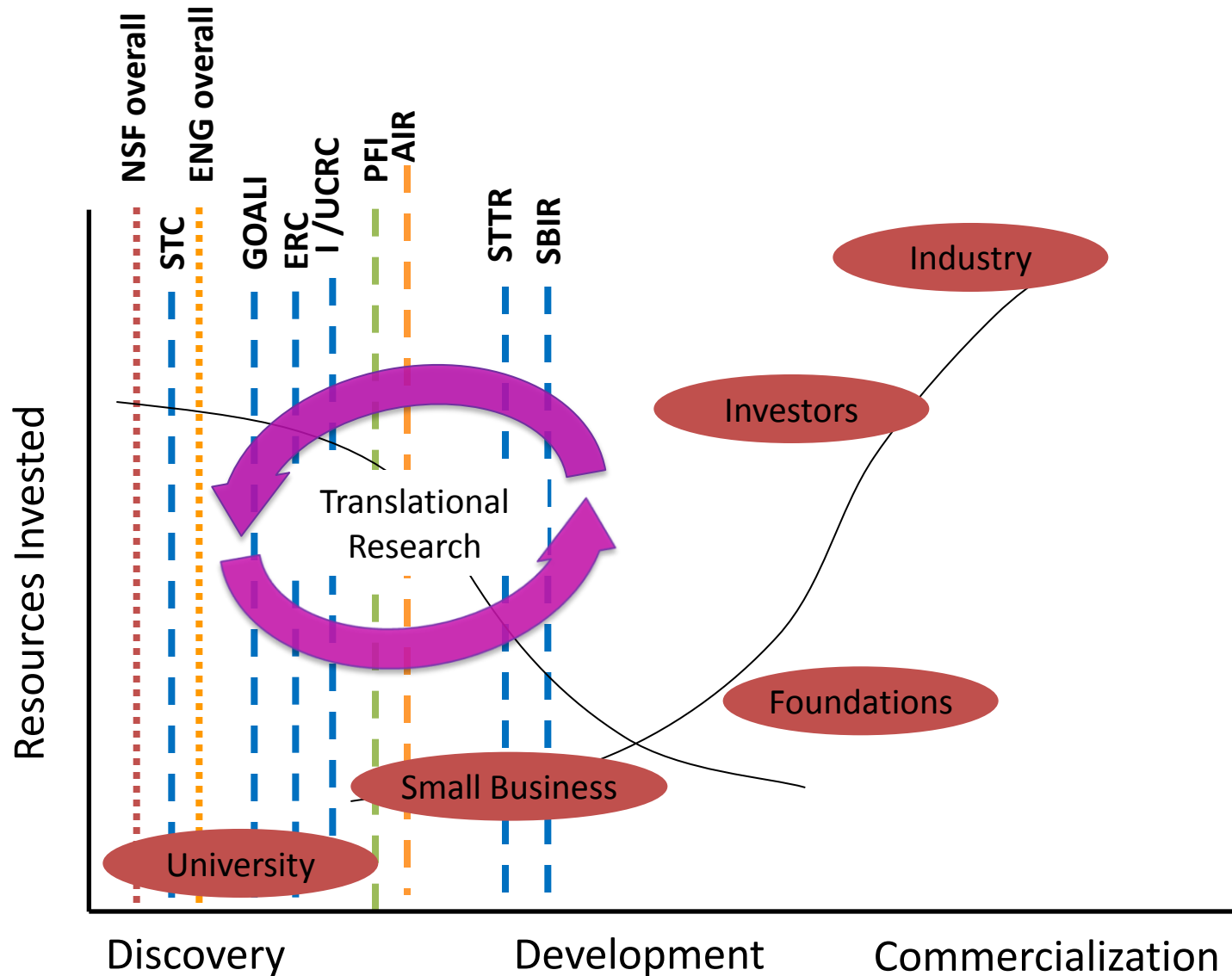
# Innovation



# Beacon Activities

- Innovation
  - Cultivate an **ecosystem**
  - Accelerate the **process**
  - Support **translational activities**
- Next-generation Engineers
  - Are innovative, entrepreneurial, globally aware
  - Represent a **diverse** country
  - Support alternative pathways
- **Public understanding** of engineering

# NSF Innovation Investments



# Accelerating Innovation Research (AIR)

- AIR creates partnerships for innovation involving universities and institutions to increase the economic and social impacts of basic research through
  - Engaging faculty and students across all disciplines in innovation and entrepreneurship
  - Increasing the impacts of promising university discoveries through commercialization, industry alliances, and start-up formation
  - Developing regional communities



# Innovation Corps (I-Corps) Projects are Team-based

- Team Composition:
  - Entrepreneurial Lead: Post-doc or Student to move it forward
  - I-Corps Mentor: Domain-relevant volunteer guide
  - PI: Researcher with current or previous award
- Program Outcomes
  - Functioning network of Mentors/Advisors
  - Scientist and Engineers trained as Entrepreneurs
  - Increased impact of NSF-funded basic research

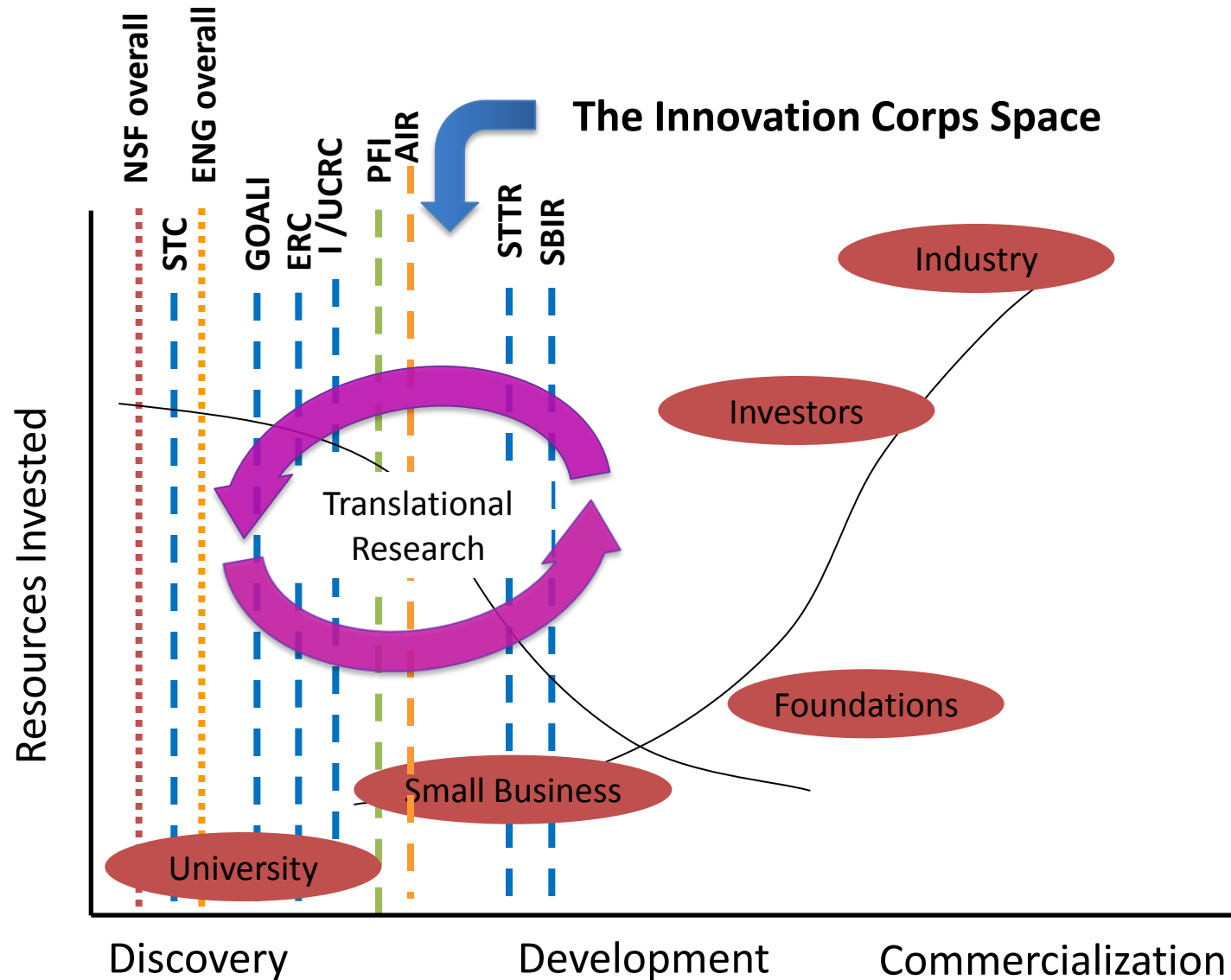


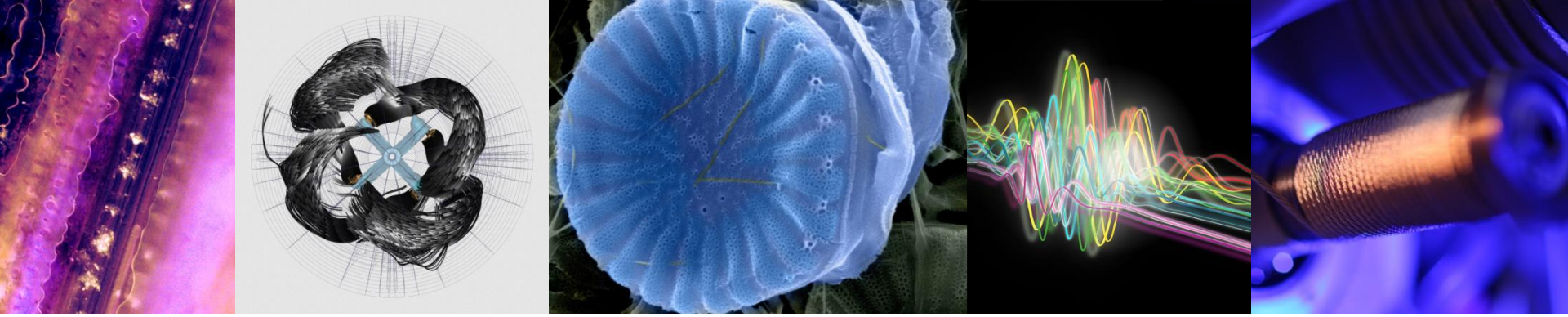
Credit: © 2011 JupiterImages Corp.

- 30 hours of curriculum
- \$50,000 per award
- F&A \$5,000 maximum
- 25 awards in FY2011
- 100 awards in FY2012

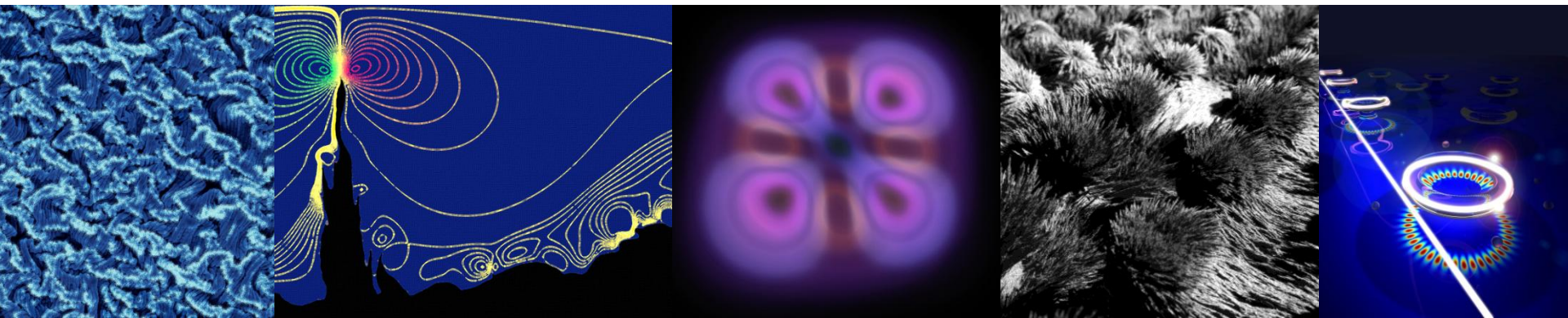


# NSF Innovation Investments



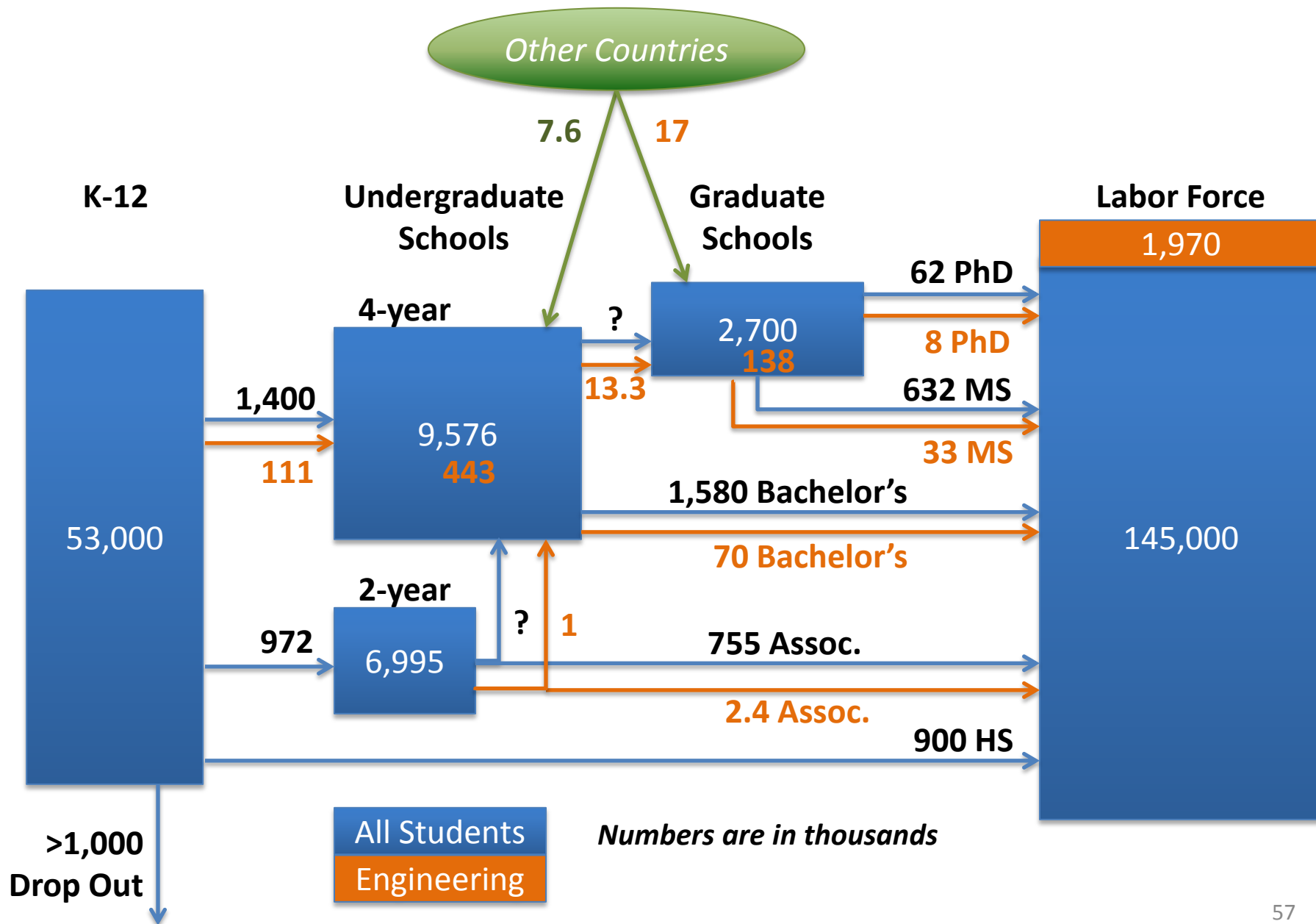


# Next-generation Engineers

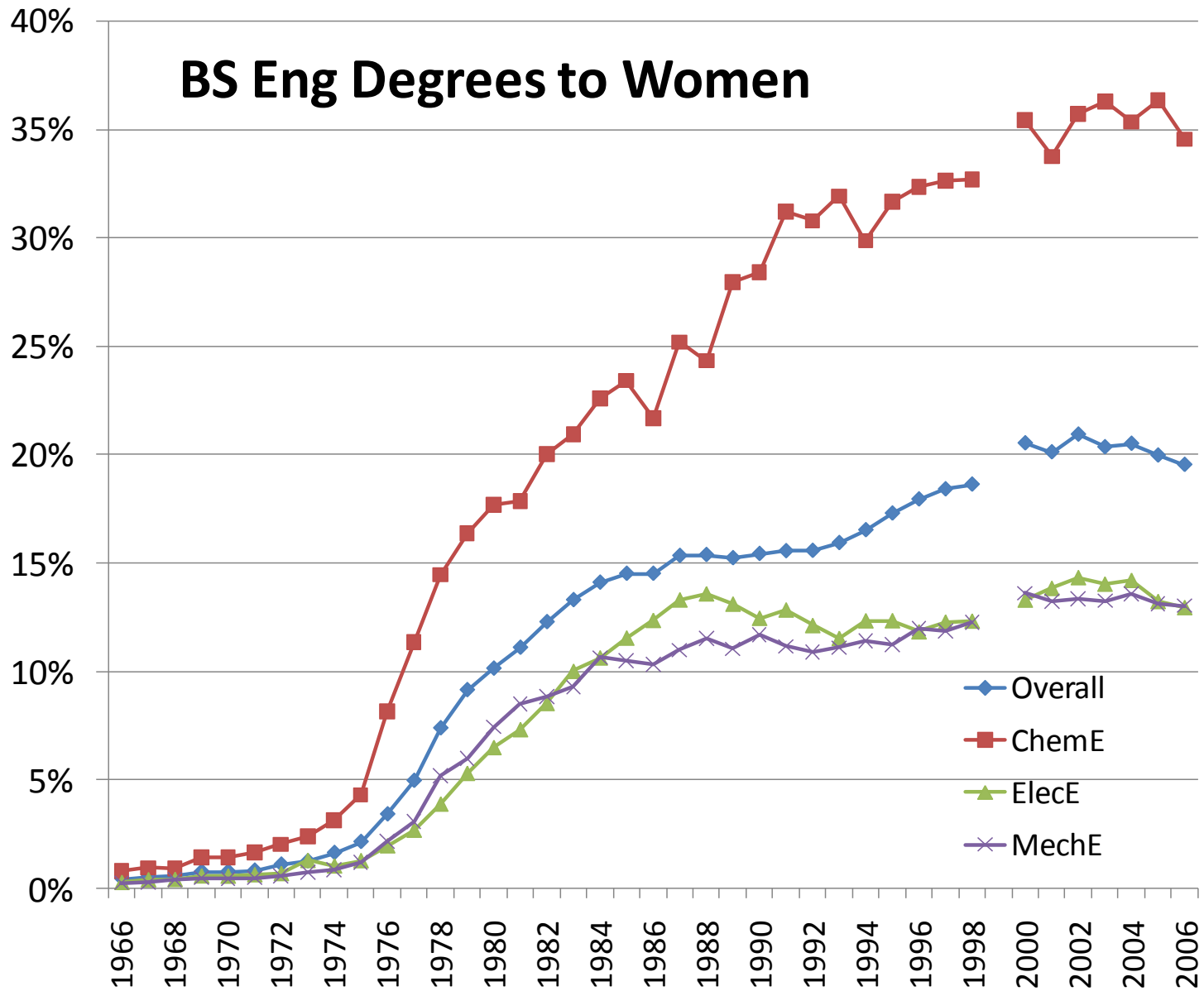


# Beacon Activities

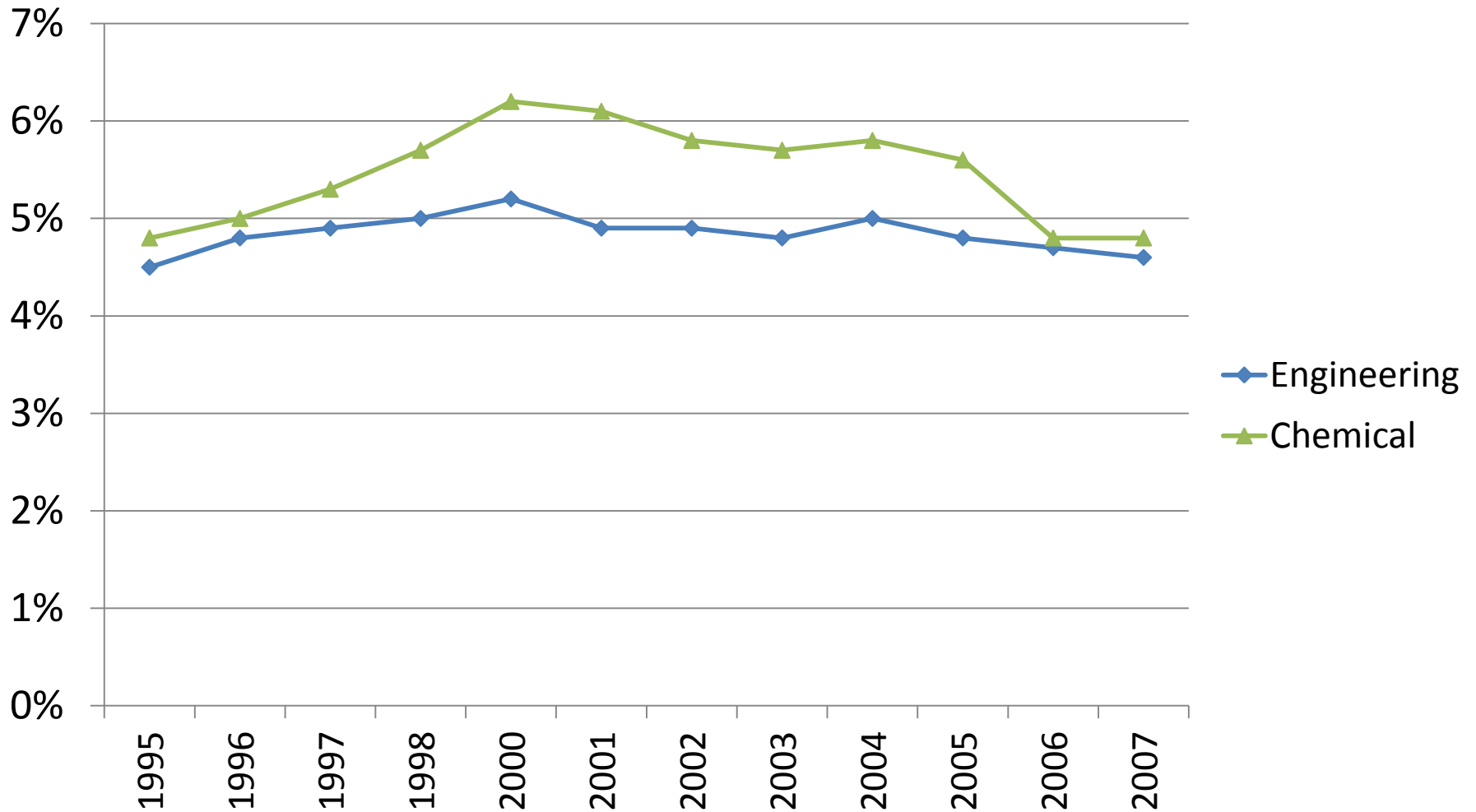
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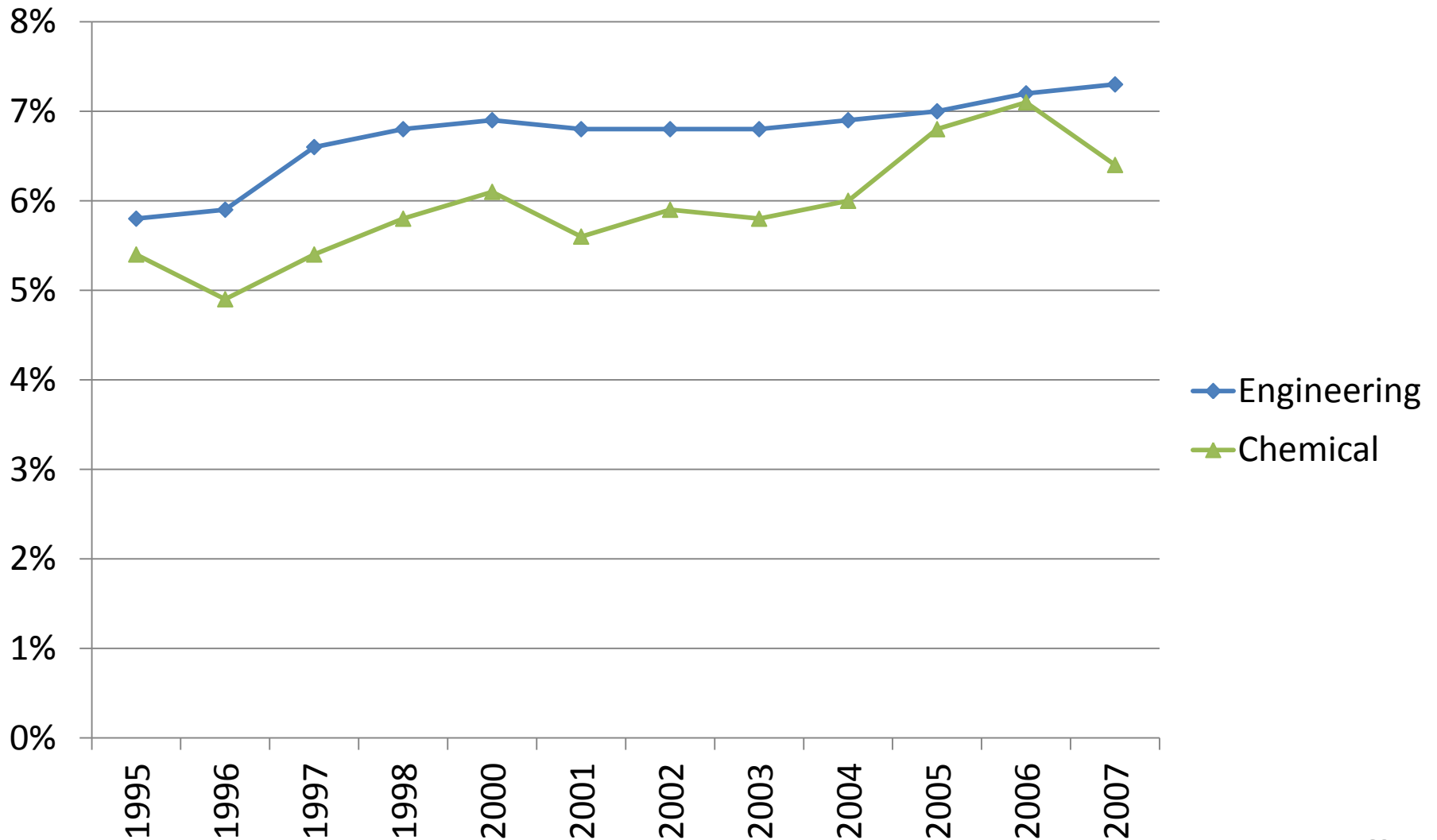
# BS Eng Degrees to Women



# Percentage BS Degrees to African-Americans



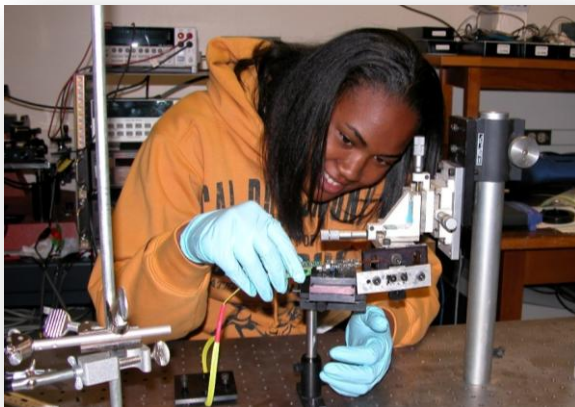
# Percentage BS Degrees to Hispanics





# Engineers of the Future

- The directorate emphasizes support for
  - CAREER awards
  - Activities that promote the entry and retention of veterans and other non-traditional students in engineering programs



REU student Brittney Perry at work.  
*Credit: Biomimetic MicroElectronic Systems ERC, USC*



Spc. Timothy Roy, 44th Expeditionary Signal Battalion, performs maintenance on computer servers and routers at Camp Echo, Iraq, in 2008. *Credit: Spc. Evan D. Marcy; Courtesy of U.S. Army*

# Tribal Colleges and Universities Programs (TCUP)

- Program to enhance quality of STEM instructional and outreach programs at Tribal Colleges and Universities
- Pre-engineering Education Collaboratives (PEEC) for pilot efforts to:
  - Develop and/or enhance pre-engineering curricula
  - Provide pathways from 2-year colleges to 4-year universities
  - Provide internships, research experiences, extramural learning opportunities, and faculty development
- So far:
  - ~80 students across the schools have participated
  - New/revised course offerings (11+), summer activities (4), degree paths and programs (4), and articulation agreements (2)
  - New engineering faculty (7) and coordinators (2)

# TCUP PEEC Awards

- **Hawaii:** led by Kapiolani Community College with partners Honolulu Community College, Leeward Community College, Maui Community College, Windward Community College, and Univ. of Hawaii at Manoa
- **North Dakota:** led by Cankdeska Cikana Community College with partners Fort Berthold Community College, Sitting Bull College, Turtle Mountain Community College, and North Dakota State Univ.
- **South Dakota:** led by Oglala Lakota College with partners South Dakota School of Mines and Technology and South Dakota State Univ.
- **Wisconsin:** led by the College of Menominee Nation with partners Univ. of Wisconsin–Madison and Univ. of Wisconsin–Platteville

Pre-engineering students are getting new research opportunities to help prepare for bachelor's degrees.

*Credit: Tawa Ducheneaux, Oglala Lakota College*



# Small Business Postdoctoral Research Diversity Fellowship

- Fellow works in current NSF SBIR Phase II grantees
- ASEE matches applications with businesses and manages the program
- Fellow receives \$65,000 from NSF and \$10,000 from the small business
- 50 fellowships, one-year duration
- Website: <http://nsfsbir.asee.org/>
- 76 applications completed (21% women, 16% other underrepresented group, 25% Asian)
- 30 fellows placed (24% women, 7% other underrepresented group, 17% Asian)

# Graduate Research Diversity Supplements

- To broaden the participation of underrepresented students in engineering Ph.D. programs through supplements to current research grants funded by ENG divisions
- FY 2011: 52 supplements
  - Diversity office co-funded all
- FY 2010: 61 supplements
  - Diversity office co-funded 35

# BRIGE Program

- Held second grantee conference in August 2011
- Receiving significant co-funding support from the EPSCoR Office
- FY 2011
  - 126 proposals
  - 30 awards (24% success rate)
- FY 2010
  - 116 proposals
  - 31 awards (27% success rate)
- FY 2009 (includes ARRA)
  - 135 proposals
  - 38 awards (31% success rate)
- FY 2008
  - 130 proposals
  - 28 awards (25% success rate)

# NSF Family-friendly Policies

- NSF Working Group
  - Examining internal policies
  - Examining program opportunities

# Career–Life Balance Initiative

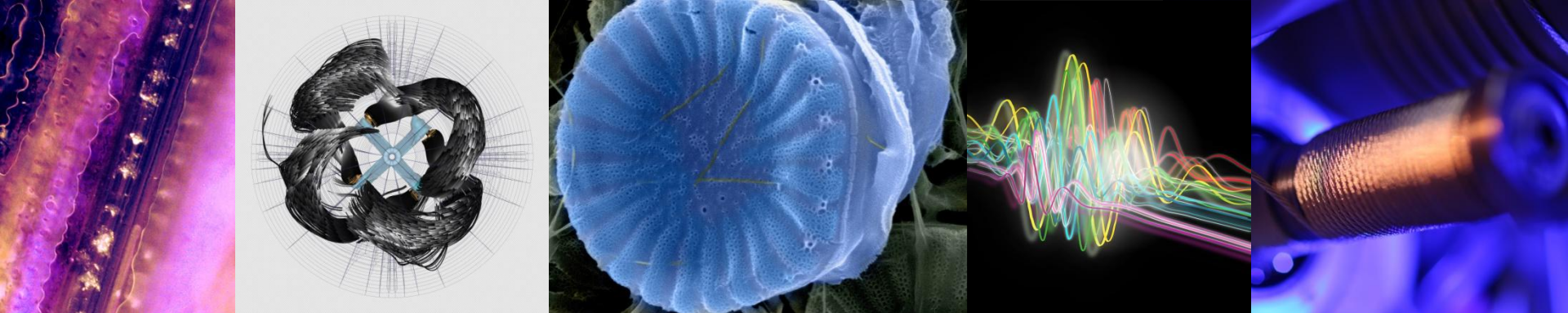
Allow:

- Postponement of grants for childbirth and adoption
- Grant suspension for parental leave
- Funding to support research technicians for family leave

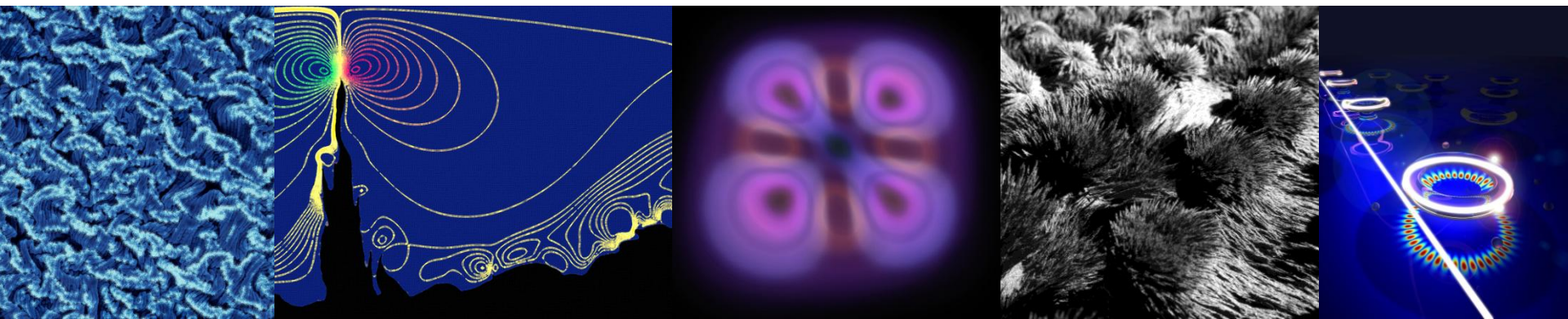
Promote, Support and Publicize:

- Family friendliness for panel reviewers
- Research and evaluation of family-friendly policies
- Availability of family-friendly opportunities
- Partnerships with academic institutions





# Outreach



# Hazards on the Hill



*Credit: NSF*

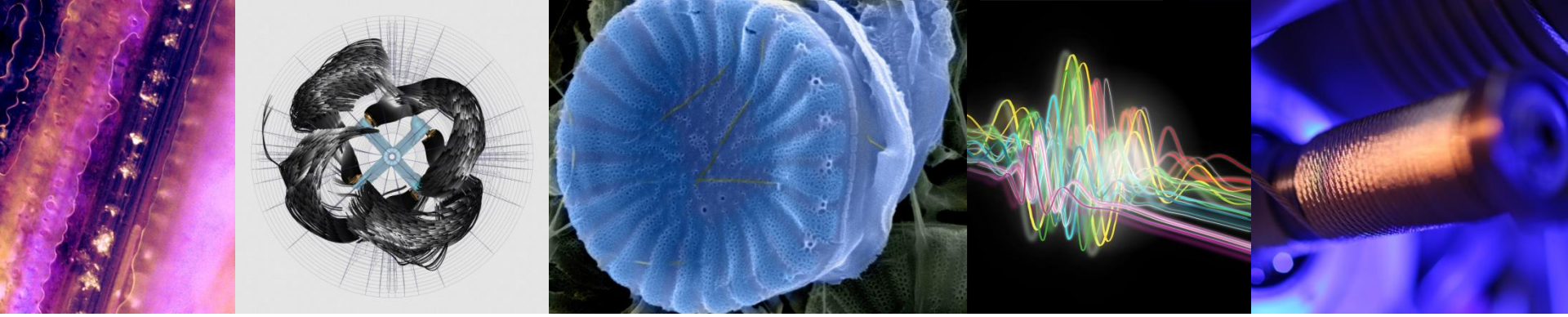
# Engagement in Administration Priorities

- Advanced Manufacturing Partnership (AMP)
  - CMU, GaTech, MIT, Berkeley, Michigan
- Advanced Robotics Initiative
- EARS
- Materials Genome
- NNI Signature Initiatives
- Smart Health Systems
- Innovation
  - Duke, Florida, AAU, APLU

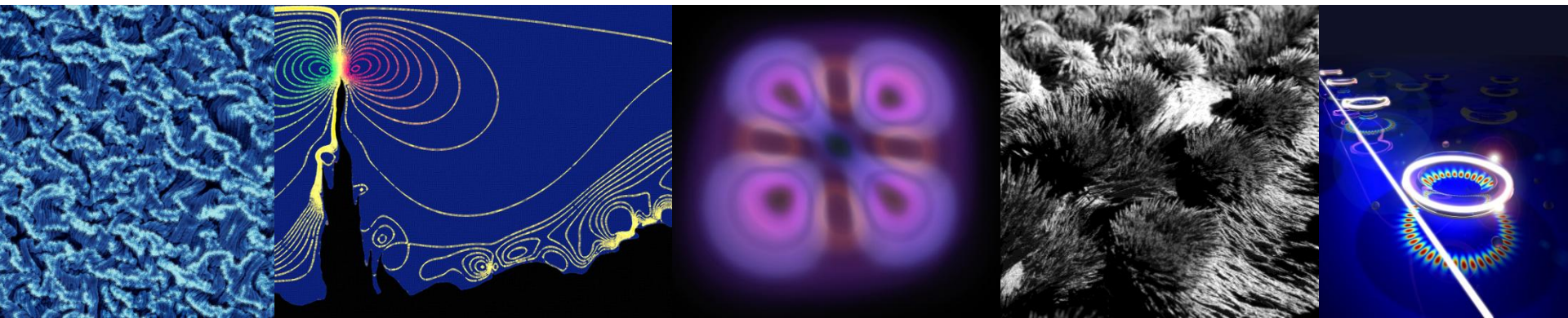


# **Engagement in Engineering Conferences for Under-represented Groups**

- Hispanic Engineering, Science, and Technology Week (HESTEC) University of Texas–Pan American, Sept. 26-Oct. 1, 2011
- Great Minds in STEM (HENAAC), Florida International University and University of Central Florida, Oct. 6-8, 2011
- National Action Council for Minorities in Engineering (NACME), St. Paul, Minn., Oct. 18-20, 2011
- Society of Hispanic Professional Engineers, (SHPE), Anaheim, Calif., Oct. 26-30, 2011



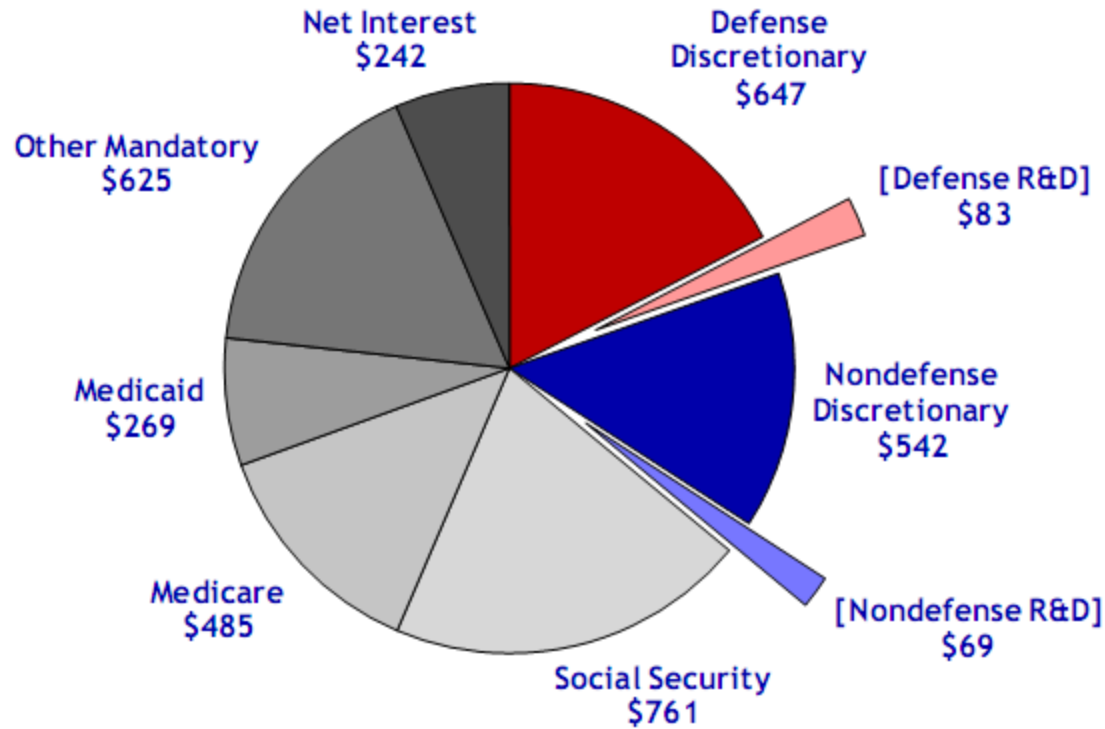
# ENG Budget and Trends



# Composition of the Proposed FY 2012 Budget

## Total Outlays = \$3.7 trillion

outlays in billions of dollars

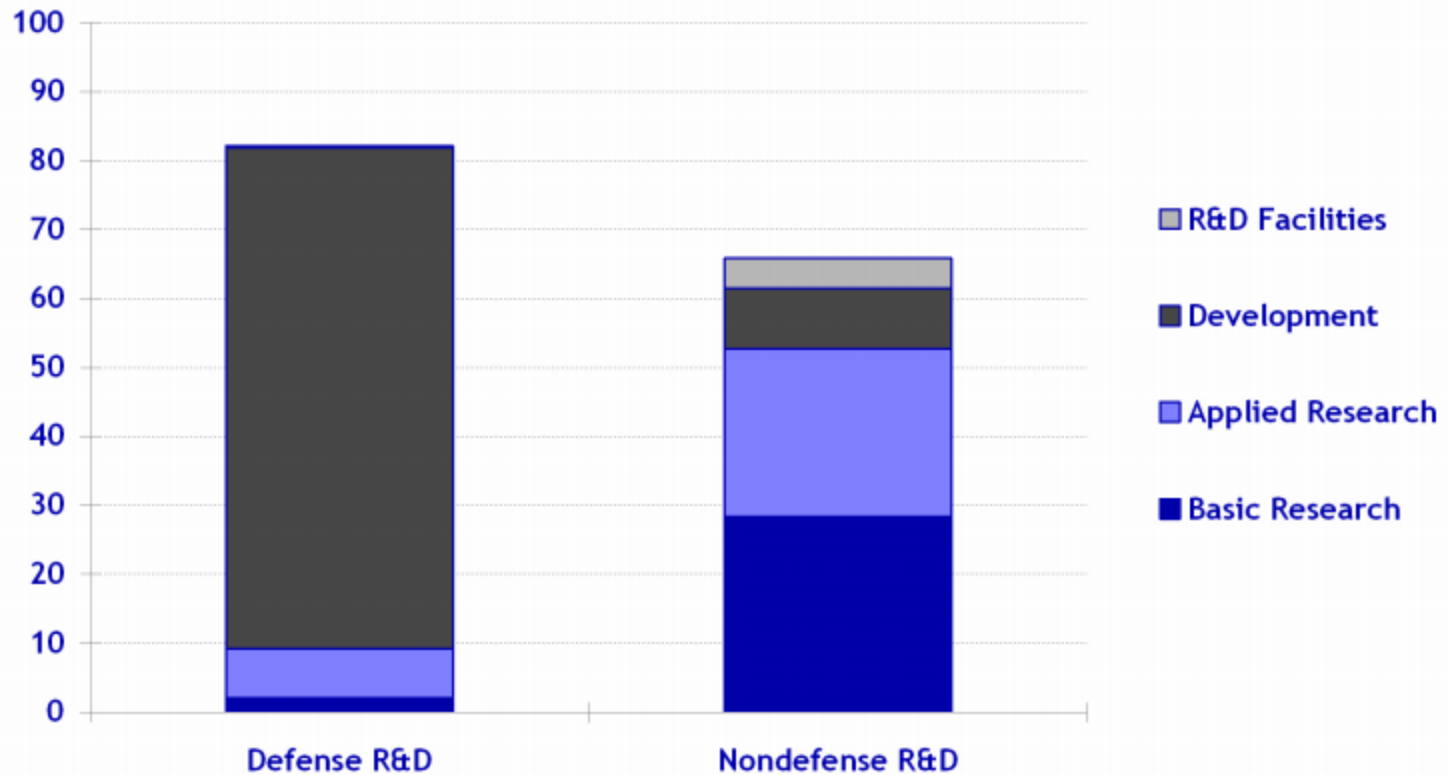


Source: *Budget of the United States Government FY 2012*.  
Projected unified deficit is \$1.1 trillion.  
© 2011 AAAS



# Character of R&D, FY 2011

budget authority in billions of dollars



Source: OMB R&D data, agency budget justifications, and agency budget documents.

Defense R&D = DOD + DOE defense.

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# ENG FY12 Budget (\$M), Proposed

	FY 2010 Omnibus Actual	FY 2010 Enacted/ Annualized FY 2011 CR	FY 2012 Request	Change over FY 2010 Enacted	
				Amt	%
<b>CBET</b>	<b>\$157.08</b>	<b>\$156.82</b>	<b>\$194.03</b>	<b>\$37.21</b>	<b>23.7%</b>
<b>CMMI</b>	<b>189.40</b>	<b>188.00</b>	<b>226.10</b>	<b>38.10</b>	<b>20.3</b>
<b>ECCS</b>	<b>93.97</b>	<b>94.00</b>	<b>131.00</b>	<b>37.00</b>	<b>39.4</b>
<b>EEC</b>	<b>125.86</b>	<b>124.11</b>	<b>132.40</b>	<b>8.29</b>	<b>6.7</b>
<b>IIP</b>	<b>180.63</b>	<b>152.00</b>	<b>191.57</b>	<b>39.57</b>	<b>26.0</b>
<b><i>SBIR/STTR</i></b>	<b><i>156.84</i></b>	<b><i>125.77</i></b>	<b><i>146.88</i></b>	<b><i>21.11</i></b>	<b><i>16.8</i></b>
<b>EFRI</b>	<b>28.99</b>	<b>29.00</b>	<b>33.20</b>	<b>4.20</b>	<b>14.5</b>
<b>ENG TOTAL</b>	<b>\$775.92</b>	<b>\$743.93</b>	<b>\$908.30</b>	<b>\$164.37</b>	<b>22.1%</b>



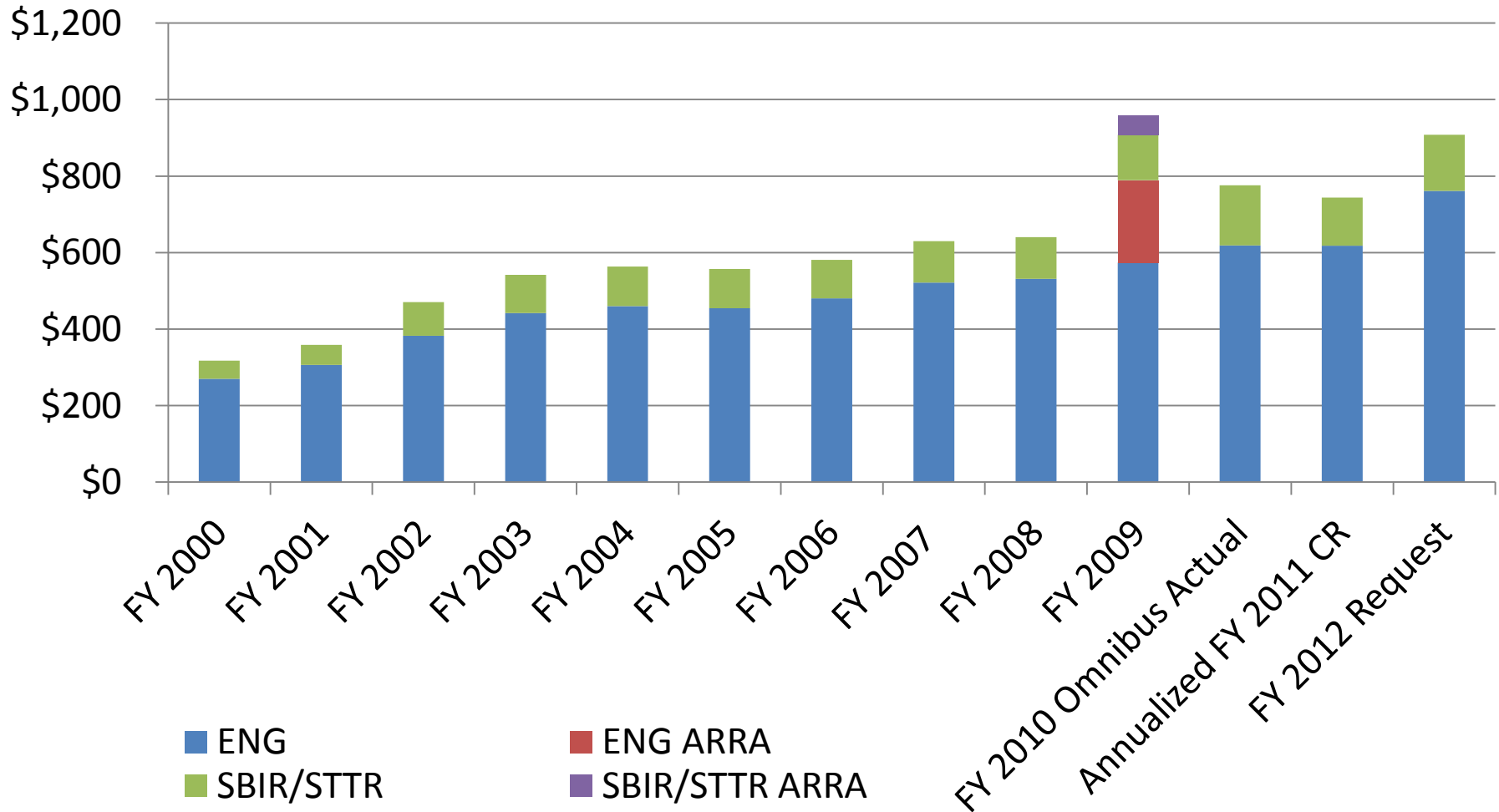
# How our Proposed Budgets Have Fared (\$M)

	FY09	FY10	FY11	FY12
NSF Proposed (R&RA)	\$5,593.99	\$5,733.24	\$6,018.83	\$6,253.54
NSF Actual (R&RA)	5,152.39	5,615.33	5,563.92	TBD
	* 2,062.64	* 439.17		
ENG Proposed	759.33	764.52	825.67	908.30
ENG Actual	664.99	743.88	743.93	TBD
	* 264.99	** 32.05		

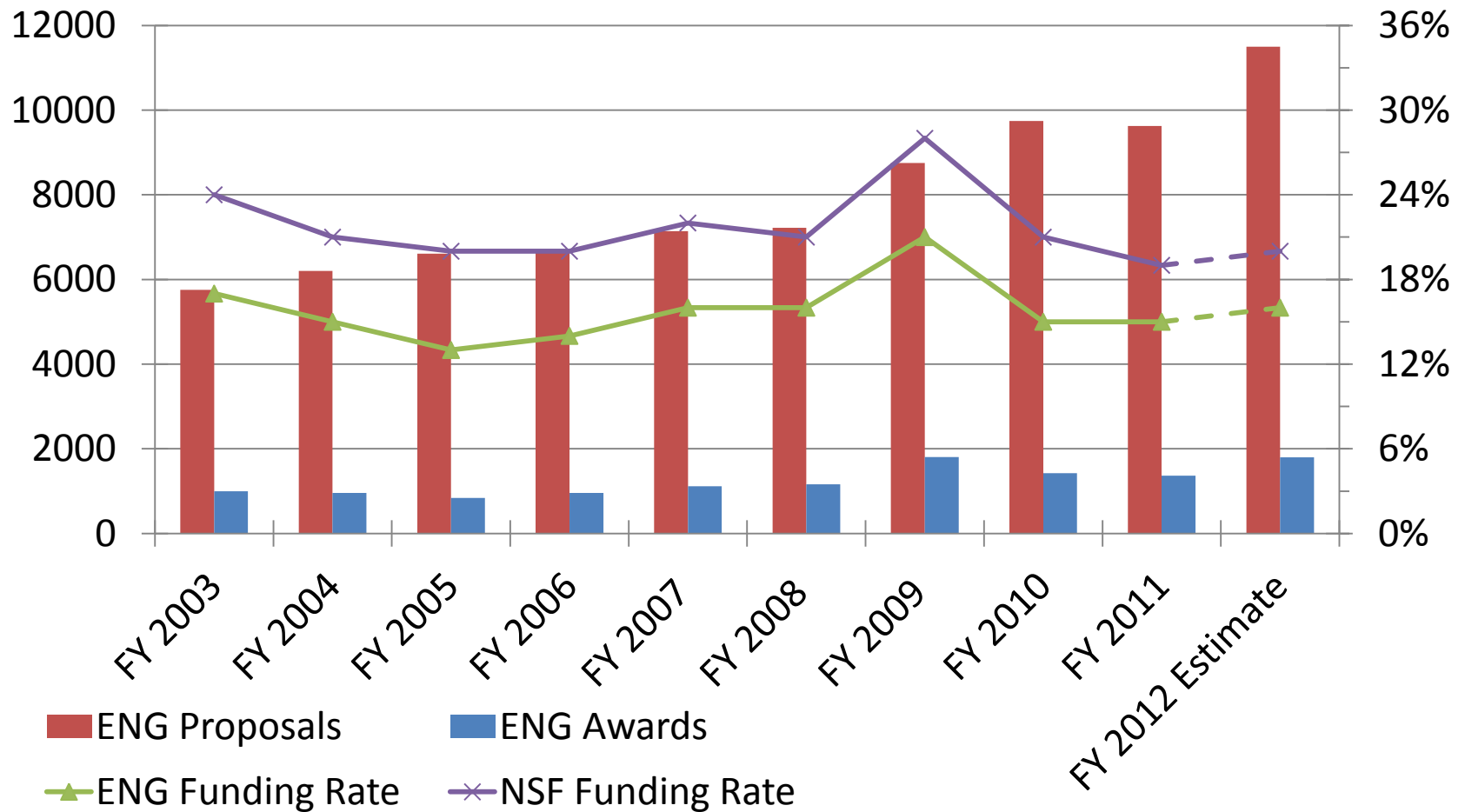
\* ARRA amount

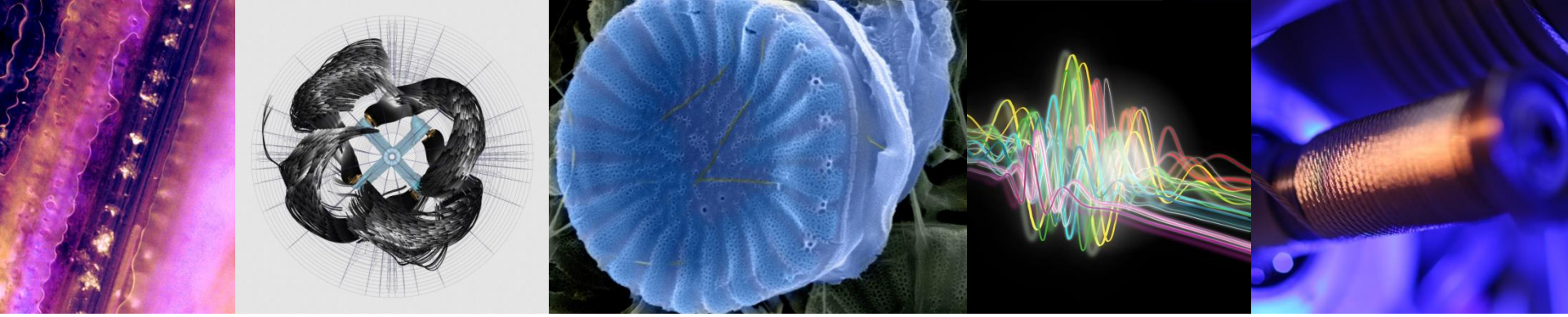
\*\* Carry-over amount

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

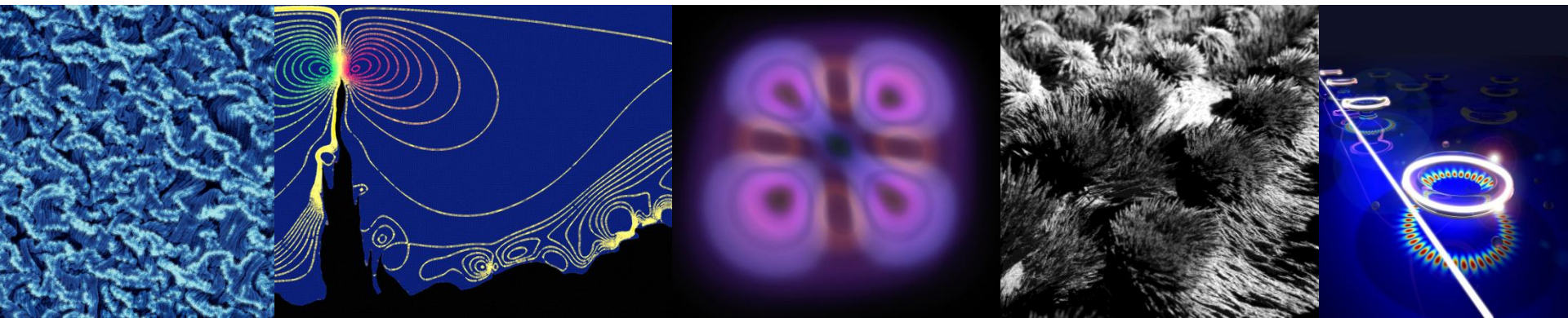


# ENG and NSF Research Grant Proposals and Awards





# ENG Strategic Planning



# NSB Policy Recommendations

- Task Force on Merit Review
  - Report with policy recommendations later in 2011
- Task Force on Unsolicited Mid-Scale Research
  - Findings in Summer 2011

# Strategic Planning 2009-10

## Five Working Groups

- Strategic Thinking Group
  - *Considered ENG Directorate Organization*
  - *Coordinated with NSF Strategic Plan*
- Awards and Solicitations
- Assessment and Evaluation
- Public Understanding of Engineering
- Engineering Education and Workforce

# Flagship Activities

Research that is:

- Fundamental – supported by core programs
- Frontier – integrated with education, addressing grand challenges
- Potentially Transformative – high risk, high reward

Research *Teams* that are:

- Interdisciplinary
- International

# Beacon Activities

- Innovation
  - Cultivate an ecosystem
  - Accelerate the process
  - Support translational activities
- Next-generation Engineers
  - Are innovative, entrepreneurial, globally aware
  - Represent a diverse country
  - Support alternative pathways
- Public understanding of engineering



# AdCom Meeting Focus

- Discussion and feedback on ENG alignment with NSF and ENG strategic goals



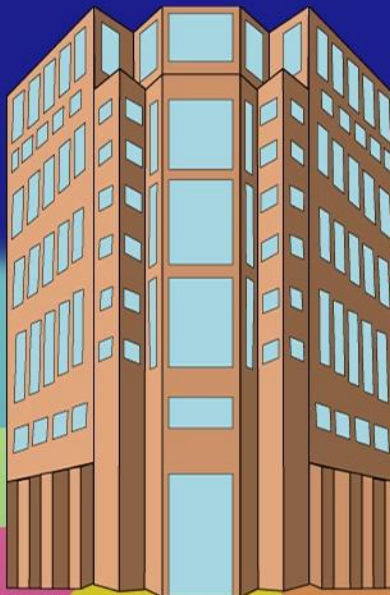
# OneNSF



**catalyze** human capital development



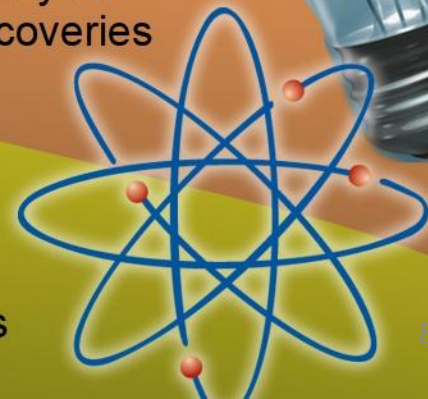
**improve**  
organizational  
efficiency



**create**  
networks and  
infrastructure  
for the nation



**spark** greater innovation  
and opportunity for  
scientific discoveries



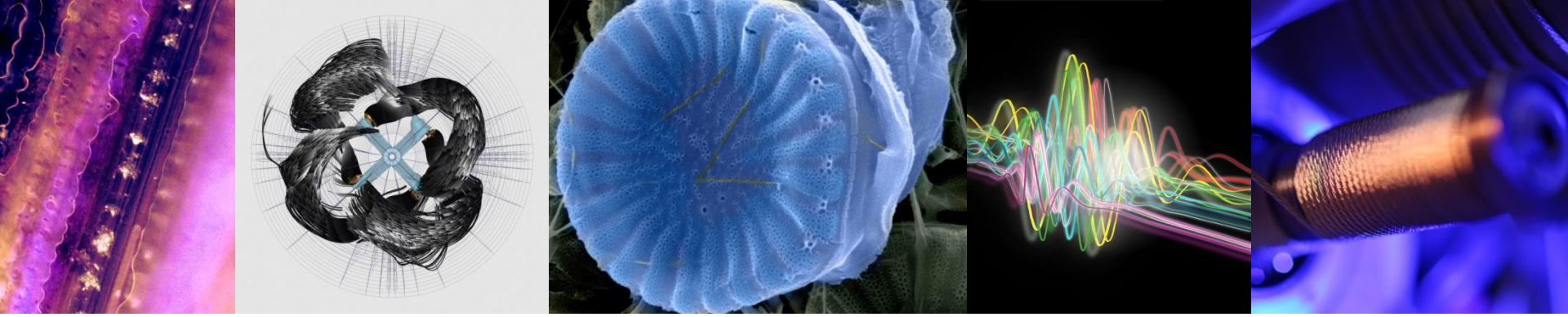
**support**  
fundamental  
research in  
all disciplines



**address**  
multidisciplinary  
challenges of  
national/global significance







# Questions

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