

Engineering at the National Science Foundation

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WWW.NSF.GOV



NSF's Origin, Mission, and Goals

- An Independent Agency Established in 1950 by NSF Act:
“To Promote Progress of Science” and “Advance National Health, Prosperity & Welfare”, and “Secure the National Defense”
- Support basic research and education across science and engineering
- Uses grant mechanism
- Maintains low overhead and extensive automation
- Discipline-based structure with cross-disciplinary mechanisms
- Uses “rotators” or IPAs
- Works with the National Science Board



NSF's Vision

***Enabling the nation's
future through discovery,
learning and innovation.***



NSF STRATEGIC INVESTMENT GOALS

- **People** - Developing “a diverse, internationally competitive and globally engaged workforce of scientists, engineers, and well-prepared citizens.”
- **Ideas** - Enabling “discoveries across the frontier of science and engineering, connected to learning, innovation, and service to society.”
- **Tools** - Providing “broadly accessible, state-of-the-art shared research and education tools.”
- **Organizational Excellence** – Operating an agile, innovative organization with leadership and sound business practices



OSTP/OMB 2006 RESEARCH PRIORITIES*

- **Homeland Security**
 - Prevention, Detection, & Remediation of NCB Threats
 - Medical Countermeasures and Biosurveillance Networks
- **Networking & IT**
 - Supercomputing & Cyberinfrastructure
- **Nanotechnology via National Nanotechnology Institute**
- **Priorities of Physical Sciences**
 - Fundamental Understanding of Phenomena
 - Instruments and/or Facilities
- **Biology of Complex Systems**
- **Climate, Water, Hydrogen R&D**

*See www.ostp.gov/html/m04-23.pdf



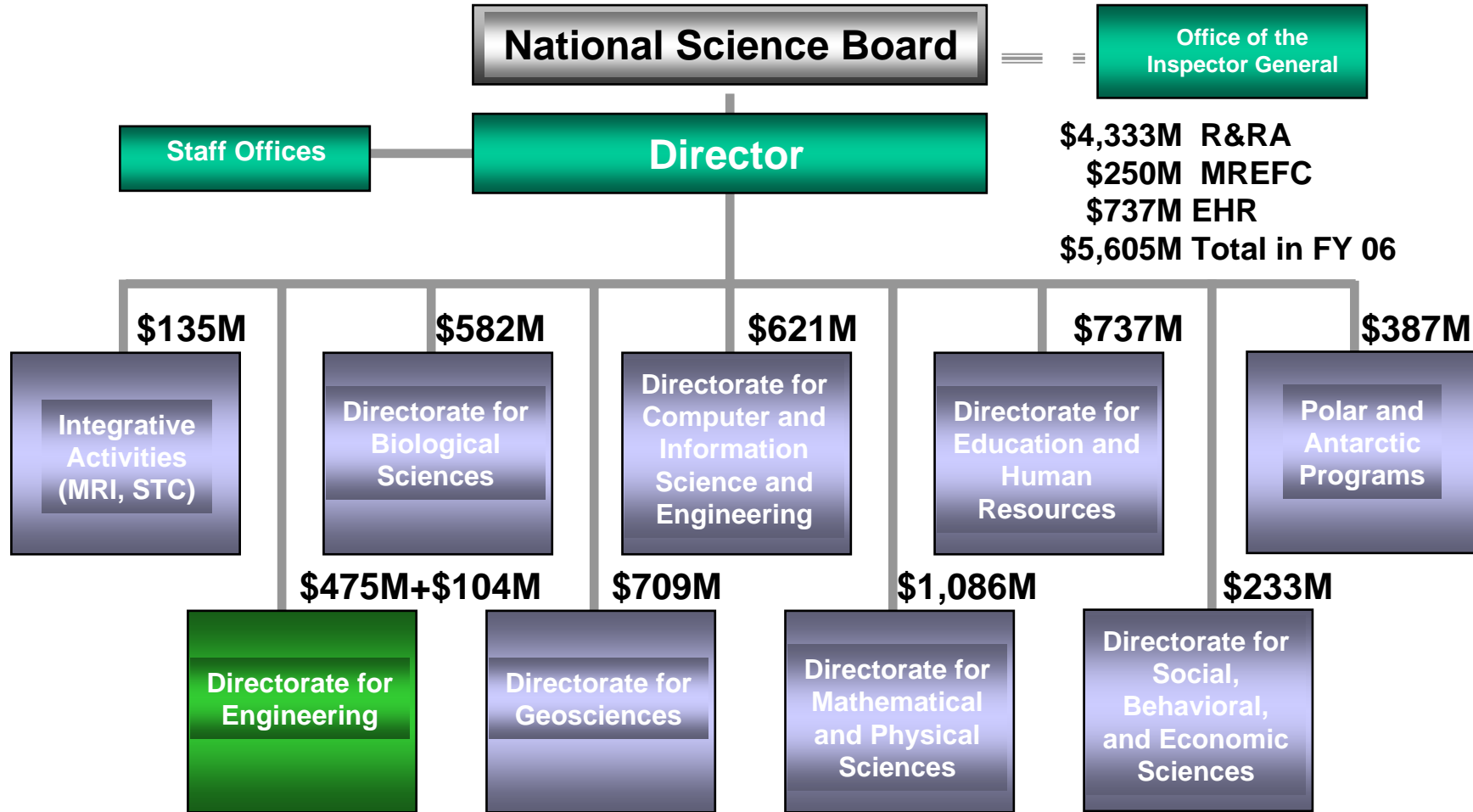
Priorities: NSF FY 2003 - FY 2008

Strategic Goals

- **Broadening participation** in the science and engineering workforce
- **Strengthening core** disciplinary research and **increasing the funding rate** for research grants
- Providing **broadly accessible cyberinfrastructure and world-class facilities** to enhance research performance
- Sustaining **organizational excellence** in NSF management practices



National Science Foundation FY 06 Budget Request





National Science Foundation FY 2006 Congressional Request

	FY 2005 Current Plan	FY 2006 Request	Total Change over '05	% Change
BIO	576.6	581.8	5.2	0.9%
CISE	613.7	620.6	6.8	1.1%
ENG Programs	458.5	475.4	16.8	3.7%
SBIR/STTR	102.8	105.3	2.6	2.5%
GEO	694.2	709.1	14.9	2.2%
MPS	1069.9	1086.2	16.4	1.5%
SBE	230.6	233.3	2.7	1.2%
OPP	344.4	386.9	42.6	12.4%
IA	129.9	134.9	5.0	3.8%
R&RA	4220.6	4333.5	112.9	2.7%
EHR	841.4	737.0	-104.4	-12.4%
MREFC	173.7	250.0	76.4	44.0%
S&E	223.2	269.0	45.8	20.5%
NSB	4.0	4.0	0.0	0.8%
OIG	10.0	11.5	1.5	14.7%
Total NSF	\$5,472.8	\$5,605.0	\$132.2	2.4%

(Dollars in Millions)



Priority Areas

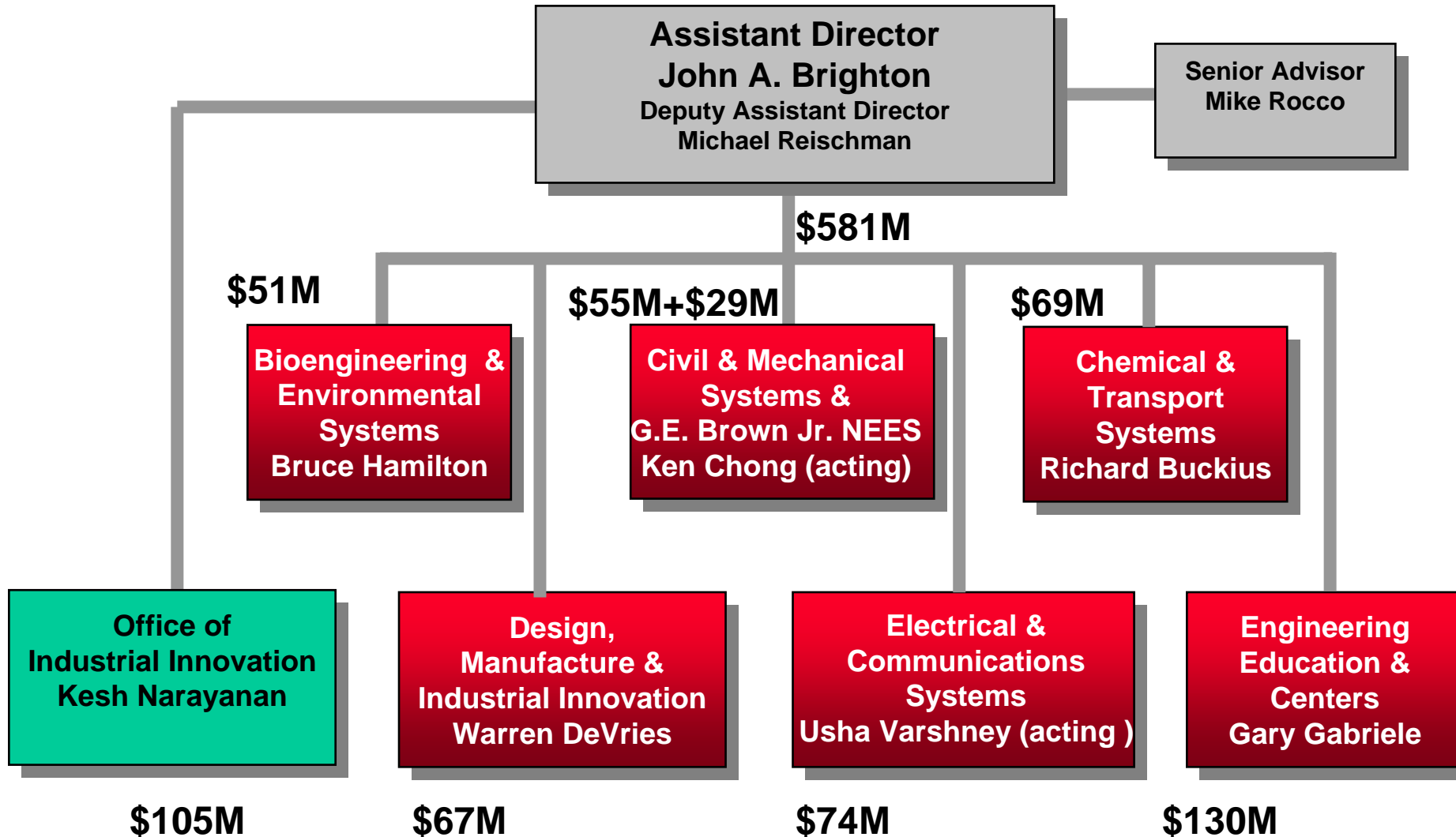
Part of the FY 06 Request

Priority Areas	NSF	ENG
Biocomplexity in the Environment	\$83.8M	\$6.0M
Nanoscale Science and Engineering	\$243.0M	\$127.8M
Mathematical Sciences	\$88.63M	\$2.9M
Human and Social Dynamics	\$39.5M	\$2.0M
Total Priority Area Planned Investments	\$454.9M	\$138.7M



Directorate for Engineering

FY 06 Request





ENG Funding

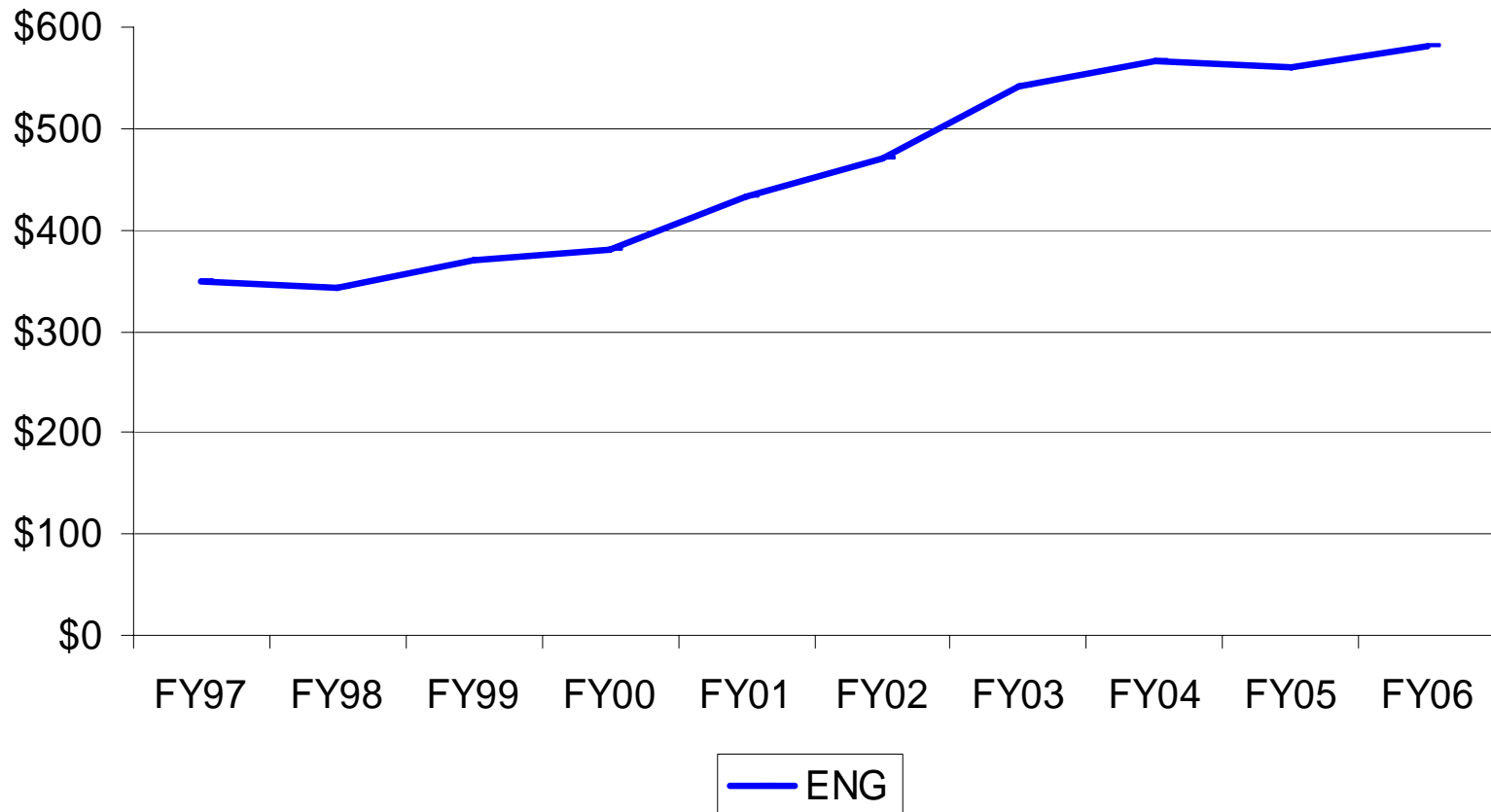
(Dollars in Millions)

	FY 2005			Change over	
	FY 2004	Current	FY 2006	FY 2005	
	Actual	Plan	Request	Amount	%
BES	51.00	48.22	50.68	2.46	5.1%
CTS	69.21	65.79	68.99	3.20	4.9%
CMS	67.22	81.98	84.21	2.23	2.7%
DMI	65.92	63.85	67.41	3.56	5.6%
ECS	74.61	71.64	74.35	2.71	3.8%
EEC	134.03	127.06	129.71	2.65	2.1%
OII	103.58	102.76	105.33	2.57	2.5%
Total, ENG	\$565.57	\$561.30	\$580.68	\$19.38	3.5%

Full NSF budget at www.nsf.gov



ENG Funding History





ENG Investments in NSF Priority Areas

	FY 2004	FY 2005	FY 2006	Change over	
	Actual	Plan	Request	FY 2005	
				Amount	Percent
Biocomplexity in the Environment	6.00	6.00	6.00	0.00	0.0%
Nanoscale Science and Engineering	108.88	127.77	127.77	0.00	0.0%
Mathematical Sciences	2.91	2.91	2.91	0.00	0.0%
Human and Social Dynamics	2.00	2.00	2.00	0.00	0.0%



NSF PROPOSAL SUBMISSION ELIGIBILITY*

- **U.S. Universities and Colleges**
- **U.S. Nonprofit, Nonacademic Organizations**
- **U.S. For-Profit Organizations**
- **State/Local Educational Organizations**
- **Unaffiliated U.S. Scientists, Engineers, Educators, & Citizens**
- **NSF Rarely Supports Foreign Organizations or Other Federal Agencies**

* **Program Solicitations may establish more restrictive eligibility**



NSF PROPOSAL EVALUATION PROCESS

- **Merit Review as Backbone**
 - **Knowledgeable Program Directors**
 - **External Individual Experts**
 - **Panel Groups**
 - **Site Visits**
 - **Peer Reviews Advisory to PD**
- **Written Peer Reviews**
 - **Verbatim Copies of Mail Reviews to PI**
 - **Verbatim Copy of Panel Summary to PI**
 - **Conceal Names of Reviewers**



NSF DECISION PROCESS

- **Program Directors Are Empowered**
 - Assign Qualified Reviewers
 - Access Reviews & Other Programmatic Factors
 - Recommend Decline/Fund
 - Recommend Award Amount & Duration
- **NSF's Guideline of Decision to PI within 6 Months**
- **Reconsideration is Possible**
 - Grant Policy Manual (NSF-02-151) Chapter IX, Section 900



Bioengineering and Environmental Systems (BES)

- **Current Areas of Interest:**
 - postgenomic engineering, metabolic engineering, and tissue engineering.
 - biomedical photonics and sensing, assistive technology, medical technology innovation
 - complex environmental systems, especially with respect to understanding the fate and transport of surface and groundwater pollutants; novel processes for waste treatment; industrial ecology; and technologies for avoiding pollution
- **BES supports the following programs and activities:**
 - Biochemical Engineering and Biotechnology
 - Biomedical Engineering and Research to Aid Persons with Disabilities
 - Environmental Engineering and Technology
- **Website for more information:**
 - www.eng.nsf.gov/bes/



Civil and Mechanical Systems (CMS)

- **CMS areas of interest:**
 - Dynamics and control, mechanics and materials, nano and bio mechanics, sensing for civil and mechanical systems, simulation-based engineering science.
 - reduction of risks induced by earthquakes and other natural and technological hazards, critical infrastructure protection.
 - Infrastructure construction and management, geotechnology, structures
- **CMS Division supports the following 3 Clusters [with 12 programs]:**
 - Engineered Materials and Mechanics
 - Intelligent Civil and Mechanical Systems
 - Infrastructure Systems and Hazard Mitigation
- **Website for more information:**
 - www.eng.nsf.gov/cms/



Chemical and Transport Systems (CTS)

- **Current Areas of Emphasis:**
 - projects that develop and integrate new principles and knowledge underpinning use-inspired products and services based on chemical, fluid-thermal and biological transformations of energy and matter.
 - nanoscale science and engineering, safety and security, environmentally-friendly and energy-focused processes and products, and smart manufacturing and processing.
- **CTS supports four general thematic areas through the following programs:**
 - Chemical Reaction Processes
 - Fluid and Particle Processes
 - Interfacial, Transport, and Separation Processes
 - Thermal Systems
- **Website for more information:**
 - www.nsf.gov/div/index.jsp?div=CTScts/



Design, Manufacture, and Industrial Innovation (DMII)

- **Current Areas of Interest:**
 - DMII supports fundamental academic research in design, manufacturing, and industrial engineering. DMII also manages crosscutting industrial innovation programs that encompass major components of NSF.
 - DMII-funded research includes an emphasis on environmentally benign manufacturing and a sustainable industrial economy, and seeks to address those fundamental issues that will deepen our understanding of the processes and systems that comprise modern design, manufacturing, and service enterprises and benefit society.
- **DMII supports the following clusters and programs:**
 - Engineering Decision Systems
 - Manufacturing Process and Equipment Systems
 - Industrial Innovation Programs
- **Website for more information:**
 - www.eng.nsf.gov/dmii/



Electrical and Communications Systems

Current Areas of Interest:

- component and device technologies, computation, networking, controls and system principles at the nano, micro, and macro scales
- Integration and networking of intelligent systems for use in sensing, imaging, telecommunications, wireless networks, disaster mitigation, homeland security, power systems, environment, transportation, healthcare, manufacturing, and system-related areas.

ECS supports the following clusters and programs:

- Electronics, Photonics and Device Technologies (EPDT)
- Control, Networks and Computational Intelligence (CNCI)
- Integrative, Hybrid and Complex Systems (IHCS)
- Resources and Infrastructure

Website for more information:

- www.eng.nsf.gov/ecs/



Engineering Education and Centers (EEC)

Current Areas of Interest:

- centers that collaborate with industry to integrate research, education, and projects
- centers promote partnerships among researchers in different disciplines and between industry and universities.
- focused efforts that integrate research into new advances in engineering education and the development and implementation of large-scale models for engineering curriculum reform.

ECS supports the following clusters and programs:

- Engineering Research Centers (ERCs)
- Industry/University Cooperative Research Centers (I/UCRCs)
- Engineering Education Programs
- Grants for Department-Level Reform of Engineering Education
- Partnerships for Innovation
- Research Experiences for Teachers and Research for Undergraduates Sites

Website for more information:

- www.eng.nsf.gov/div/index.jsp?div=EEC



2006 Division Focus

- BES → Quantitative Systems Biotechnology
→ CLEANER (Large Scale Environmental Network)
- CTS → Safety and Security
- CMS → Transition from construction to operations/research phase of NEES
- DMI → Nano/micro factories of the future
→ Design of globally competitive and sustainable manufacturing enterprises
- ECS → Integrative systems in nano/micro/macro complex & hybrid
- EEC → Elevating funding research into how students learn engineering
- OII → Security technologies



A Few Interesting Facts About NSF Engineering

- ENG makes about 1/3 of
 - all CAREER awards.
 - the high risk/high return SGER investments.
 - the priority area investments.
- ENG's divisions all use panel review and all have windows for submitting Investigator Initiated proposals.
- In FY 03, ENG reviewed 11,119 proposals in 419 panels and with a total of more than 2015 reviewers, and made 1888 awards.
- ENG's FY 04 average annual award amount was \$120.2k and duration was 2.9 yrs. with a 15% success rate for competitive academic research proposals.



CAREER

The Faculty Early Career Development (CAREER) Program: a Foundation-wide activity that offers the NSF's most prestigious awards for new faculty members.

Recognizes and supports the early career-development activities of those teacher-scholars who are most likely to become the academic leaders of the 21st century.

Awardees selected on the basis of creative, career-development plans that integrate research and education.



ENG Directorate Signature Activities

- Merit-based awards
- Integration of research and education
- Broadening participation
- Fundamental research, innovation, and education at the frontiers
- Partnerships with universities and industry

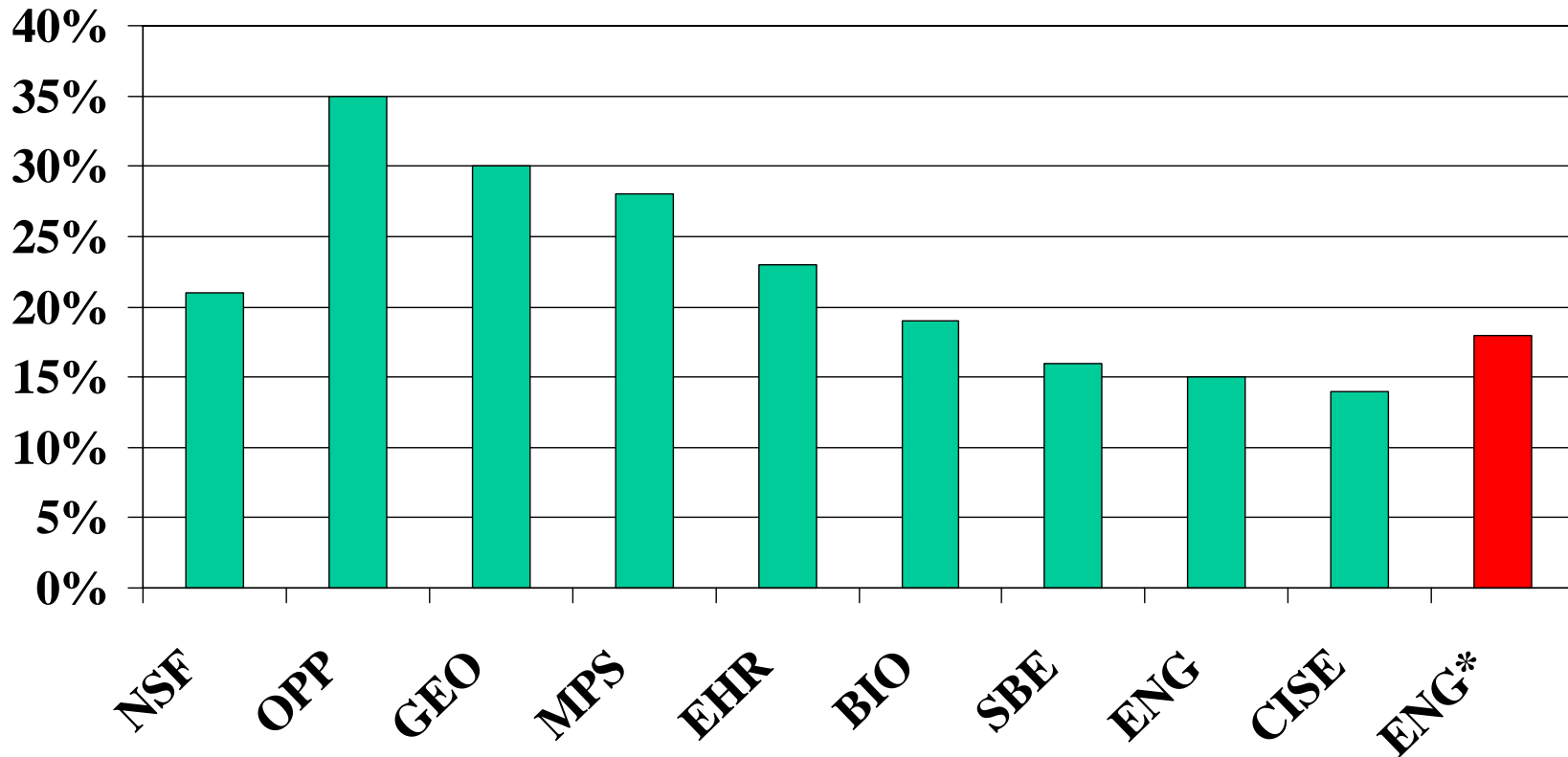


Issues Facing Engineering at NSF

- **Public Understanding and Appreciation**
- **K–12 Education**
- **Rate of Change of Technology**
- **Federal Budgets & Decreasing Interest in Engr.**
- **Proposal Pressure and Success Rates**
- **Lack of Focus Among Engineering Factions**
- **Where Does NSF Engineering Go From Here**



FY 2004 NSF Directorate Success Rates (Research Grants)



* FY 2006 Request



**Enabling the nation's future through
discovery, learning and innovation**