NSF Support of Energy through CBET

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Overview

- Introduction
  - NSF
  - ENG
  - CBET
- Statistics
- Direction
- Sample Projects from CBET
NSF Organizational Structure

Dollar figures: total FY 2006 budgets in millions

- Director of the Director: $127 (OCI)
- Directorate for Biological Sciences: $577
- Directorate for Computer and Information Sciences and Engineering: $496
- Directorate for Education and Human Resources: $797
- Directorate for Engineering: $580 (incl. $100 for SBIR/STTR)
- Directorate for Geosciences: $703
- Directorate for Mathematical and Physical Sciences: $1085
- Directorate for Social, Behavioral And Economic Sciences: $200
- Office of the Director: $34
- Office of Polar Programs: $322
PEOPLE: Activities to Better Attract and Retain Science & Engineering Graduates and to Ensure That They Receive a Quality Education.

IDEAS: Advancement of Knowledge About Fundamental STEM Research.....

TOOLS: Enhancement of Infrastructure to Conduct STEM Research......

ORG.EXCELLENCE: Admin. Activities to Enable NSF to Achieve its Mission ....
NSF Budget 2001-2007

(Dollars in Millions)
Our Hope for the Future?
The American Competitive Initiatives
American Competitiveness Initiative (ACI)

- New money
- Administration initiative
- Double the NSF budget over 10 years
- Boost physical sciences
- Math & science education
- Focus on applied energy research
- Makes the Research & Experimentation Federal Tax Credit permanent
NSF Priority Areas

- Homeland Security
- Nanoscale Science & Engineering
- Cyberinfrastructure (CI)
- Energy & Environment
- Understanding Complex Biological Systems
New ENG Organizational Structure

Crosscutting Areas
- Emerging Frontiers in Research and Innovation (EFRI)
- Engineering Education and Centers (EEC)
- Industrial Innovation and Partnerships (IIP)

Disciplinary Areas
- Chemical, Bioengineering Environmental and Transport Systems (CBET)
- Civil, Mechanical and Manufacturing Innovation (CMMI)
- Electrical, Communications and Cyber Systems (ECCS)
Emerging Frontiers in Research & Innovation (EFRI)

- Solicitation NSF06-596
- Auto-reconfigurable Engineered Systems Enabled by Cyberinfrastructure (ARES-CI)
- Cellular and Biomolecular Engineering (CBE)
- Letter of intent (optional) October 16, 2006
- Pre-proposal November 17, 2006
- Full proposal April 30, 2006
- $25 million FY2007
Division of Chemical, Bioengineering, Environmental, & Transport Systems (CBET)

- Merger of CTS & BES on Oct 1, 2006
- Support Research in Chemical, Bioengineering, Environmental, & Transport Systems
- Catalyze the merging of biology, chemistry, physics and socio-economic science in engineering research
- Support research to enhance and protect US national health, energy, environment, security and wealth
CBET Priority Areas FY07

- Nanoscale Science & Engineering
- Cyberinfrastructure (CI)
- Energy, Environment & Sustainability
- Biology in Engineering
- Multi-scale Modelling
FY 2006 Plan
- BES $52 million
- CTS $71 million

FY 2007 Request
- CBET $124 million
Major CBET Initiatives for FY 2007

- NNI (National Nanotechnology Initiative)
  - $43 Million
- Sensors/Explosives
  - $5 Million
- EFRI (Emerging Frontiers in Research & Innovation)
  - Support for Interdisciplinary Group Projects
  - $25 Million Total for ENG
  - CYBERINFRASTRUCTURE for RECONFIGURABLE SYSTEMS
  - CELLULAR-MOLECULAR BIOENGINEERING
CBET Proposals & Awards FY 04-06

- Proposals
- Awards
Success Rates CBET 2006

1179 – Environmental Technology
1401 – Catalysts and Biocatalysts
1402 – Biochemical Engineering
1403 – Process and Reaction Engineering
1406 – Thermal Transport Processes
1407 – Combustion, Fire, and Plasma Systems
1414 – Interfacial Processes and Thermodynamics
1415 – Particulate and Multiphase Processes
1417 – Chemical and Biological Separations
1440 – Environmental Engineering
1443 – Fluid Dynamics
1491 -- Biotechnology
5342 – Research to Aid Persons with Disabilities
5345 – Biomedical Engineering
7236 – Biophotonics
7643 – Environmental Sustainability
7644 – Energy Sustainability
CBET Unsolicited Proposals FY 07 as of 10-20-06

- 1179 – Environmental Technology
- 1401 – Catalysts and Biocatalysts
- 1402 – Biochemical Engineering
- 1403 – Process and Reaction Engineering
- 1406 – Thermal Transport Processes
- 1407 – Combustion, Fire, and Plasma Systems
- 1414 – Interfacial Processes and Thermodynamics
- 1415 – Particulate and Multiphase Processes
- 1417 – Chemical and Biological Separations
- 1440 – Environmental Engineering
- 1443 – Fluid Dynamics
- 1491 - Biotechnology
- 5342 – Research to Aid Persons with Disabilities
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- 7236 – Biophotonics
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- 7644 – Energy Sustainability
CBET’s 2007 Budget By Program

1179 – Environmental Technology
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7644 – Energy Sustainability
“...NSF has and will continue to catalyze fundamental innovations vital to a new energy future for our nation and the world.”

(Dr. Richard O. Buckius, Assistant Director for Engineering, National Science Foundation, Testimony before the United States Senate Commerce Committee's Subcommittee on Technology, Innovation and Competitiveness Wednesday, June 14, 2006)
Why?

- Sustainability of Current Resources
- Need for Alternatives
NSF’s Role

Provide Resource for Research Proposals and Grants to Further Develop Existing Technologies

Encourage Pursuit of Science to Include New Alternative Energy Sources
CBET’s Role

Fund Research and Education in Rapidly Evolving Fields to Include Alternative Energy
Future Impact

- Continue to Support Proposals for Alternative Energy
  - Environment Friendly
  - Reduce Air Pollution
  - Cost Effective
    - Monetary
    - Planetary
- Paradigm Shift on Energy Use
  - Education
  - Incentives
Typical Projects

**Reverse-selective membrane materials for purification of H2 and other light fuels**

**Hydrogen Fuel Cells**
- Purification of Natural Gas
- Design polymer hi-press membrane to separate H2

Benny D. Freeman, UT, Austin

**Catalytic activity of N2-containing functional groups supported on C structures for cathodic reduction reaction in PEM fuel cells**

**Hydrogen Fuel Cells**
- Develop alternatives to Pt O2 Reduction Reaction (ORR) at Lo-T
- Commercialization of Lo-T PEM Fuel Cells

Umit S. Ozkan, Ohio State U

**New sorbents for ultrapurification of transportation fuels**

- Reduce air pollution more effectively by removing fuel contaminants before combustion
- Find adsorbents configurations with superior electivities and capacities
- Guide adsorbent selection by molecular orbital theory

Ralph T. Yang, U Michigan
Selectively adsorption of thiophene by Cu-Y zeolite.

Nitrogen-doped carbon fiber
Questions?