U. S. National Science Foundation

Sue Kemnitzer

Skemnitz@nsf.gov

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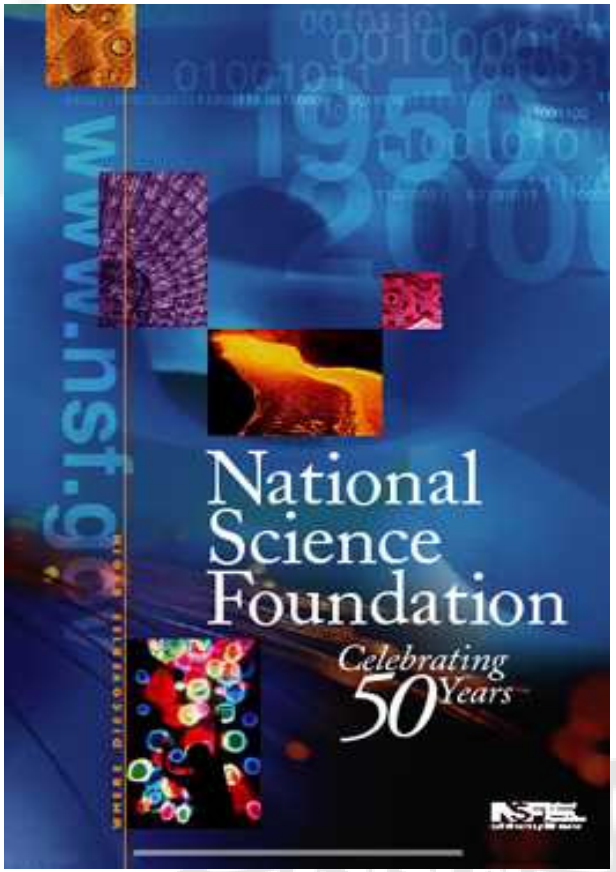
Origins of NSF

- "The Government should accept new responsibilities for promoting the flow of scientific knowledge and the development of scientific talent in our youth."
  - Science, The Endless Frontier, 1945
- 1947: Congress Approves, Truman Vetoes
- 1950: Compromise Bill Approved & Signed by Truman



NSF Act of 1950

- "To promote the progress of science…"
- NSB (24) and 1 Director, appointed by the President
- Encourage & develop a national policy for the promotion of basic research and education in the math, physical, medical,biological, engineering and other sciences
- Initiate & support basic scientific research in the sciences and engineering
- Evaluate the science research programs undertaken by agencies of the Federal government
- Provide information for S&E policy formation

NSF in a Nutshell

- Independent Agency
- Supports basic research & education
- Grants to universities
- Low overhead; all electronic operations
- Discipline-based structure
- Cross-disciplinary mechanisms
- Visiting S&E
- Merit review of projects

NSF by the Numbers

$5.61B	FY 2006 Budget Request
4%	NSF share of total annual Federal spending for research and development
50%	NSF share of Federal funding for non-medical basic research at academic institutions
44,000	Proposals evaluated in FY 2004 through a competitive process of merit review
10,400	New awards funded in FY 2004

NSF by the Numbers (cont'd)

50,000	Scientists & engineers who evaluate proposals for NSF each year
200,000	Proposal reviews done each year
40,000	Students supported by NSF Graduate Research Fellowships since 1952
216,000	People (researchers, postdoctoral fellows, trainees, students) NSF directly supports

NSF: Special Responsibilities

- Polar Programs
  - U.S. Antarctic Program
- Science Resources Statistics
  - Data collection and analysis
  - Science and Engineering Indicators
- International (close cooperation with the Department of State)

Biocomplexity in the Environment

http://www.nsf.gov/news/priority_areas/biocomplexity/index.jsp

Fiscal year 2006 Areas of Emphasis:

- Earth Systems, Cycles and Pathways;
- Dynamics of Coupled Natural and Human Systems;
- Materials Use: Science, Engineering and Society;
- Microbial Genome Sequencing; and
- Ecology of Infectious Diseases.

Cyberinfrastructure

http://www.nsf.gov/news/priority_areas/cyberinfrastructure/index.jsp

FY 2006 Areas of Emphasis:

- NSF's current cyberinfrastructure investments are guided by three principles:
  - Science and engineering opportunities must drive cyberinfrastructure investments;
  - Development of intellectual capital to develop, sustain and effectively utilize cyberinfrastructure is critical; and
  - Unwavering attention to interoperability and sustainability will provide economies of scale and scope as well as guard against the balkanization of science.

Mathematical Sciences

http://www.nsf.gov/news/priority_areas/mathematics/index.jsp

Fiscal Year 2006 Areas of Emphasis:

- Fundamental Mathematical and Statistical Sciences;
- Advancing Interdisciplinary Science and Engineering;
- Mathematical and Statistical Challenges Posed by Large Data Sets;
- Managing and Modeling Uncertainty;
- Modeling Complex Nonlinear Systems; and
- Advancing Mathematical Sciences Education.

Nanoscale Science & Engineering

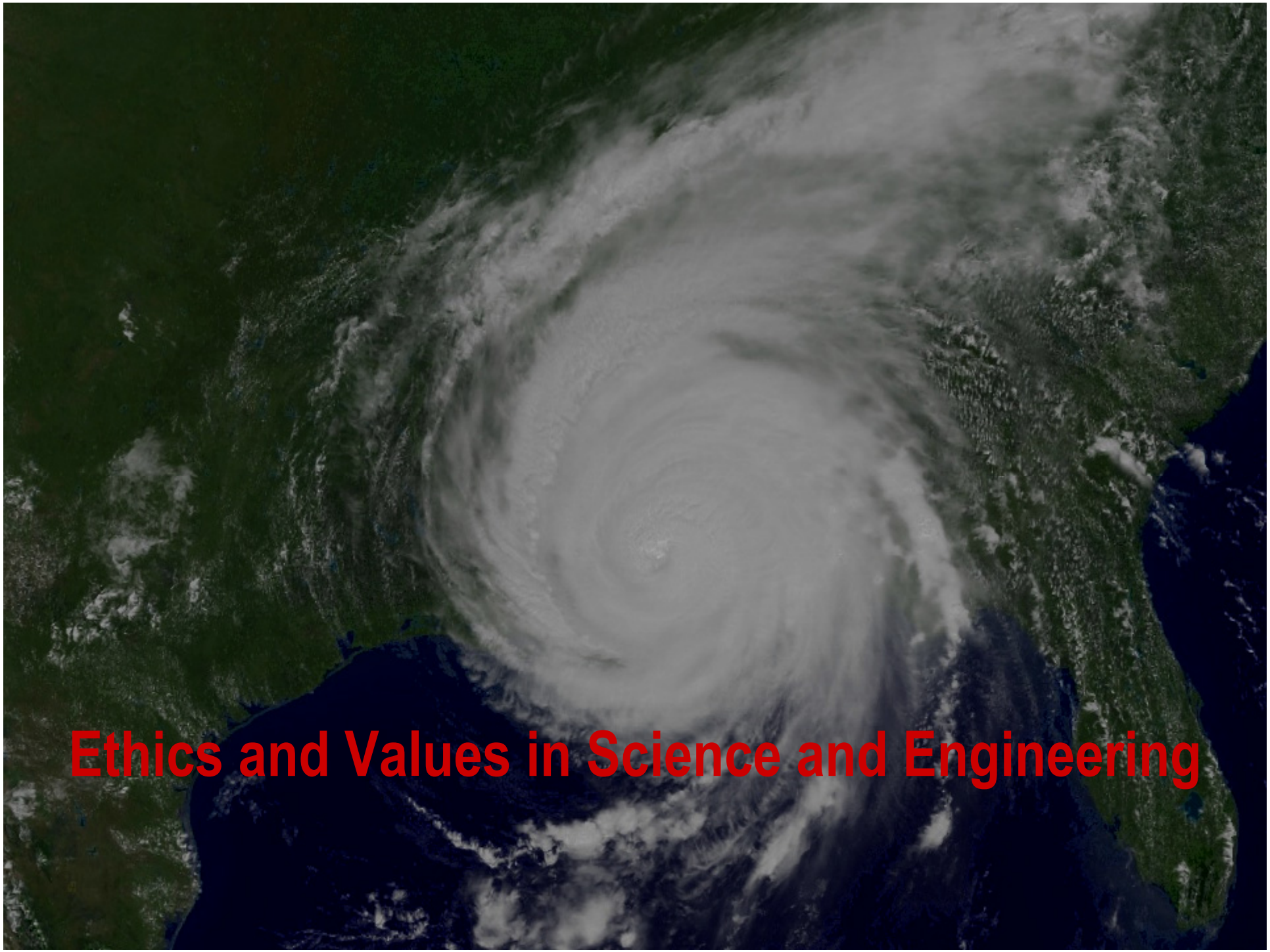
http://www.nsf.gov/news/priority_areas/nano/index.jsp

Fiscal Year 2006 Areas of Emphasis:

- Understanding and controlling the assembly of nanoscale materials;
- Research enabling nanoscale as the most efficient manufacturing domain, including fabrication of nanostructured materials and catalysts;
- Nanobiotechnology and nanobiomedicine;
- Innovative nanotechnology solutions for explosives detection and protection;
- Understanding and potential application of quantum effects and other nanoscale phenomena;
- Nanoelectronics beyond complementary metal-oxide superconductors and nanophotonics;
- New instrumentation and standards development; and
- Education and training regarding nanotechnology.

Key Documents

- FY 2006 NSF Budget Request
  - www.nsf.gov/about/budget/fy2006/
- Grant Proposal Guide (NSF 04-23)
  - http://www.nsf.gov/pubs/gpg/nsf04_23/
- Science and Engineering Indicators
  - www.nsf.gov/sbe/srs/seind04/start.htm
- National Science Foundation Homepage
  - http://www.nsf.gov/


Ethics and Values in Science and Engineering

Ethics and Values in Science and Engineering

- Interactions of science, engineering, technology, and society
- Influence of the ethics and values of wider society on science and engineering
- Normative issues in the conduct of science and engineering

Selected Topics

- Scientific, engineering and professional ethics, including research ethics
- Equity issues in the development, use and effects of science or technology
- Resolution of controversy involving science and technology

Selected Topics

- Normative issues in decisions involving science, engineering, and technology
- Ethical and value issues for organizational policy and practice involving science, engineering, and technology
- Ethics, values, and the relationship of scientific and technical expertise to democratic decision making

Selected Topics

- Ethics and values as they shape or are shaped by biotechnology, environmental science, nanotechnology, the internet or similarly transforming sciences and technologies

Example Questions

- How do choices about acceptable scientific evidence or technological developments involve social values?
- What roles do values play in the selection of research priorities?
- What scientific or social values influence the direction and outcomes of research?

Example Questions

- How do social institutions stimulate responsible research conduct?
- How does disciplinary, professional, or collective responsibility affect the work of scientists and engineers?
- How do students best learn ethics and values in science and engineering?

"One Find, Two Astronomers: An Ethical Brawl" New York Times, September 13, 2005

National Science Foundation Programs

- Ethics Education in Science and Engineering
- Ethics and Values in Engineering, Science, and Technology
  - Research grants
  - Postdoctoral Fellowships
  - Professional Development Fellowships
  - Conference and Workshop awards

Example NSF Grant
A Narrative Approach to Ethics for Science and Engineering Graduate Students
Taft Broome (Howard University)

- Identify cross-cultural and cross-disciplinary perspectives of individuals on selected ethical topics in science and engineering.
- Compare African and Western ethics and the accommodation of African ethics to Western values (later extended to other cultures).
- Develop a coherent arrangement of a narrative theory of personality, the mythic story, and comparative ethics.
- Apply that arrangement to practical problems in science and engineering.

Example NSF Grant
Engineers and the Metrics of Progress
Gary Downey (VT)/Juan Lucena (CSM)

- Compares emergence and present state of engineering education and profession in 7 countries
  - France, U.K., Germany, Brazil, Mexico, Japan, U.S.
  - Trends in engineering linked to changing national identities
  - When nations change direction, engineers redesign their education
  - Historical and ethnographic/interview data
  - Helps explain contrasting interests in engineering ethics
- Linked to Engineering Cultures® educational project
  - Web-based modules for global competency available in January
  - New modules in process: Egypt, Turkey, Korea, Taiwan
- Future research
  - Educational modules China, India, & . . . . Chile?

Selected References

- *Encyclopedia of Science, Technology, and Ethics. Edited by Carl Mitcham. Detroit: Macmillan Reference, 2005. ISBN0-02-865831-0 hardcover and ISBN0-02-865991-0 e-book.*

- *Carl Mitcham and Marcos García de la Huerta. La ética en al profesión de ingeniero: Ingeniería y ciudadanía. Santiago: Universidad de Chile, 2001.*

- *The Online Ethics Center for Engineering and Science. http://onlineethics.org/. U. S. National Academy of Engineering*