

NSF GRANTS OPPORTUNITIES FOR INDUSTRY-UNIVERSITY COLLABORATIONS

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Power, Controls, and Adaptive Networks**

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Grants Opportunities for Academic Liaison
With Industry (GOALI)**



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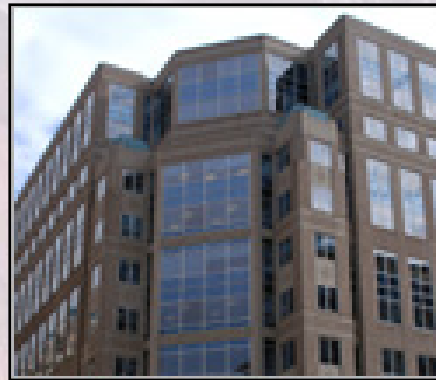
National Science Foundation Update

- Funding Updates and Trends
- Emerging Research Areas
- International Collaborations



NSF Today

- **The National Science Foundation supports basic research in science and engineering by investing in people, in their ideas, and in the tools they use.**
- **In 2005 NSF received 42,000 proposals and funded 9800 awards to 1700 colleges and universities.**



Unique Features of NSF

- ➔ Dual mission for research and education at all age levels
- ➔ Emphasis on integrating research and education
- ➔ Close interaction with Universities
- ➔ Rotator System: about 50% Program Directors are visitors from universities, labs, or industries



NSF Proposal Review Process

- ➔ Proposal reviewed by panel of experts from academia and industry
- ➔ Each proposal receives minimum three reviews
- ➔ Review Criteria
 - ◆ Intellectual Merit
 - ◆ Broader Impacts
- ➔ **Transformative Research:** to what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts?



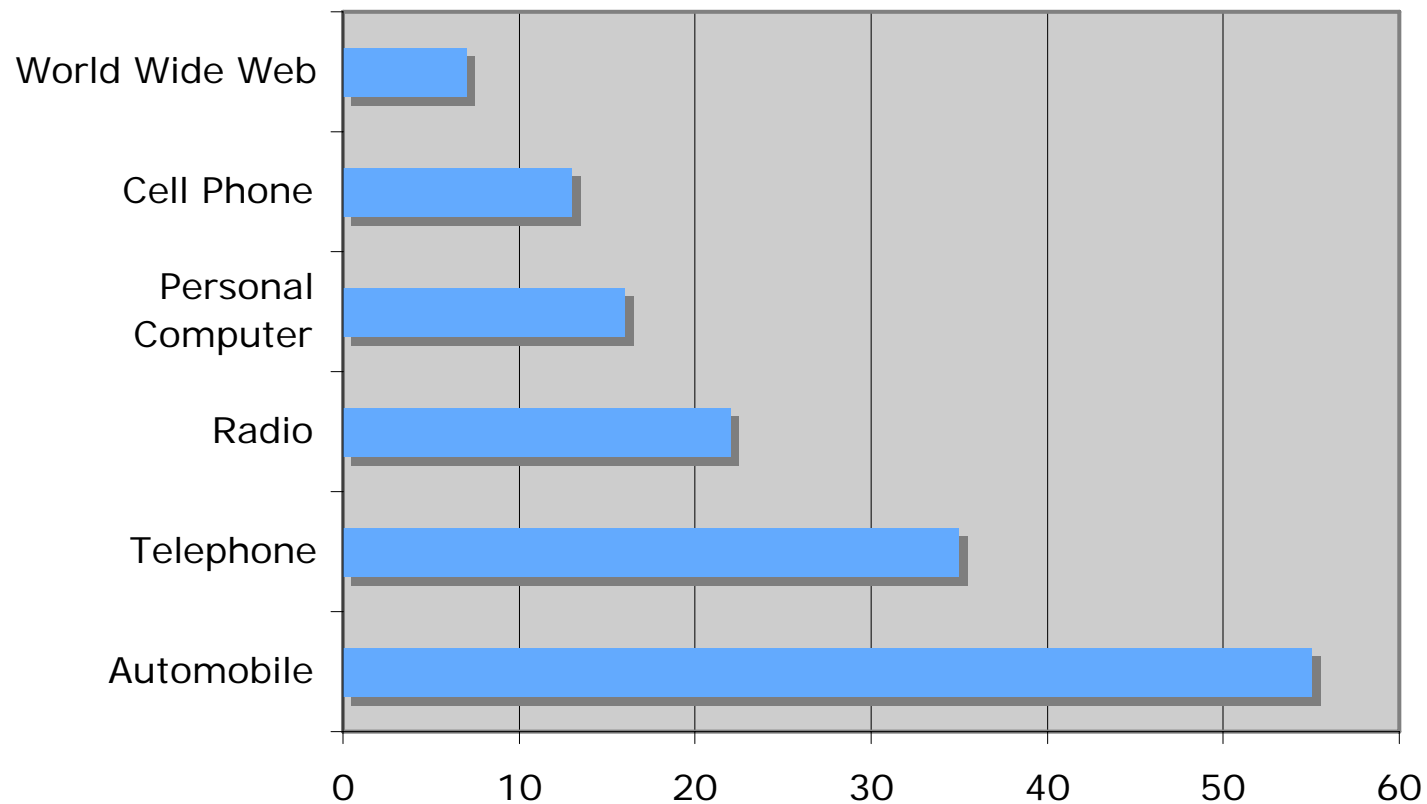
Updates and Trends



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Why Everyone is in a Hurry.

**Years for Innovative Products to Reach 25%
of the U.S. Population**



21st Century Competition Requires Fast Innovation

- In today's competitive environment, many companies set goals for 20-40% of their business to come from products developed within the last 2-4 years.
- The specific goal and speed depends on the product sector.



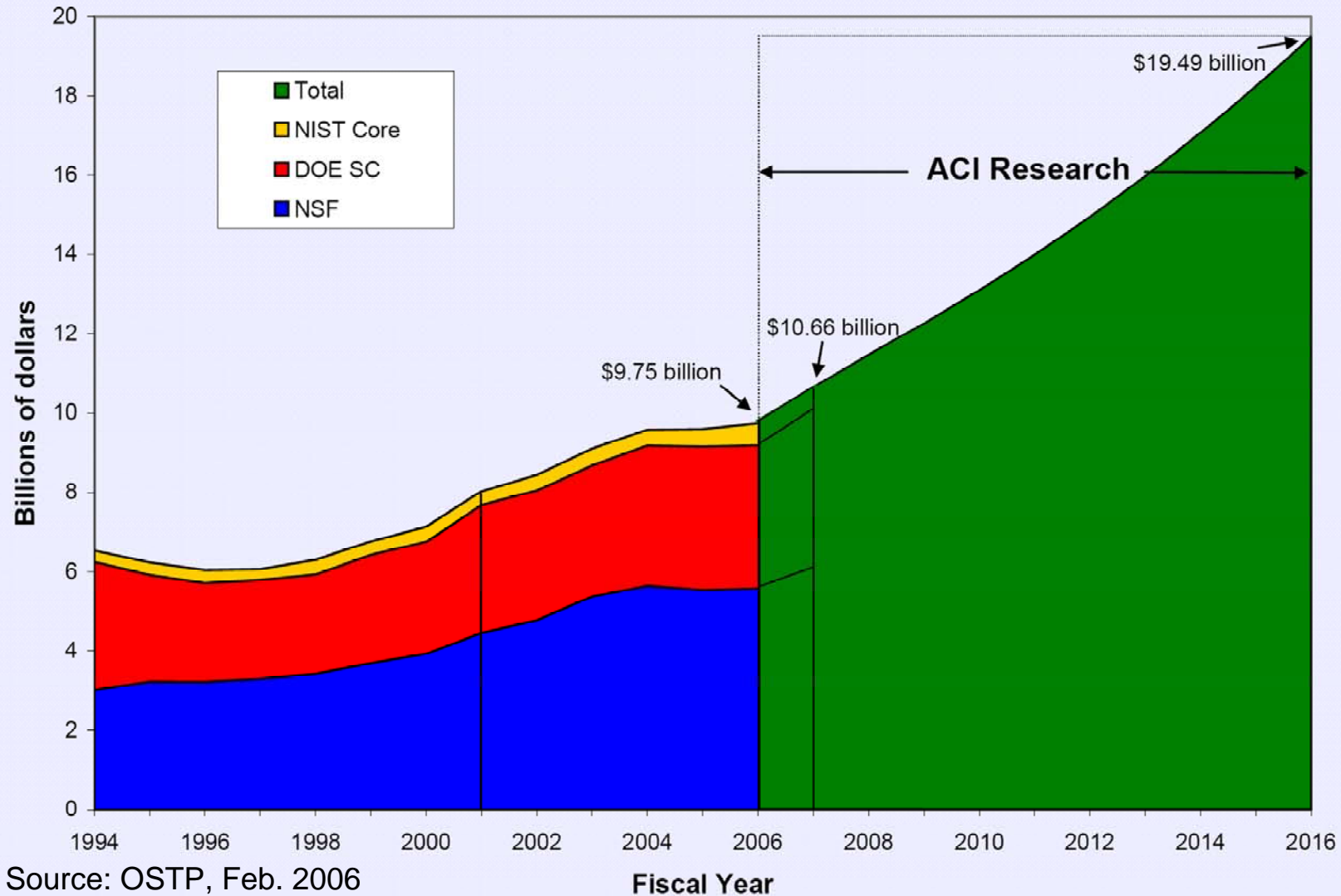
Something to Think About

Goldman Sachs analysts estimate that in about a decade 80% of the world's *middle-income* consumers will live in nations outside the currently industrialized world.



American Competitiveness Initiative

FY 2007 – FY 2016

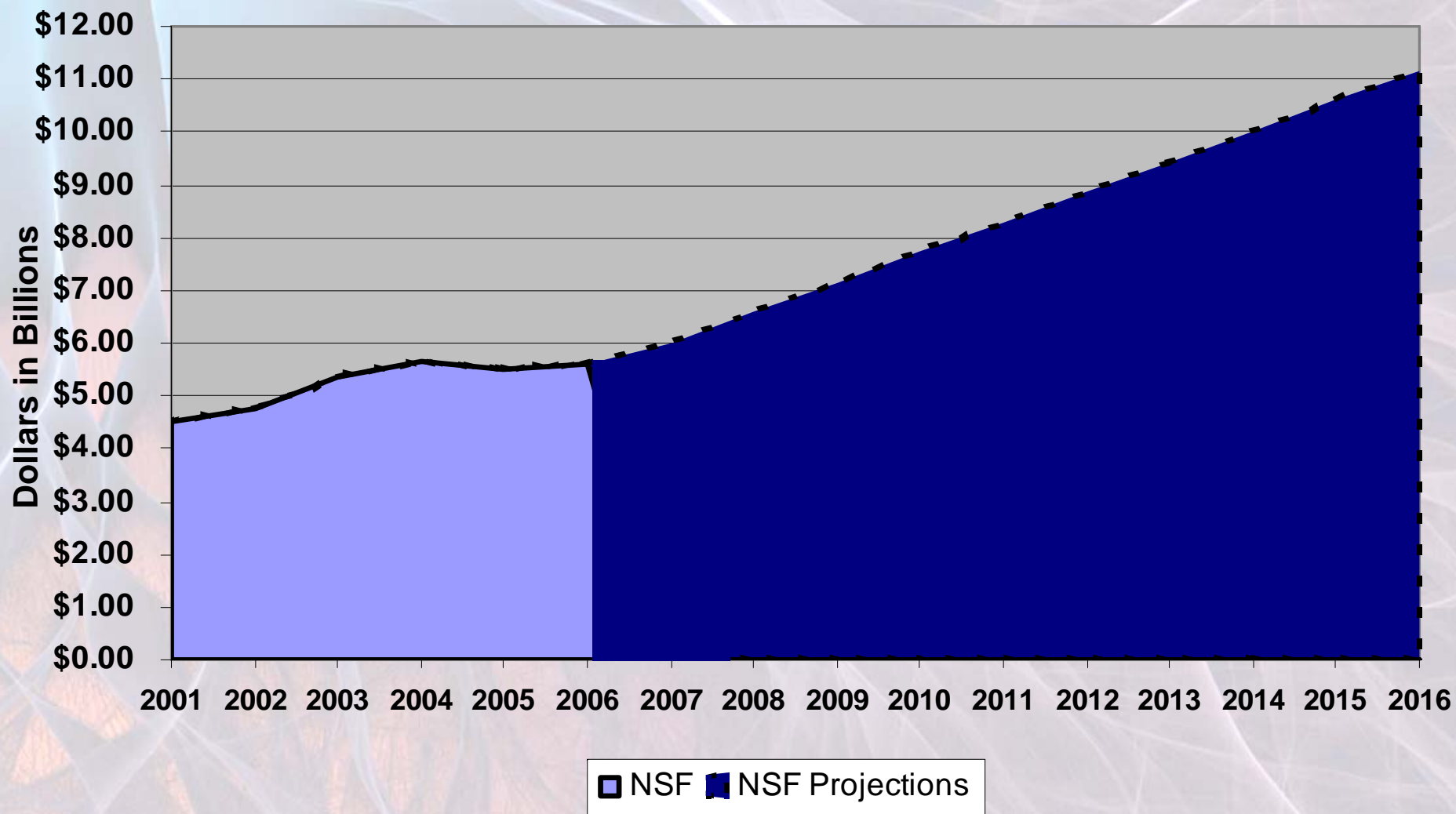


Source: OSTP, Feb. 2006



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ACI-Driven NSF Budget Projections

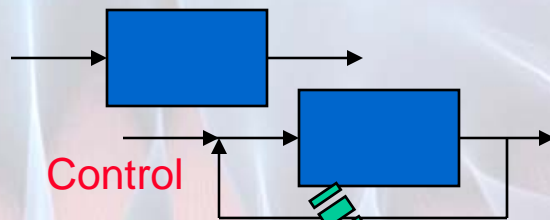


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FY 2006 through FY 2016 budgets are estimates based on White House data.



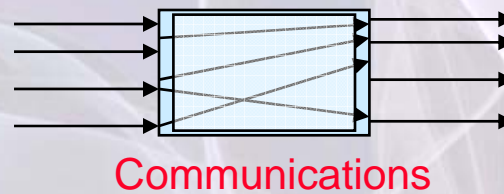
Convergence of Control, Networks and Computations at Nano, Micro, and Macro Scale

Systems Principles



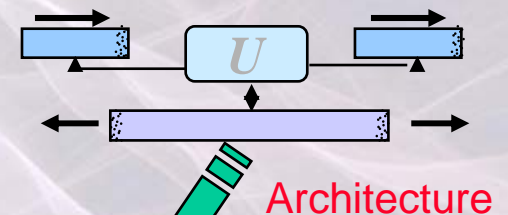
Embedded
Control

Information Principles



Control
Over Networks

Computation Principles



Distributed
Control

Methods and Tools for analysis, design, optimization
and control of
Complex, Dynamic, and Uncertain Systems

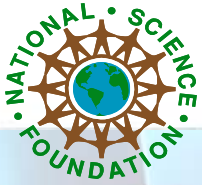




Examples of Research Areas

- ➔ Distributed sensors, actuators, and networked control systems
 - ♦ [0642839](#) CAREER: Algorithms for tractable computation of decentralized control systems (Lall)
 - ♦ [0725419](#) Topological methods for distributed coverage problems in mobile sensing networks (Jadbabai)
- ➔ Complex systems with both symbolic and continuous dynamics – Hybrid Systems
 - ♦ [0725485](#) Modeling and analysis of biological systems using stochastic hybrid systems (Hespanha)
 - ♦ [0725441](#) Adaptive sampling methods with application to water resource management (Sayed)





Examples of Research Areas

- ➔ Micro, nano and bio systems modeling and control
 - ♦ [0449310](#) CAREER: Enabling methods for micro-cantilever based nanotechnology (Salapaka)
 - ♦ [0701531](#) Modeling and control in cancer genomics (Datta)
- ➔ Secure and high confidence systems
 - ♦ [0735114](#) SGER: Towards security-enabled communications for optical sensor networks
 - ♦ [0701365](#) Patient-adaptive control of rotary heart-assist devices (Simaan)



NSF INITIATIVES

- Cyber-enabled Discovery and Innovations (CDI)
- Cyber-Physical Systems (CPS)



Cyber-Enabled Discovery and Innovation

- Multi-disciplinary research seeking contributions to more than one area of science or engineering, by innovation in, or innovative use of **computational thinking**
- Computational thinking refers to computational...
 - ◆ ...Concepts
 - ◆ ...Methods
 - ◆ ...Models
 - ◆ ...Algorithms
 - ◆ ...Tools



Three CDI Themes

CDI seeks transformative research in the following general themes, via innovations in, and/or innovative use of, computational thinking:

- **From Data to Knowledge:** *enhancing human cognition and generating new knowledge from a wealth of heterogeneous digital data;*
- **Understanding Complexity in Natural, Built, and Social Systems:** *deriving fundamental insights on systems comprising multiple interacting elements; and*
- **Building Virtual Organizations:** *enhancing discovery and innovation by bringing people and resources together across institutional, geographical and cultural boundaries.*



Long-term Funding for Cyber-enabled Discovery and Innovation

- All NSF directorates are participating in this activity (*subject to budget approval*); estimated \$750M investment in 5 years:

Request FY 2008	FY 2009	FY 2010	FY2011	FY 2012
\$ 48 M (min of \$26M in the solicitation)	\$100M	\$150M	\$200M	\$250M



Cyber-Physical Systems (CPS)

Networking and Information Technologies
and Engineering Systems



Cyber-Physical Systems (CPS)

- size and power of components for real-time monitoring and control
- power of computational tools for engineering design
- networking technologies
- sensing technologies
- massive data storage
- increasing autonomy
- security concerns
- ...



CPS Initiative Timeline

fundamentals

tool chains

test beds/demonstrations



International Collaborations

Domestic and International Collaborations are expanding because of

- Complexities of new scientific fields,
- Growing scale and scope of scientific initiatives
- Information and communications technologies
- Professional ties and study abroad
- Explicit government policies and incentives



International Collaborations

NSF supplemental funding can be used to add an international dimension to an existing NSF grant

Provides funds to US researchers and students for travel and study abroad

- ➔ Can Foreign Researchers get NSF funding ?
- ➔ Not directly but by participation with US researchers.

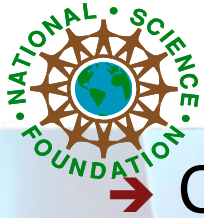


International Collaborations

- involve true intellectual partnership in which successful outcomes depend on the unique contributions of all partners, U.S. and foreign
- engage junior researchers and students in the collaboration, taking advantage of cyber environments to prepare a globally-engaged workforce

NSF awards are, in principle, limited to support of the U.S. side of an international collaboration. In almost all cases, international partners should obtain their own funding for participation.





Conclusions

- ➔ Convergence of control, communications, and computations
 - Emerging Research Areas
 - Energy
 - Environment
 - Health care
 - Nanotechnology
 - Systems biology
 - Cyber-enabled Discovery and Innovations (CDI)
 - Cyber-Physical Systems (CPS)
 - NSF encourages multi-disciplinary collaborations with industry, international researchers

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Acknowledgement

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Thanks to all the MSC participants

