Europe and the United States – A Crucial Moment for Science Cooperation

Joint Research Centre Annual Lecture

October 28, 2009

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ADVANCING SCIENCE, SERVING SOCIETY

Let's talk about the "moment"

- Many factors are interacting at once
  - Provide opportunities and obligations to collaborate

World society is (slowly but surely) becoming more global in character

- Science and technology are critical components of every major issue facing global society
  - Cause
  - Cure
- Science and technology are important instruments of globalization generally
  - Communication and information technologies

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Some major global societal issues

- Environmentally sustainable development
- Need for renewable energy sources
- Information and communications technology
- Universal access to education
- Poverty and economic opportunity
- Technology-based manufacturing and jobs
- Intellectual property rights
- Terrorism
- International security
- Natural disasters
- Science and technology capacity building
- Vaccines and medical therapies against infectious diseases
- Quality and accessibility of health care

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The US and Europe should be collaborating on all of these issues

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It has not always been easy to collaborate with US science and scientists

- But may be getting easier

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The climate for science in and with the US is changing

- And that could affect the ability to collaborate

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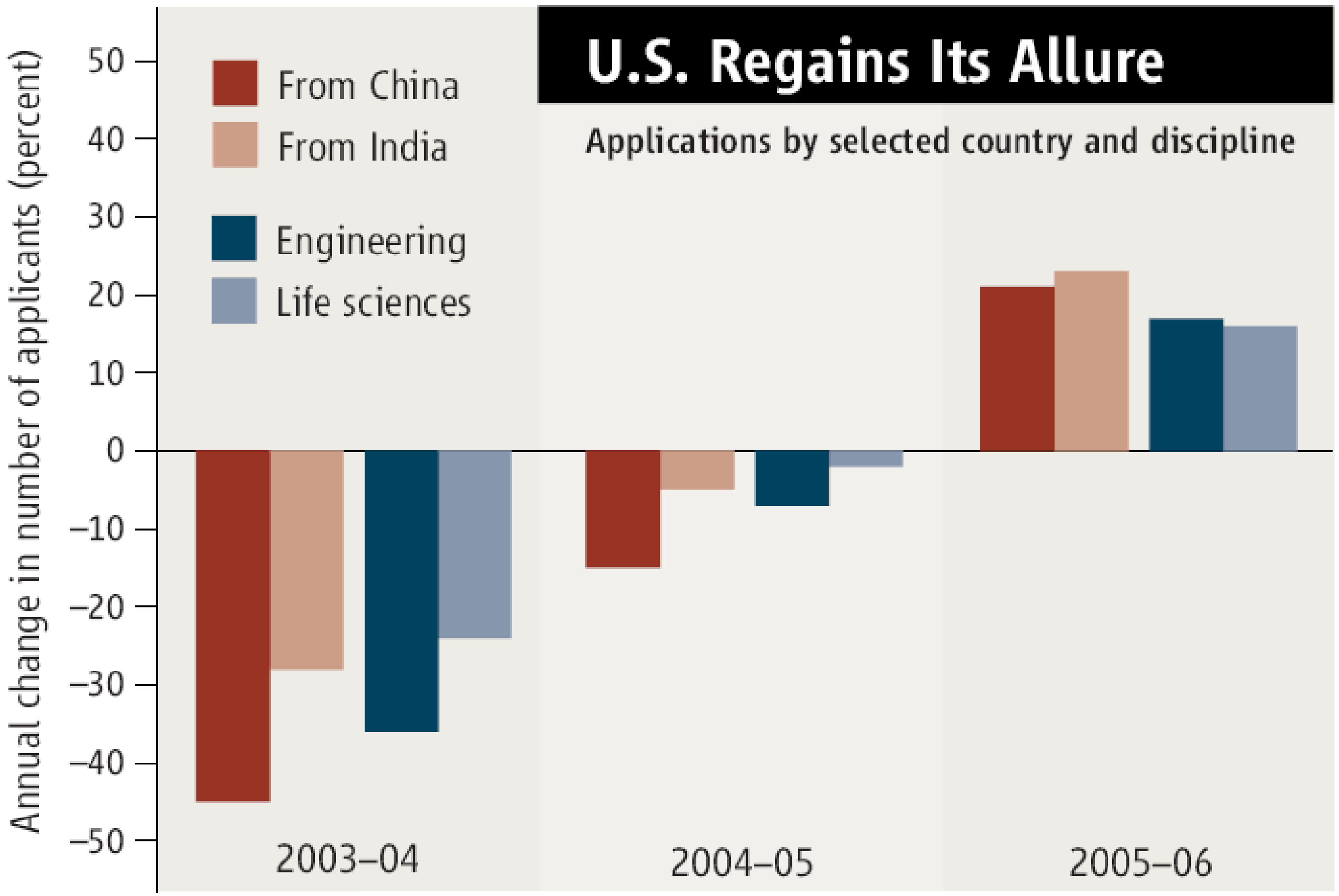
A big deterrent to collaboration has been

- Terrorism and its aftermaths
    - September 11, 2001

Impacts on science in and with the US

- Visa issues – foreign students & visitors
- Restrictive clauses in grants & contracts (export controls)
- Laboratory security – “select agents”
- “Sensitive but unclassified” information



Friendlier shores. U.S. graduate schools received a surge of applications this year from Chinese and Indian students, and those in engineering and the life sciences.

Source: Council of Graduate Schools , 2006

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The US government has seemed unfriendly to science generally

- But that seems to be changing

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President Obama's Inaugural Address – Jan. 20, 2009

- "We will restore science to its rightful place, and wield technology's wonders."

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President Obama's S&T Agenda

- **<u>Restore Scientific Integrity to the White House</u>:** "…government decisions should be based on the best-available, scientifically-valid evidence and not on ideological predispositions."

From: www.whitehouse.gov

President Obama's Sept. 2009 Innovation Agenda

- Restoring American leadership in research
  - Double the budgets of NSF, DOE/OS, NIST
  - Invest 3% of GDP in research
  - Make the R&E tax credit permanent
- Improve America's STEM education at all levels
  - Use "Race to the Top" to encourage states to put STEM at the center of reform efforts
- Improve the processing of high-tech visas

House Speaker Nancy Pelosi

- It’s about science, science, science and science, innovation, as we rebuild America, create jobs, invest in our people and turn this economy around.” (Fox News, Jan. 18)
- “It is a commitment to innovation, to science, to keep America number one and competitive.” (Fox News, Jan. 18)

American Recovery and Reinvestment Act

- $21.5 billion, over two years, for science
  - $10 billion for National Institutes of Health
    - On a $30 billion base
  - $3 billion for the National Science Foundation
    - On a $6 billion base
  - $2 billion billion for Energy R&D

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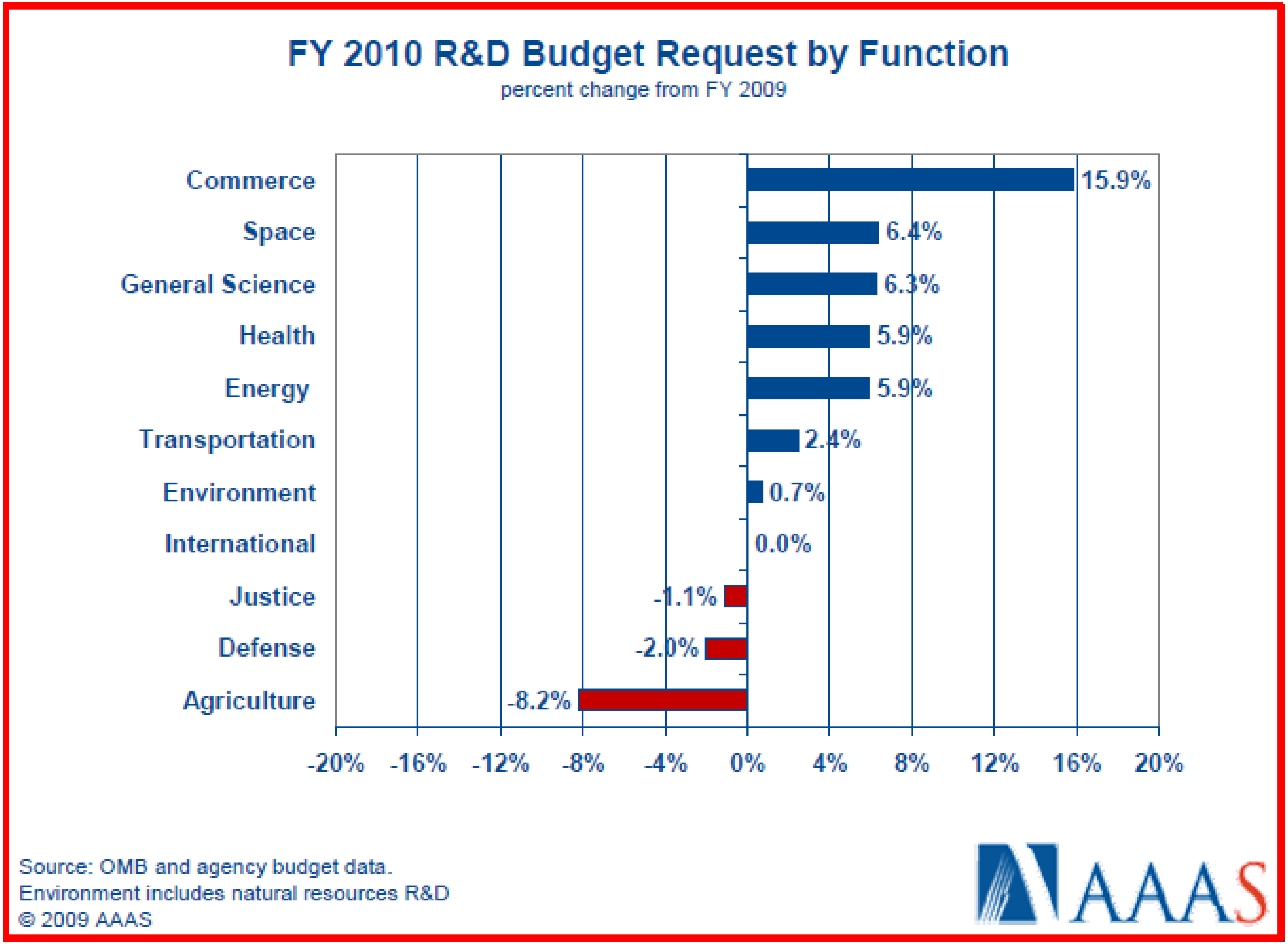
R&D Investment Priorities

- Investing in the Sciences for a Prosperous America
  - General increases in science funding, especially basic research (3.4% increase, plus ARRA)
- A Clean Energy Future
  - DOE Energy Programs (5.4% increase, plus ARRA)
- Healthy Lives for All Americans
  - National Institutes of Health (1.5% increase, plus ARRA)
- A Safe and Secure America
  - Homeland Security Funding (23.8% increase)


FY 2010 R&D Budget Request by Function
percent change from FY 2009
Commerce
Space
General Science
Health
Energy
Transportation
Environment
International
Justice
Defense
Agriculture
15.9%
6.4%
6.3%
5.9%
5.9%
2.4%
0.7%
0.0%
-1.1%
-2.0%
-8.2%
-20%
-16%
-12%
-8%
-4%
0%
4%
8%
12%
16%
20%
Source: OMB and agency budget data.
Environment includes natural resources R&D
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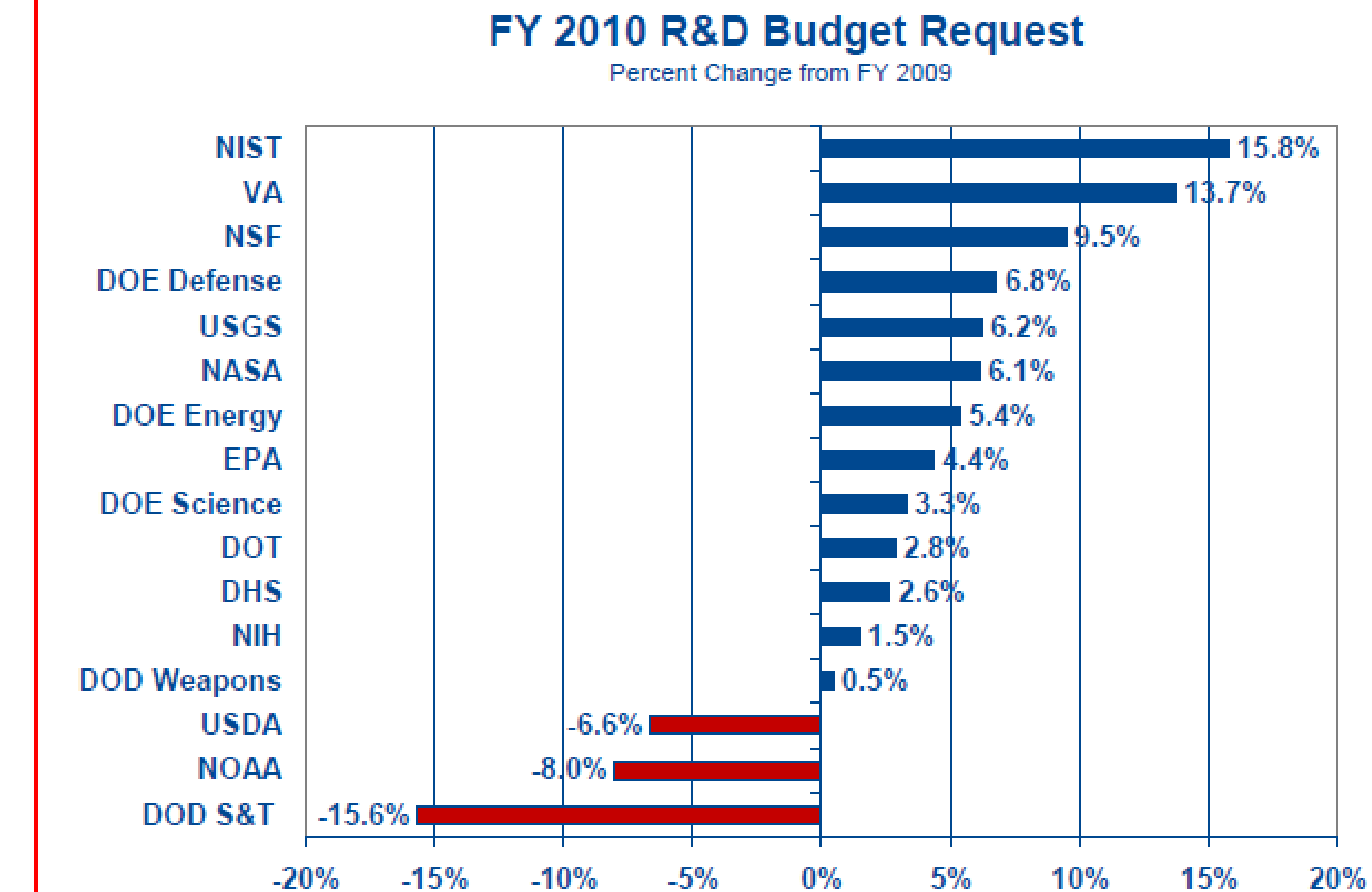

Source: *AAAS Report XXXIV: Research & Development FY 2010*.
DOD "S&T" = DOD R&D in "6.1" through "6.3" categories plus medical research.
DOD weapons = DOD R&D in "6.4" and higher categories.

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The official US stance on science is changing

- New attitudes and support likely will improve the position of the US as global science collaborator
  - Particularly in priority areas

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Thinking more broadly than just US and Europe

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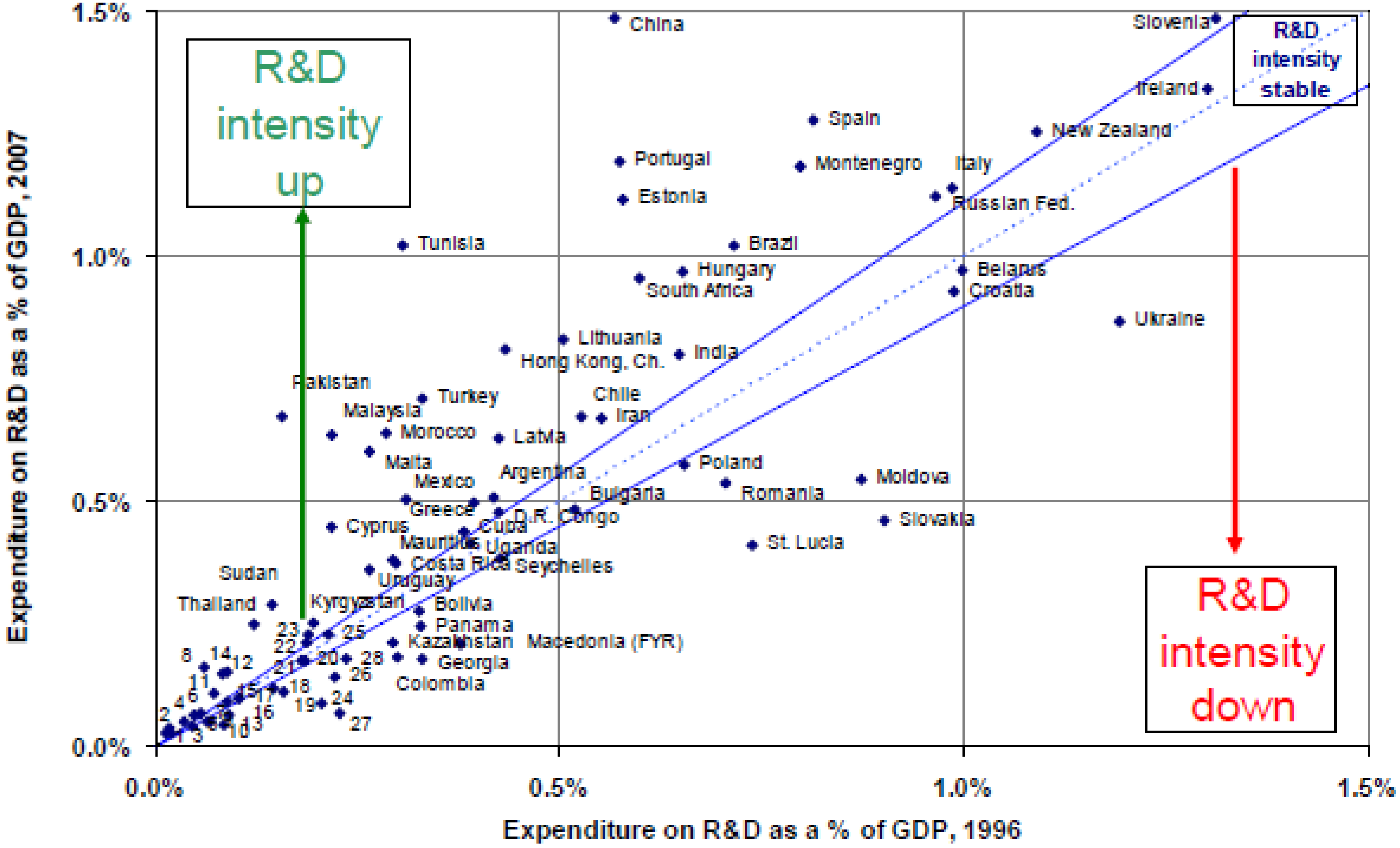
The fact that S&T are central to every major issue of modern life means:

- For people to prosper in modern society, they need fundamental understanding and comfort with S&T
- For nations to prosper they need
  - Scientific capacity
  - National policies that reflect the best science

More nations are investing in S&T

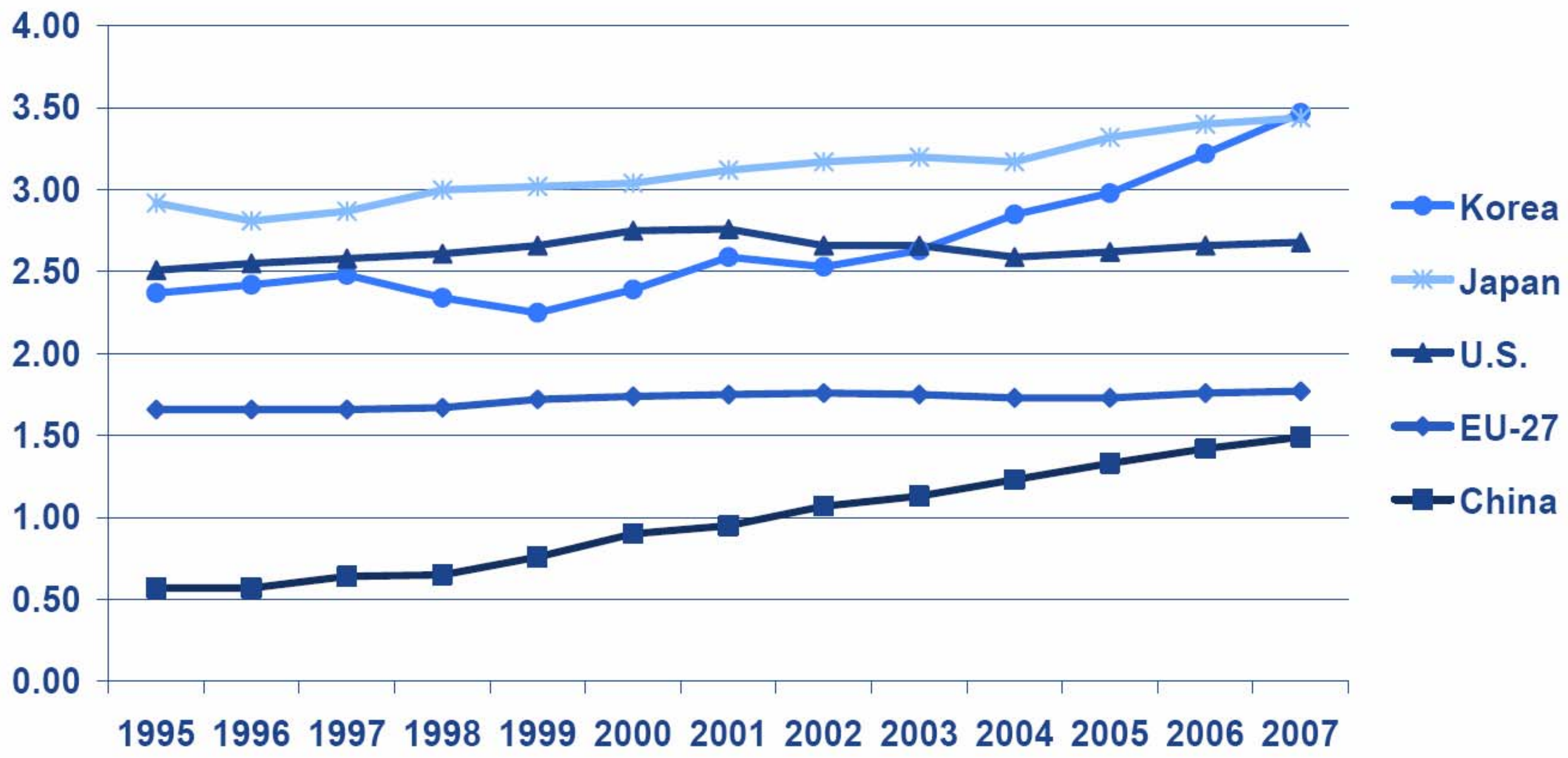
Figure 8. The evolution of R&D intensity

GERD as a percentage of GDP, 1996 (or earliest available year) and 2007 (or latest available year), countries with R&D intensity below 1.5% in both years.



Source: UNESCO Institute for Statistics, September 2009

National R&D Investment as % of GDP, 1995-2007



Source: OECD, Main Science and Technology Indicators, May 2009.

Wen Jiabao is Premier of the State Council of the People's Republic of China.*

EDITORIAL

Science and China's Modernization

THE HISTORY OF MODERNIZATION IS IN ESSENCE A HISTORY OF SCIENTIFIC AND TECHNOLOGICAL progress. Scientific discovery and technological inventions have brought about new civilizations, modern industries, and the rise and fall of nations. China is now engaged in a modernization drive unprecedented in the history of humankind.

Over the past half century, China has made great achievements in basic science and technological innovation. It now ranks among the top nations in the annual number of papers published internationally and patent applications filed. China has also made achievements in such areas as manned space flight, high-performance computers, super–large-scale integrated circuits, and third-generation telecommunications technology. High-tech industry has experienced rapid growth, accounting for over 15% of the manufacturing industry.

Francis Bacon, the 16th-century English philosopher, referred to science as a means to improve humankind's lot. Today, the hybrid rice variety developed by Chinese scientists has been adopted for planting in over three million hectares and has become a "golden key" to meeting China's own food needs and boosting world cereal production. Scientific and technological development in the realm of health has also increased average life expectancy in China to that in developed countries.

To encourage further innovation, the Chinese government has formulated a Mid- to Long-Term Plan for Development of Science and Technology (2006–2020), which highlights research in the basic sciences and frontier technologies, with priority given to energy, water resources, and environmental protection. We strive to develop independent intellectual property rights in areas of information technology and new materials, while strengthening the application of biotechnology to agriculture, industry, population, and health.

The future of China's science and technology depends fundamentally on how we attract, train, and use young scientific talents today. Thus, at the core of our science and technology policy is attracting a diverse range of talents, especially young people, into science and providing them with an environment that brings out the best of their creative ideas.

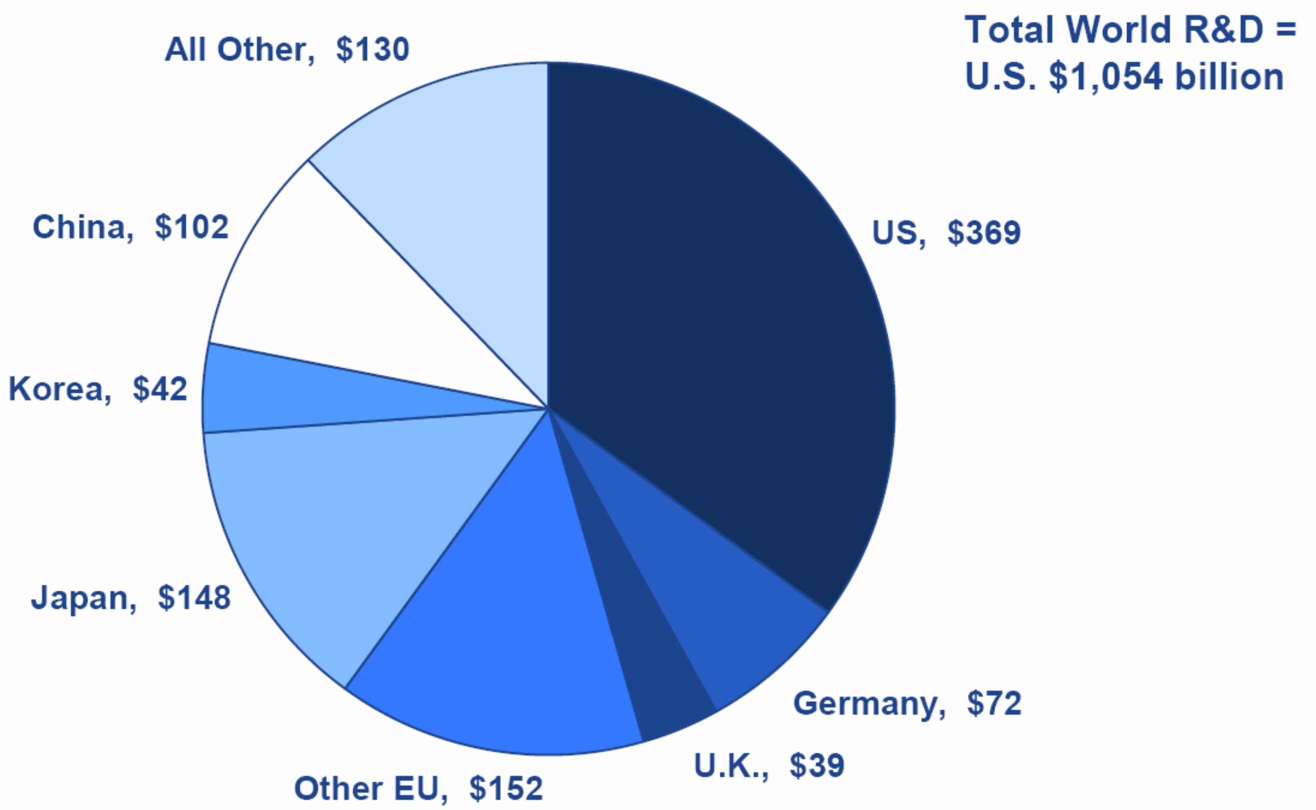
In the field of science and technology, we will intensify institutional reform, restructure scientific research, rationally allocate public resources, and enhance innovation capability. We

"…it has become all the more important to rely on scientific and technological progress to promote growth in the real economy…"

High quality science is now going on all over the world

- Both within and across countries

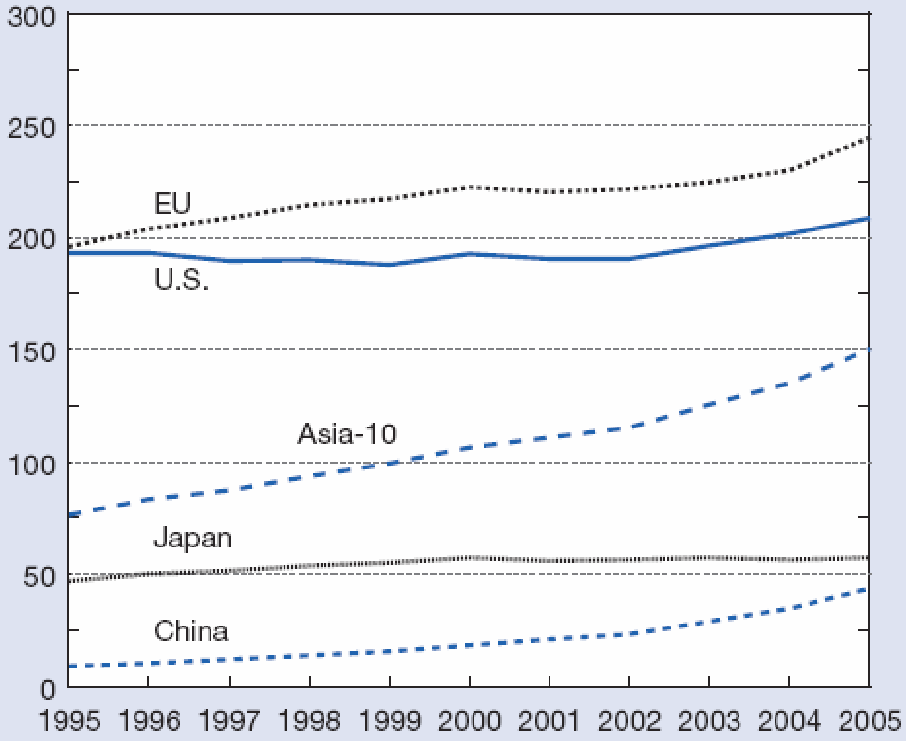
Shares of Total World R&D, 2007



Source: OECD, Main Science and Technology Indicators, May 2009.
World = OECD members plus Argentina, China, Israel, Romania, Russian Federation, Singapore, Slovenia, South Africa, Taiwan.
Calculated using purchasing power parities.

Figure O-18

Scientific and technical articles in peer-reviewed journals, by region/country: 1995–2005

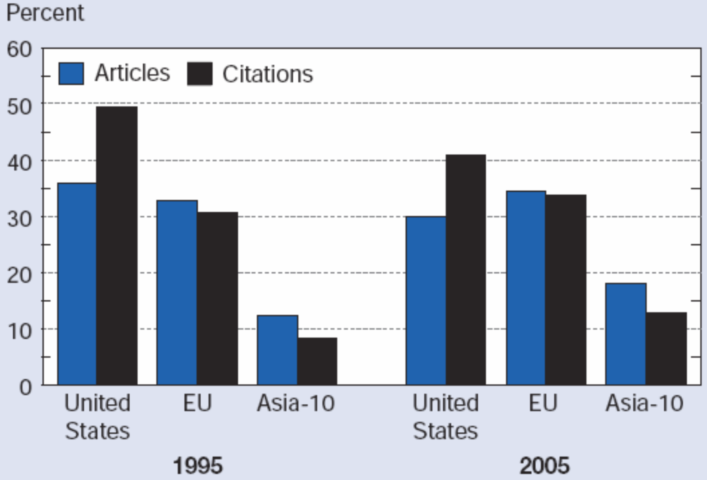


NOTES: Asia-10 includes China, India, Indonesia, Japan, Malaysia, Philippines, Singapore, South Korea, Taiwan, and Thailand. China includes Hong Kong.

SOURCES: Thomson Scientific, Science Citation Index and Social Sciences Citation Index; ipIQ Inc.; and National Science Foundation, Division of Science Resources Statistics, special tabulations.

Science and Engineering Indicators 2008

Figure 5-33
S&E articles and citations in all fields, by selected region/country: 1995 and 2005



EU = European Union

NOTES: Share of all articles based on 3-year period. Article counts from set of journals covered by Science Citation Index (SCI) and Social Sciences Citation Index (SSCI). Articles classified by year they entered database and assigned to region/country/economy on basis of institutional address(es) listed on article. Articles and citations on fractional-count basis, i.e., for articles with collaborating institutions from multiple countries/economies, each country/economy receives fractional credit on basis of proportion of its participating institutions. Citation data based on year article entered database. Citation counts based on 3-year period with 2-year lag, e.g., citations for 1995 are references made in articles in 1995 data tape to articles in 1991–93 data tapes. See appendix table 5-33 for countries/economies included in EU and Asia-10.

SOURCES: Thomson Scientific, SCI and SSCI, http://scientific.thomson.com/products/categories/citation/; ipIQ, Inc.; and National Science Foundation, Division of Science Resources Statistics, special tabulations. See appendix table 5-39 and table 5-28.

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US and Europe remain the leaders in science

- But other countries are developing their capacity
  - We should help build that capacity

Science as an enterprise is more and more collaborative

- On an international or global scale

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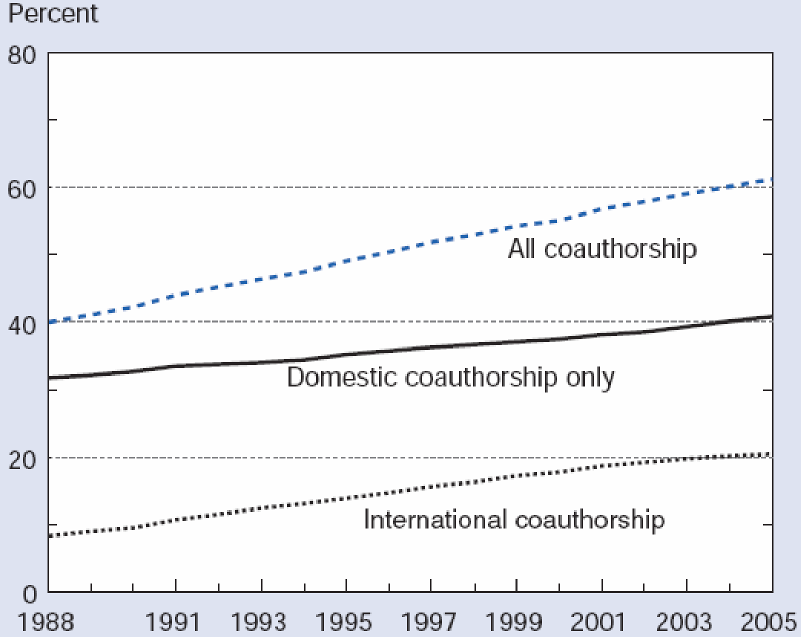
International research teams are becoming much more common

- One-on-one collaborations
- Large international projects
  - Human Genome Project
  - Intergovernmental Panel on Climate Change
- Large shareable resources and infrastructure
  - Most telescope/array projects
  - Large Hadron Collider
  - ITER

Figure 5-30

Share of worldwide S&E articles coauthored domestically and internationally: 1988–2005



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SOURCES: Thomson Scientific, SCI and SSCI, http://scientific.thomson.com/products/categories/citation/; ipIQ, Inc.; and National Science Foundation, Division of Science Resources Statistics, special tabulations.

Science and Engineering Indicators 2008

Science is becoming more global and more internationally collaborative

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We do not have world norms or standards for global science

- We need to find ways to better integrate the global scientific community
  - Particularly countries where science capacity is just developing

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Europe has been working to better integrate the European science community

- European Research Area
- European Research Council
- European Science Foundation

US and Europe should be working together to help integrate the global scientific community

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Integrating the global scientific community

- Develop global standards
  - Scientific ethics
  - Intellectual property
- Help developing scientific communities become part of the global community
- Help deal with varied national science policies
  - E.g., embryonic stem cell research
  - GMO's
  - Research using animal subjects
- Better coordinate funding policies
- Streamline diverse bureaucracies
  - American researchers spend 42% of research time on administrative tasks

The climate for science and for collaboration is also affected by the broader societal context

- How society relates to science

We have a problem

- The science-society relationship has been experiencing significant tension
  - Not just in the US

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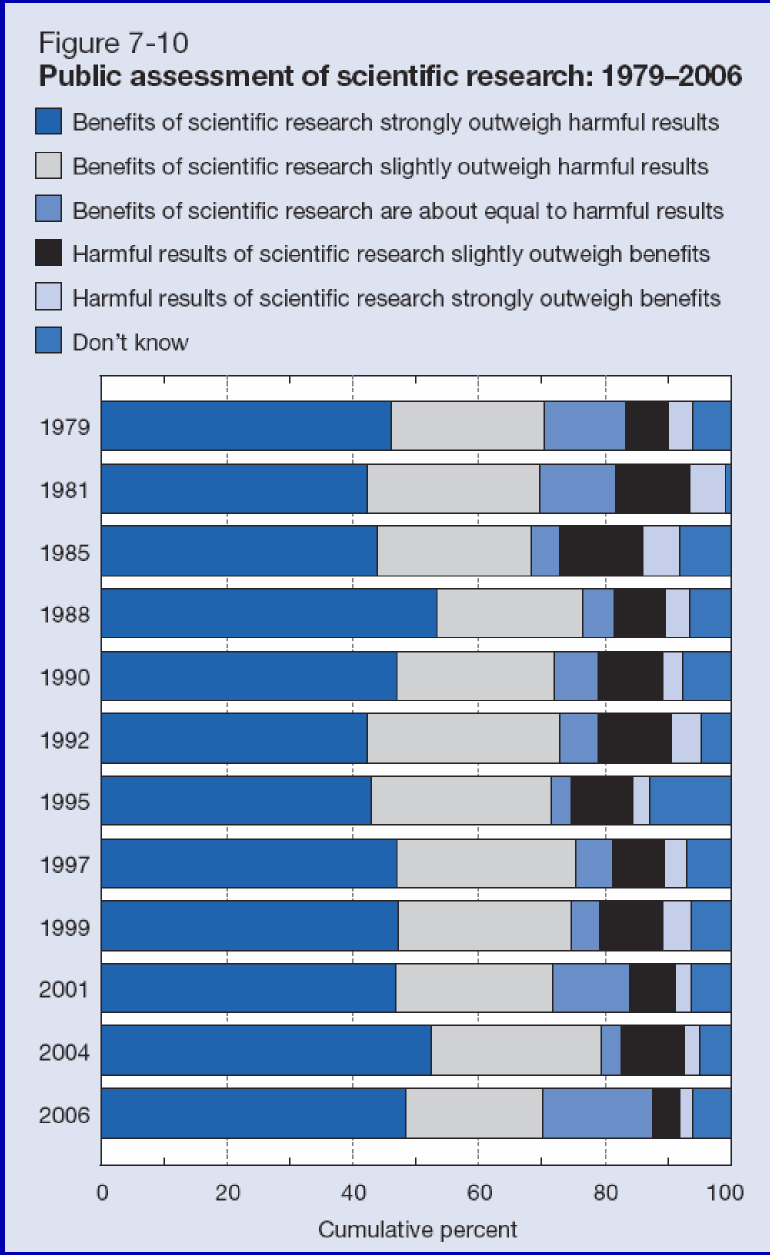
Some points of tension come from factors *internal* to science

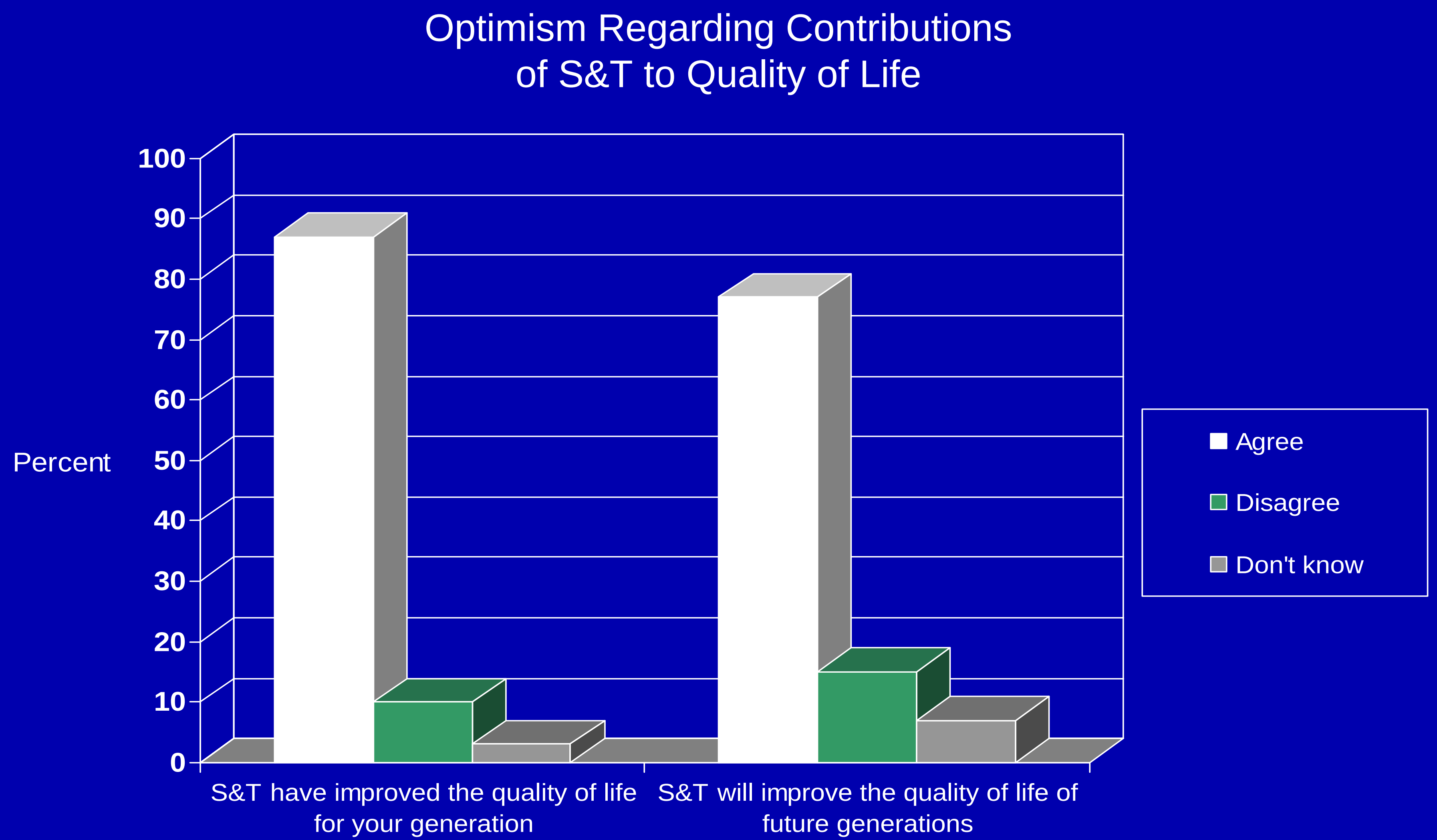
- Incidents of scientific misconduct
- Human subjects concerns
- Animal welfare issues
- Conflict of interest problems

There are problematic *external* factors as well

People generally still respect science and technology….



Source: Science and Engineering Indicators, 2008



Source: Eurobarometer, 2005

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They have little understanding of what is and is not science

- 60% of Americans believe in extrasensory perception
- 41% think astrology is somewhat scientific
- 47% still do not answer “*true*” to the statement: “Human beings developed from earlier species of animals”

Science and Engineering Indicators, 2004

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What do Europeans consider as scientific?

- Medicine – 89%
- Physics – 83%
- Astronomy – 70%
- History – 34%
- Astrology – 41%
- Homeopathy – 33%

Source: Eurobarometer, 2005

Much science-society tension results from conflicts between scientific findings and

- Political/economic expediency
- Core human values

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An American political (economic) example…

- Is there global warming?

"Saying that global warming is controversial within science is like saying that whether Ralph Nader should be President is controversial among US voters."

….quoted by Christine Ebi, 2009

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Only scientists are required to adhere to what science says/shows

- Climate change in the US
- GMO's?

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Current scientific issues that abut against core values

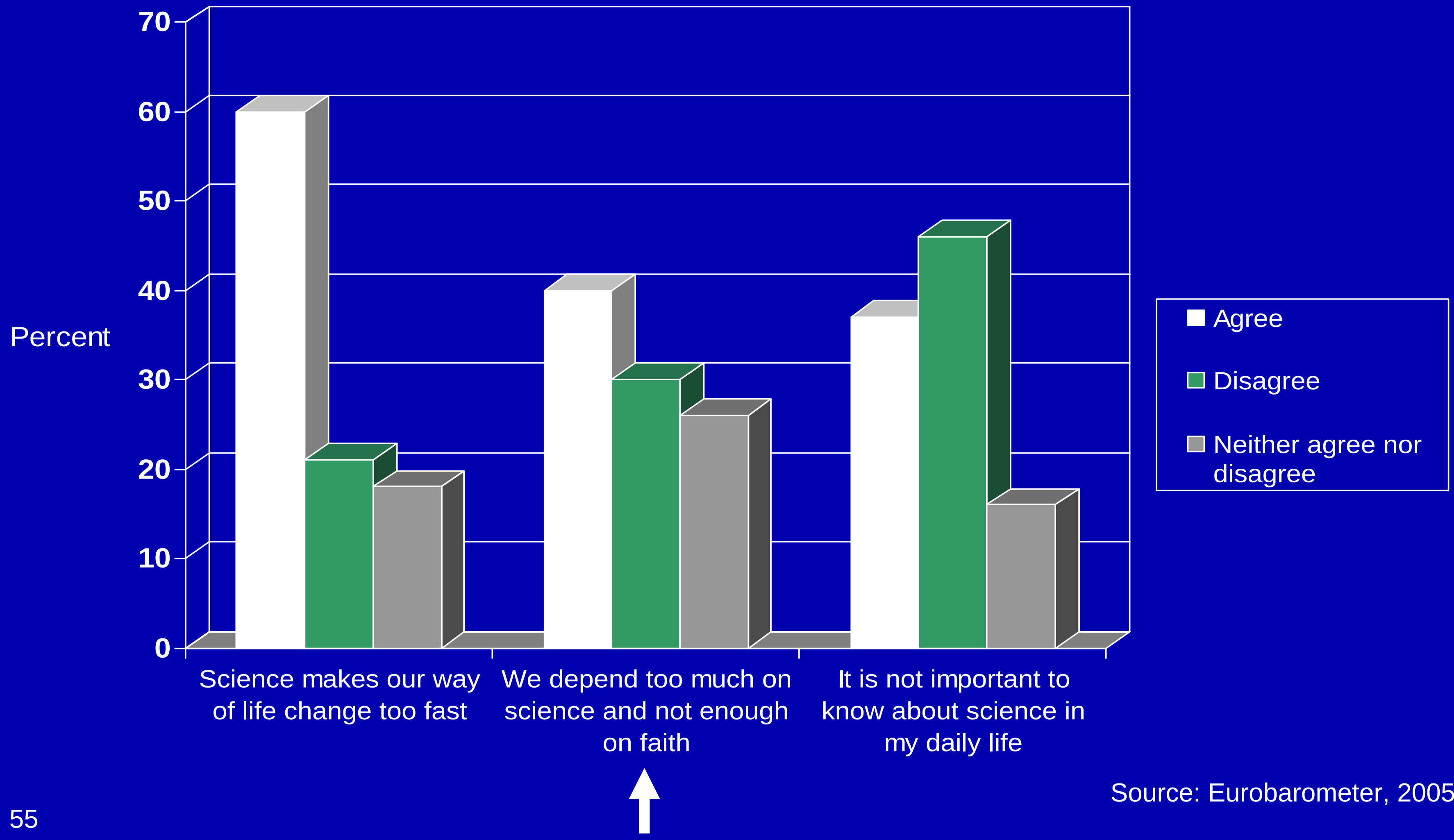
- Embryonic stem cell research
- Studying “personal” topics
  - Sex
  - Genetics of behavior
- Teaching “Intelligent Design” versus evolution in science classrooms
- Neuroscience – mind/body issues
- Synthetic biology

Some Americans have reservations about science

	Agree	Disagree
	%	%
Scientific research doesn't pay enough attention to the moral values of society	56	37
We depend too much on science and not enough on faith	50	45

Science and Engineering Indicators, 2006

Science and Faith



Source: Eurobarometer, 2005

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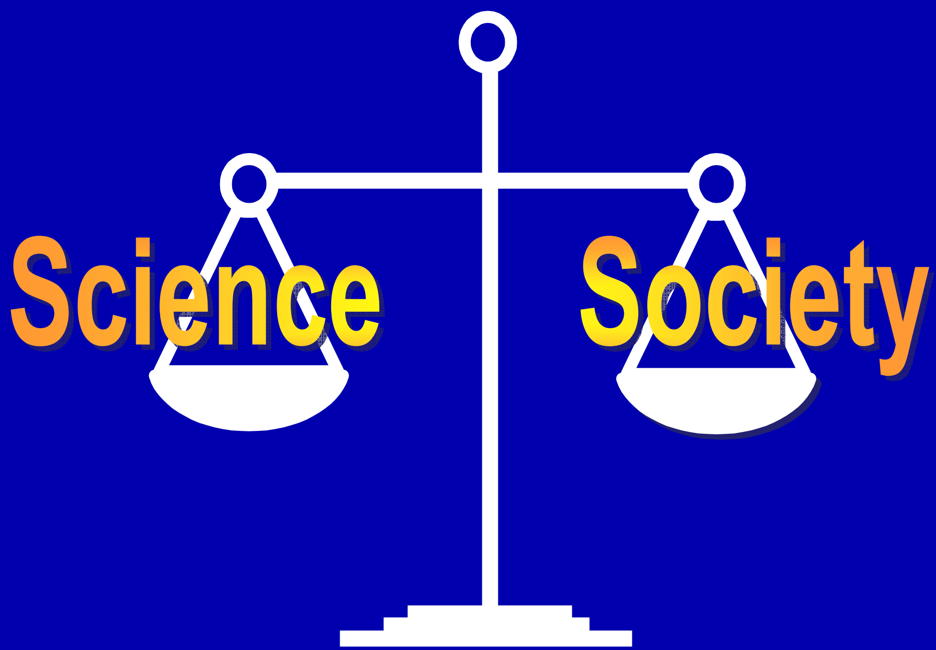
“Conflict” with politics and values has consequences for the science-society relationship

- Creating a growing divide between science and the rest of society
  - We work for society
  - We need society’s support
- Society wants to exert too much influence on what science can be done
  - Or not

The science-society relationship needs constant attention to keep it balanced!



US and Europe can work together to address tension when it emerges

A re-emerging science-society trend and opportunity to collaborate

Science Diplomacy

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Science Diplomacy

- "The application of international science cooperation motivated by the desire to establish or enhance relationships between societies"

Science and diplomacy take different forms

- Science in Diplomacy
  - Dealing with global issues with science cause or cure
    - climate change
    - global health
    - agriculture
    - sustainability
    - energy
- Diplomacy for Science
  - Getting things done for the science community
- Science Diplomacy
  - Building relationships through science

Science diplomacy has different "actors"

- Done by governments
  - Science <u>for</u> diplomatic purposes
  - Science as a tool <u>in</u> diplomacy
- Done by NGO's
  - Maintain relationships among people when their governments have less friendly relationships

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Historical Examples of US Science Diplomacy

- U.S. – Japan – Building Societal Links
- U.S.- China – Moving Beyond the Geopolitical
- U.S. – USSR – Establishing a Connection

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Science diplomacy is not just a U.S. strategy

- Europe: After WWII, Science cooperation provides way to knit together Europe
- Europe: Post cold war, provides important bridge to potential future members
- Israel – Palestine: IPSO, building trust and working on issues of mutual interest and benefit

Whither US Science and Diplomacy?

"I think science diplomacy and science and technology cooperation between the United States and other countries is one of our most effective ways of influencing and assisting other nations and creating real bridges between the United States and counterparts "

Secretary Clinton February 4, 2009; State Department Town Hall

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Obama Administration's High-profile of Science in Diplomacy

- Cairo Speech, June 2009
- Launches a new partnership with Muslim Majority Countries
- Places science at the center of relationship
  - Science envoys
  - Science Fund
  - Creation of Centers of Excellence

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Some lessons learned from US experience

- Governments have important role to play, but need not lead all efforts
- Conversations must be of mutual benefit
- Science *cooperation* and science *development* are not the same
- Having outside non-governmental groups fund activities helpful
- Must bring together foreign policy and science communities to be effective

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AAAS Center for Science Diplomacy

- Established in July 2008
- Vaughan Turekian, Director

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Sample activities

- Women Leaders in Science, Technology, and Engineering Conference in Kuwait between Muslim-Majority Countries and U.S.
- Conference on Science Cooperation with Iran
- AAAS-organized APEC Workshop on Science and Innovation in Vietnam
- High-level visit to Syria

US and Europe are leaders in an increasingly global scientific enterprise

We have both opportunities and obligations to collaborate in:

- Solving global problems
- Capacity building for emerging scientific communities
- Fostering integration of the global scientific community
- Attending to the science-society relationship
- Science diplomacy


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