The Evolving Climate for US Science

Federal Demonstration Partnership

January 25, 2010

AAAS

ADVANCING SCIENCE, SERVING SOCIETY

The *Revolving* Climate for US Science

Federal Demonstration Partnership

January 25, 2010

AAAS

ADVANCING SCIENCE, SERVING SOCIETY

AAAS

The climate is determined by

- State of science institutions
- Overall Federal and agency-specific funding policies
- Broader governmental climate for science and its use
- Globalization of science
- Societal climate for science and its use

The climate for US science is determined by

- State of science institutions
  - Universities
  - National labs
  - Independent research labs

Never Discuss Floods With Noah In the Audience

AAAS

The climate is determined by

- State of science institutions
- Overall Federal and agency-specific funding policies
  - Budgets
  - Priorities
  - What can be funded
  - Administrative burden

AAAS

American Recovery and Reinvestment Act

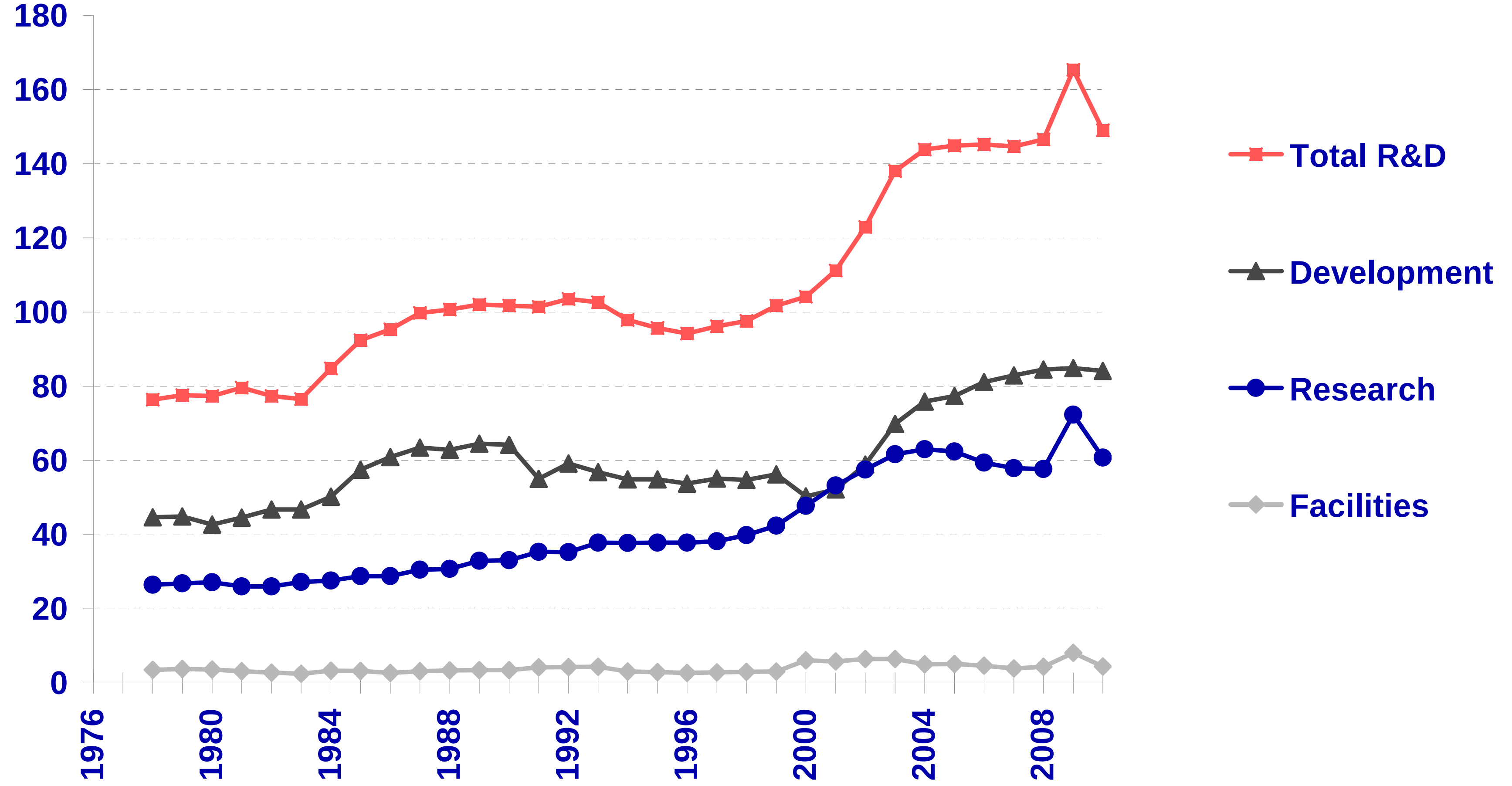
- $18.4 billion in R&D (12.5 percent of FY 2009 Investment)
  - National Institutes of Health - $10.4 billion
    - $8.2 billion in standard grants
  - National Science Foundation - $3.0 billion
    - $2.0 billion in standard grants
  - DOE Office of Science - $1.6 billion
  - National Institute of Standards and Technology - $600 million
- ARRA Obligation Deadline: September 30, 2010
- Different agencies, different mechanisms

The FY 2010 Federal R&D Investment

- $150.5 billion, 2.4% increase from FY 2009
  - 2.0% more than the President's request
    - Defense S&T, Agriculture biggest increases
- 1.3% increase in real dollars from FY 2009
  - 2.6% increase in R&D investment since FY 2006

Trends in Federal R&D, FY 1976-2010

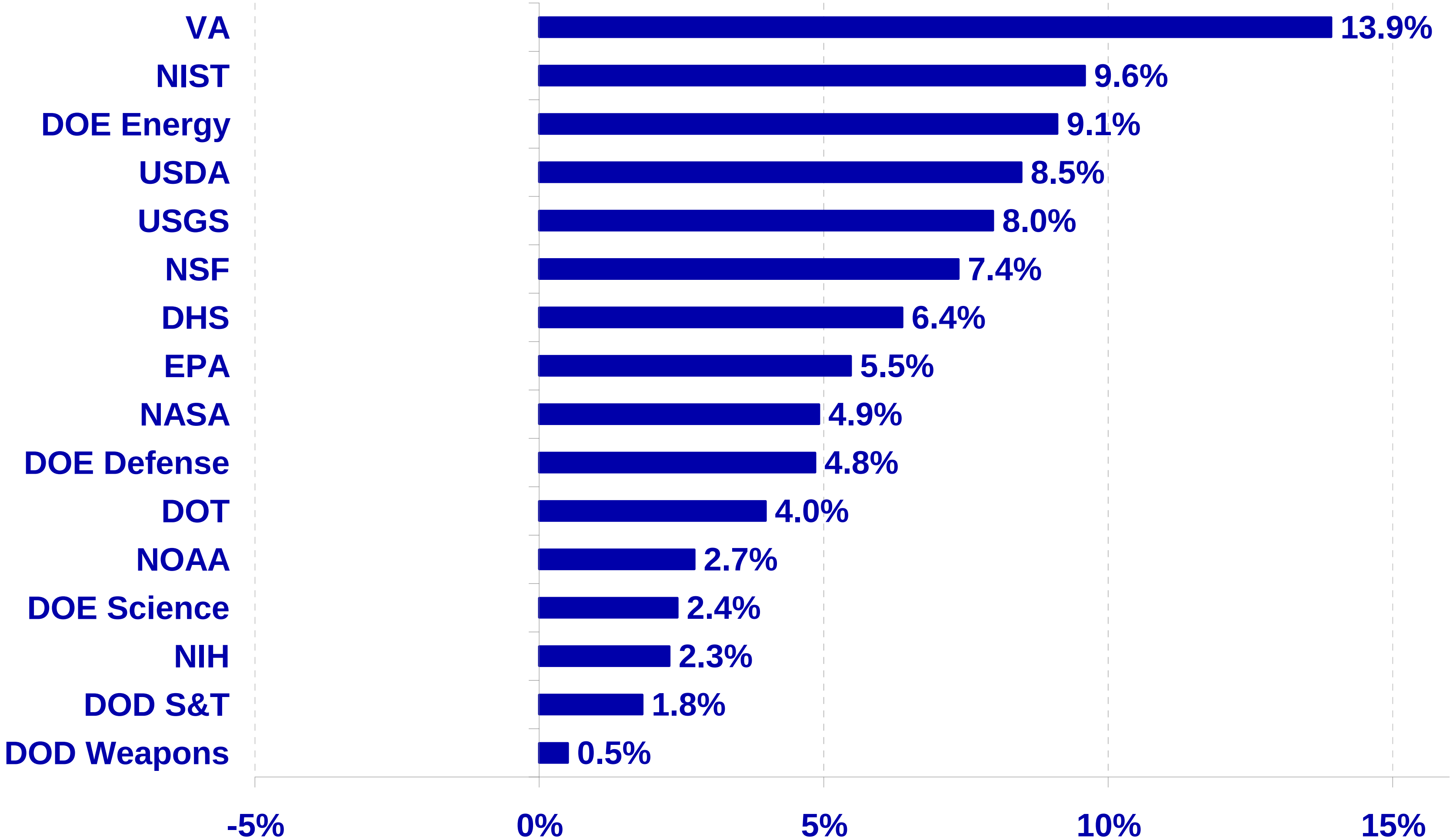
in billions of constant FY 2009 dollars



Source: AAAS estimates of R&D in FY 2010 appropriation bills and reports.
R&D includes conduct of R&D and R&D facilities.
1976-1994 figures are NSF data on obligations in the Federal Funds survey.

FY 2010 R&D Appropriations

percent change from FY 2009



Source: AAAS estimates of R&D in FY 2010 appropriation bills and reports.
DOD S&T includes R&D in 6.1 through 6.3 categories plus medical research.
DOD weapons includes R&D in 6.4 and higher categories.

General Outlook for FY 2011

- OMB/OSTP R&D Priority Memo
  - Economic Growth
  - Energy Technologies
  - Healthier Lives
  - National Defense
- Bart Gordon (D-TN): "... we've got to get the deficit down."
- Steven Chu: "It's a flat overall budget..."
- Presidential and Congressional support for 10-year doubling of basic research
  - Presidential memo to Senate and NSF conference report

We'll know the President's budget for sure on February 1

Special emphases

- Transformative research
- “Young”/newish investigators

Rules surrounding conduct of science

- Embryonic stem cell research
- Emerging conflict of interest policies
    - NIH or broader?
- Public access policy discussion
- No real progress on administrative burden!

The climate is determined by

- State of science institutions
- Overall Federal and agency-specific funding policies
- Broader governmental climate for science and its use

The science-government relationship has not always been smooth

Science Policy: 2001 - 2009

- Science advisor position downgraded
- Some, but uneven, budget growth
  - Congress & Administration did pass America COMPETES Act
- Administration showed lack of interest and respect for scientific data and expertise
  - Accused of ignoring or distorting data
  - Other constituencies received higher priority
- Scientific community became discouraged and disaffected

Causes of tension in science-policy relationship

- Conflict with political priorities/policies
  - Inconvenient truths
    - Climate/energy data
- Conflict with some public values
  - Teaching evolution in the schools
  - Should we study human sexual behavior?

Will the situation change with the new Washington power balance?

AAAS

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 budets 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

- “I come back to the science that is in it to reduce our dependence on foreign oil and climate change. 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)


Science and technology
SOLAR PANEL

It pays to have been a AAAS President

AAAS

Other notable nominations/appointments

- Margaret Hamburg, Commissioner of the FDA
  - Joshua Scharfstein, Deputy Commissioner
- Steven Koonin, Undersecretary of Energy for Science
- William Brinkman, Director, Office of Science
- Shere Abbott, Associate Director for Environment, OSTP
- Rajiv Shah, Administrator of USAID
- Marcia McNutt, Director USGS
- Roger Beachy, Director National Institute of Food and Agriculture, USDA

They've done unusual things

The President has had numerous science and science education events

There's much science talk on policy issues

- Holdren and PCAST have lots of “face time”
- Climate
- Energy
- Health

AAAS

“Open Government” Initiative

- Increased agency transparency
- Opportunities for input into policy formulation
  - AAAS Expert Labs project

Will the situation change with the new Washington power balance?

- A bit too soon to know
  - No base budget money yet
  - Policies still evolving
- Looking different from before
  - “Rubber hasn’t fully hit the road”

The climate is determined by

- State of science institutions
- Overall Federal and agency-specific funding policies
- Broader governmental climate for science and its use
- Globalization of science

AAAS

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

- Science and technology are important instruments of globalization
  - Communication and information technologies
- Science and technology are critical components of every major issue facing global society
  - Cause
  - Cure
  - Require globally coordinated scientific responses

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

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

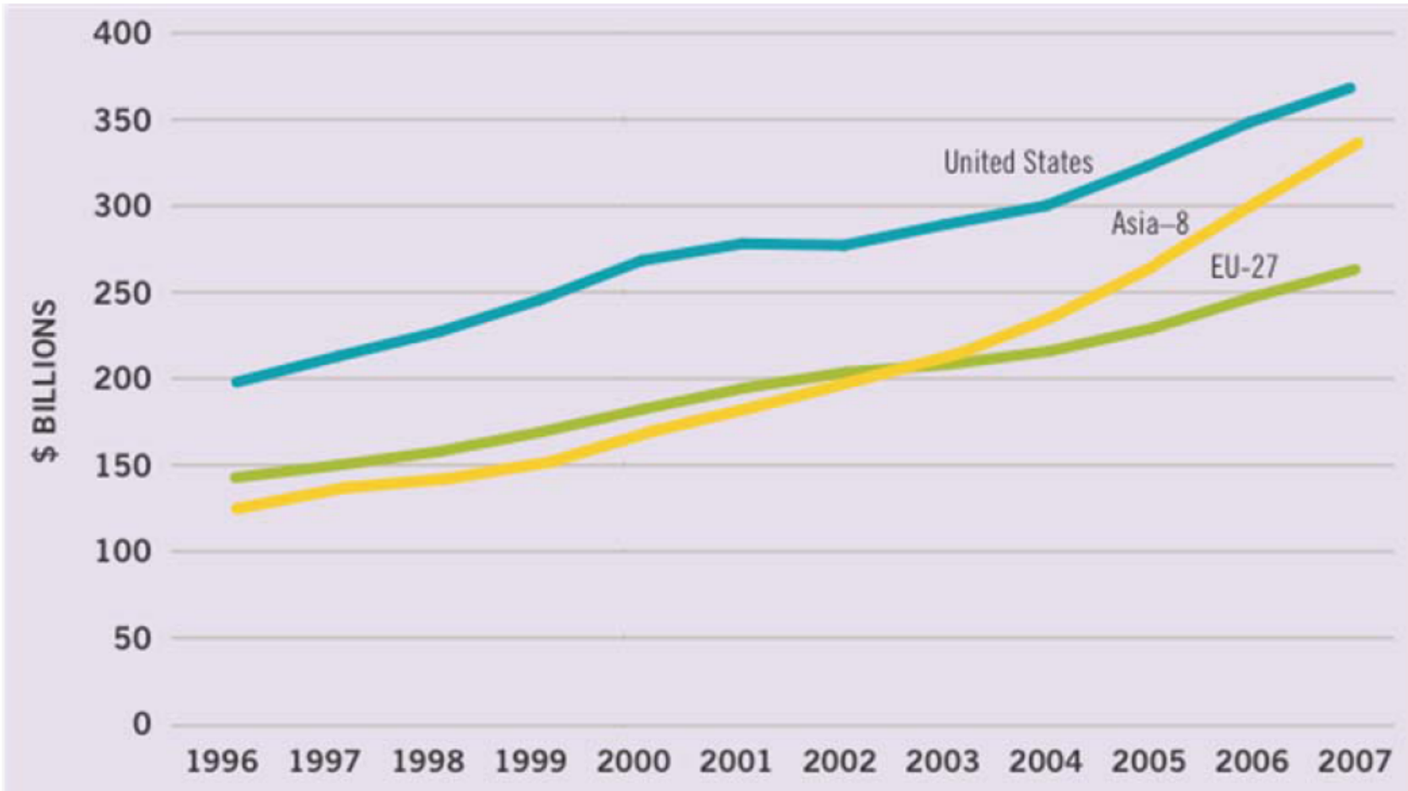
- For people to prosper in modern society, they need fundamental understanding and comfort with S&T
- For nations to prosper they need
  - Scientific capacity
  - National policies that reflect the best science
- For science to prosper, and to serve society well, it must have broad public support

More and more countries are investing in science

The motivation is typically tied to

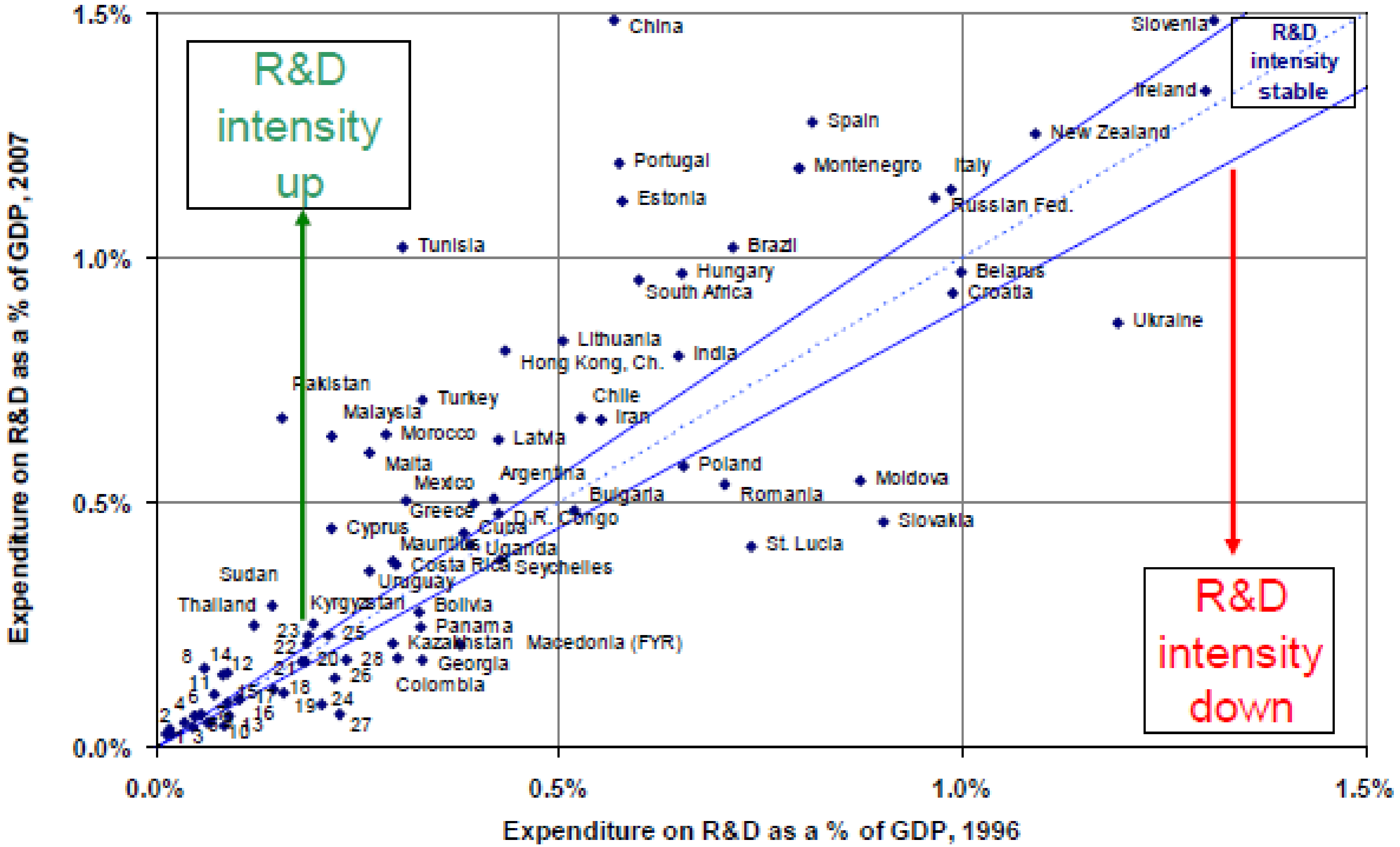
- Innovation and the economy
- Health and quality of life of their people

R&D Expenditures



SEI 2010: Global patterns of R&D Expenditures, Chapter 4

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.

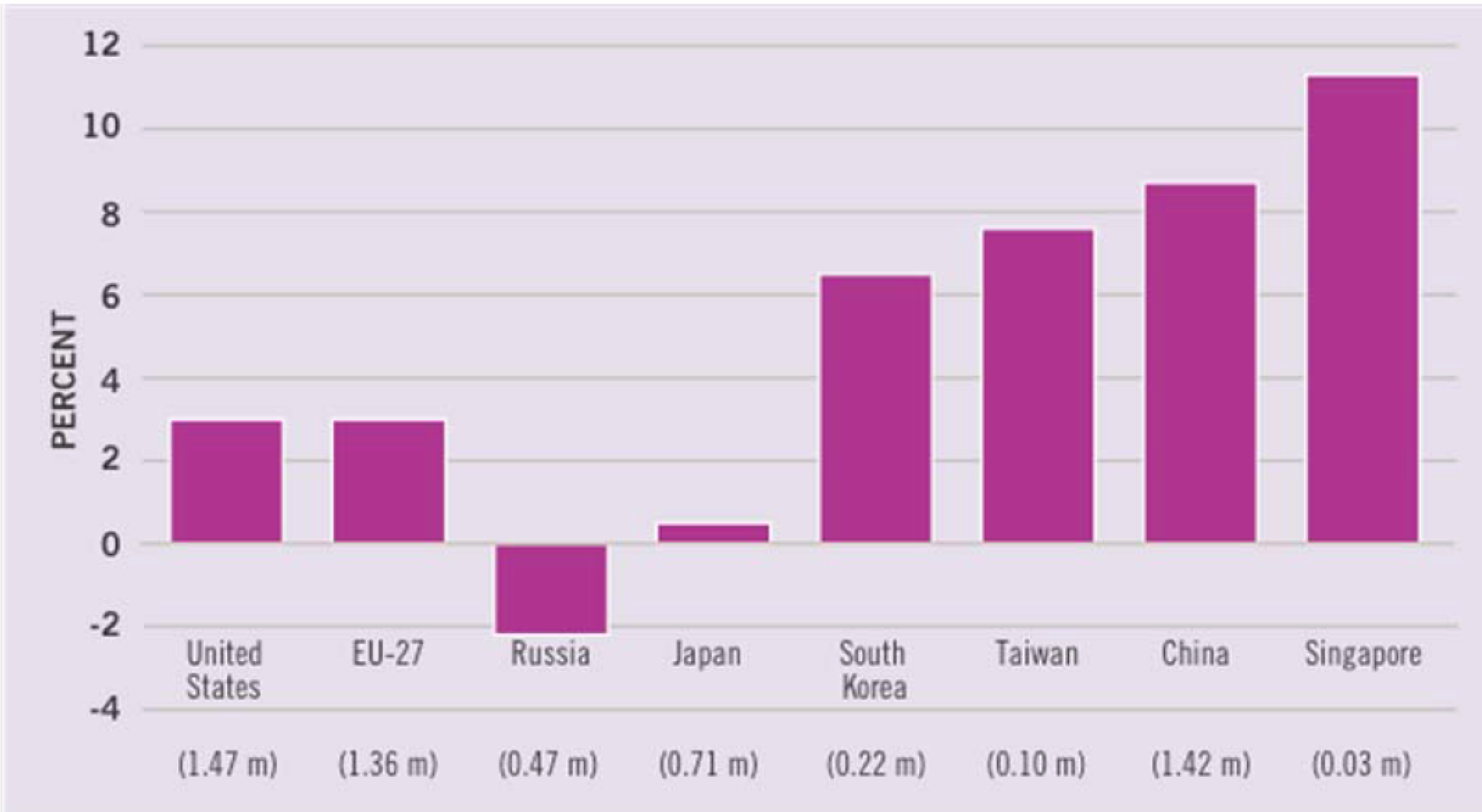


Source: UNESCO Institute for Statistics, September 2009

More and more countries are investing in science means

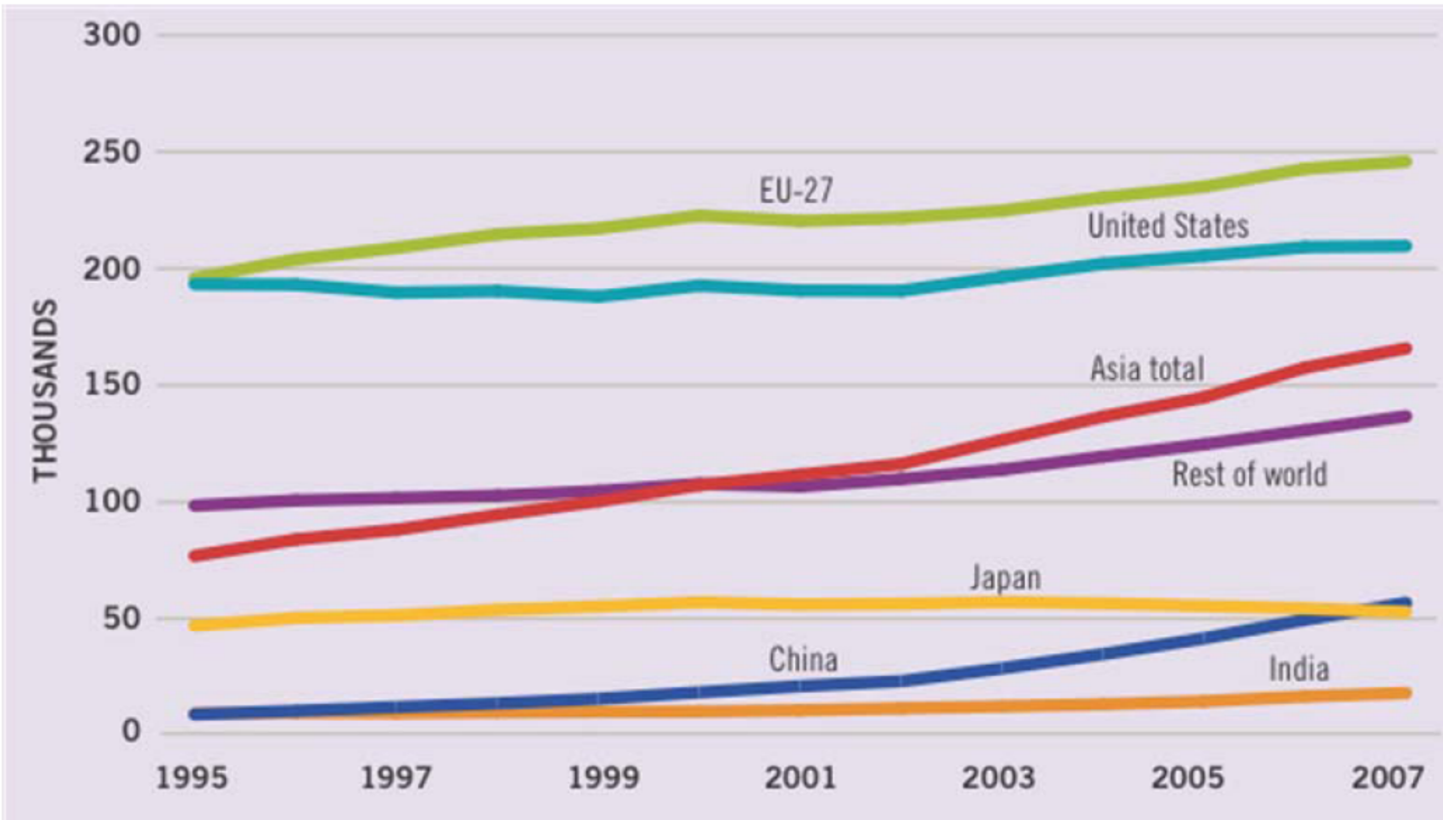
- High quality science is now going on all over the world

Annual Growth in the Number of Researchers



SEI 2010: Global S&E Labor Force, Chapter 3

S&E Articles by Region and Country



SEI 2010: S&E Article Output, Chapter 5

Science as an enterprise has become more and more collaborative

- On an international scale

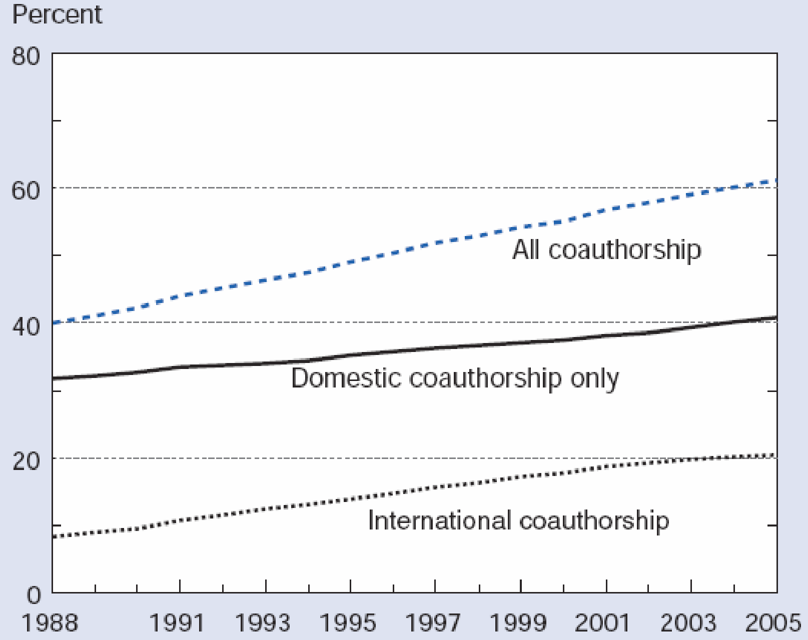
AAAS

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

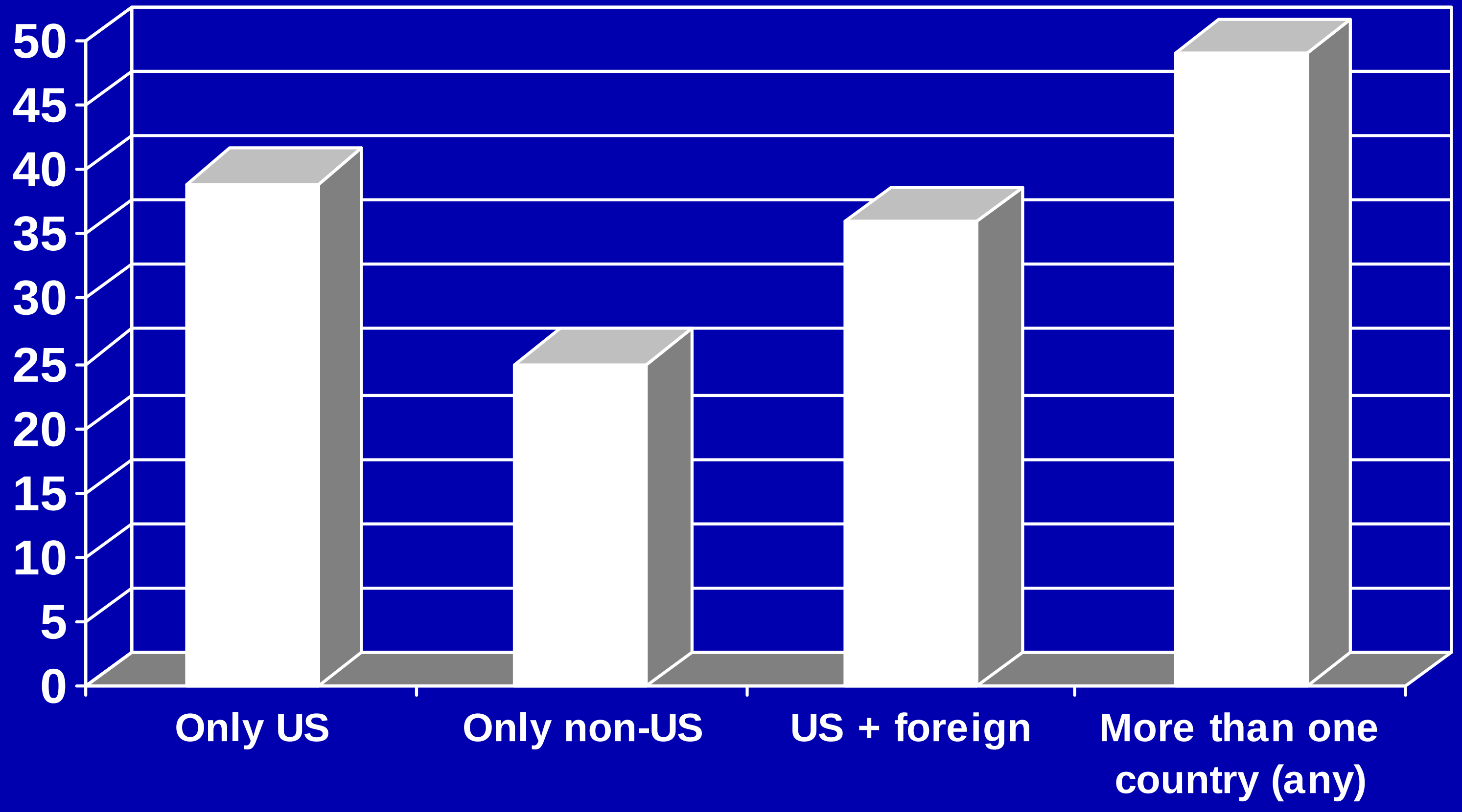


NOTES: Article counts from set of journals covered by Science Citation Index (SCI) and Social Sciences Citation Index (SSCI). Articles classified by year they entered database, rather than year of publication, and assigned to region/country/economy on basis of institutional address(es) listed on article. Articles on whole-count basis, i.e., each collaborating institution or country credited one count. Internationally coauthored articles may also have multiple domestic coauthors.

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 (2009) author origins (percent)



AAAS

The official US stance on science is changing

- New attitudes and support likely will improve the position of the US as a global science collaborator

AAAS

Obama Administration's High-profile of Science in Diplomacy

- E.g., Cairo Speech, June 2009
  - Launches a new partnership with Muslim Majority Countries
- Places science at the center of many international relationships
  - Science envoys
  - Science Fund
  - Creation of Centers of Excellence

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

All of this is good, but……

- If we want science to reach its full potential and best serve society
  - We need to move to the next level of internationalization

Science needs to become a truly *global* enterprise

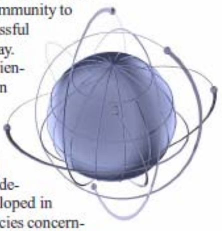
Alan I. Leshner is the chief executive officer of AAAS and executive publisher of *Science*.

Vaughan Turekian is the chief international officer and director of the Center for Science Diplomacy of AAAS.

Harmonizing Global Science

EVERY MAJOR PROBLEM FACING MODERN SOCIETY NOW HAS A SCIENCE AND TECHNOLOGY COMPONENT—either as a cause or cure—whether it's energy and the environment, access to water and fertile land, the spread of infectious diseases, or sustaining a viable economy. Although every societal problem has unique regional characteristics that require attention, there are sufficient implications across regions for which only globally coordinated efforts will be successful. The recent assessments of the Intergovernmental Panel on Climate Change and their impacts on public and policymaker perceptions provide one example of successful cooperation on a near-global scale. The betterment of humankind depends on a deliberate move from being an international community of scientists to being a truly global community.

As more countries have invested in science and technology to advance their societies, high-quality science is increasingly being carried out in every part of the world. The scientific enterprise has become highly collaborative both within and across countries. These trends present great opportunities and increasing obligations for the scientific community to contribute to solving society's major problems. But efforts will be successful only if the community can function in a much more globally integrated way.



Becoming global can only happen if the differences among national scientific communities are reduced. For example, there is substantial variation in the norms and standards that govern the work of scientists in different countries. Effective collaboration requires harmonizing these standards of conduct so that scientists can work together with full trust and confidence. Consider the work of the International Society for Stem Cell Research, which has been striving as a community to develop global guidelines for embryonic stem cell research so that biological materials developed in one nation can be shared with others. Similar concerns apply to other policies concerning the conduct of science, such as those regarding the use of human subjects, animal welfare, or work on genetically modified organisms. Harmonizing norms and standards may be the most pressing need for successful globalization. But disparate national intellectual property rules and regulations can also deter international cooperation, as can differing publication and information access policies.

The heavily nationalistic funding policies of some wealthier countries and regions that make it difficult to support noncitizen students or to fund science conducted in other countries raise particularly difficult barriers to effective global collaboration. There is also the problem of daunting and widely varying administrative policies. A recent study by the U.S. Federal Demonstration Project showed that U.S. researchers spend 42% of the time allocated to research on administrative tasks. Add to this the need to meet the diverse bureaucratic requirements of different nations, and the burden on the global scientific community becomes truly excessive.

Creating greater uniformity across countries to reduce such deterrents will require both individual and institutional leadership. Perhaps regular international gatherings, such as the annual Science and Technology in Society Forum in Japan, the annual American Association for the Advancement of Science (AAAS) meeting, or the biannual World Science Forum in Hungary, could dedicate a major part of their time to working on these issues. However, globalizing science will require sustained efforts throughout the year, of a type not normally associated with these meetings. International scientific organizations could take the lead in efforts to harmonize overarching ethical norms and standards or intellectual property policies. Both public and private funders and policy-makers must be brought into the process early to make these endeavors successful.

The widespread increase in scientific activity throughout the world reflects great confidence in science's ability not only to reveal the nature of the natural world but also to contribute to the betterment of humankind. To exploit its full potential power, however, those involved in science and technology must become better able to function as a truly global community.

—Alan I. Leshner[1], —Vaughan Turekian[2]

10.1126/science.1184624

CREDITS:

Globalizing science

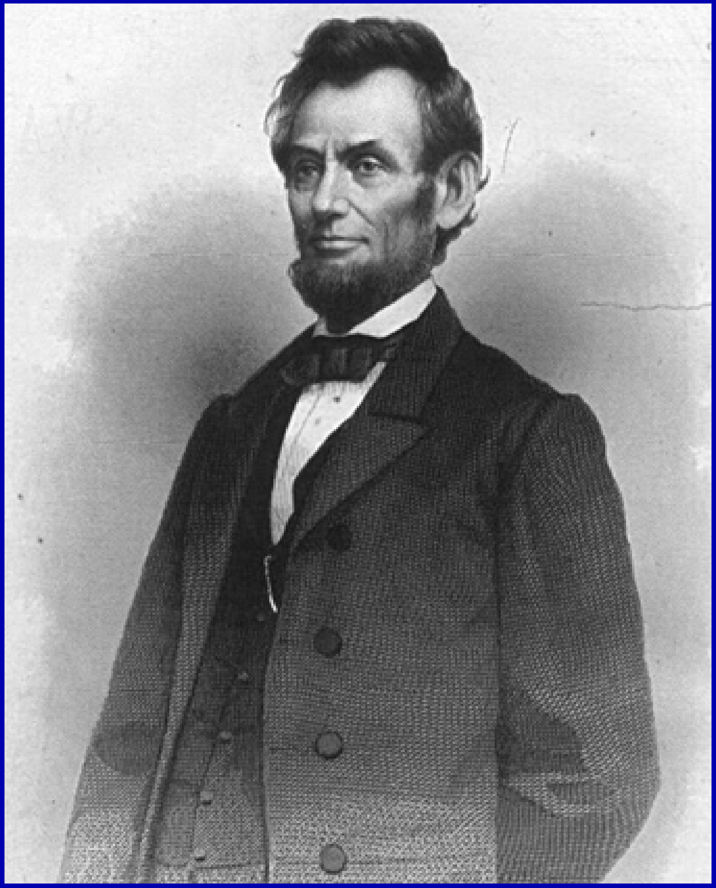
- Develop global standards
  - Scientific ethics
  - Intellectual property
  - Publication/access issues
- Harmonize science policies across countries
  - E.g., embryonic stem cell research
  - Research using animal subjects
- Help bring developing scientific communities into the global community
- Better coordinate funding policies
- Streamline diverse bureaucracies
  - American researchers spend 42% of research time on administrative tasks

The climate is determined by

- State of science institutions
- Overall Federal and agency-specific funding policies
- Broader governmental climate for science and its use
- Globalization of science
- Societal climate for science and its use

Public sentiment is everything. With public sentiment, nothing can fail; without it, nothing can succeed.

Abraham Lincoln



More specifically

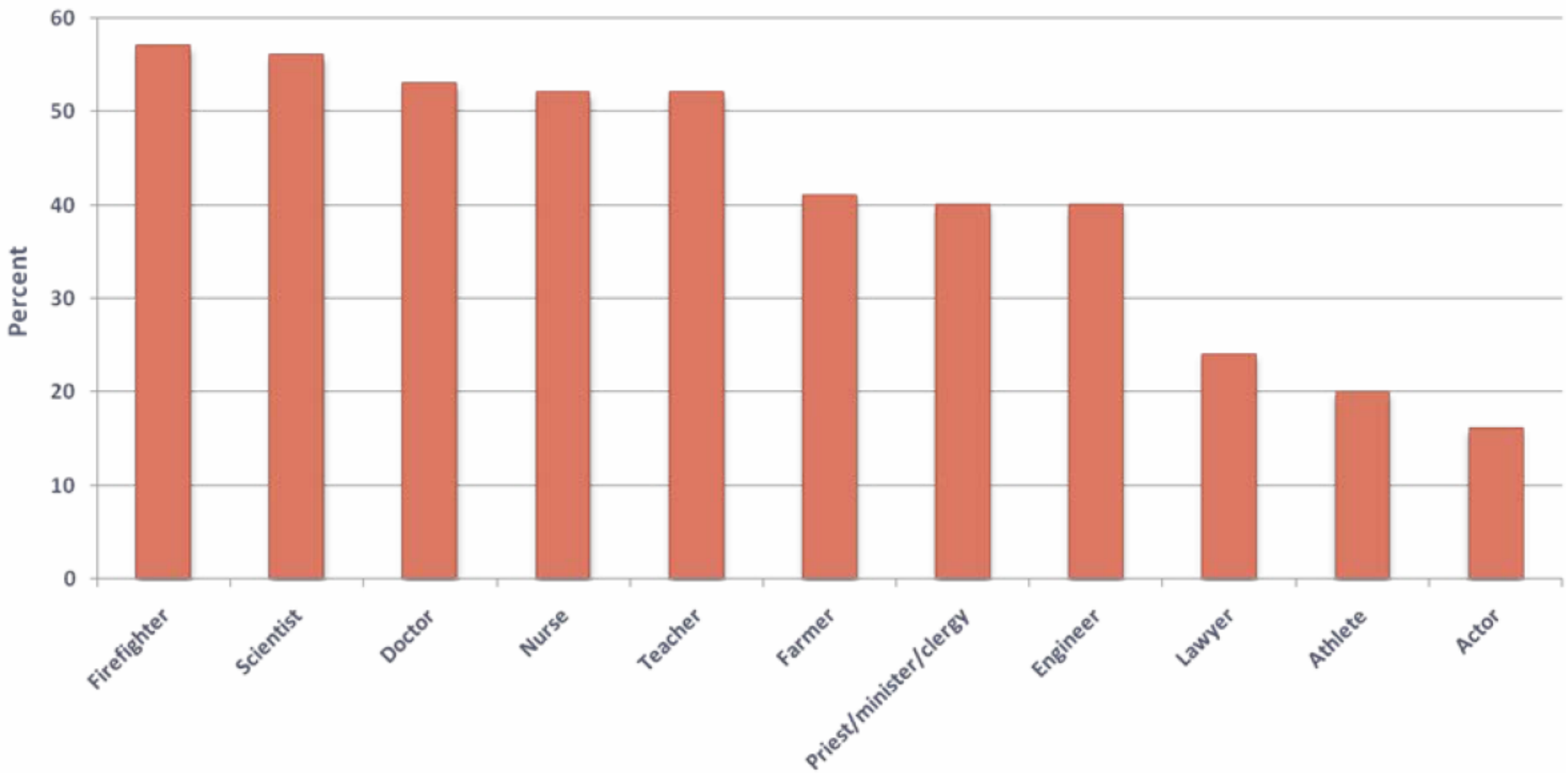
- For people to prosper in modern society, they need fundamental understanding and comfort with S&T
- For science to prosper, the science-society relationship must be positive and strong

In fact,

- The science-society relationship has been rather tense over the last decade

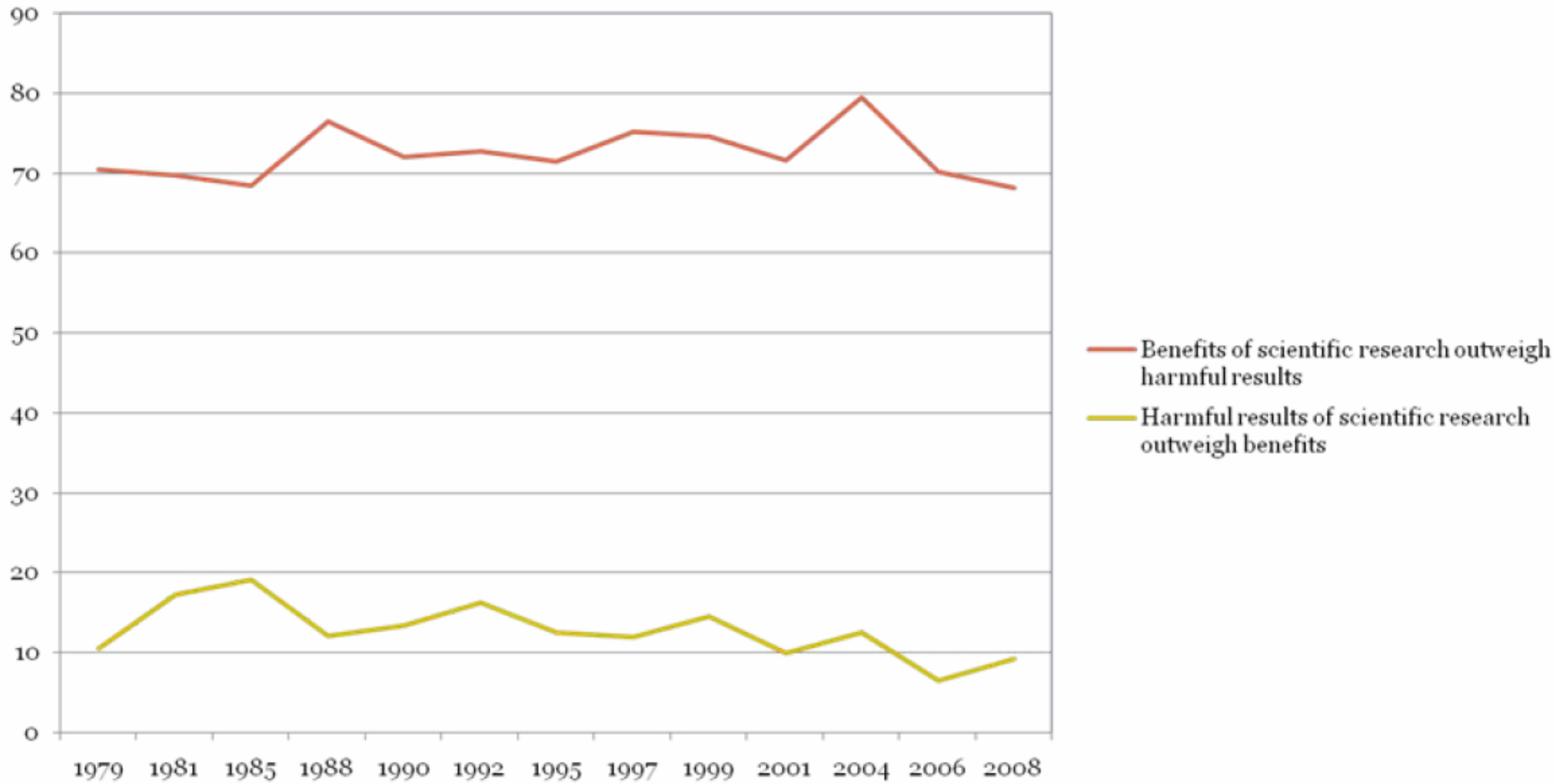
People generally still respect science and technology….

Prestige of Scientists and Engineers



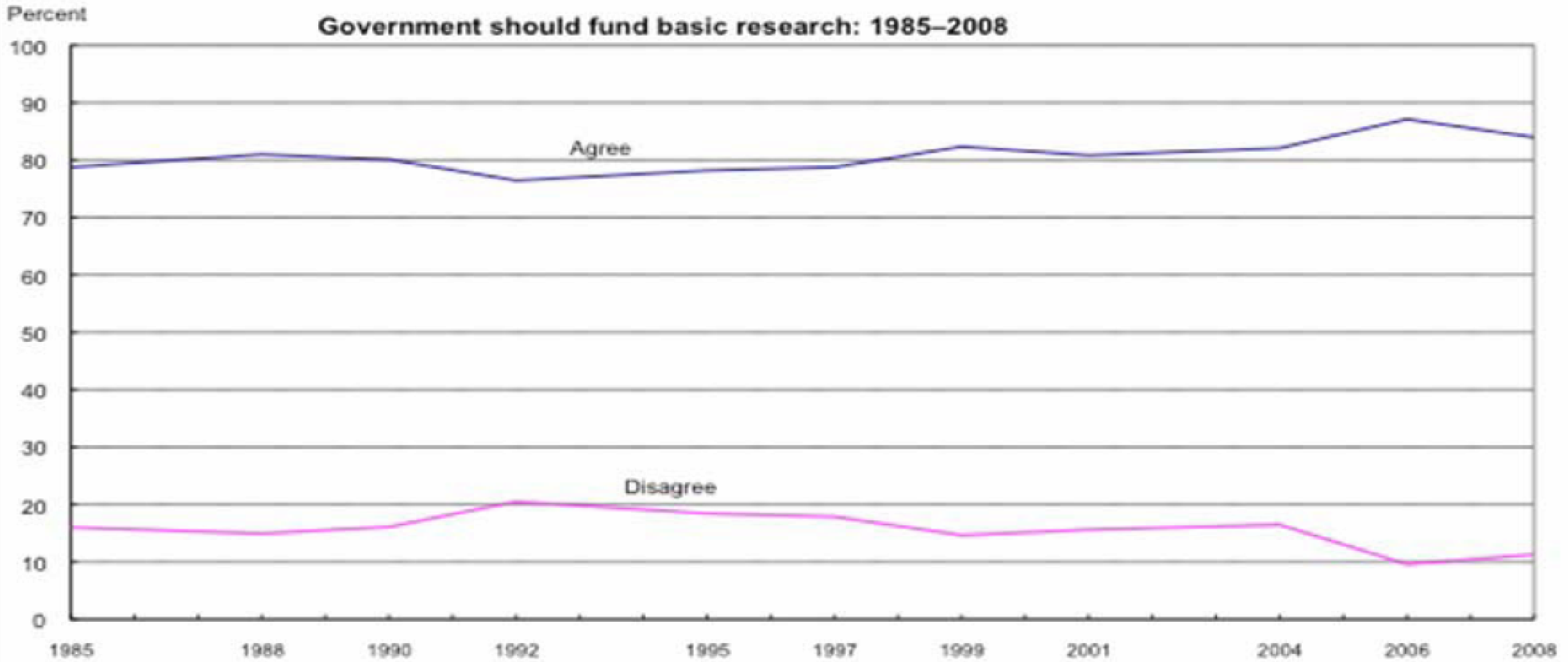
Science and Engineering Indicators 2010

Public Attitudes Toward Scientific Research



Science and Engineering Indicators 2010

Public Attitudes Toward Government-Funded Basic Research



National Science Foundation, Division of Science Resources Statistics, Survey of Public Attitudes Toward and Understanding of Science and Technology (years through 2001); University of Michigan, Survey of Consumer Attitudes (2004 in top panel); and University of Chicago, National Opinion Research Center, General Social Survey (2006, 2008 in top panel, 2002–08 in bottom panel)

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

It’s not just lack of understanding….

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

- Political/economic expediency
- Core human values

One 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

AAAS

Science-society tension results from conflicts between scientific findings and

- Political/economic expediency
- Core human values

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
- Synthetic biology
- Neuroscience – mind/body issues

Many Americans have reservations about science

	Agree	Disagree
	%	%
Scientific research these days 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

Why do we care?

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

- Creating a growing divide between science and the rest of society
  - Society won’t reap the benefits of science
  - Science won’t get societal support
- Society wants to exert too much influence on what science can be done
  - Or not

The only solution is greater public engagement with science

True public engagement means

- Public understanding of science
- Scientists listening to and understanding the public
- Working with the public to find common ground

How to do it?

AAAS

Public engagement approaches

- Public forums/town meetings
- Visits with community groups
- Small group, problem-solving sessions
- Exploiting natural opportunities
  - Science museums and centers
  - Over the neighbor’s fence
  - Physicians offices

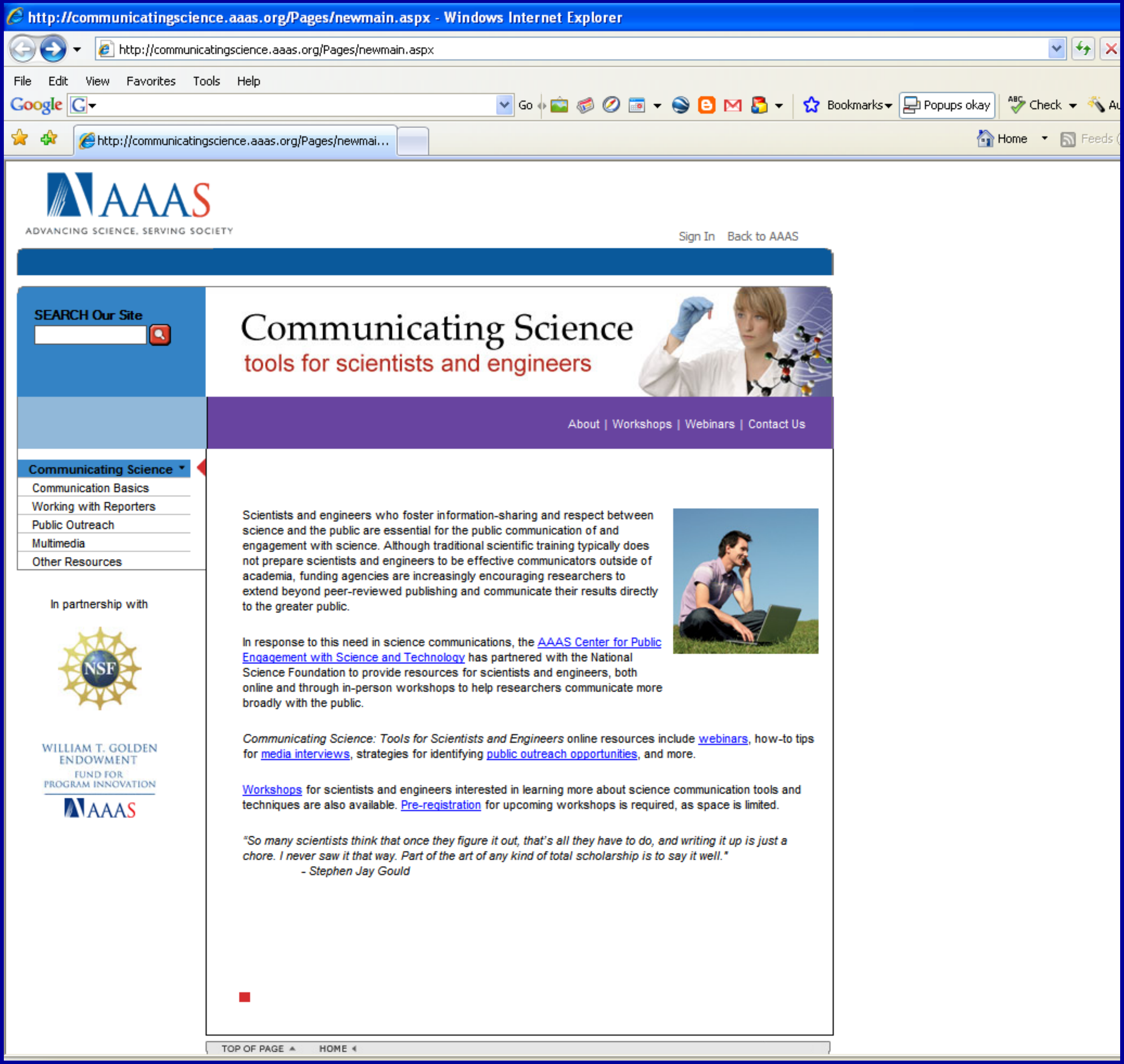
AAAS

Engaging with both policymakers and the public involves learned skills

- We need to build them into our training programs!
- We need to tell our students/colleagues it's good to do!!

AAAS offers some training activities

- Online communication training
- Regional training workshops for scientists and engineers
  - Partnership with NSF

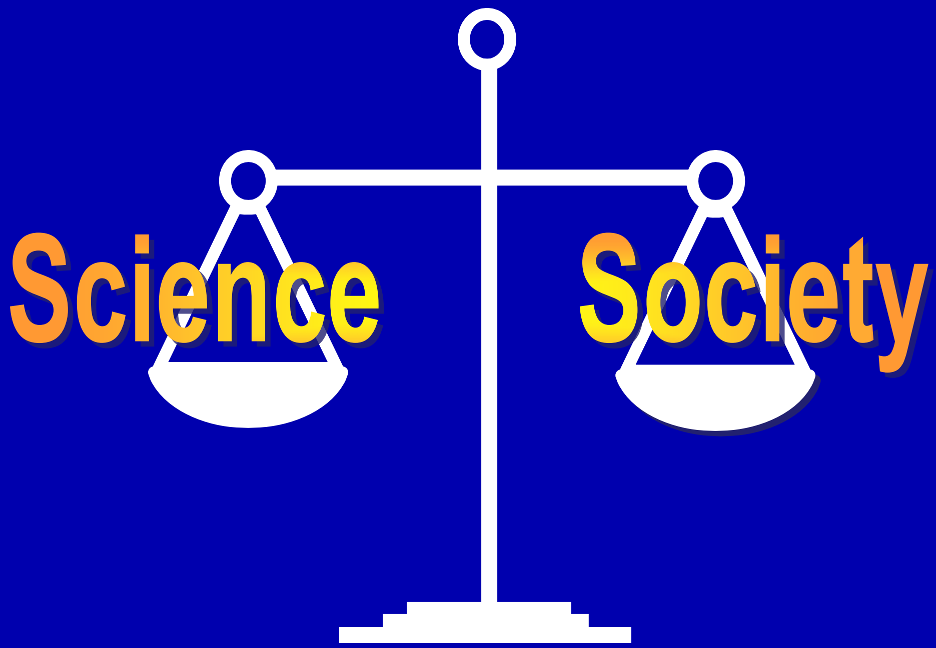


www.aaas.org/communicatingscience

I urge you to take on public engagement as a core function of modern universities

- Not only because of NSF's "Criterion 2"

Science's ultimate success requires a balanced relationship



The ultimate determinant of the "climate for science"


Science
Translational
Medicine
Online issue 14 October 2009