

The U.S. Federal Budget in Science and Technology

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for the International Seminar on Policies of Science,
Technology and Innovation

AAAS R&D Budget and Policy Program

<http://www.aaas.org/spp/rd>

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the “Seminars and Presentations” section for copies of
this presentation.



ADVANCING SCIENCE, SERVING SOCIETY

SCIENCE, TECHNOLOGY, AND INNOVATION

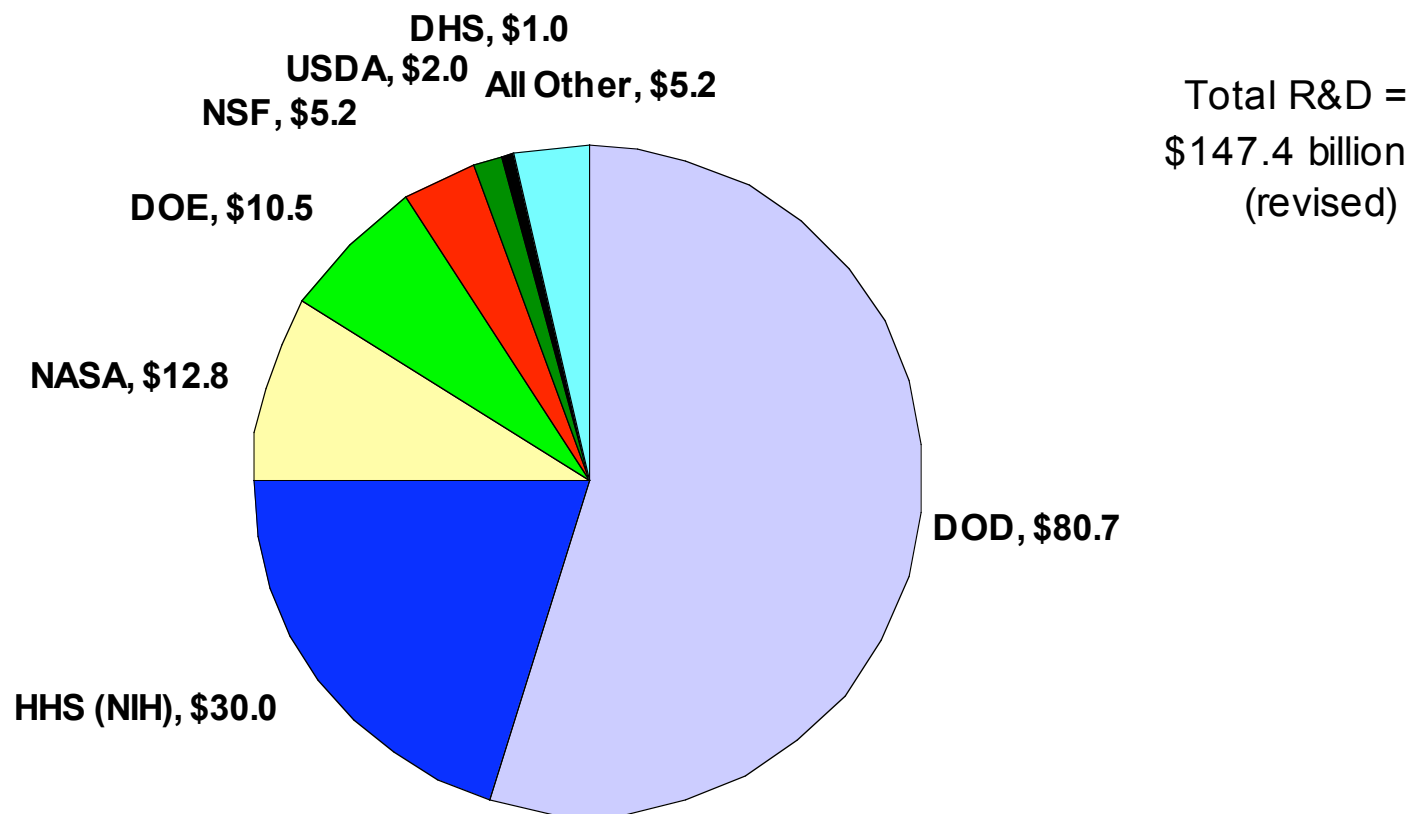
- Science and technology–based innovation is a key strength of the U.S. economy, but U.S. policymakers worry that U.S. strengths are eroding. The government wants to encourage more government R&D funding, better science and math education, and more students pursuing science and engineering careers.
- Several recent policies try to improve U.S. innovation. The American Competitiveness Initiative (ACI) in 2006, and the America COMPETES Act in 2007 authorize new programs in science and technology.
- But the money to implement the new laws are far short of the targets. And the U.S. does not have a comprehensive S&T policy, nor any long-term S&T plan.

THE 2009 BUDGET

- The U.S. government spends more than \$140 billion a year on R&D. More than half goes to the military, and the remainder goes to R&D for other national missions (health, energy, etc.)
- There is no Department of Science and Technology, no central budget for R&D, and very little coordination among 24 departments and agencies involved in science and technology.
- Spending on non-military programs has been flat since 2004.
- In 2009, there would be large increases for NSF, DOE Science, and the NIST labs to fulfill the ACI and America COMPETES Act to double basic research in the physical sciences between 2006-2016.
- There would be large increases for DOD weapons and NASA spacecraft development.
- But funding for health, environmental, and agricultural research would decline.

Total R&D by Agency: FY 2009 Proposed

Budget Authority in billions of dollars



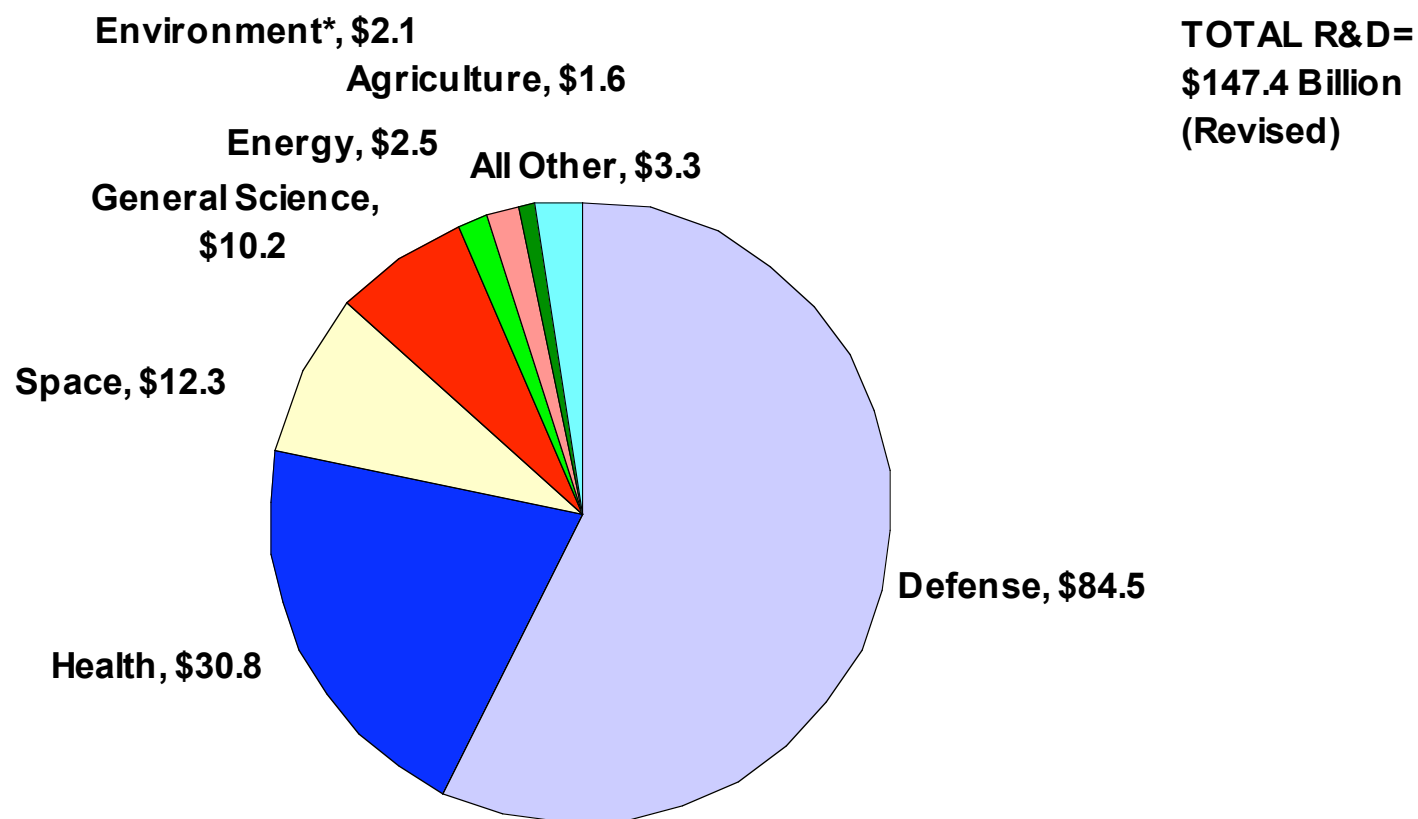
Source: AAAS, based on OMB R&D Budget Data and agency estimates for FY 2009.

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Major Functional Categories of R&D

FY 2009 President's Budget



* - includes natural resources R&D

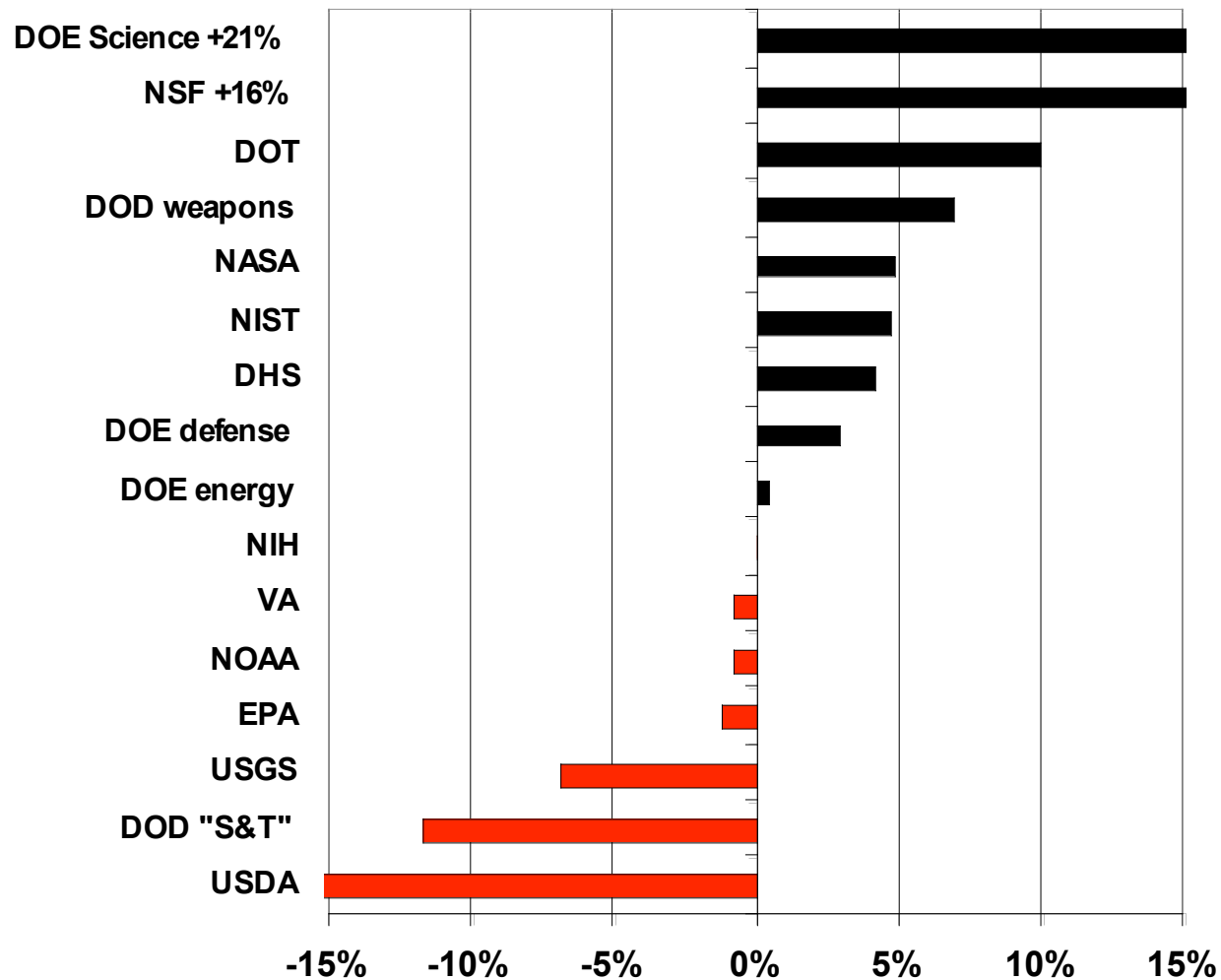
Source: AAAS, based on OMB and agency budget data.

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FY 2009 R&D Request

Percent Change from FY 2008

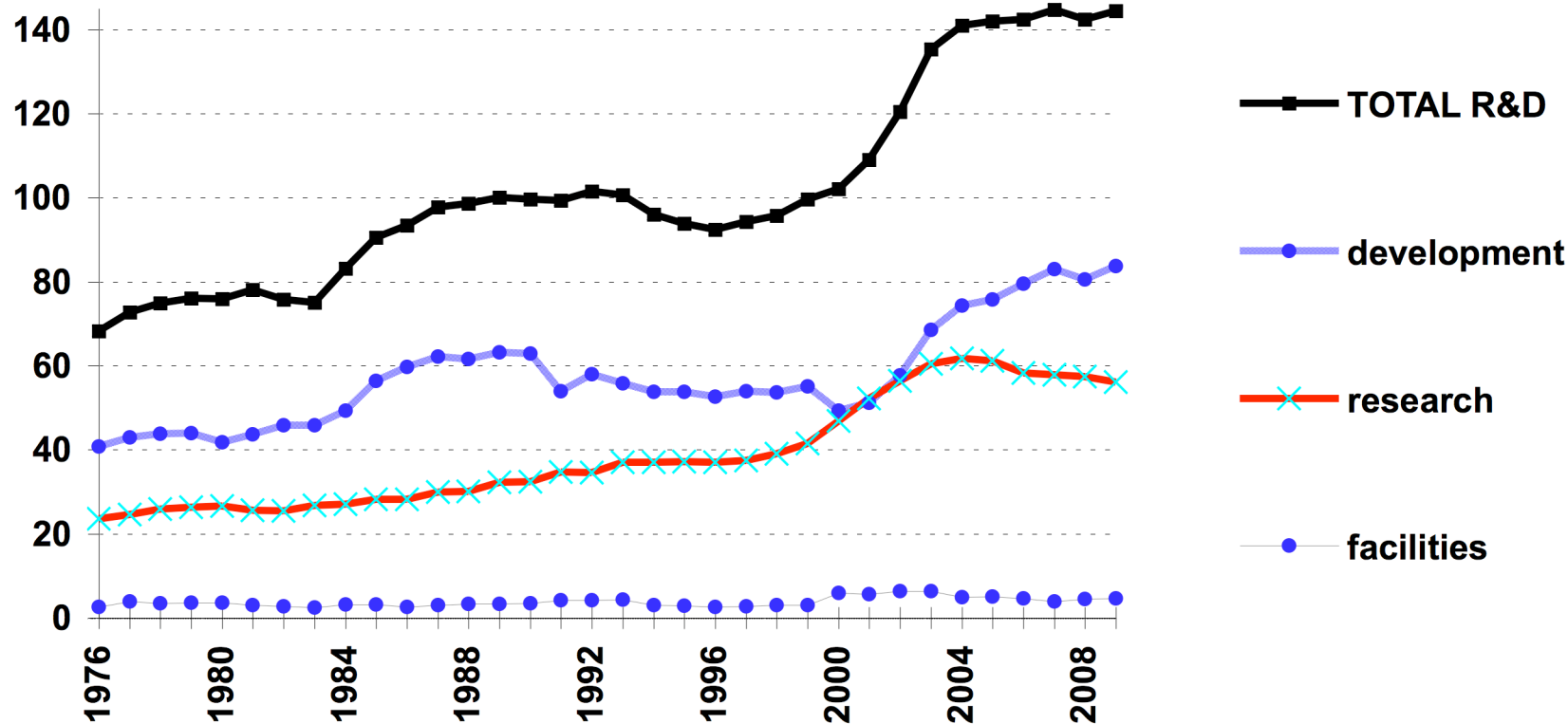


Source: AAAS, based on OMB R&D data and agency estimates for FY 2009.
 DOD "S&T" = DOD R&D in "6.1" through "6.3" categories plus medical research.
 DOD weapons = DOD R&D in "6.4" and higher categories.
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Trends in Federal R&D, FY 1976-2009 *

in billions of constant FY 2008 dollars

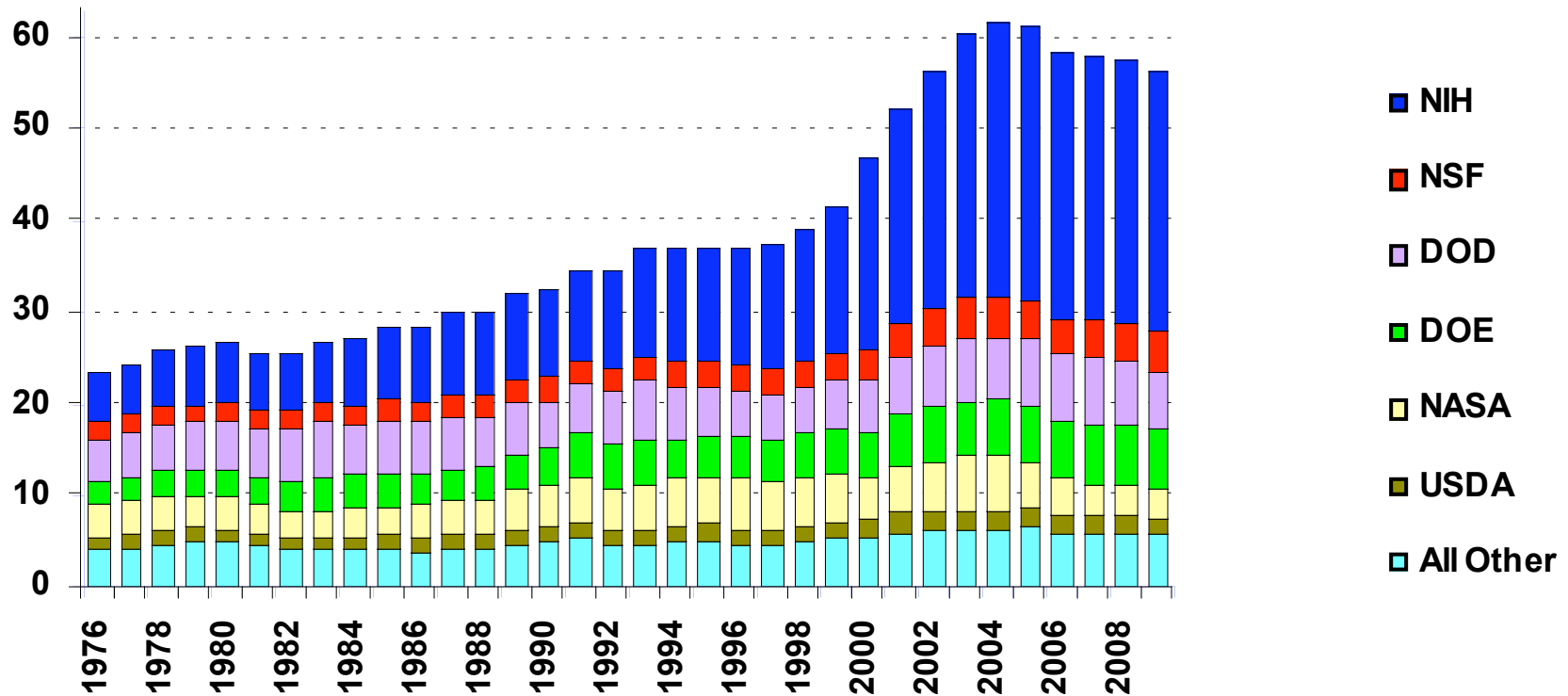


Source: AAAS analyses of R&D in annual AAAS R&D reports. * FY 2009 figures are latest AAAS estimates of FY 2009 request. R&D includes conduct of R&D and R&D facilities. Data to 1984 are obligations from the NSF Federal Funds survey. GDP figures are from OMB, Budget of the U.S. Government FY 2009.
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Trends in Research by Agency, FY 1976-2009 *

in billions of constant FY 2008 dollars



Source: AAAS analyses of R&D in annual AAAS R&D reports.

* FY 2009 figures are latest AAAS estimates of FY 2009 request. Research includes basic research and applied research. 1976-1994 figures are NSF data on obligations in the Federal Funds survey.

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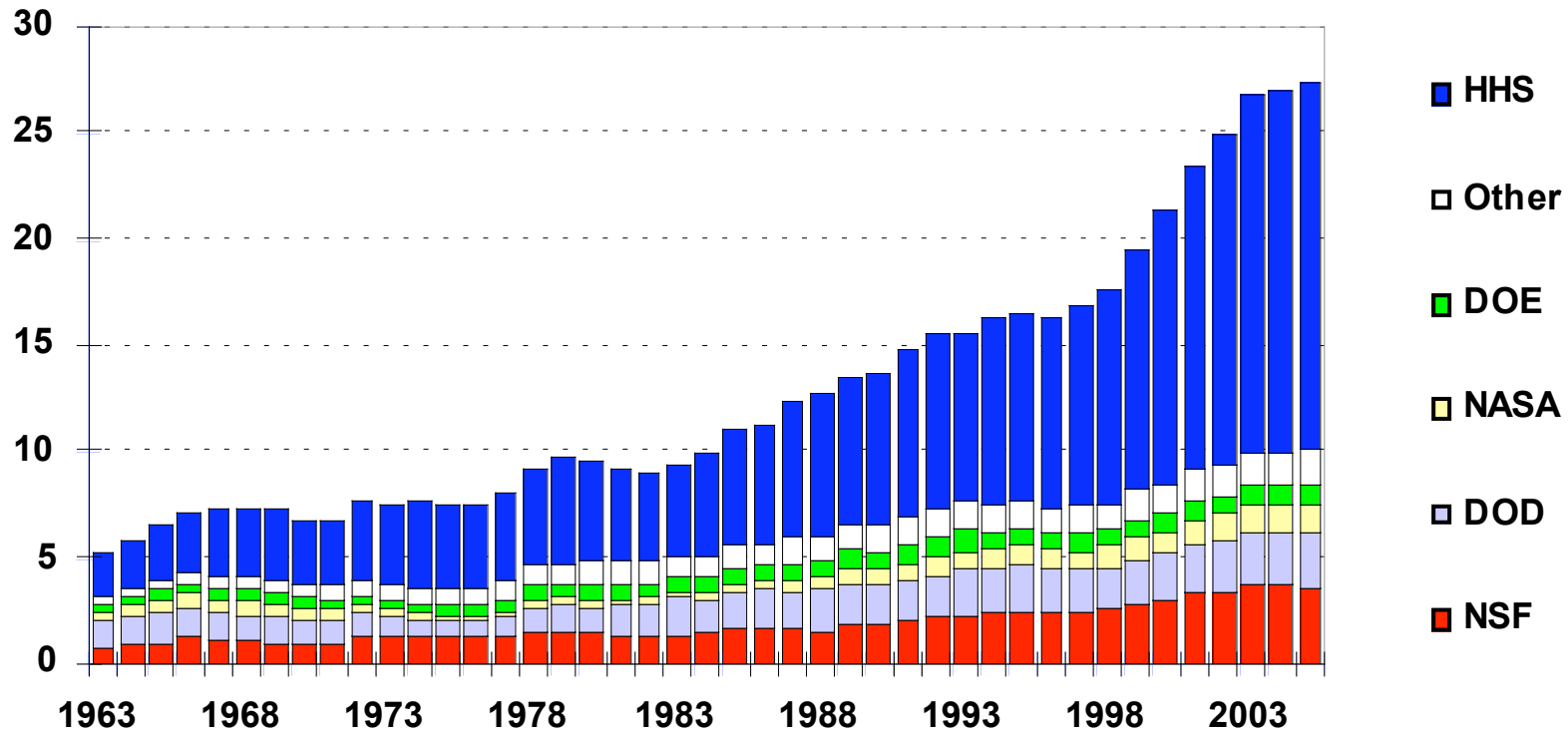


INNOVATION AND FEDERAL R&D

- The majority of RESEARCH funding goes to U.S. universities. U.S. public universities are supported by states. There are also private universities. The federal government supports very little higher education, EXCEPT university research (65% of all university research).
- Universities compete for government research grants through peer reviewed competitions, usually on topics decided by scientists; the grants fund research, but also graduate education and infrastructure.
- Universities and professors are entrepreneurs because they have incentives to commercialize technologies (the Bayh-Dole Act, allowing universities to keep intellectual property from federal research) and start companies.
- There are also small government programs to encourage companies to commercialize promising technologies (MEP, TIP).
- Although “innovation” or “economic development” are not government missions, federal R&D investments in many areas (energy, homeland security, biomedical research) try to develop new private-sector technologies to meet national needs.

Federal R&D Funding to Colleges and Universities FY 1963-2005

Obligations by agency in billions of constant FY 2008 \$



Source: AAAS, based on NSF, *Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions, FY 2005, 2007.*

R&D includes research, development, and R&D facilities support. Constant-dollar conversions based on OMB's GDP deflators.

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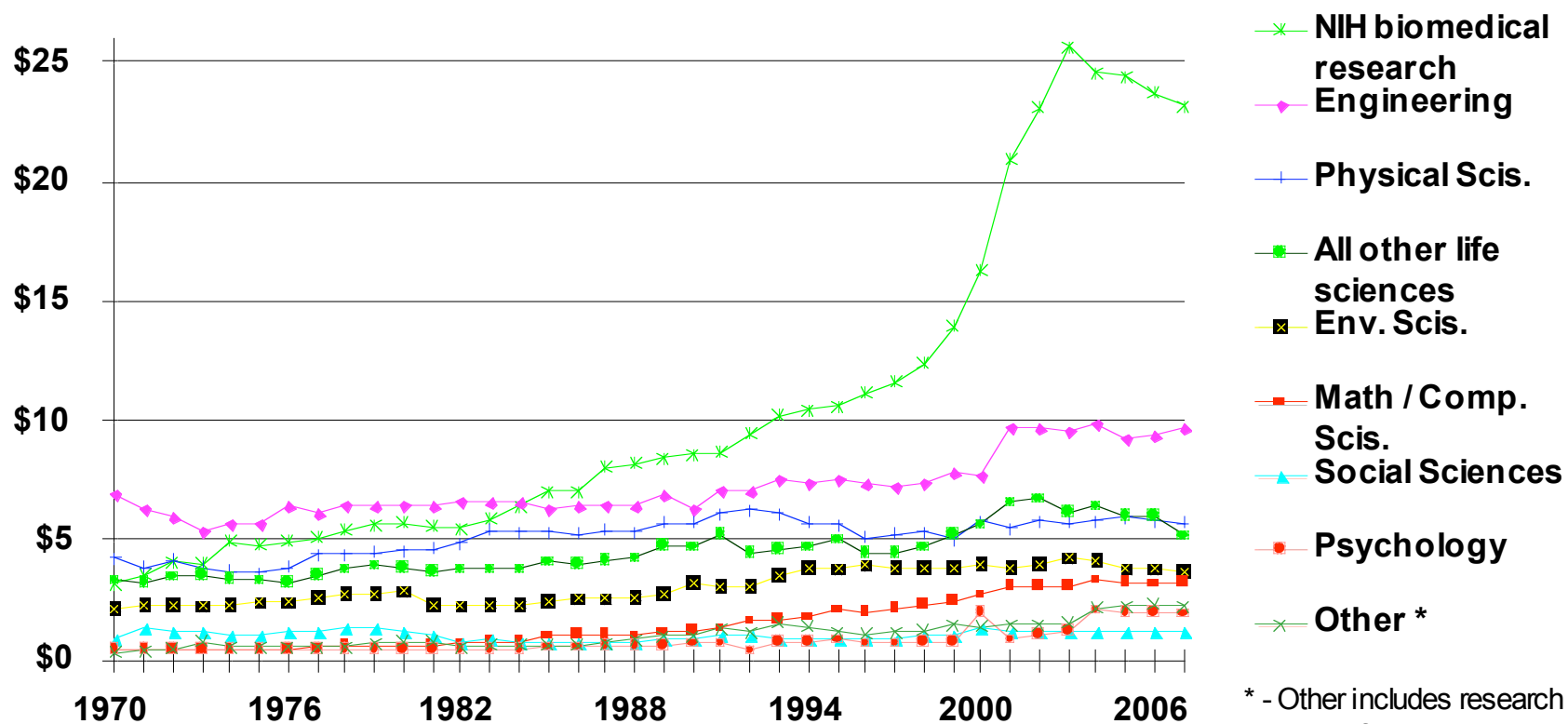
U.S. GOVERNMENT RESEARCH CHALLENGES

The government has very little central control or coordination, or even information for R&D. Because we have a mission-oriented system, the impacts of budget decisions on U.S. science and engineering are often ignored.

- Many important government R&D priorities are funded by multiple government agencies, for example nanotechnology, or homeland security. Each agency's budget is determined separately.
- The federal government funds less than 10% of U.S. education. Other than research grants, how can the federal government encourage students to study science and engineering?

Trends in Federal Research by Discipline, FY 1970-2007

obligations in billions of constant FY 2008 dollars



* - Other includes research not classified (includes basic research and applied research; excludes development and R&D facilities)

Life sciences - split into NIH support for biomedical research and all other agencies' support for life sciences.

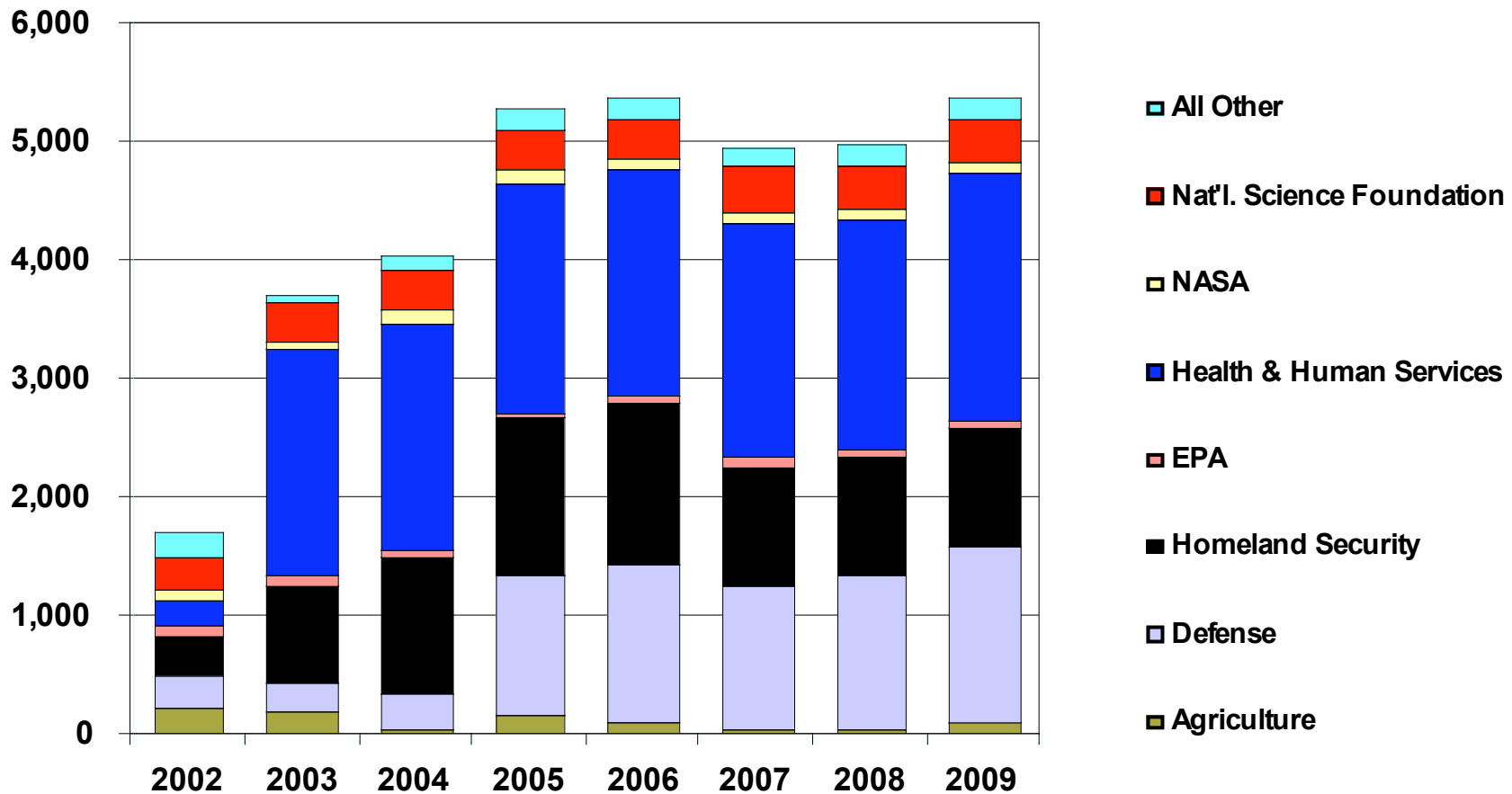
Source: National Science Foundation, *Federal Funds for Research and Development FY 2005, 2006, 2007, 2008*. FY 2006 and 2007 data are preliminary. Constant-dollar conversions based on OMB's GDP deflators.

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Federal Homeland Security R&D, by Agency

(budget authority in millions of constant FY 2008 dollars, FY 2002-2009)



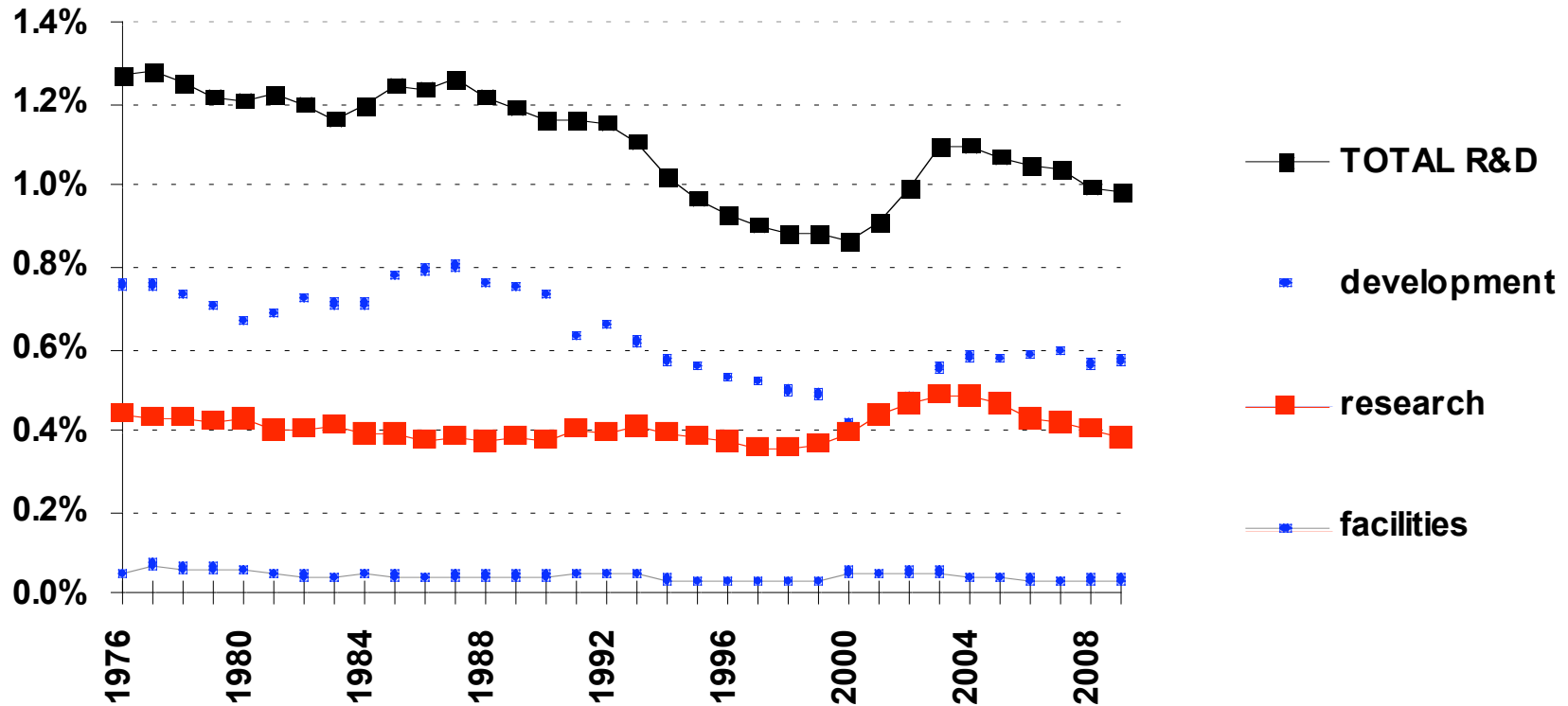
Source: AAAS, based on Office of Management and Budget data. Includes conduct of R&D and R&D facilities.

Note: DOD expanded its reporting of HS spending beginning in 2005.

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Trends in Federal R&D as % of GDP, FY 1976-2009 *



Source: AAAS analyses of R&D in annual AAAS R&D reports. * FY 2009 figures are latest AAAS estimates of FY 2009 request. R&D includes conduct of R&D and R&D facilities. Data to 1984 are obligations from the NSF Federal Funds survey. GDP figures are from OMB, Budget of the U.S. Government FY 2009. MARCH '08 REVISED © 2008 AAAS

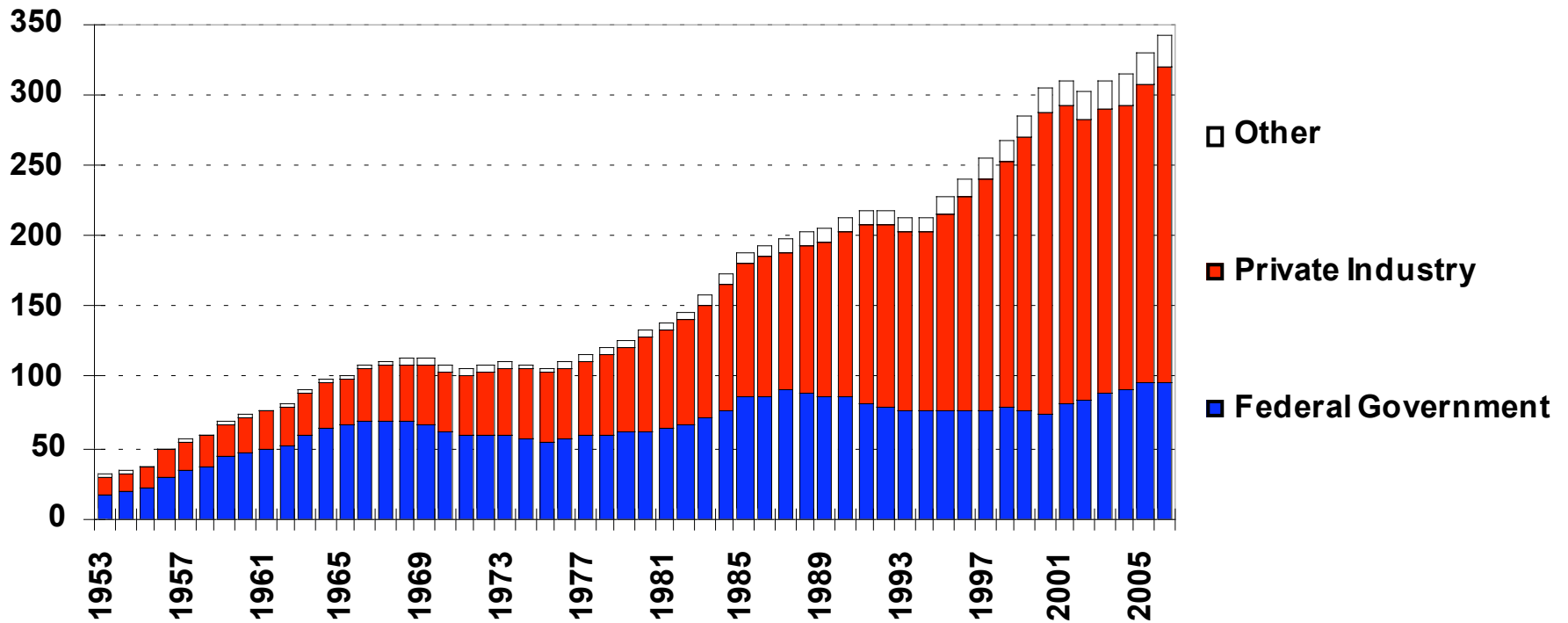


FEDERAL R&D IN CONTEXT: INDUSTRY AND THE WORLD

- 2/3 of all U.S. R&D is funded by industry, but industry focuses heavily on development; the majority of U.S. research is funded by the federal government.
- The U.S. government has very little power over private sector R&D decisions: there are few incentives, little direct R&D support except in special sectors (defense, aerospace).
- The largest power the U.S. government is to supply a steady stream of new scientific knowledge and new technologies to the private sector through R&D investments.
- The U.S. compares favorably with other nations in R&D spending, but many Asian nations are dramatically increasing their R&D. Policymakers are worried.

U.S. R&D Funding by Source, 1953-2006

expenditures in billions of constant 2006 dollars

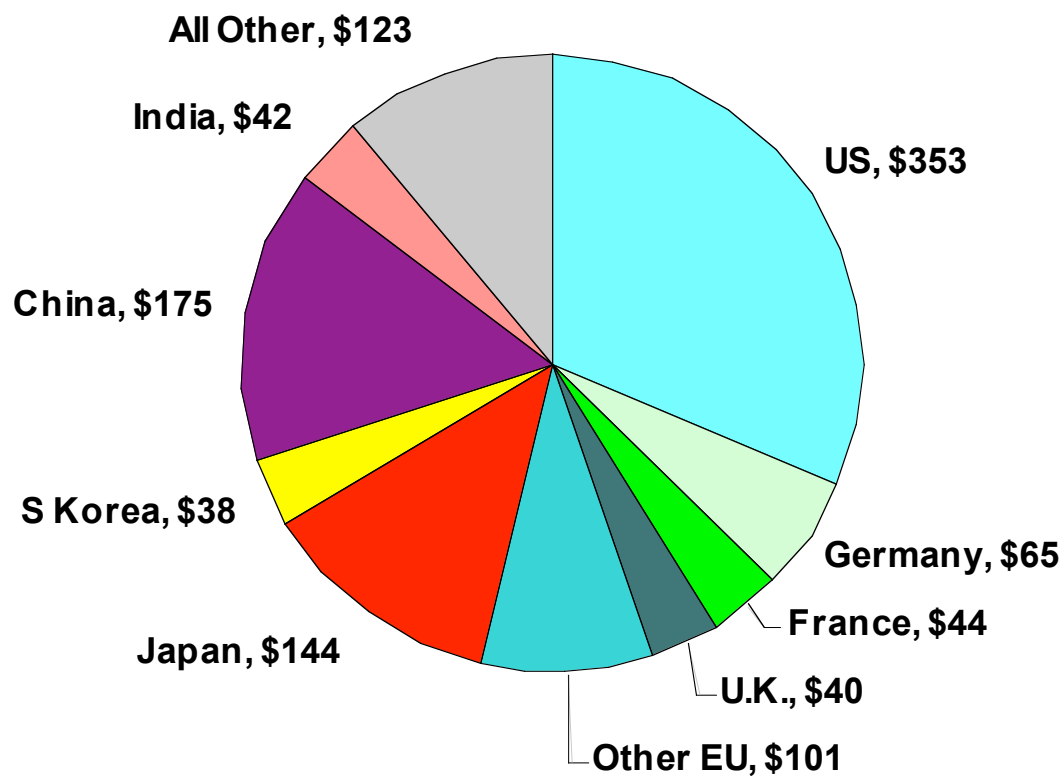


Source: NSF, Division of Science Resources Statistics. (Data for 2005 and 2006 are preliminary.)

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Shares of Total World R&D, 2007

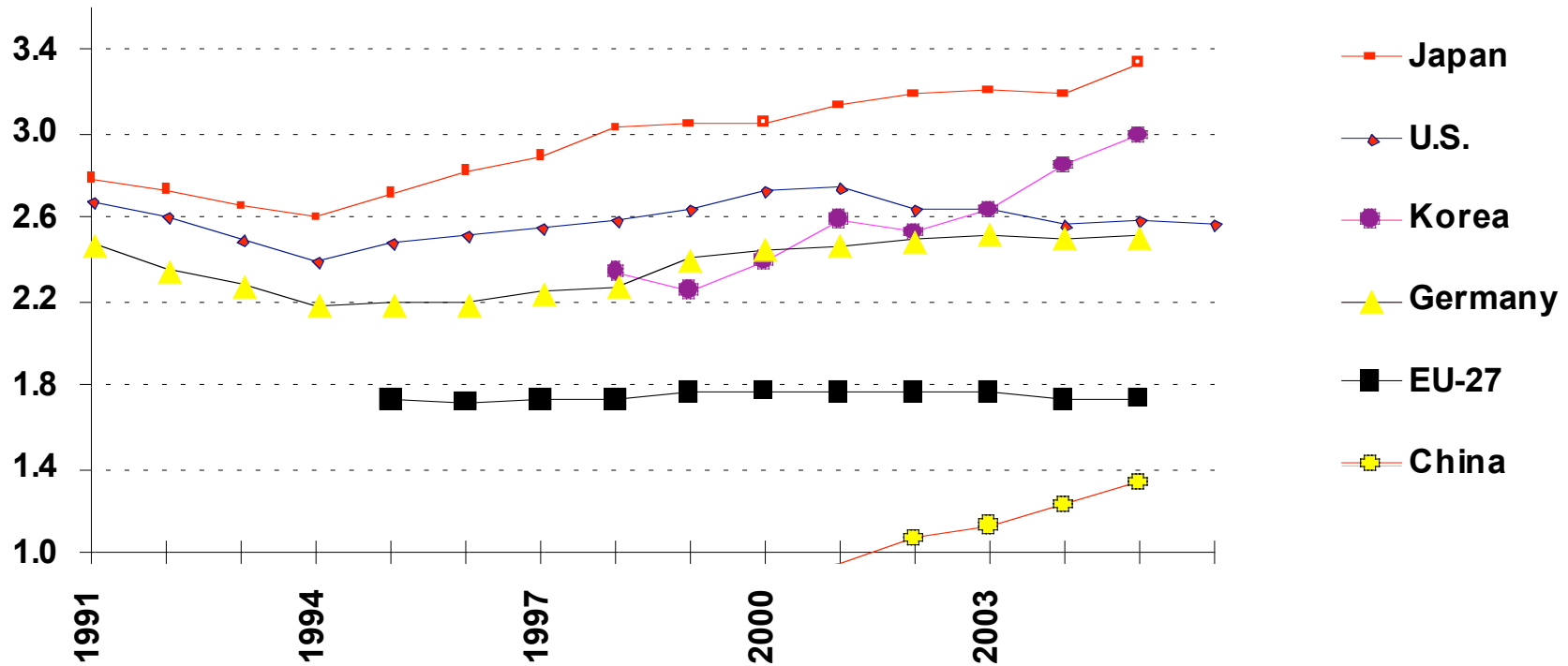


**Total World R&D =
U.S. \$1,124 billion****

Source: Battelle, Global R&D Report, 2007, from Battelle, OECD, and R&D Magazine data. Projections for 2007, by performer nation. * *- calculated using purchasing power parities, in millions of dollars.
DECEMBER '07 © 2007 AAAS



Total National R&D as % of GDP, 1991-2006



Source: National Science Foundation, National Patterns of R&D Resources and OECD, Main Science and Technology Indicators. Data not available for all nations for all years. DECEMBER '07 © 2007 AAAS

WHAT DOES AAAS DO?

- The federal budget can take 10-11 months from proposal to laws. AAAS analyzes the federal budget for R&D at every stage of the process.
- We bring together the fragments of the U.S. R&D system, and identify trends, priorities, and challenges. We try to analyze the potential impacts of political decisions on U.S. science and engineering, gathering data from our own work and also data from other sources.
- We do not lobby, but we do talk to government policymakers about the importance of a strong, balanced U.S. federal R&D portfolio for all the sciences and engineering.
- We have other public policy programs (fellowships), science and mathematics education programs, and scientific cooperation programs.

GRACIAS

FOR MORE INFORMATION...

The AAAS R&D web site is
www.aaas.org/spp/rd

AAAS REPORT XXXIII
Research & Development FY 2009

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