R&D in the President's FY 2011 Budget

Patrick J Clemins
June 18, 2010
for ASU's Science Outside the Lab

AAAS R&D Budget and Policy Program
http://www.aaas.org/spp/rd

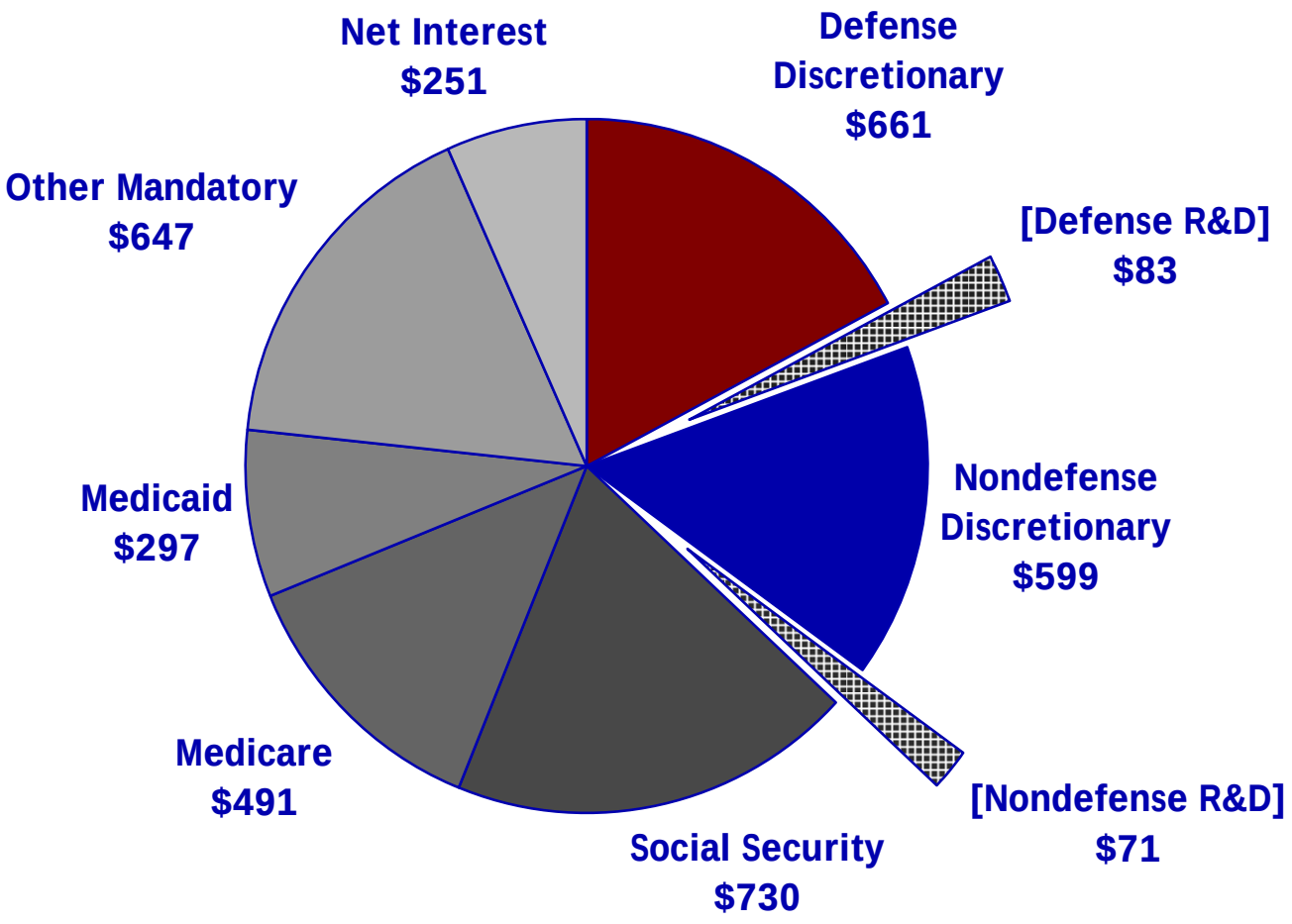
AAAS
ADVANCING SCIENCE, SERVING SOCIETY

The FY 2011 Federal Budget

- $3.8t total budget, $1.3t unified deficit
- $1.3t discretionary budget (+0.3%)
  - $532b nondefense budget (+1.4%)
- Rescuing the Economy
- A Foundation for Economic Growth and Job Creation
  - Small business initiatives
  - Investing in science and basic research
- Restoring Responsibility
  - Three year non-security discretionary funding freeze

Composition of the Proposed FY 2011 Budget
Total Outlays = $3.8 trillion

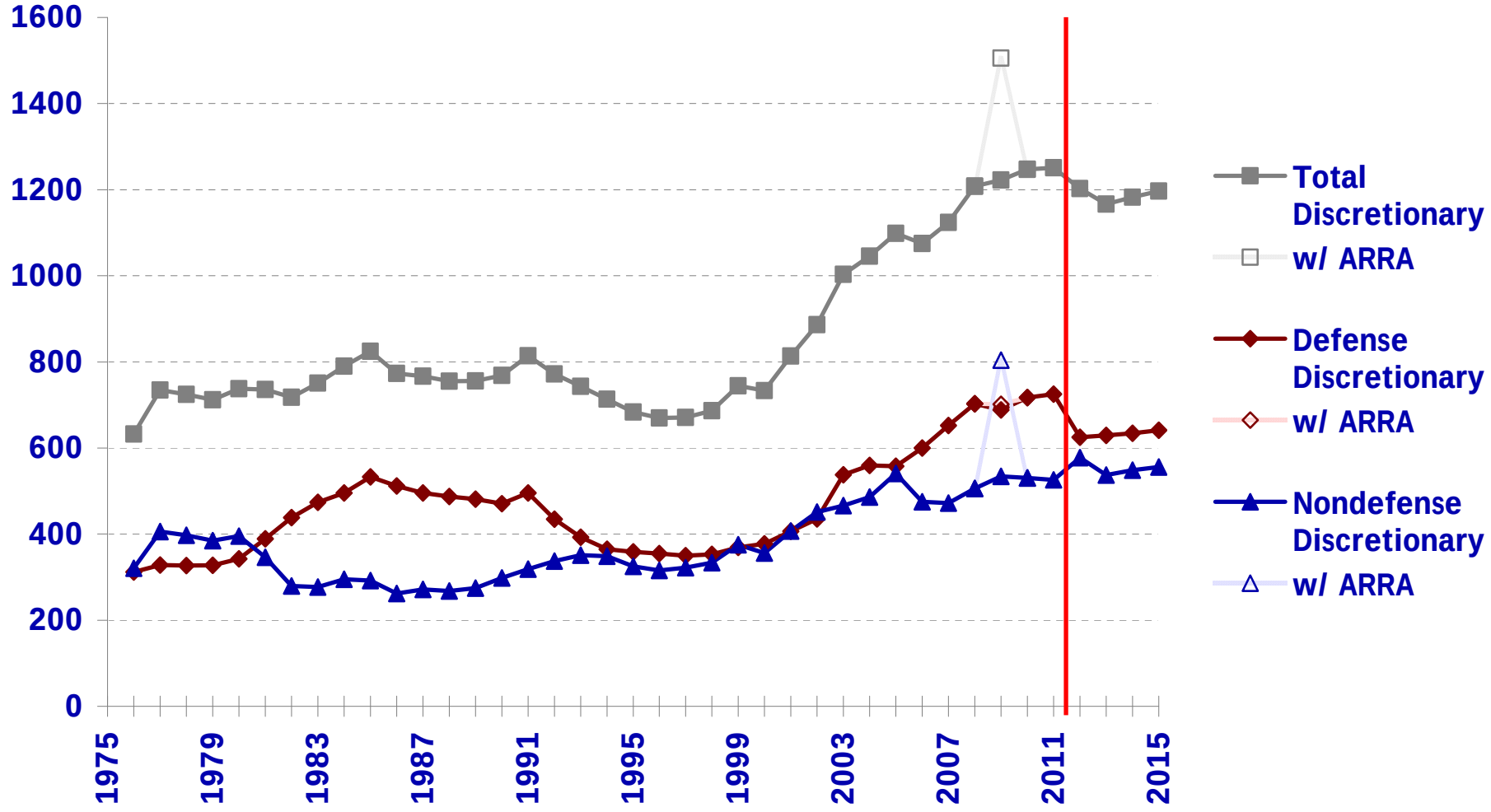
outlays in billions of dollars



Source: *Budget of the United States Government FY 2011.*
Projected unified deficit is $1.3 trillion.

Trends in Discretionary Spending

budget authority in billions of constant FY 2010 dollars



Source: *Budget of the United States Government, FY 2011.*
FY 2010-2015 data are budget projections.

Federal R&D in Context

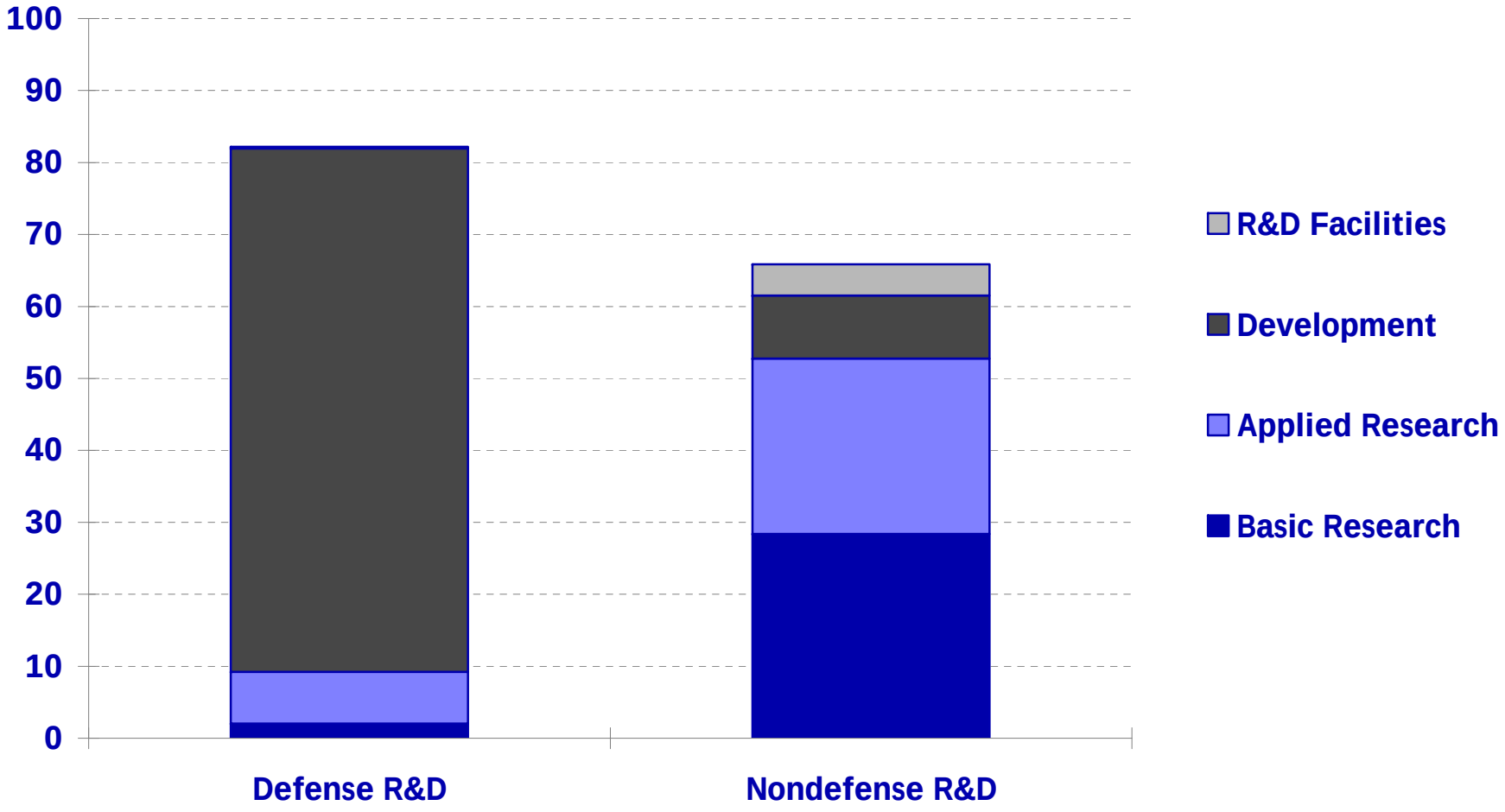
- The federal R&D investment is spread across over two dozen departments and agencies
  - Only two manage more than 10% of the investment
    - Department of Defense (52.7%)
    - Department of Health and Human Services (21.7%)
- The federal R&D investment is also spread across 11 of the 12 appropriations subcommittees.
- Role of federal R&D
  - Supports federal missions
  - Drives U.S. innovation

Character of R&D

- The Innovation Lifecycle
  - Basic Research
    - Study toward knowledge or understanding of fundamental properties and phenomena without a specific need in mind.
  - Applied Research
    - Study toward knowledge or understanding necessary to satisfy a specific need.
  - Development
    - The application of knowledge or understanding toward the production of materials, devices, systems, or methods.
- Facilities and Equipment (R&D Plant)

Character of R&D, FY 2011

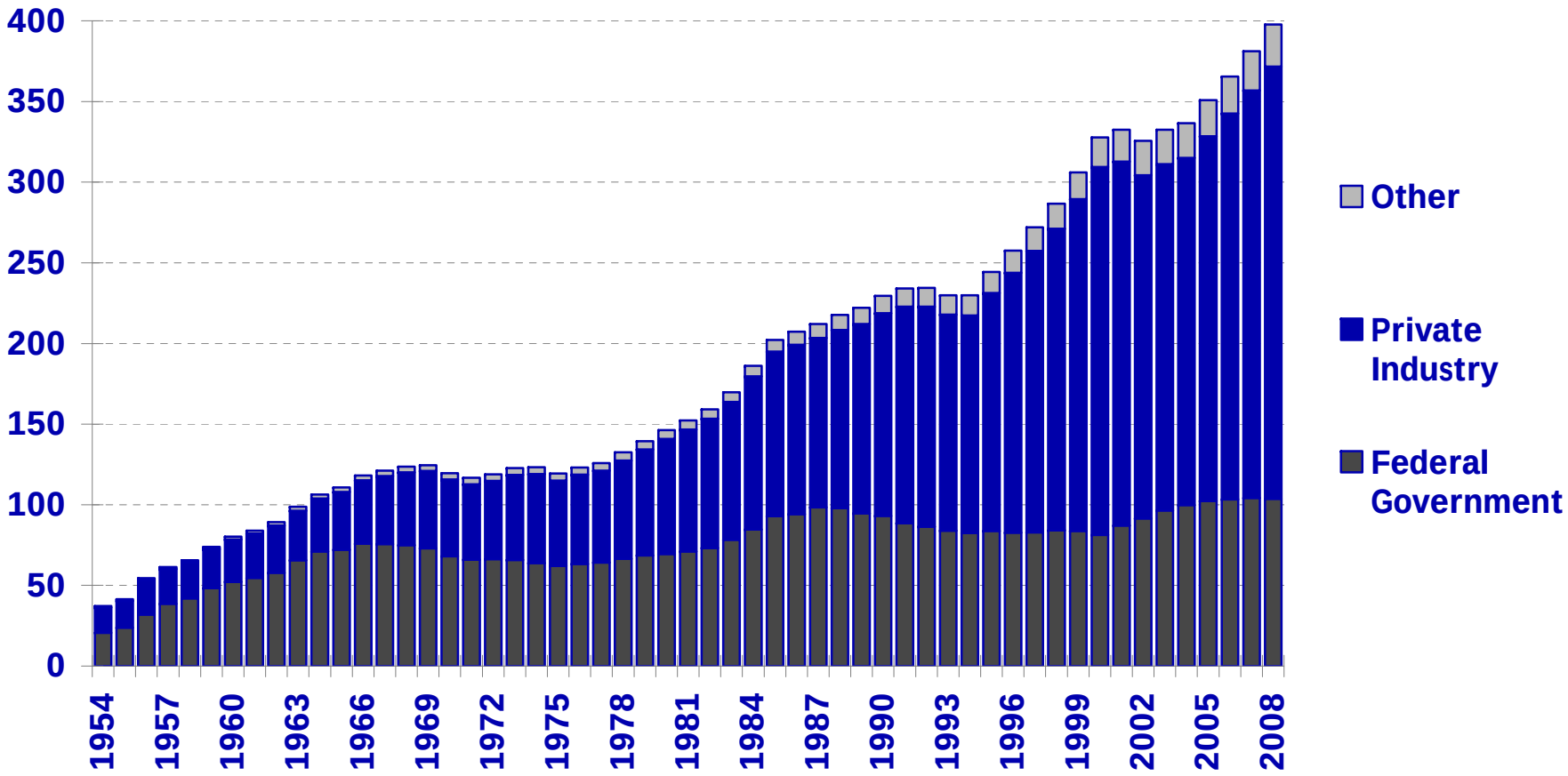
budget authority in billions of dollars



Source: OMB R&D data, agency budget justifications, and agency budget documents.
Defense R&D = DOD + DOE defense.

Federal R&D Funding by Source

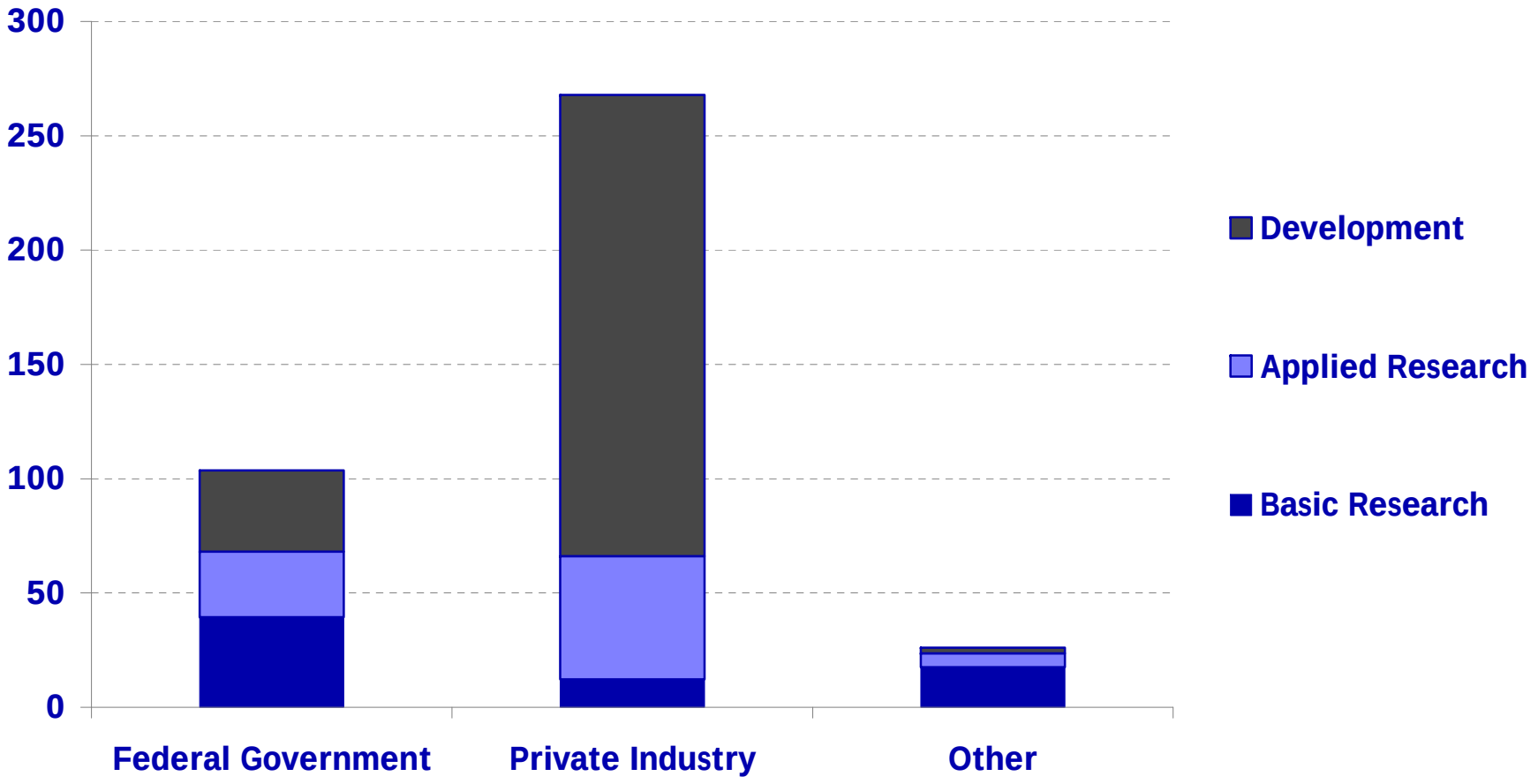
outlays in billions of constant 2008 dollars



Source: NSF, Division of Science Resources Statistics,
National Patterns of R&D Resources (NSF 08-318)
2008 figures are preliminary.

Character of R&D, 2008

outlays in billions of dollars



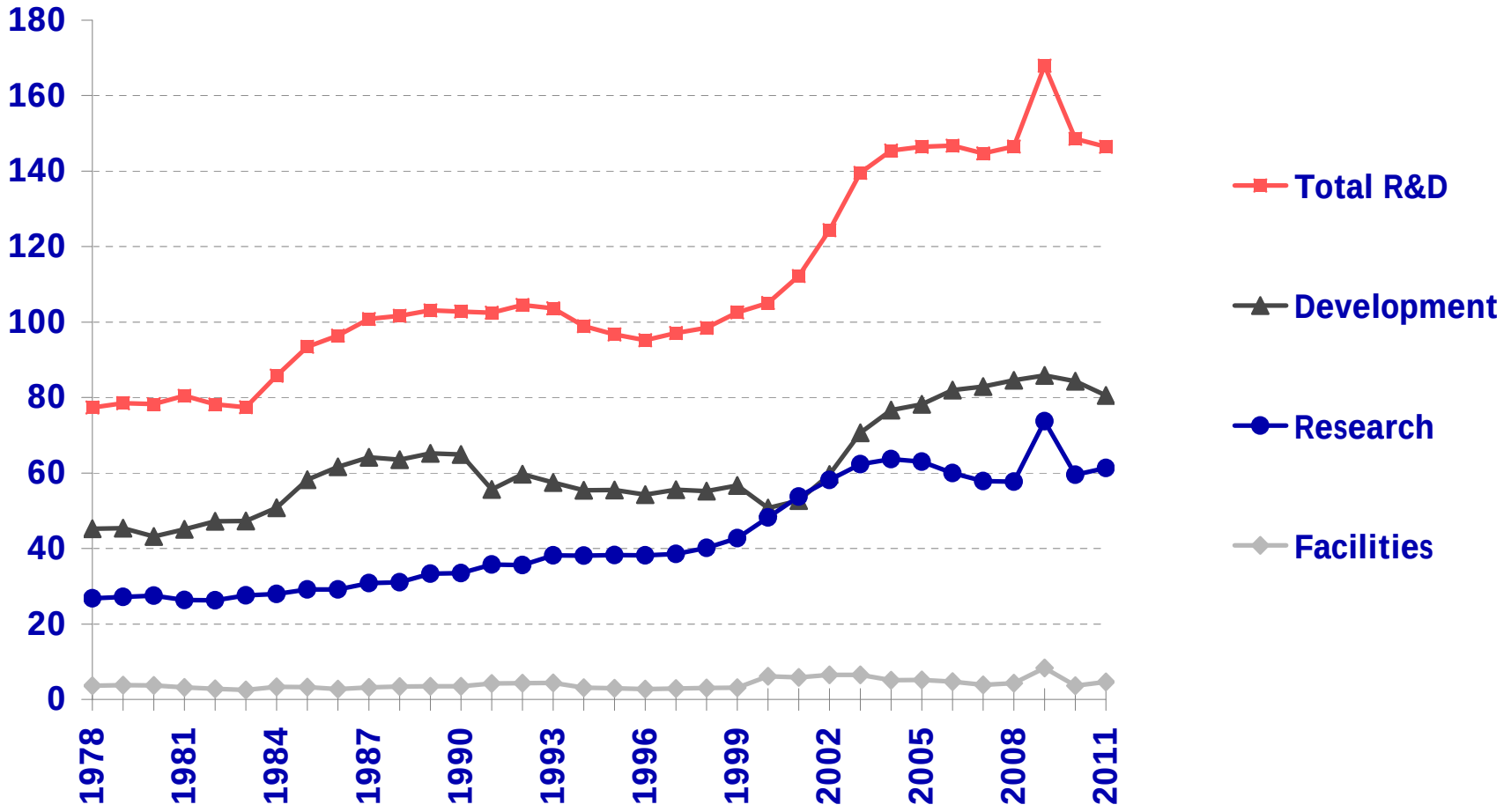
Source: NSF, Division of Science Resources Statistics,
National Patterns of R&D Resources (NSF 08-318)
Figures are preliminary.

The FY 2011 Federal R&D Investment

- Total R&D: $148.1b, -0.3% from FY 2010
  - Basic Research: $30.4b, +4.3%
  - Applied Research: $31.6b, +2.1%
  - Development: $81.5b, -2.9%
  - Equipment and Facilities: $4.6b, +1.3%
- $82.2b for defense R&D, -4.8%
- $65.9b for non-defense R&D, +5.9%
- -1.4% in constant dollars from FY 2010
- +0.7% in constant dollars since FY 2004
  - Peak in FY 2009

Trends in Federal R&D

in billions of constant FY 2010 dollars

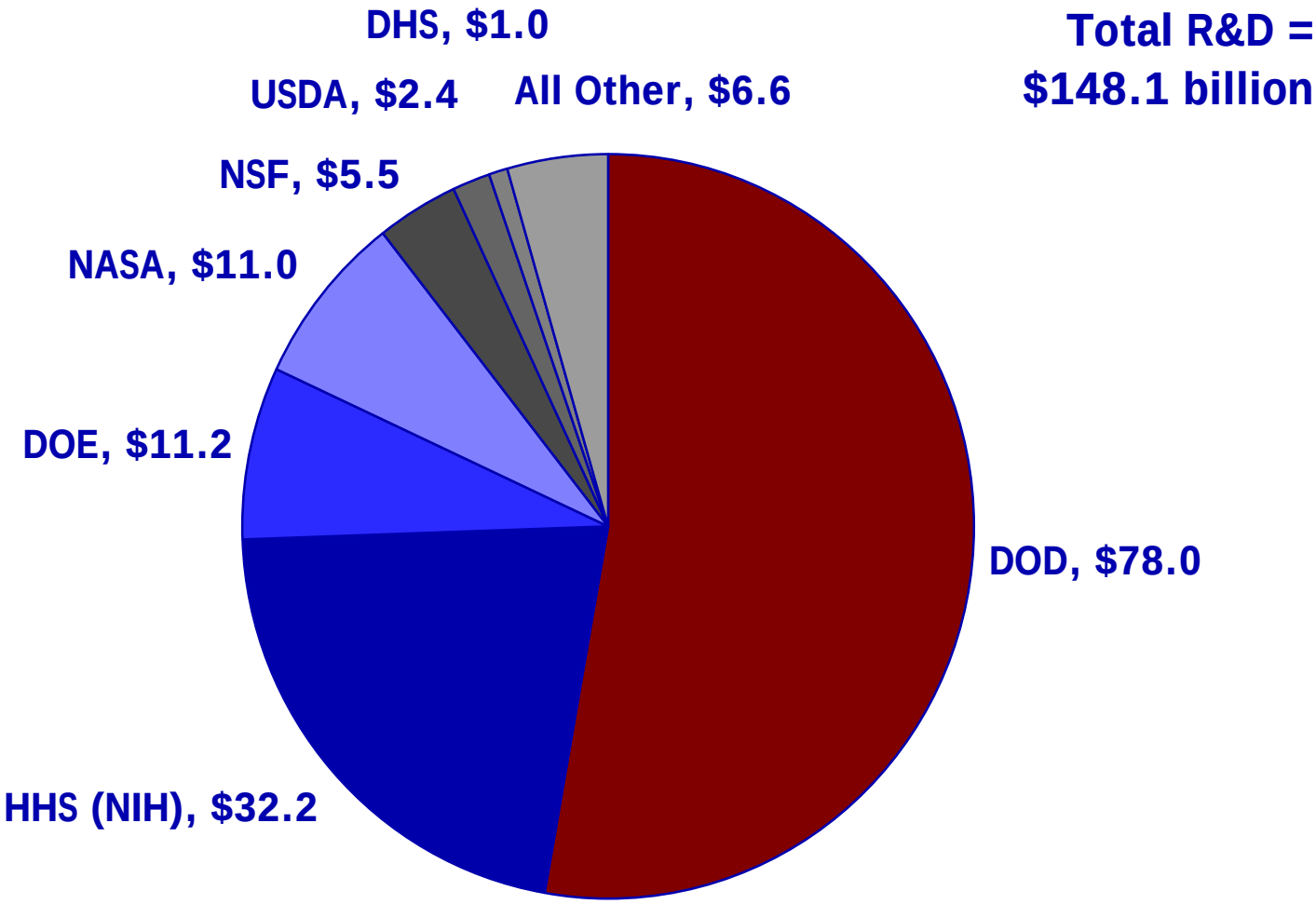


Source: AAAS analyses of R&D in annual AAAS R&D reports.
FY 2011 figures are latest AAAS estimates of FY 2011 request.
R&D includes conduct of R&D and R&D facilities.
1976-1994 figures are NSF data on obligations in the Federal Funds survey.

AAAS

Total R&D by Agency, FY 2011

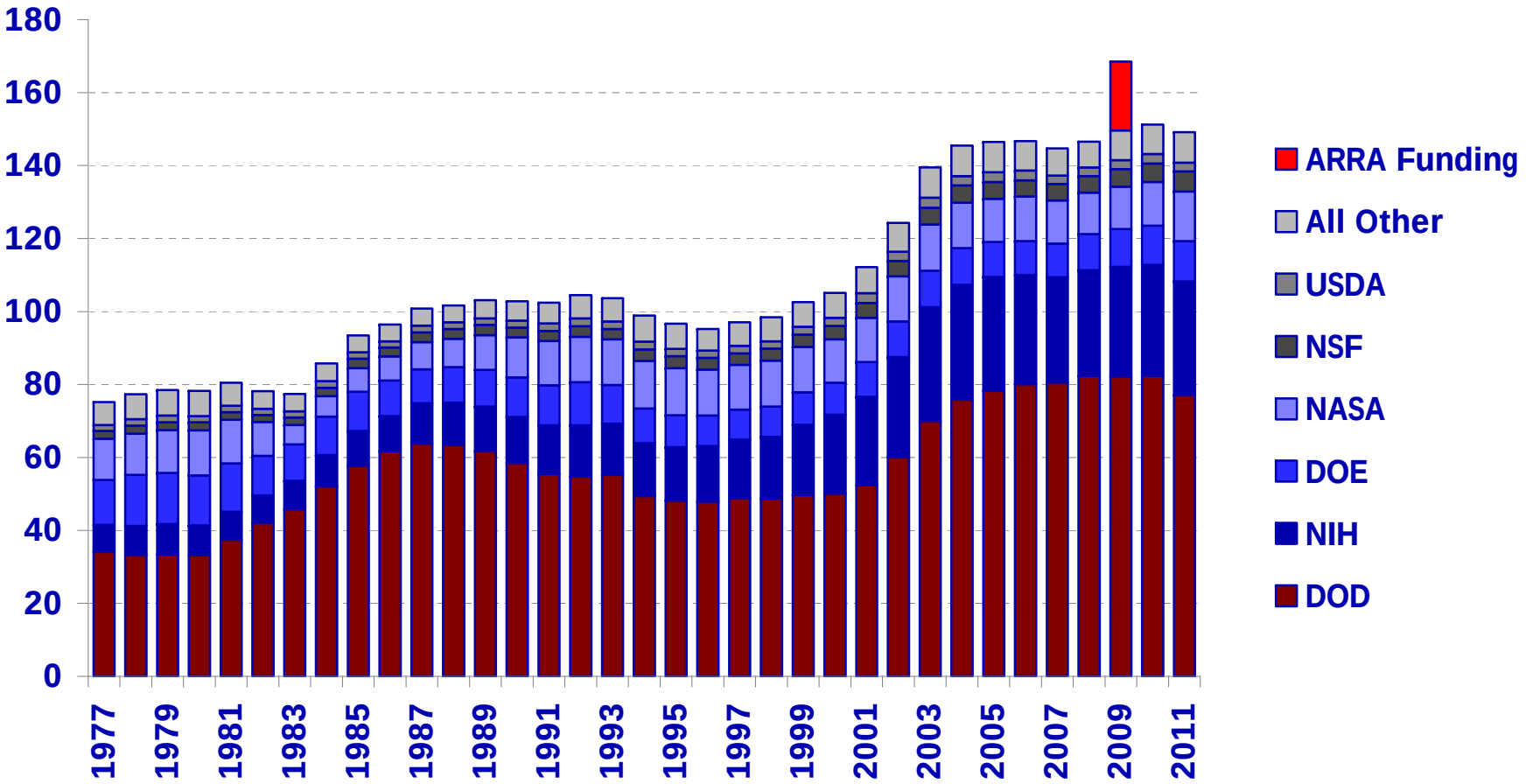
budget authority in billions of dollars



Source: OMB R&D budget data, agency budget justifications, and other agency documents.
R&D includes conduct of R&D and R&D facilities.

Trends in R&D by Agency

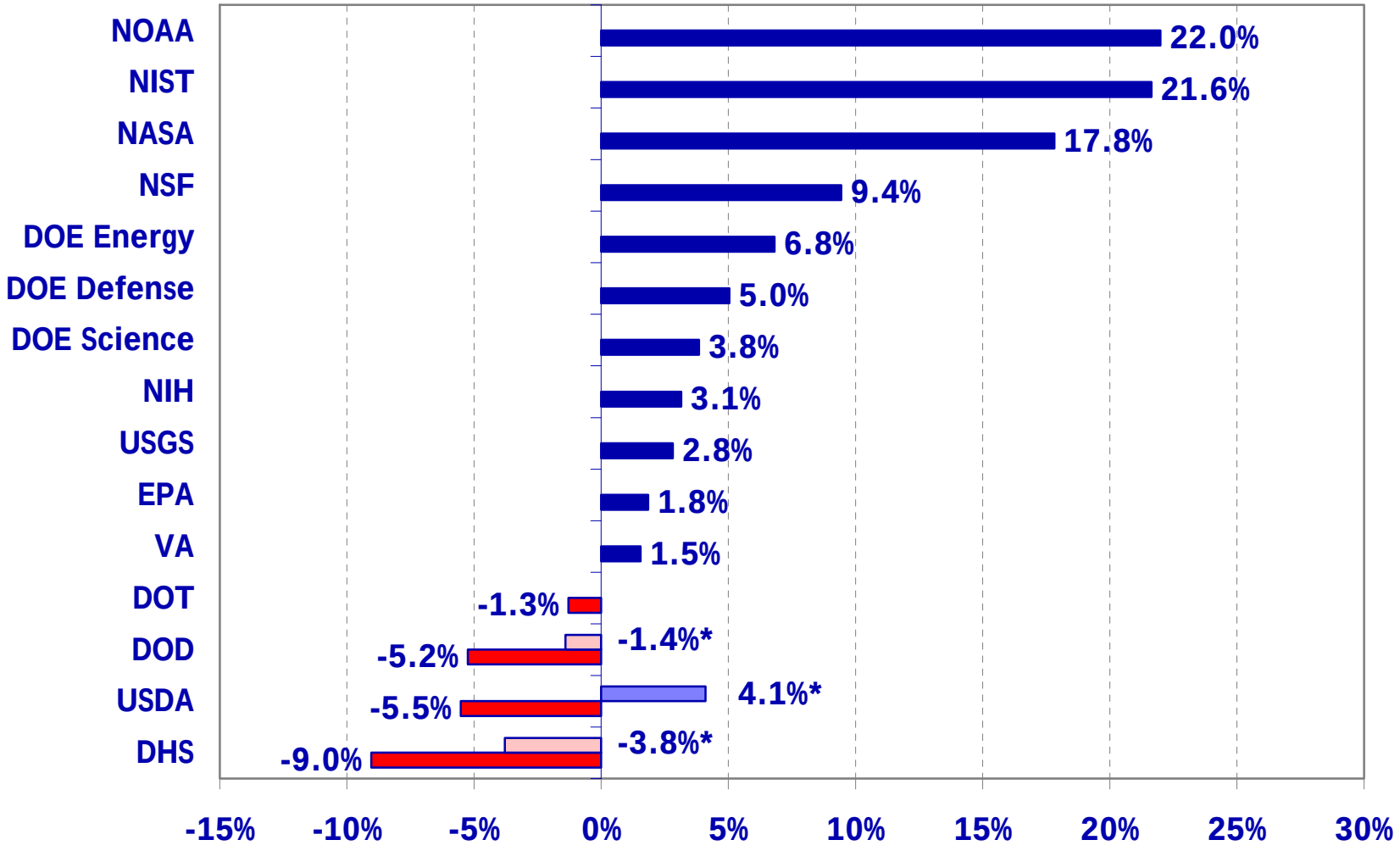
in billions of constant FY 2010 dollars



Source: *AAAS Report: Research & Development* series.
FY 2010 and FY 2011 figures are latest estimates.
1976-1994 figures are NSF data on obligations in the Federal Funds survey.

R&D in the FY 2011 Budget Request

percent change from FY 2010



Source: OMB R&D budget data, agency budget justifications, and other agency documents.

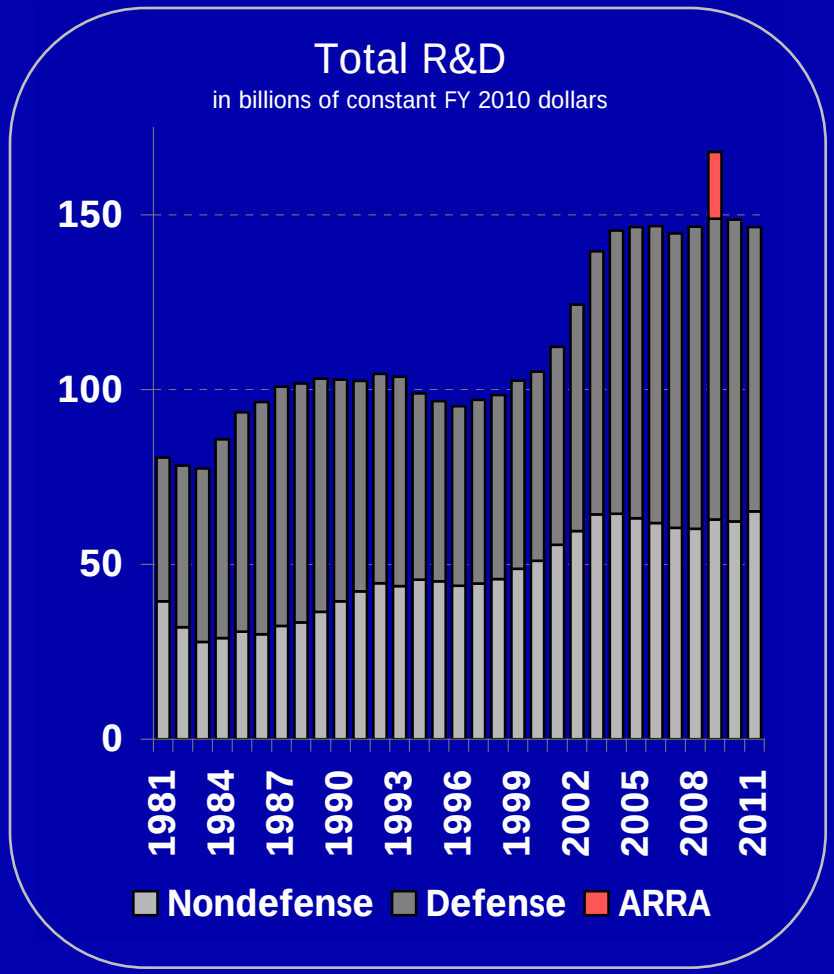
* - Lighter colored bars indicate percent change with projected FY 2011 earmarks.

Earmarks

- Early February – Senate Republicans introduce amendment to make earmarks a point of order requiring 60 votes to overcome
- March 9/10 – House Democrat leaders announce ban on earmarks to **for-profit** entities
- March 10/11 – House Republicans vote in closed-door session to ban **all** earmarks
- March 17 – Senate amendment fails
- Early April – Some House Republicans, including Young (R-AL), Cao (R-LA), and Paul (R-TX), break rank and request earmarks

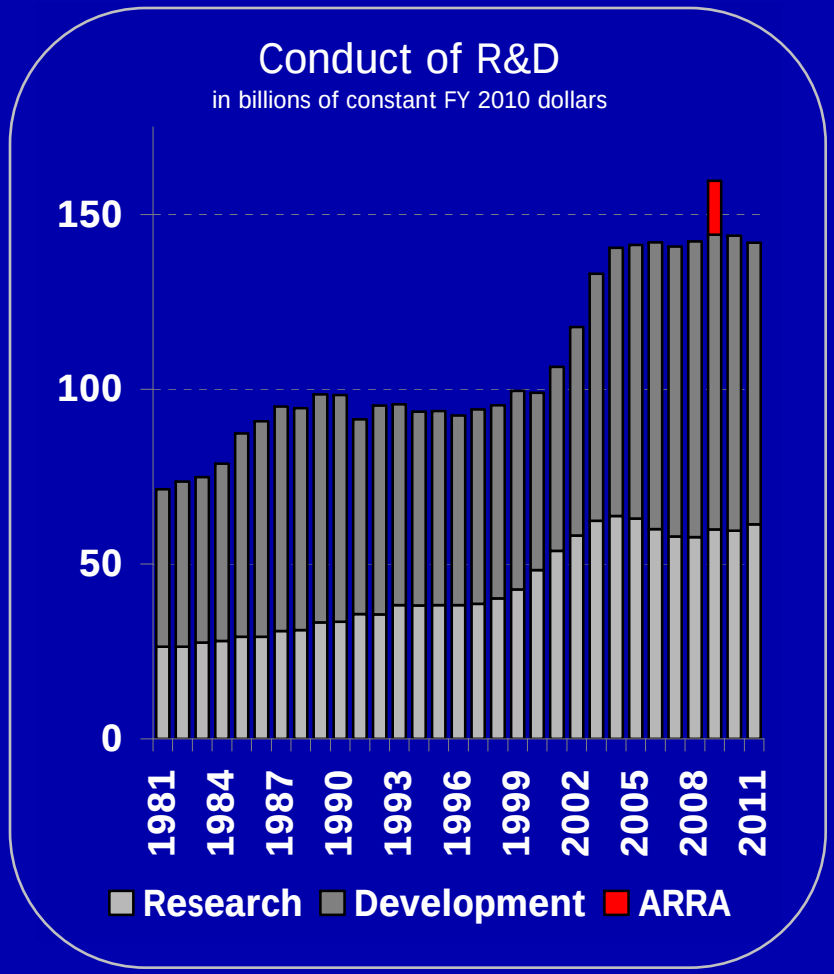
Funding Shifts: Function

- Defense
  - -$4.1b to $82.2b
  - 4.8% decrease
- Nondefense
  - +3.6b to $65.9b
  - 5.8% increase



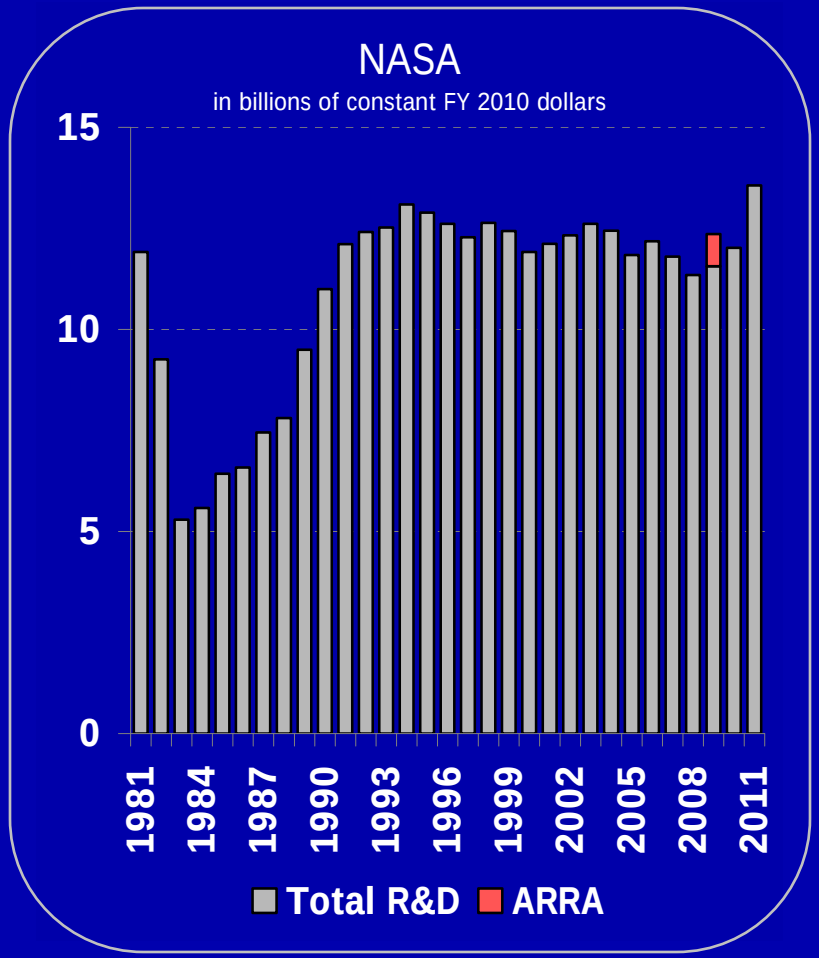
Funding Shifts: Character

- Development
  - -$2.9b to $81.5b
  - 3.5% decrease
- Research
  - +$2.5b to $62.0b
  - 4.1% increase



Funding Shifts: NASA

- Retire space shuttle and cancel Constellation Program
- Frees $6.5b over 2 yrs
- Near-earth orbit through private industry
  - +$6.1b over 5 yrs
- Heavy Lift and Propulsion
  - +$559m
- International Space Station
  - +$905m to $3.2b over 4 yrs

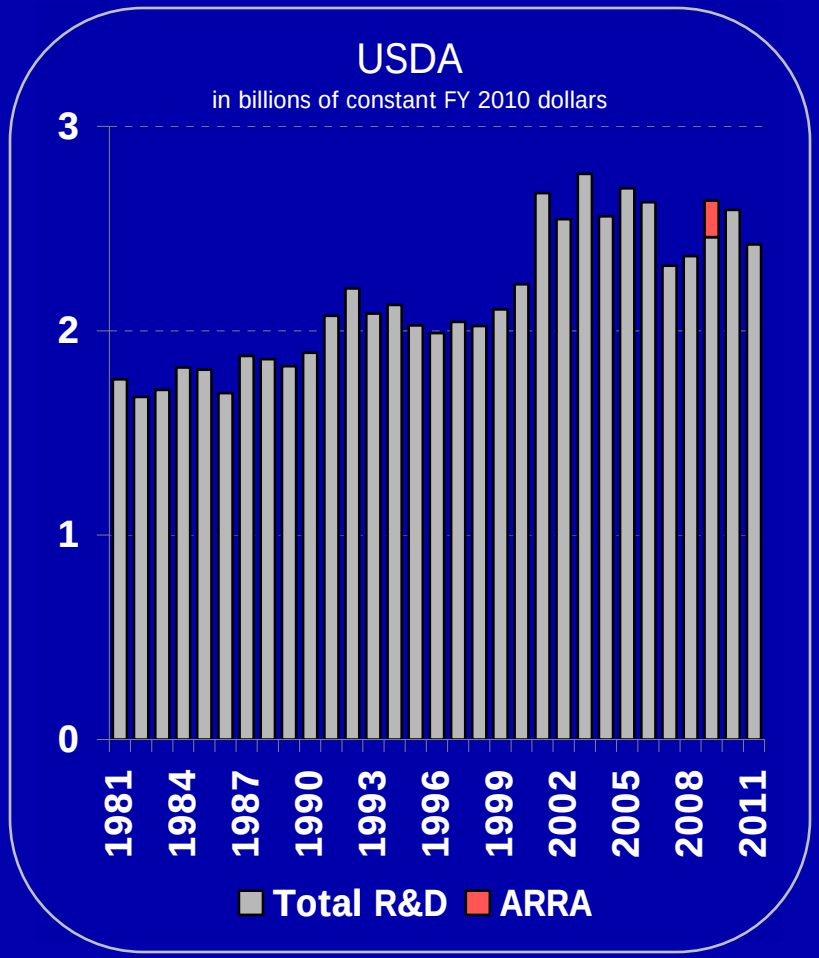


NASA Update

- Congressional Concerns
  - U.S. space leadership
  - Reliance on industry/Russia for near-earth orbit
  - Jobs
- Administration Response – Kennedy Space Center – April 15
  - Use Orion technology for Space Station rescue vehicle
  - Heavy lift and propulsion: $3b over next few years
    - Final design by 2015
  - Job assistance: $40m
- Sen. Nelson (D-FL) letter to Sen. Mikulski (D-MD) – June 14
  - International Space Station through 2020; one additional shuttle mission
  - Commercial cargo capability and crew services
  - International effort for beyond-Earth orbit; Heavy-lift and crew exploration vehicles

Funding Shifts: USDA

- Buildings and Facilities
  - -$147m to -$76m in R&D after rescissions
- Agriculture and Food Research Initiative (AFRI)
  - +$166m to $429m in total budget
  - 63.4% increase

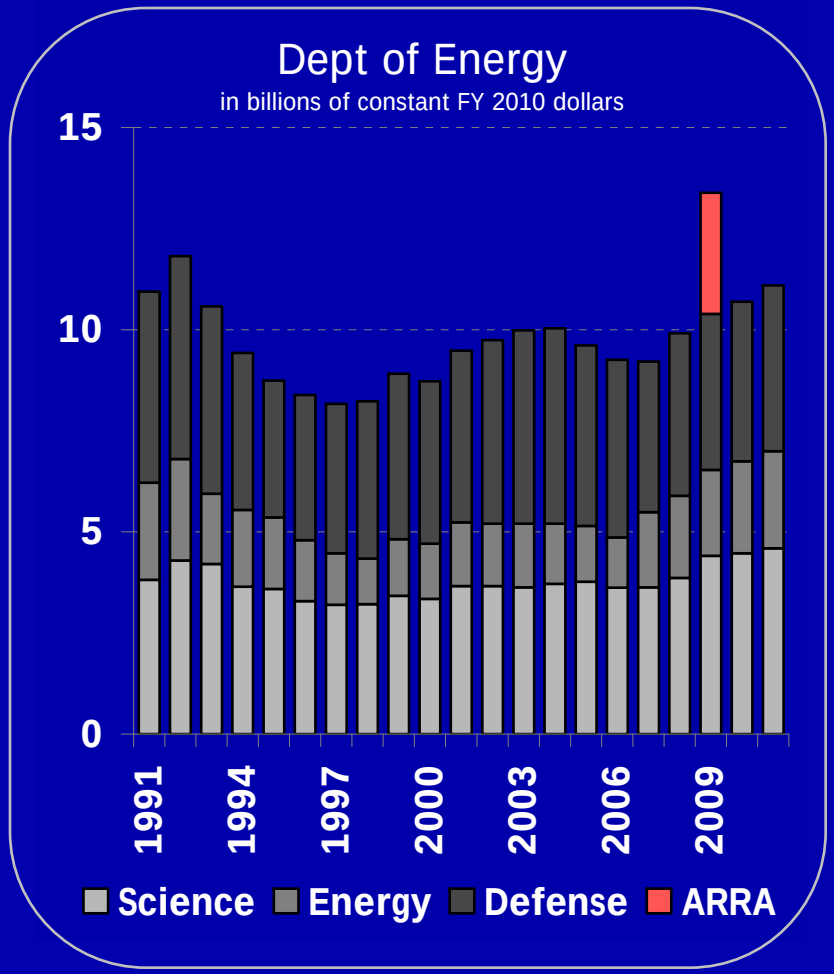


Funding Shifts: Dept of Energy

- Fossil, –$53m
- Nuclear, –$122m

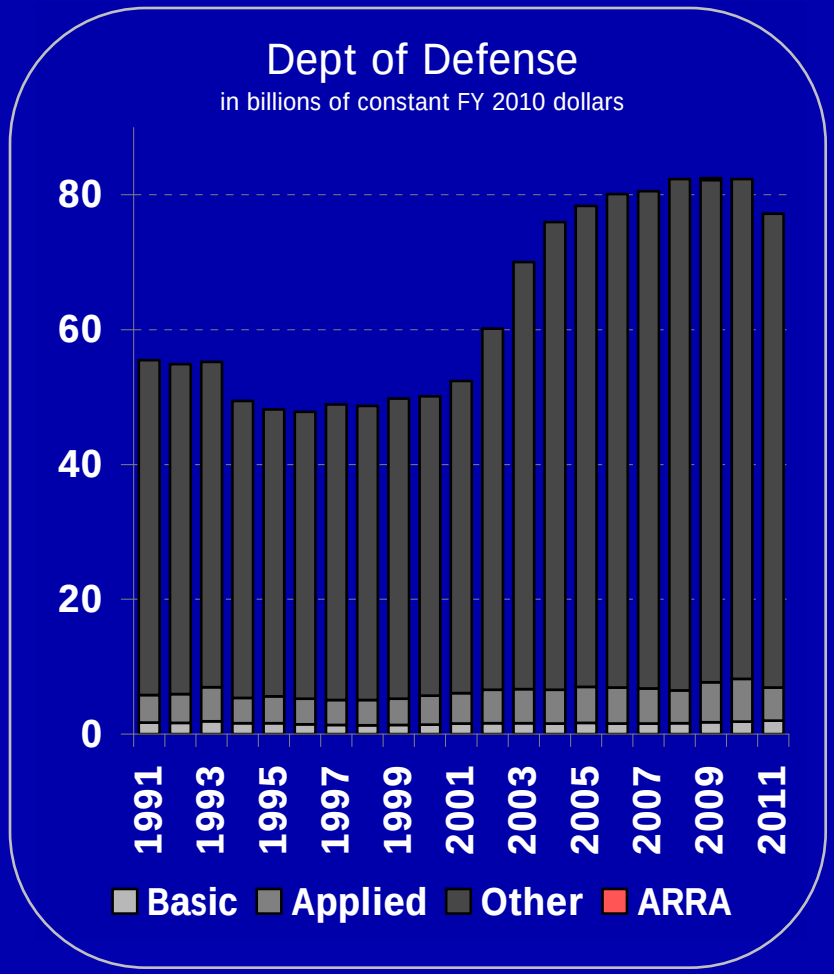
- EERE, +$35m
- Electric Grid, +$22m
- Office of Science, +$172m

- ARPA-E, +$273m



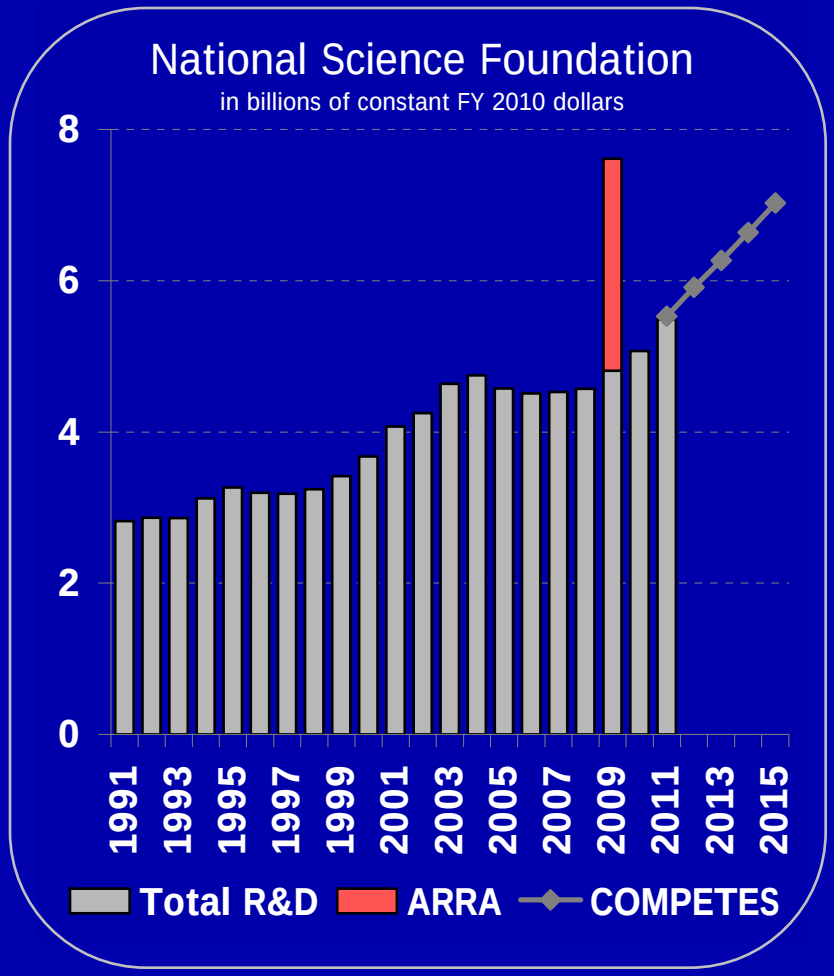
Funding Shifts: Dept of Defense

- Basic Research
  - +6.7% to $2.0b
- Development
  - -5.0% to $71.0b
- DARPA
  - +3.7% to $3.1b



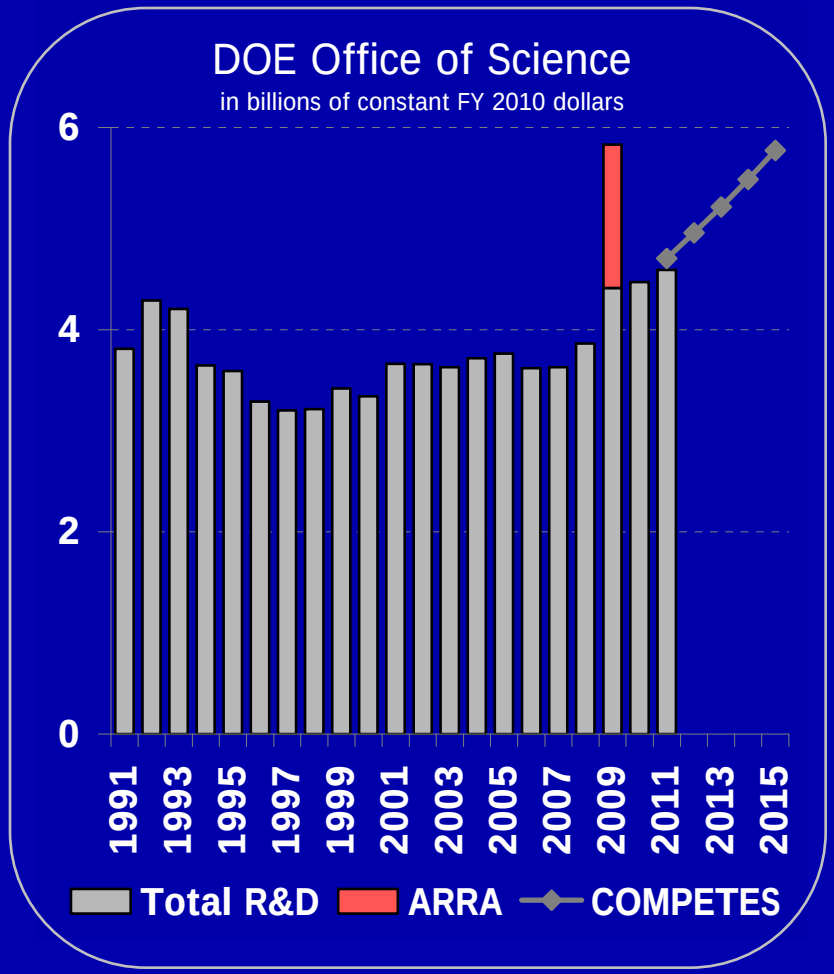
Funding Doubling for Basic Research

- National Science Foundation
  - Total Budget: +8.0% to $7.4b
  - R&D: +9.4% to $5.5b
  - National Innovation Strategy
    - Next-Generation Information and Communications Technology
    - Innovation-Based Entrepreneurship
  - Workforce Development
  - Broadening Participation



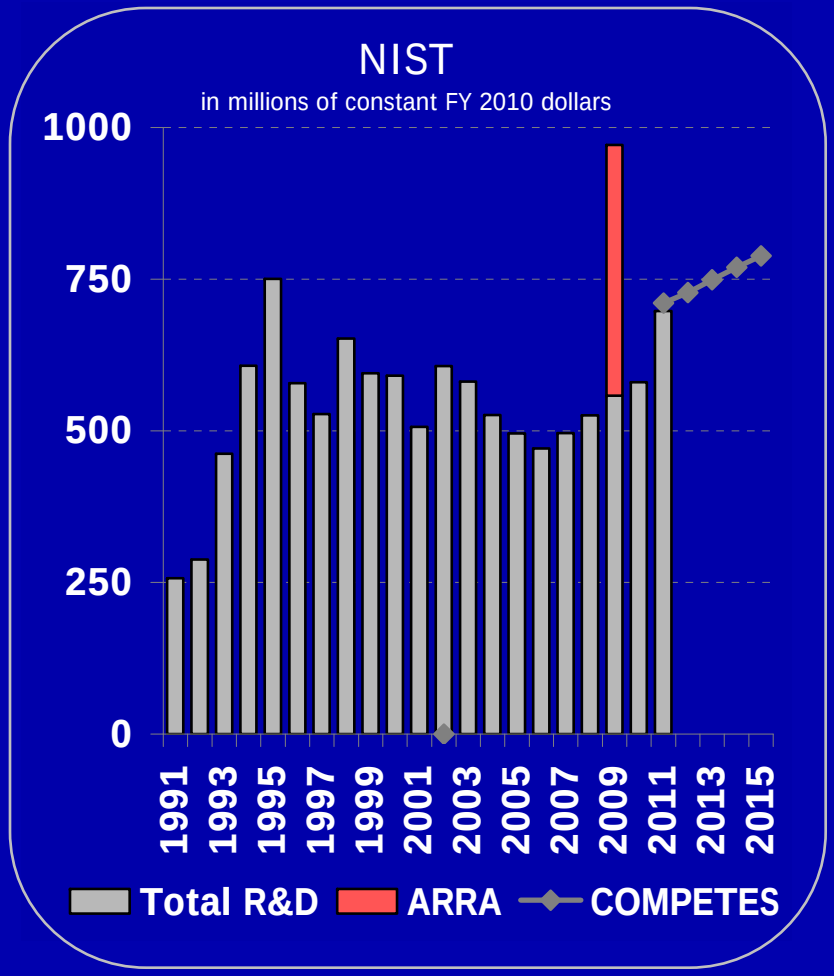
Funding Doubling for Basic Research

- DOE Office of Science
  - Total Budget: +4.4% to $5.1b
  - R&D: +3.8% to $4.6b
  - New Energy Innovation Hub
    - Batteries and Energy Storage
  - Energy Frontier Research Centers (EFRCs)
  - Advanced Computing
  - Scientific User Facilities
  - Education and Workforce Development



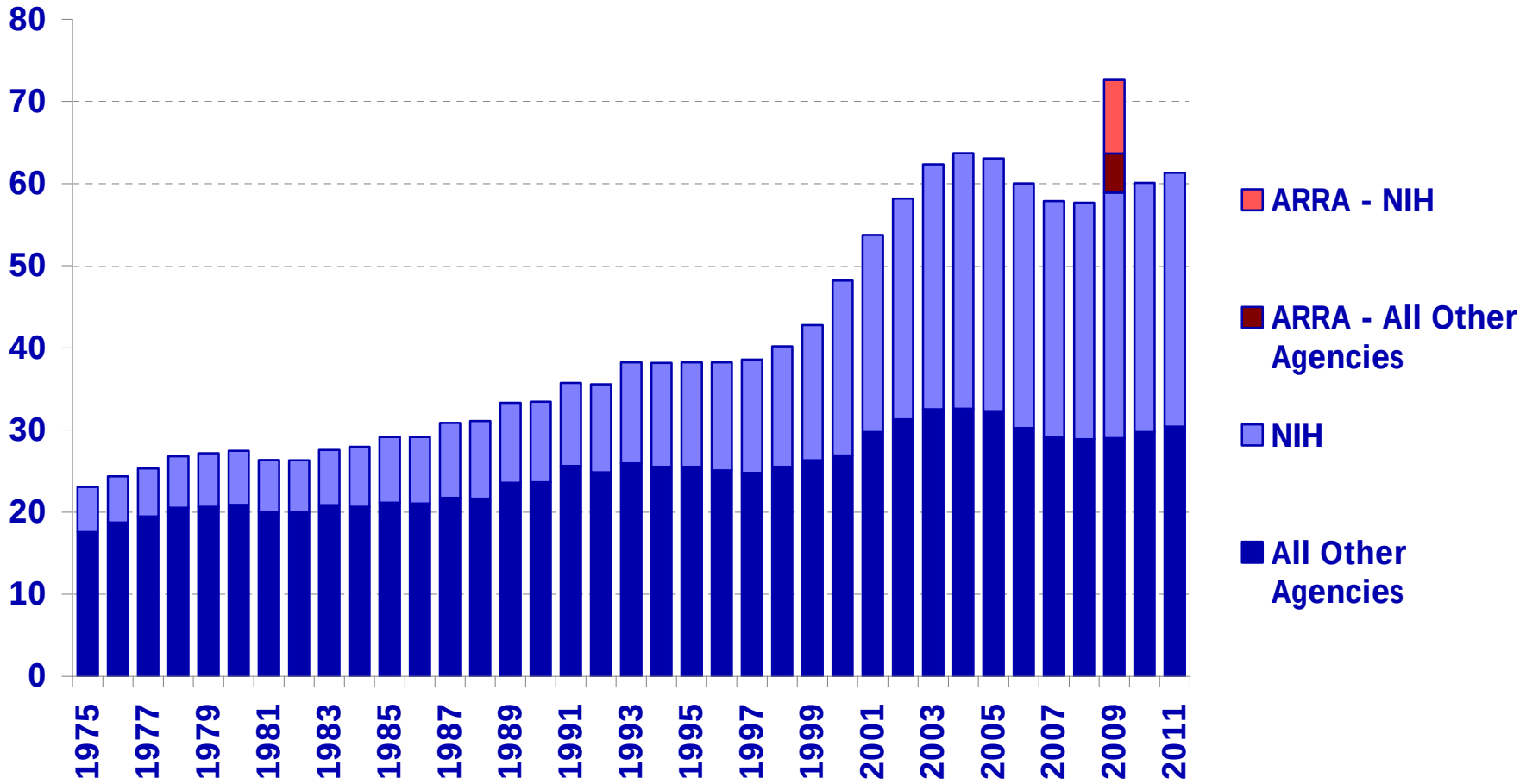
Funding Doubling for Basic Research

- National Institute of Standards and Technology
  - Total Budget: +7.3% to $919 million
  - NIST Labs (STRS)
    - +13.5% to $585 million
  - R&D
    - +21.7% to $706 million
  - Competitive Manufacturing and Construction in a Clean-Energy Economy
    - +$34.6 million



Trends in Research by Agency

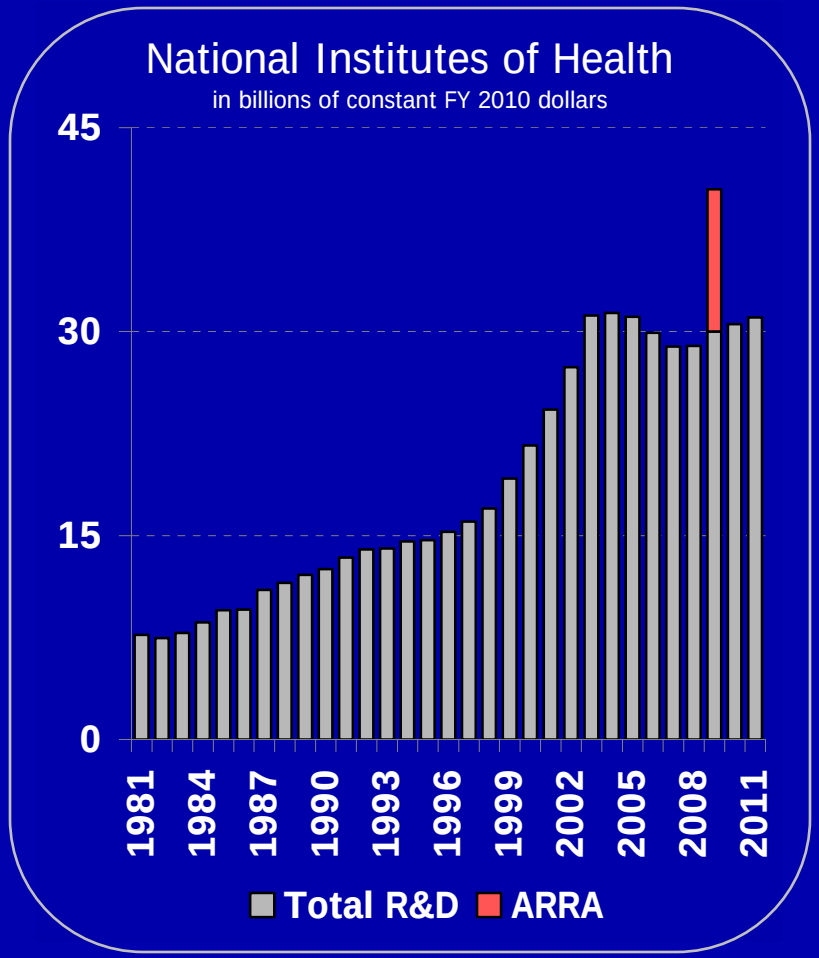
in billions of constant FY 2010 dollars



Source: *AAAS Report: Research & Development* series.
FY 2010 and FY 2011 figures are latest estimates.
Research includes basic research and applied research.
1976-1994 figures are NSF data on obligations in the Federal Funds survey.

National Institutes of Health

- Total Budget: +2.8% to $32.2b
- R&D: +2.8% to $31.4b
- Cancer and autism spectrum disorders
- AIDS research – Global Fund
- National Nanotechnology Initiative: +6.0% to $382m
- Therapeutics for Rare and Neglected Diseases (TRND)
  - +$26m to $50m
- National Synchrotron Light Source-II (NSLS-II): $33m

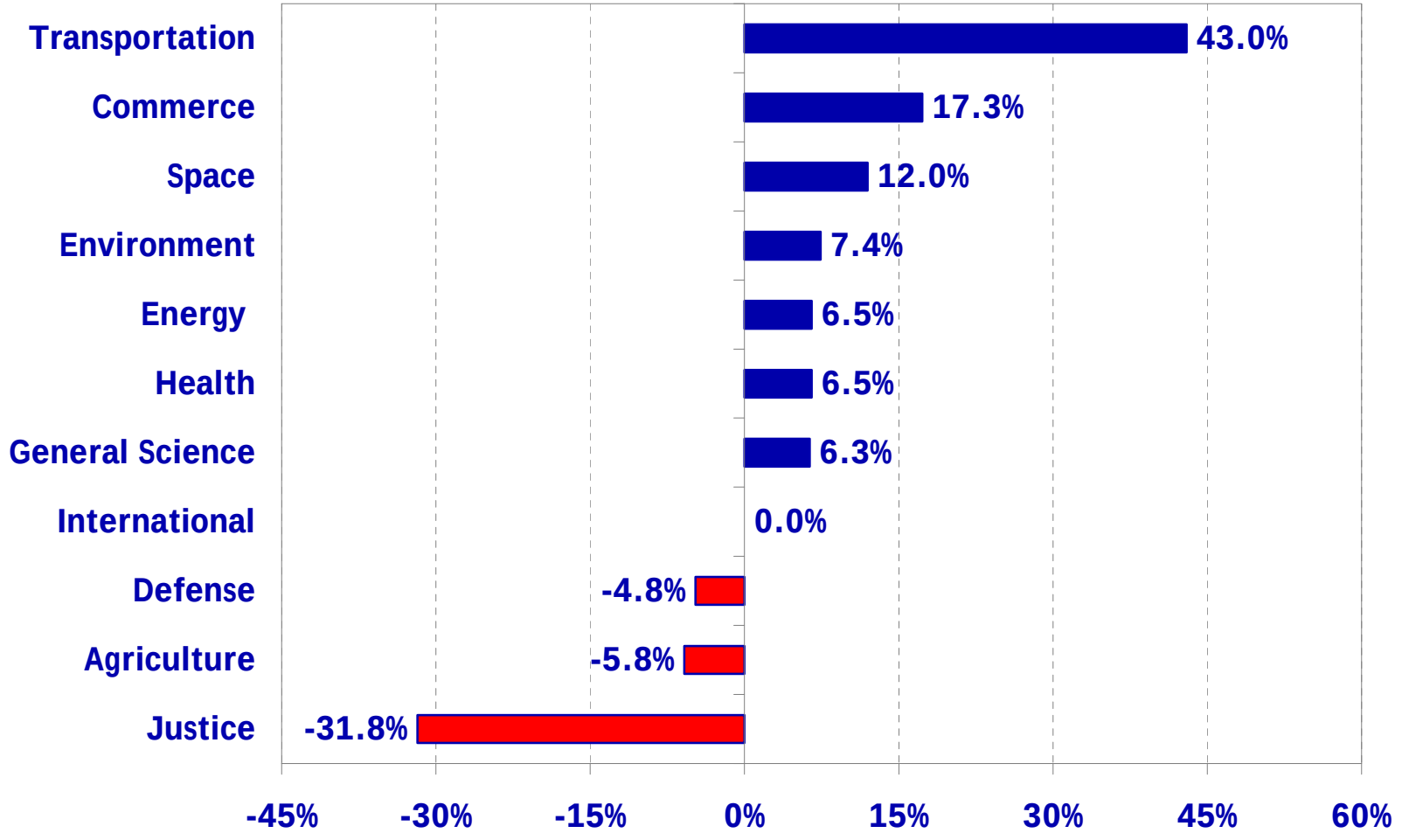


R&D Investment Priorities

- New Industries and Jobs
  - Advanced materials and manufacturing methods
  - $6.1b over 5 years for commercial earth orbit
- Cleaner Energy
  - +$155m (+6.8%) for DOE Energy R&D
- Healthier America
  - +$956m (+3.1%) for National Institutes of Health R&D
- Enhanced Security
  - DOD Basic Research: +6.7% to $2.0b

FY 2011 R&D Budget Request by Function

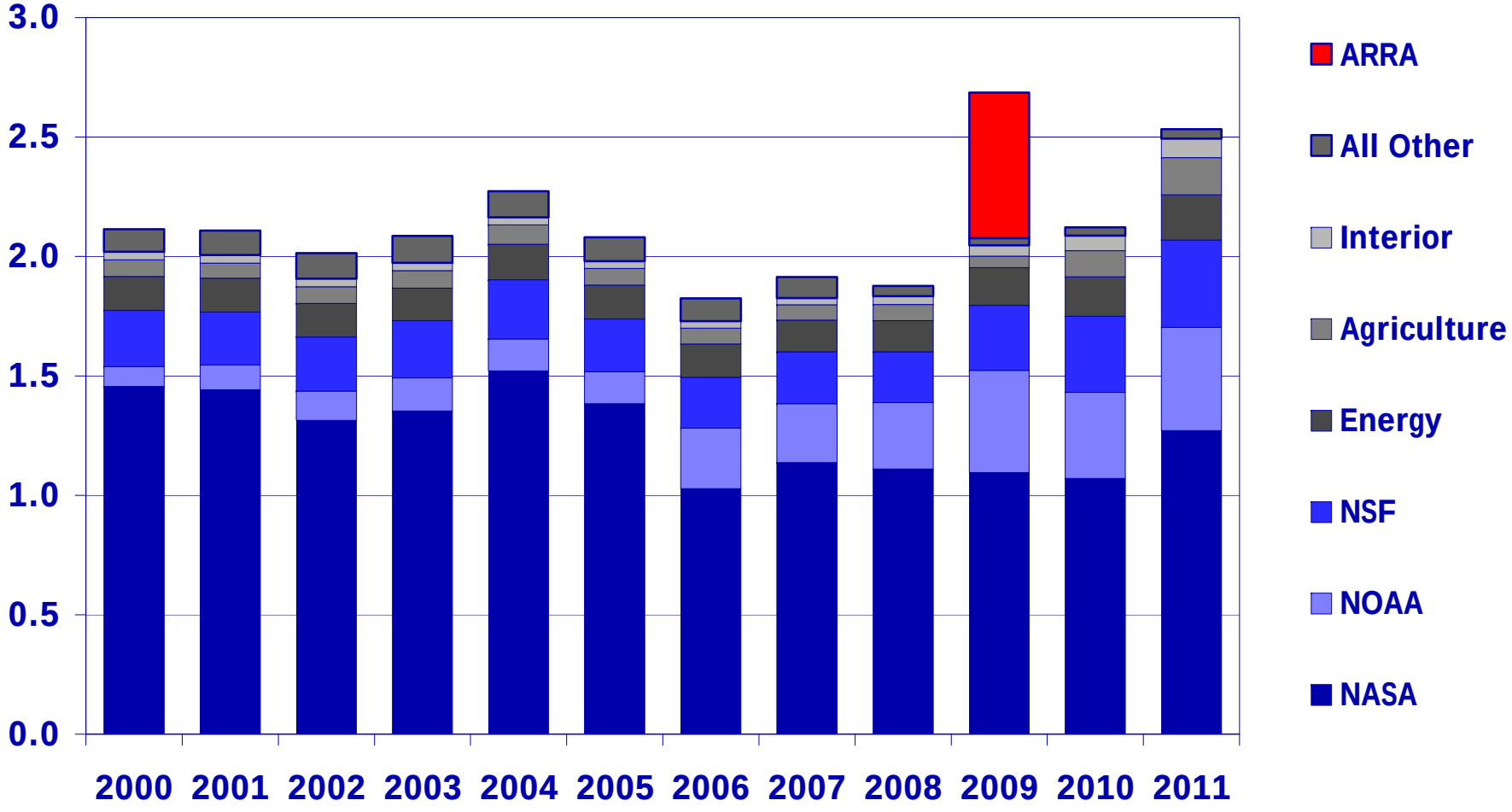
percent change from FY 2010



Source: OMB and agency budget data.
Environment includes natural resources R&D

U.S. Global Change Research Program, by Agency

(budget authority in billions of constant FY 2010 dollars)



Source: USGCRP/CCSP Annual Reports and OSTP.
Constant-dollar conversions based on OMB's GDP deflators.

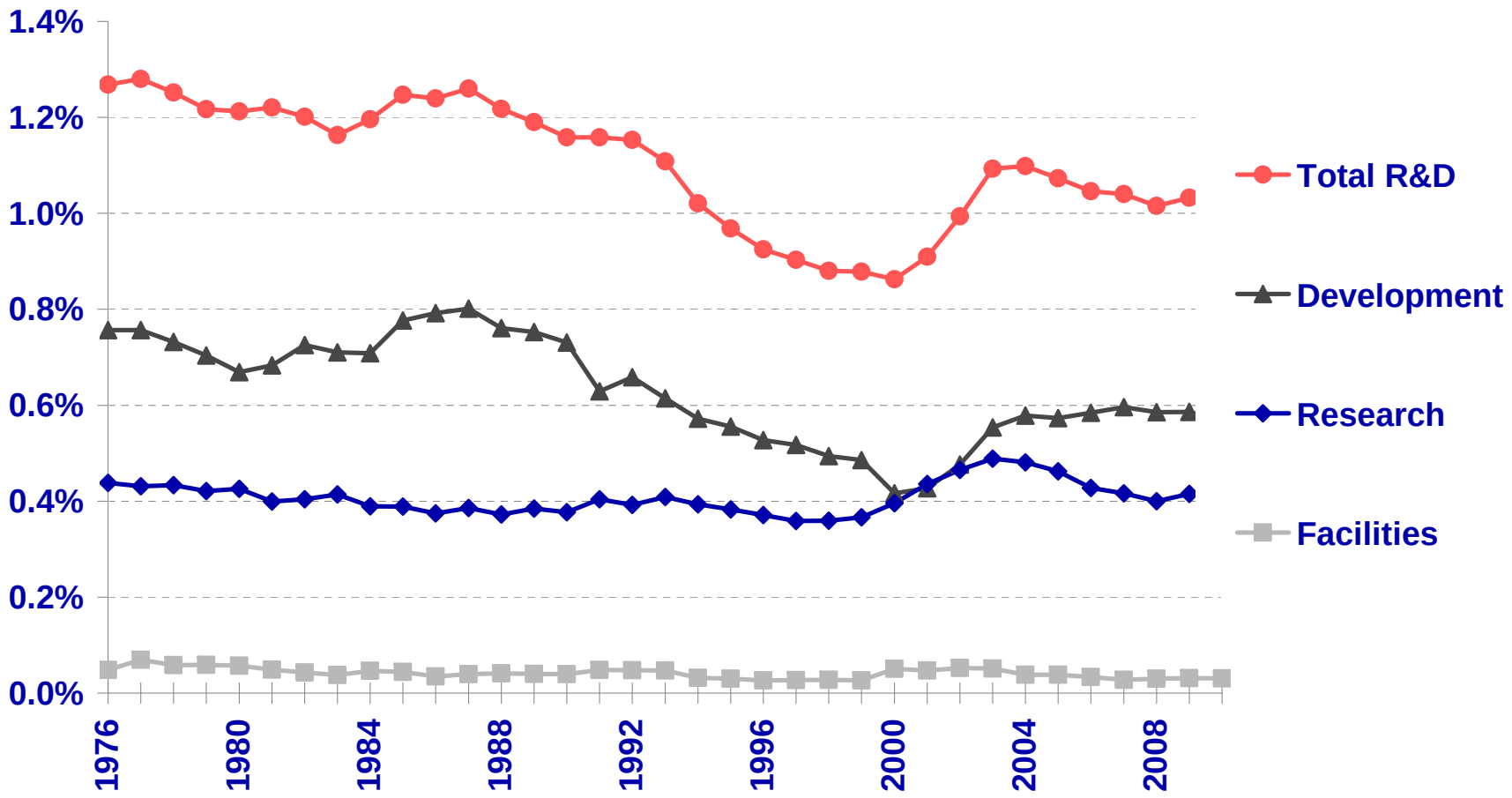
STEM Education

- $3.7b, +$32m from FY 2010
- K-12 Education
  - Dept of Ed: $450m, NASA: $63m, NSF: $41m
- RE-ENERGYSE (Undergraduate)
  - NSF: $19m, DOE: $55m
- Undergraduate Diversity
  - NSF: +14% to $103m
- Graduate Fellowships
  - NSF: +16% to $158m, NIH: +5% to $824m, EPA: +55% to $17m
    DOD: +4% to $40m, DOE: +$10m to $15m

International R&D Investment

- The United States leads the world in R&D investment
  - $369b PPP, 35.7% of world R&D investment
- But, others are quickly increasing their investment
  - Over 1997 - 2007,
    - South Korea, +0.99% of GDP to 3.47%
    - China, +0.85% of GDP to 1.49%
    - Taiwan, +0.81% of GDP to 2.63%
    - Japan, +0.57% of GDP to 3.44%
    - United States, +0.10% of GDP to 2.68%
- President Obama set goal of 3.0% of GDP investment in R&D

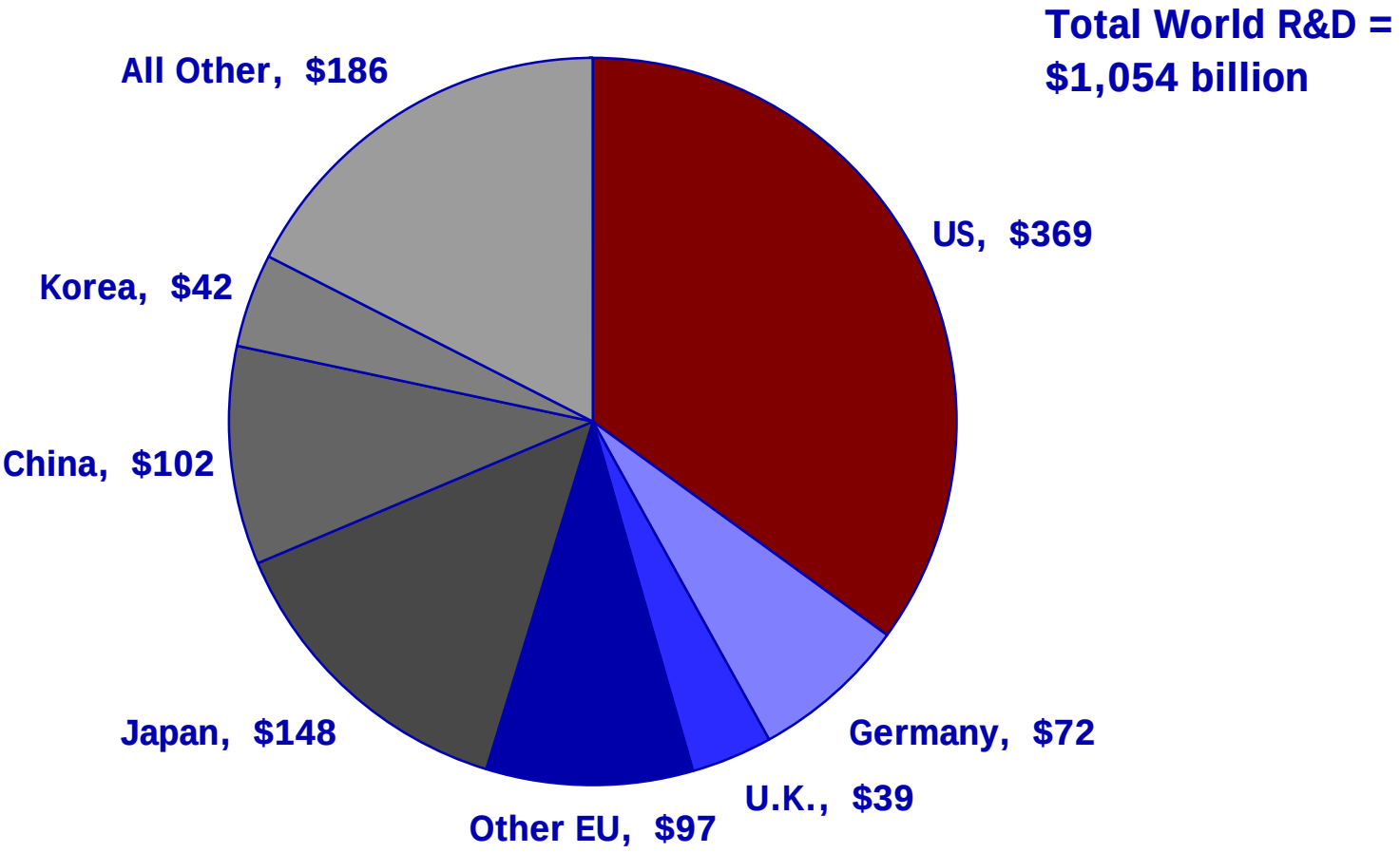
Trends in Federal R&D as Percent of GDP, FY 1976-2010



Source: *AAAS Report: Research and Development* series.
FY 2010 figures are latest AAAS estimates of the FY 2010 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 2010.*

Total World R&D, 2007

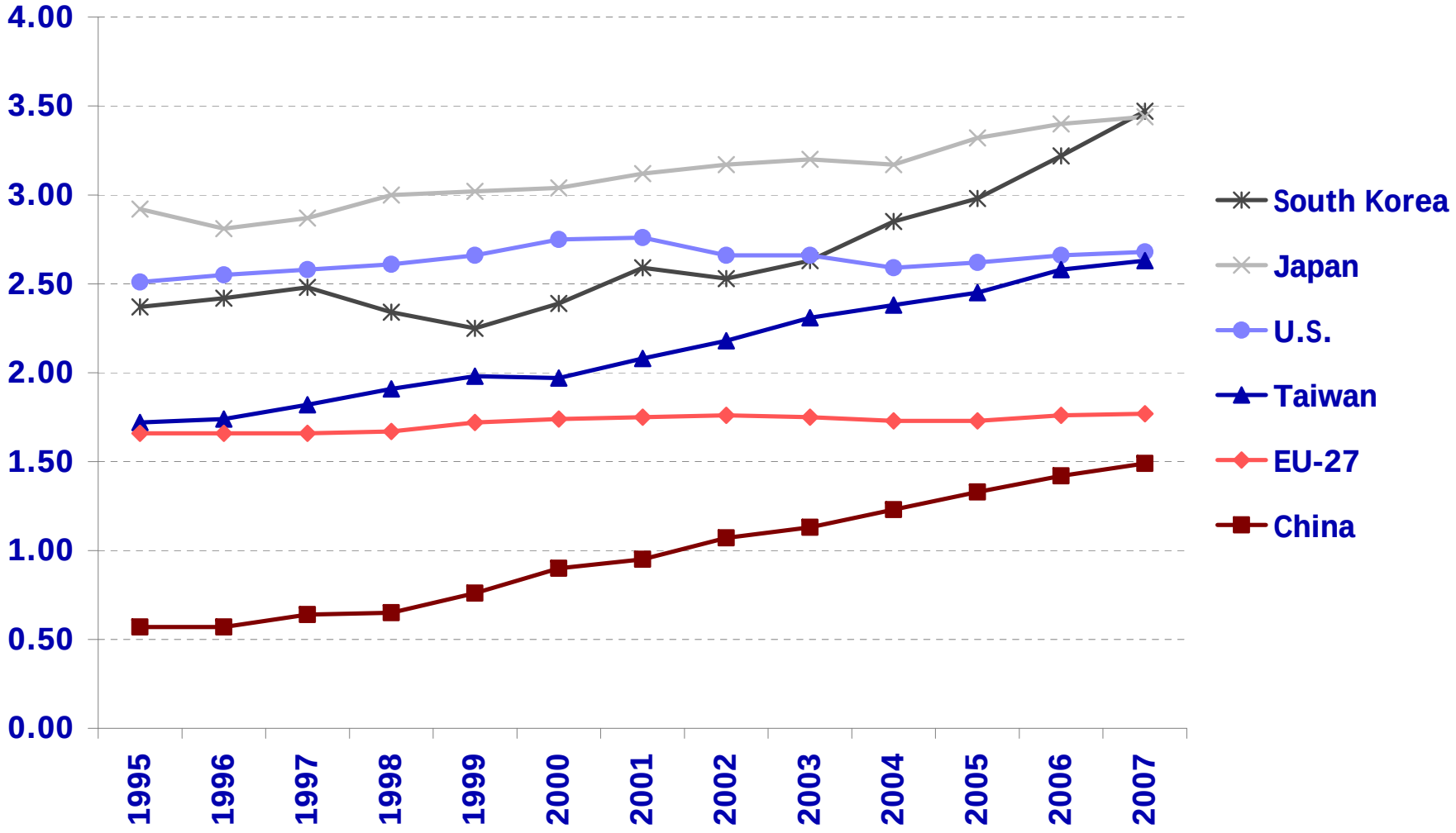
in billions of PPP $



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.

National R&D Investment

percent of GDP



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

Next Steps

- The Senate Budget Committee has approved a budget resolution.
  - The House leadership is deciding whether to put one together and is negotiating funding levels.
- Fall elections might push budget action back to November.
- After the budget resolution, Congress determines the 302(b)s, allocating a specific amount to each appropriation subcommittee.
- Congress needs to pass 12 appropriation bills, ideally by Sept. 30, the end of FY 2010.

For More Information…

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

The FY 2012 AAAS Forum on Science and Technology Policy is May 5-6, 2011 in Washington, DC

R&D Budget and Policy Program

- Started in 1976
- Main Activities
  - AAAS Report: Research and Development
  - Science & Technology Policy Forum
  - Congressional Action updates on Website
  - Consultation / Outreach
    - Government, Academic, Industry, Associations
    - Domestic and International

My Background

- PhD in 2005: Marquette University: Electrical and Computer Engineering
- Systems Engineer: Techterriors, LLC
- AAAS S&T Policy Fellow: National Science Foundation: Directorate of Biological Sciences

Getting into Science Policy

- Campus Organizations (i.e. FOSEP)
- Fellowships
  - AAAS S&T Policy
  - Association Congressional (Administered by AAAS)
  - Presidential Management
  - National Academies (Mirzayan S&T Policy)
  - NASA, NOAA
- Internships
- Volunteer
- Jobs

Observations

- Build your social networks
- Be aware of your audience
- Leadership and communication skills trump your research topic
- Accept uncomfortable tasks
- Listen for, and keep an open mind to opportunity
- Contentment is derived from who you are working with, not what you are working on