Politics and Physics

Benn Tannenbaum, Ph.D.
Sandia National Laboratories

Outline

- The problem
- The enabling technology
- How we got here
- What I do
- What you can do

The Problem

- Science has become just another special interest
  - Funding is down and decreasing
  - Planning for the future is a challenge, given the inability to pass a budget
  - On-again, off-again immigration reform may impact visas for students, postdocs, and visiting scientists

The Problem

- Science is all too often dismissed by policy makers
- No real discussion of climate change
- No real changes to energy policy
- Climate skeptics chair the House Science Committee and several subcommittees

New Highs and Lows In Presidential Support

Senate Democrats supported President Barack Obama 96 percent of the time on roll call votes on which he took a clear position in 2013, beating their previous record score of 94 percent average presidential

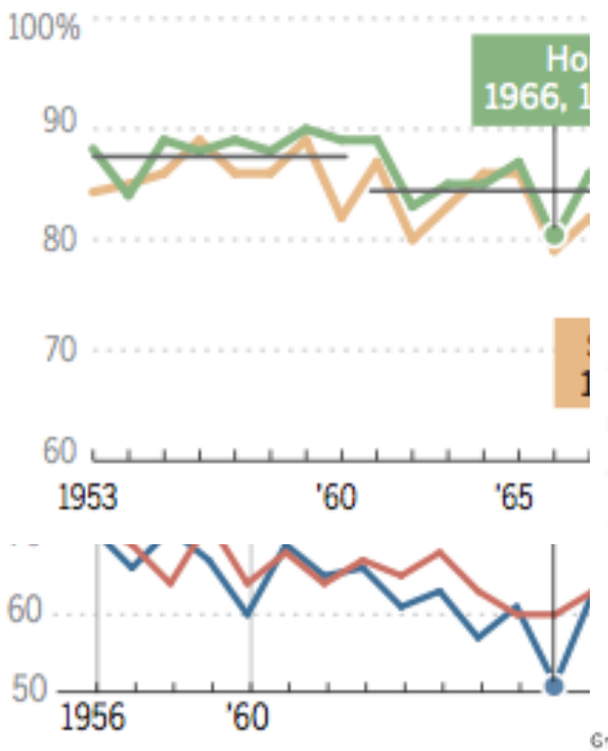
Both Parties Raise Their Support Scores

House and Senate lawmakers from both parties on average voted more often with their caucus majorities in 2013 than they did in 2012. House Republicans set a record for party support, voting on average with their caucus 92 percent of the time, up from 90 percent. Likewise,

Participation Hi

The average House member cast a "y
96.0 percent of the time on roll calls
previous year but shy of the record 9
The participation rate for senators tic

Average voting participation rate

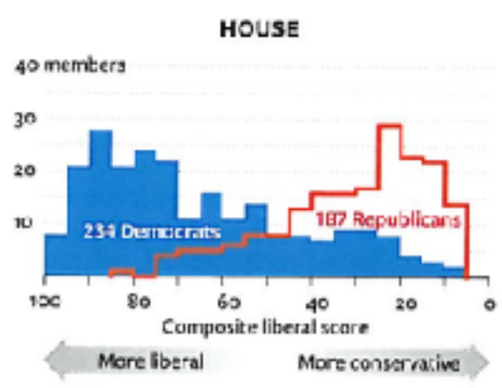


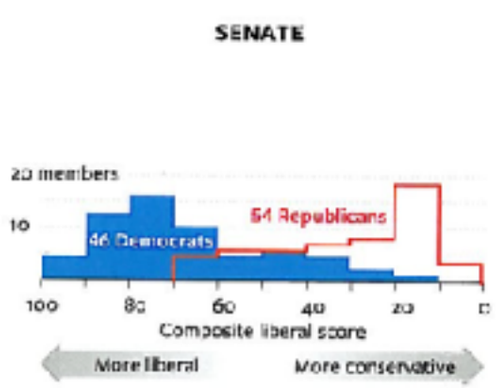
Dividing Lines

The ideological differences that once existed within each party now exist largely between them.

1982

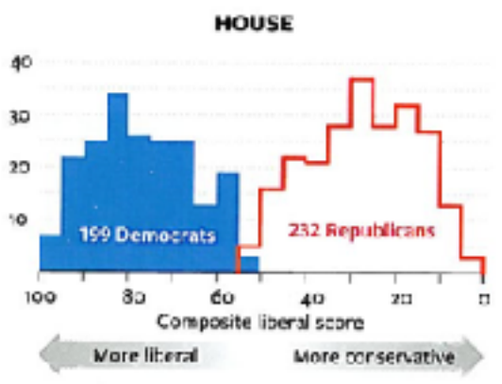
Thirty years ago, *National Journal*'s vote ratings revealed a Congress in which both parties spanned the ideological spectrum. Conservative Democrats and liberal Republicans were common.

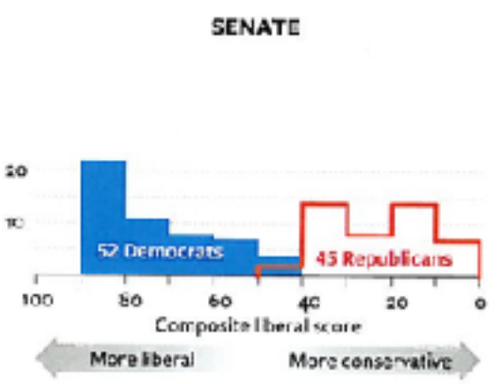




2013

Today, virtually all conservatives are Republicans and all liberals are Democrats. In the House last year, only two Republicans had scores more liberal than the most conservative Democrat, and only two Democrats had scores more conservative that the most liberal Republican.





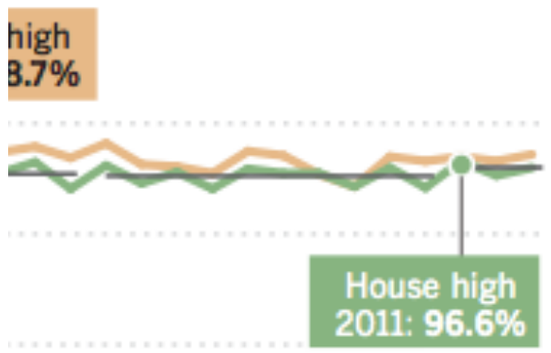
Graphic by PETER RELL

Source: National Journal analysis of House and Senate roll-call votes

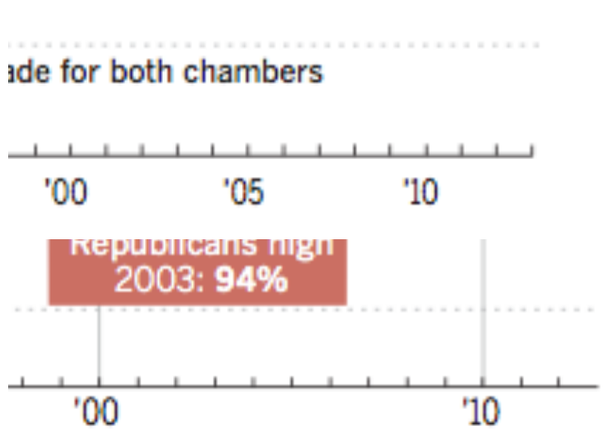
2013

980s, voting participation has
chambers for more than two
t close to 96 percent in the
te.

high
8.7%



ade for both chambers



The Question

- How did we get here?
- How can we, as citizens and as scientists, make things better?

Some Enabling Technology

Campaign costs for 2016 winners

- $1,200,000 for a House race
- $10,500,000 for a Senate race
- $1,000,000,000 for the presidency

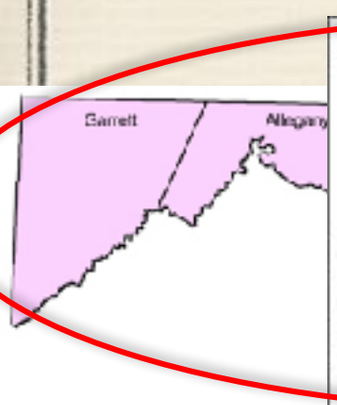
Campaign costs for 2016 winners

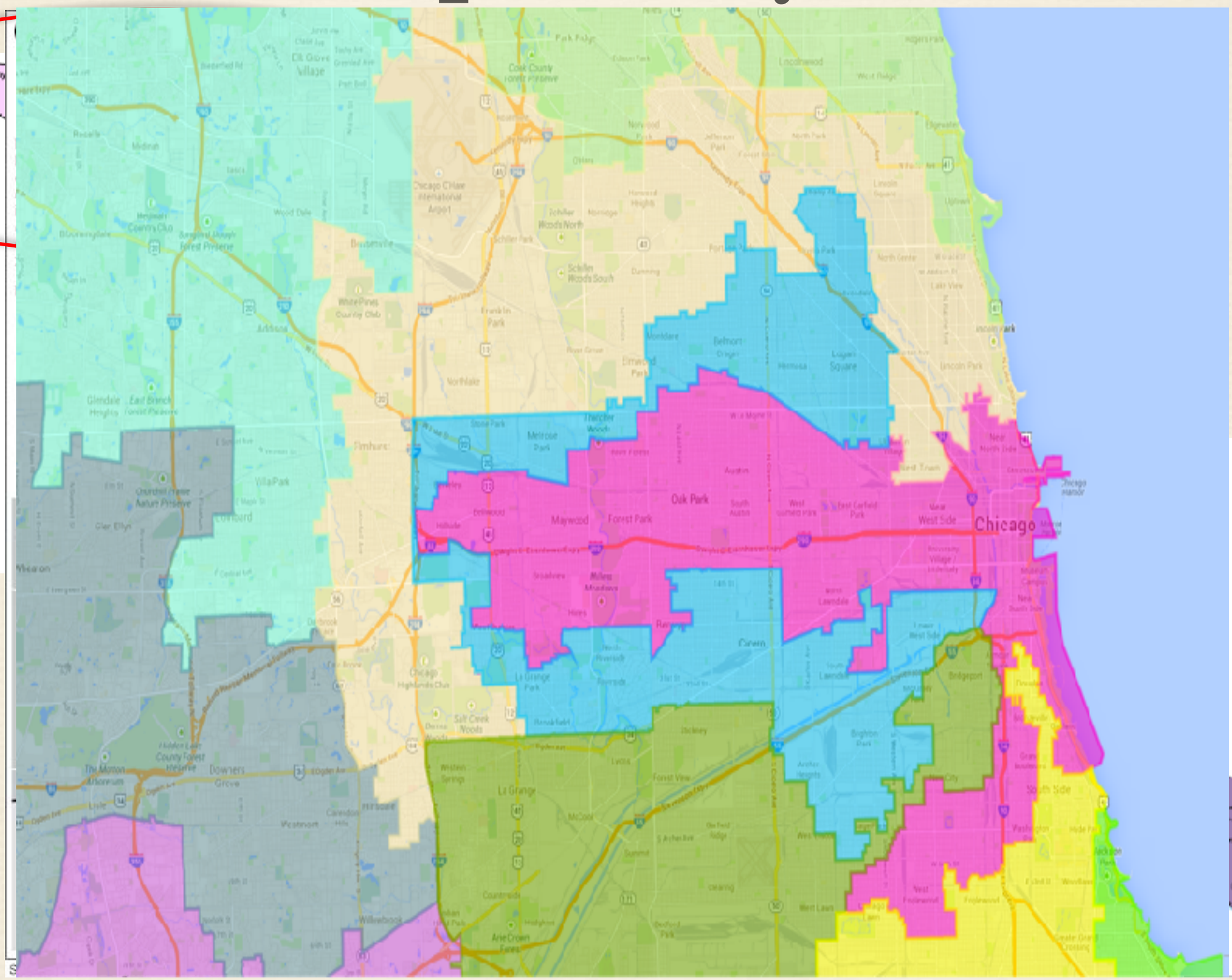
- $1,200,000 for a House race ≈ $1600 per day
- $8,600,000 for a Senate race ≈ $1200 per hour
- $1,000,000,000 for the presidency ≈ $475 per minute

The Enabling Technology

The Enabling Technology

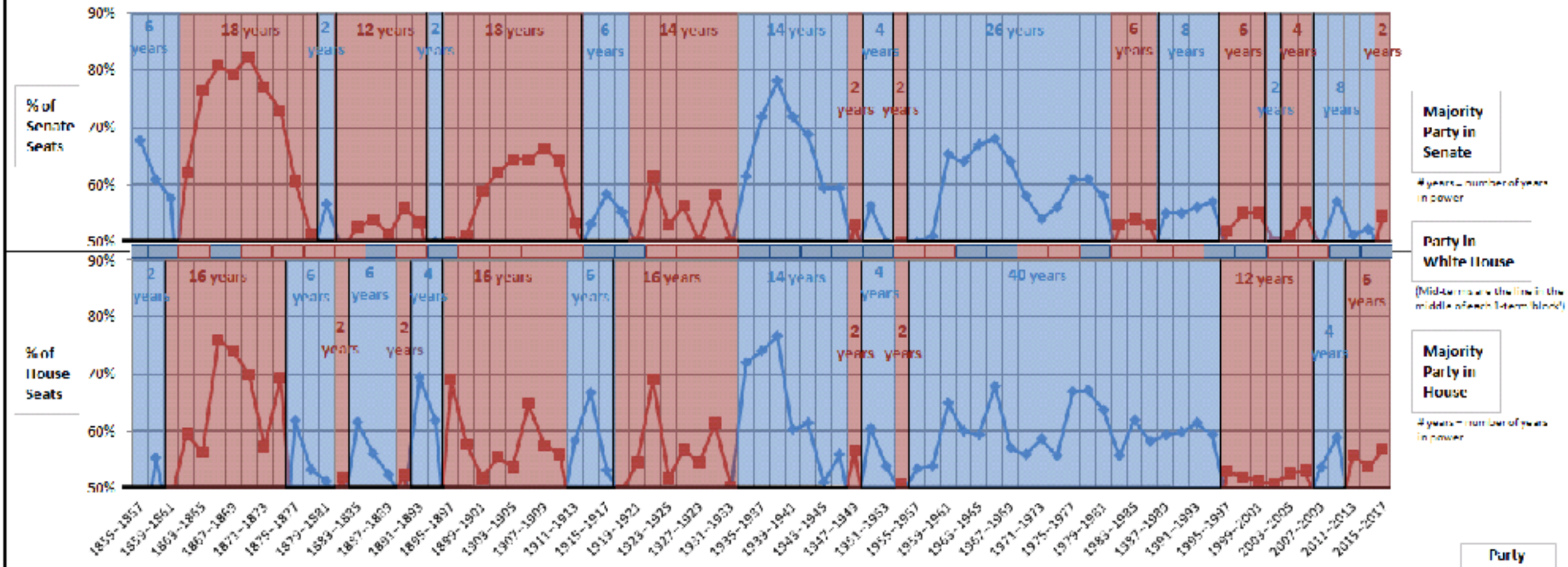
Shift to primary battles





Source: http://planning.maryland.gov/redistricting/2011/2010SenateDistrict_House_Amendment_2/ab9Plan0549.kmz

Control of the U.S. Senate and House of Representatives: 1855-2017



Sessions of Congress

Each horizontal block equals 2 years (1 session of Congress)

On the scale, every other session of Congress is shown

(i.e.- 2009-2011, is all of 2009 & 2010, new elected take office in January 2011; i.e.- 2007 is election year 2006)

The Enabling Technology

So what does this mean for us?

- People in power want to stay in power
- Money is always on their minds
- Politics seem to matter more than policy

What this means for us

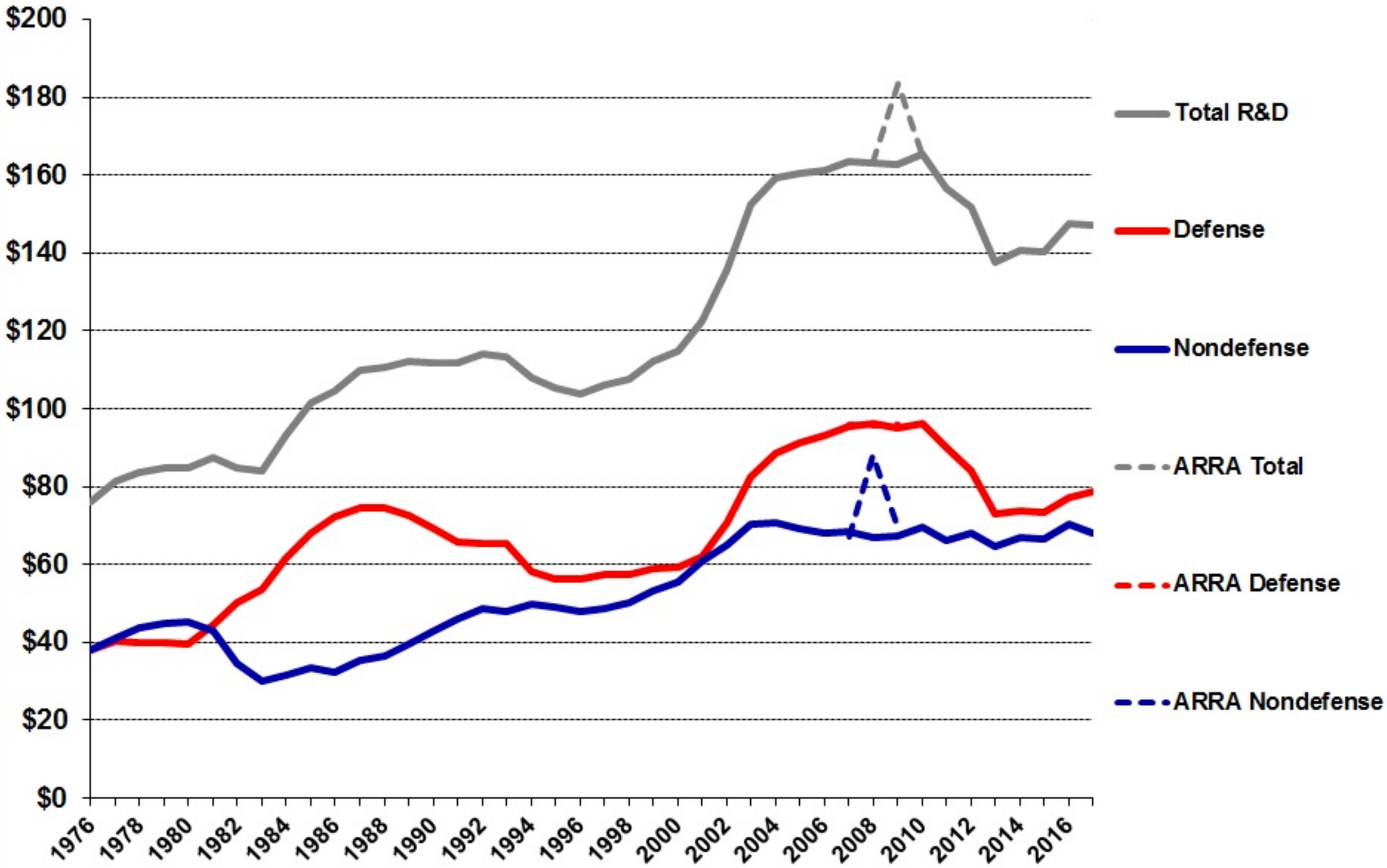
- Money talks
- Ideas don’t
- Access is key
- Access is bought

The Competition

Science is, unfortunately, small beer in the grand scheme of policy

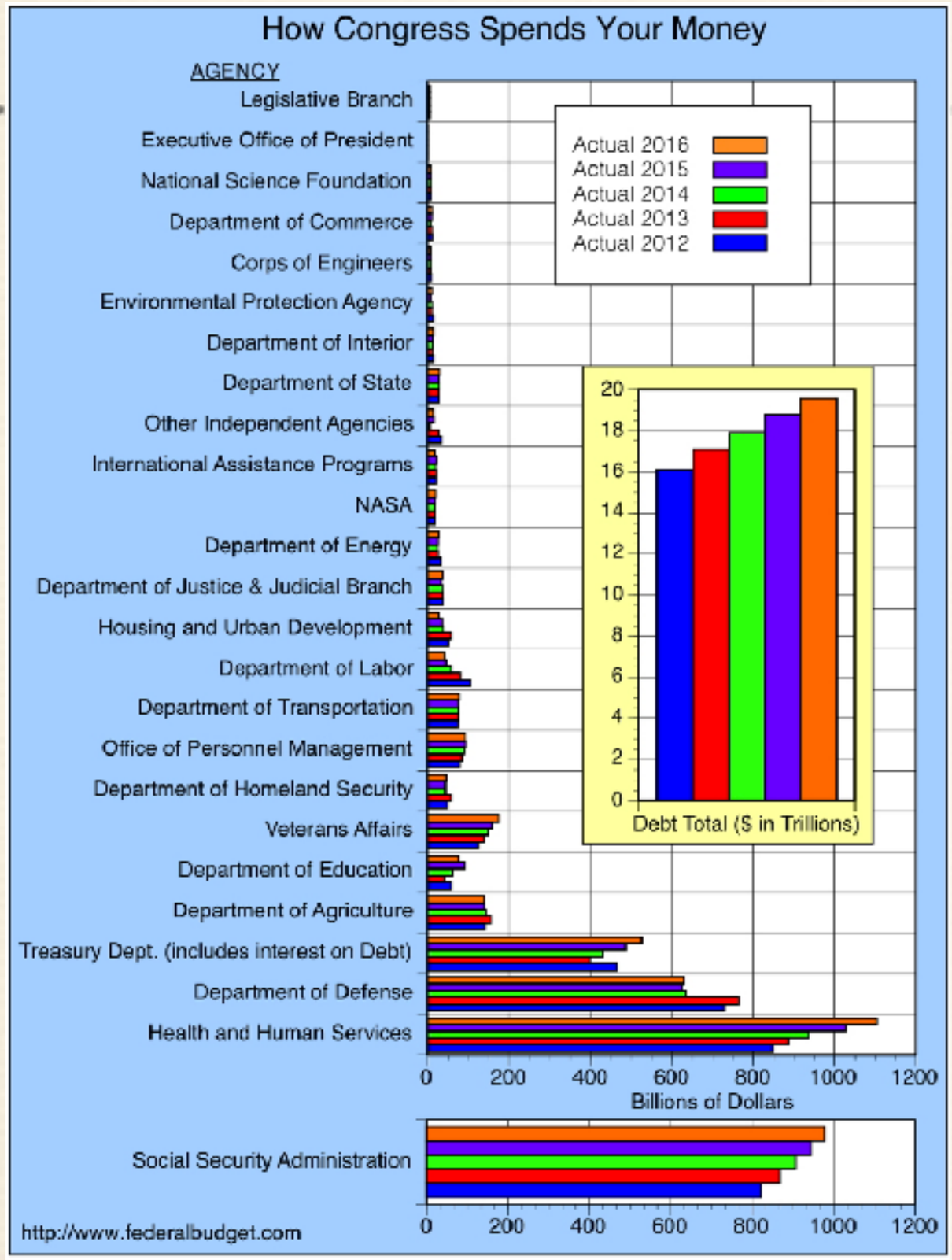
Trends in Federal R&D, FY 1976-2017

in billions of constant FY 2016 dollars, excluding mandatory proposals in FY 2017



Source: AAAS analyses of historical budget and agency data and the FY 2017 request. R&D includes conduct and facilities.

For comparison…



http://www.federalbudget.com/

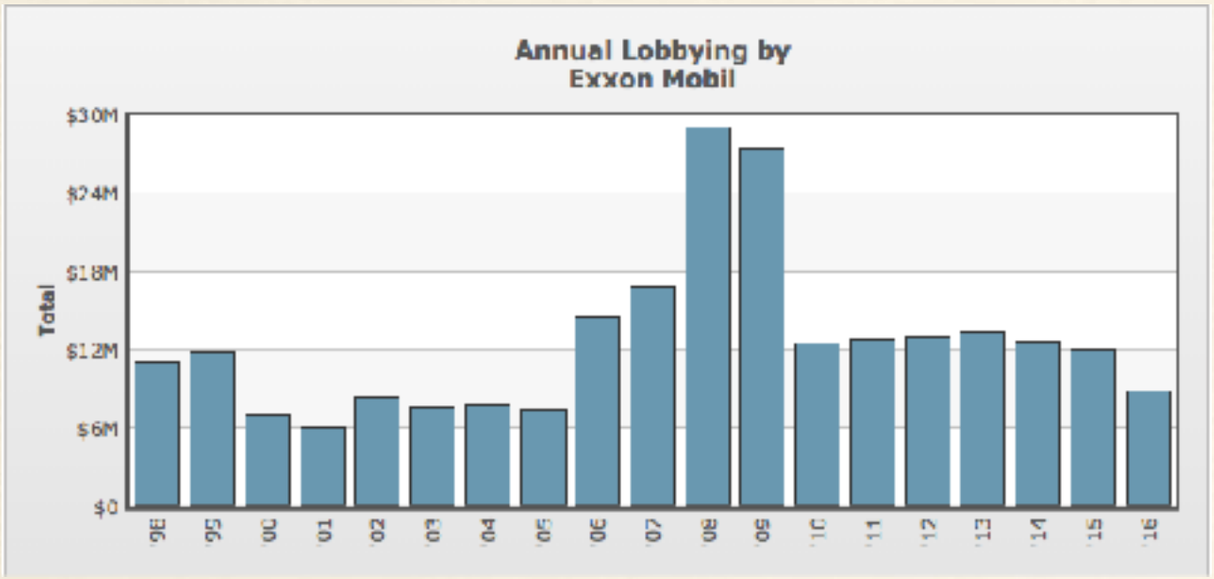
Money spent on lobbying

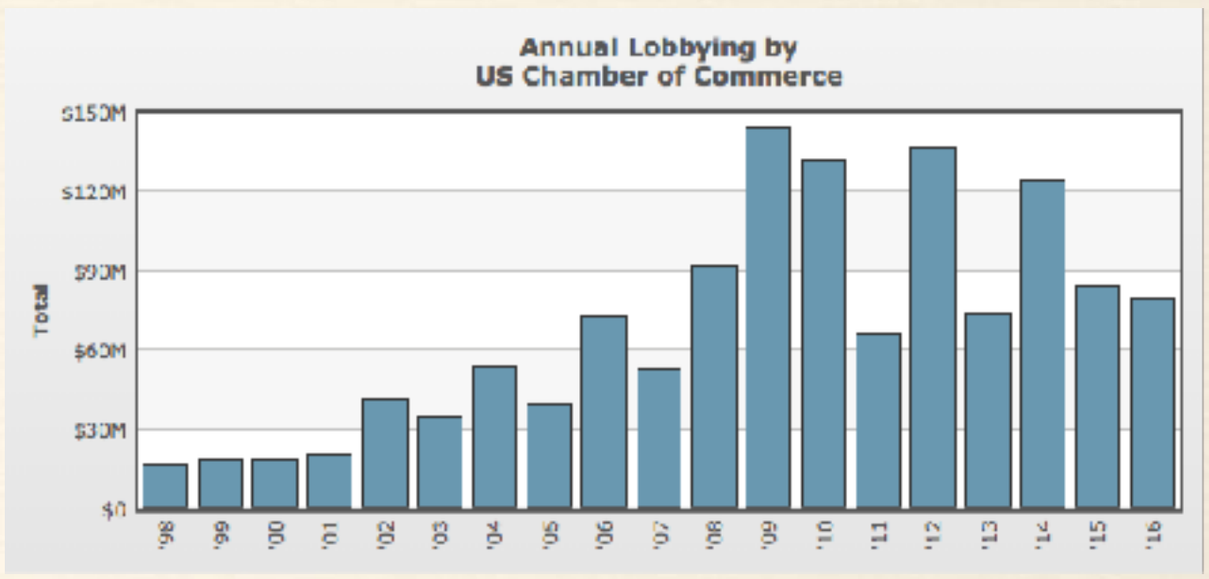
Total Lobbying Spending		Number of Lobbyists*	
1998	$1.45 Billion	1998	10,404
1999	$1.44 Billion	1999	12,926
2000	$1.57 Billion	2000	12,540
2001	$1.63 Billion	2001	11,826
2002	$1.83 Billion	2002	12,117
2003	$2.06 Billion	2003	12,916
2004	$2.19 Billion	2004	13,166
2005	$2.44 Billion	2005	14,072
2006	$2.63 Billion	2006	14,477
2007	$2.87 Billion	2007	14,822
2008	$3.31 Billion	2008	14,153
2009	$3.51 Billion	2009	13,740
2010	$3.52 Billion	2010	12,925
2011	$3.33 Billion	2011	12,618
2012	$3.31 Billion	2012	12,177
2013	$3.24 Billion	2013	12,111
2014	$3.26 Billion	2014	11,815
2015	$3.22 Billion	2015	11,514
2016	$3.12 Billion	2016	11,143

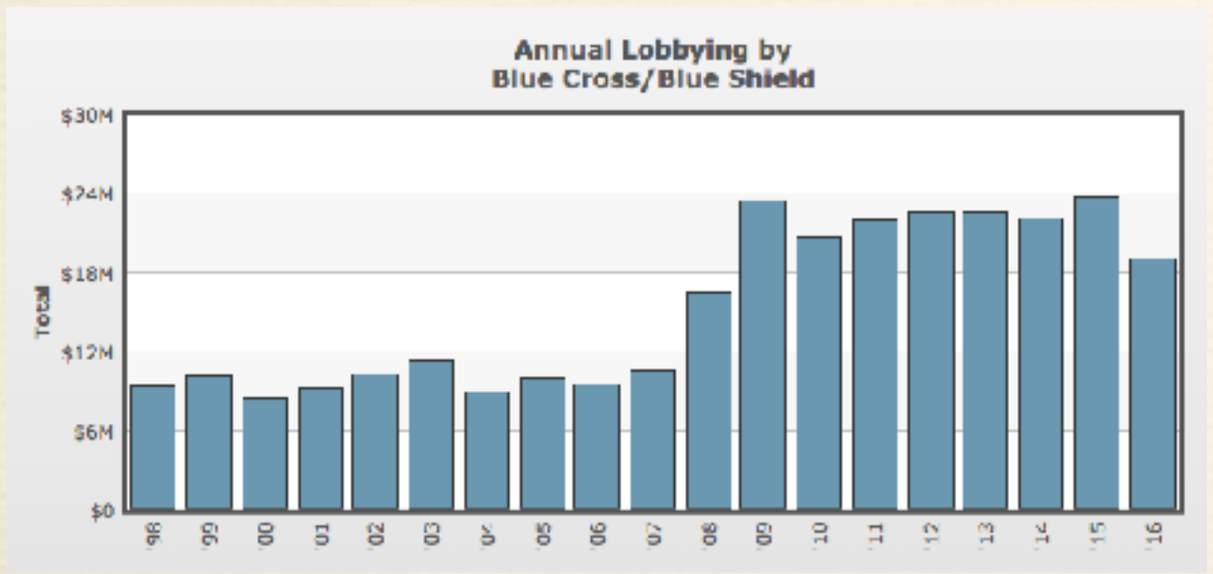
Industry	Total
Pharmaceuticals/Health Products	$244,095,383
Insurance	$146,662,996
Business Associations	$143,528,696
Electronics Mfg & Equip	$119,433,358
Oil & Gas	$117,516,956
Electric Utilities	$113,683,549
Real Estate	$103,743,325
Securities & Investment	$94,997,398
Hospitals/Nursing Homes	$93,995,578
Telecom Services	$87,604,223
Air Transport	$85,800,002
Health Professionals	$83,640,288
Misc Manufacturing & Distributing	$78,862,189
Health Services/HMOs	$75,543,718
Education	$73,100,265
Defense Aerospace	$73,064,329
Civil Servants/Public Officials	$68,888,386
Automotive	$61,677,268
TV/Movies/Music	$59,972,297
Commercial Banks	$59,672,406

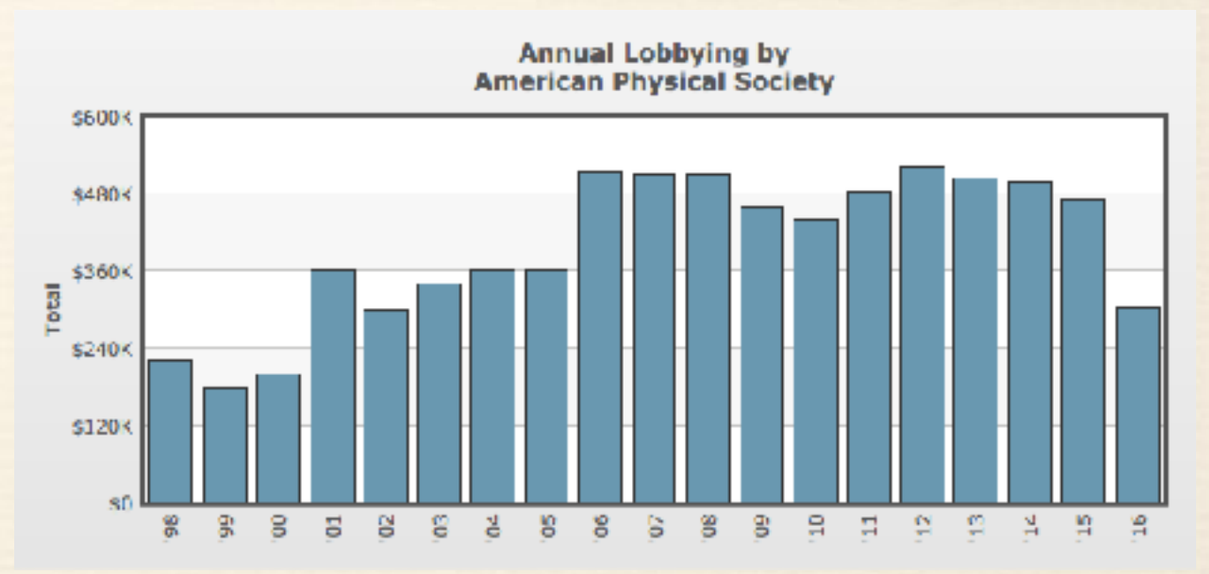
Source: http://www.opensecrets.org/lobby/index.php

Some select industries









Source: http://www.opensecrets.org/lobby/index.php

So what do we do?

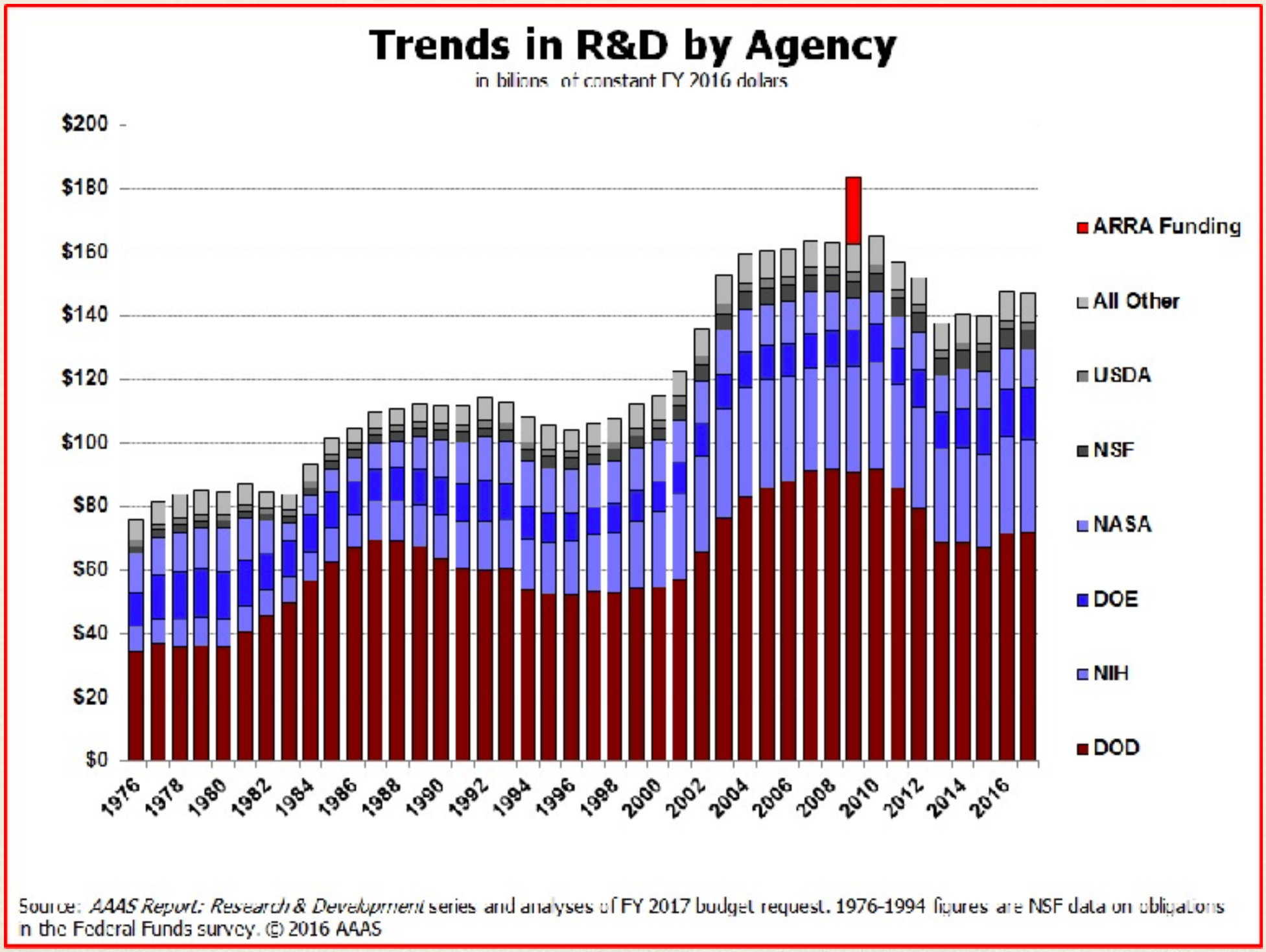
Have to tell good stories

Recall Robert Wilson's Congressional testimony, when asked how particle physics helps defend the country: "It has nothing to do directly with defending our country except to make it worth defending."

We lived on that sentence for decades.

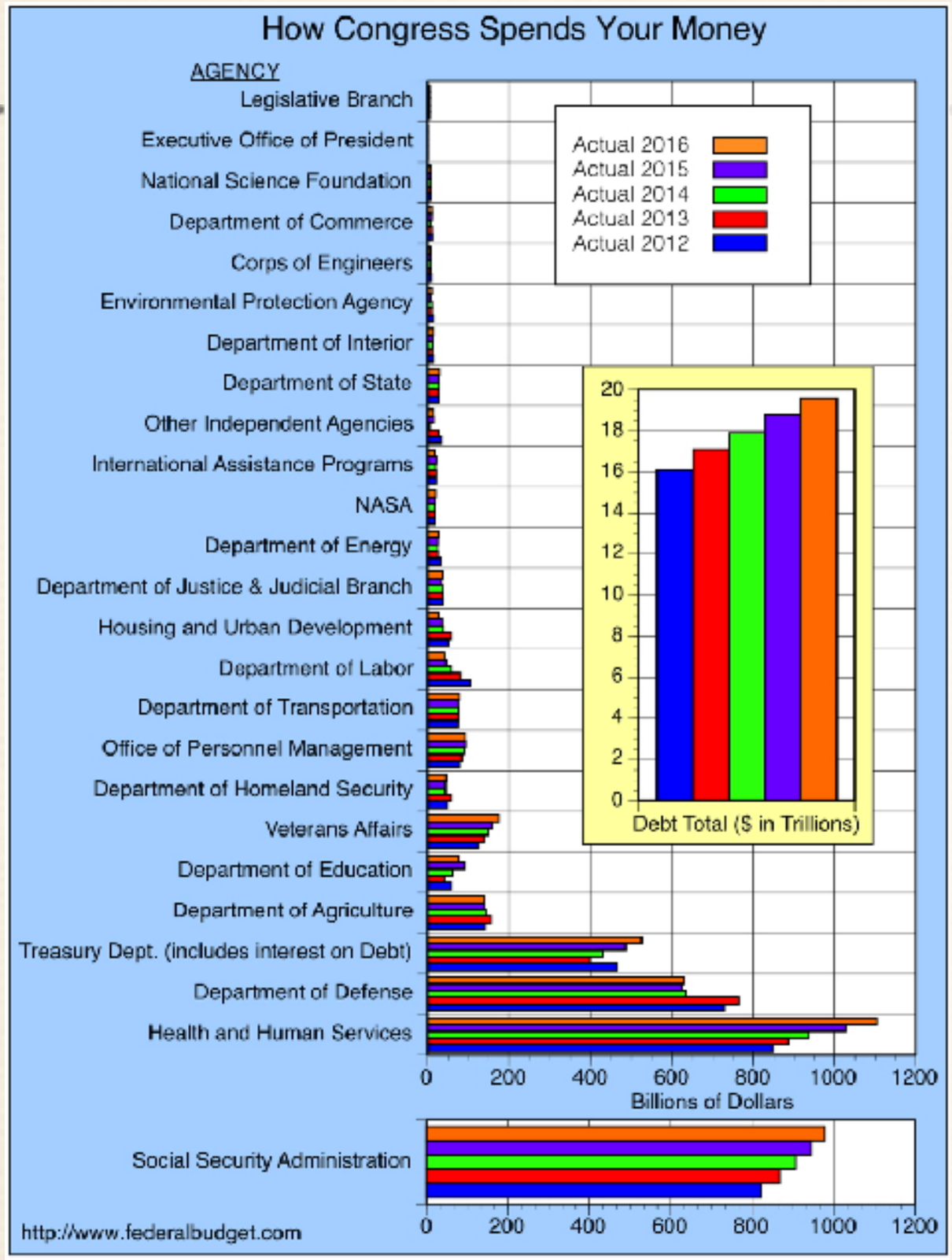
We can no longer.

How Much is Spent on Science?



Source: *AAAS Report: Research & Development* series and analyses of FY 2017 budget request. 1976-1994 figures are NSF data on obligations in the Federal Funds survey. © 2016 AAAS

For comparison…



http://www.federalbudget.com/

We need to find new ways to be relevant

Promises of future returns are not enough

Instead, we need to meet today's needs in a way that allows us to prepare for tomorrow's

So what to do?

How Scientists Impact Policy

- Three main venues
  - Informed constituent
  - Government employee
  - NGO community

Informed Constituent

- ~730,000 people / district
- ~6.4 million people / state
- How many are scientists?

US Population = 319,000,000

One of ~425 people is a Ph.D.-level scientist

More bachelors and masters-level scientists, but still a small fraction of those in this country

http://www.nsf.gov/statistics/doctoratework/
Data from 2008 survey

Field	Total
All fields	752,000
Science	588,000
Biological/agricultural/environmental life sciences	187,900
Agricultural/food sciences	19,300
Biochemistry/biophysics	29,100
Cell/molecular biology	20,600
Environmental life sciences	7,800
Microbiology	14,000
Zoology	12,300
Other biological sciences	84,300
Computer/information sciences	16,900
Mathematics/statistics	35,800
Physical sciences	139,200
Astronomy/astrophysics	5,000
Chemistry, except biochemistry	71,800
Earth/atmospheric/ocean sciences[a]	20,900
Physics	41,500
Psychology	112,200
Social sciences	96,000
Economics	25,700
Political sciences	22,700
Sociology	17,400
Other social sciences	30,300
Engineering	131,900
Aerospace/aeronautical/astronautical engineering	5,300
Chemical engineering	17,100
Civil engineering	11,500
Electrical/computer engineering	37,000
Materials/metallurgical engineering	13,500
Mechanical engineering	18,100
Other engineering	28,700
Health	32,100

Informed Constituent

- ~730,000 people / district
- ~6.4 million / state
- Not so many are scientists…
  - If build relationship with staff, are *useful* constituent
  - Can all start with phone call, email or letter
  - Visit www.congress.gov for info on laws

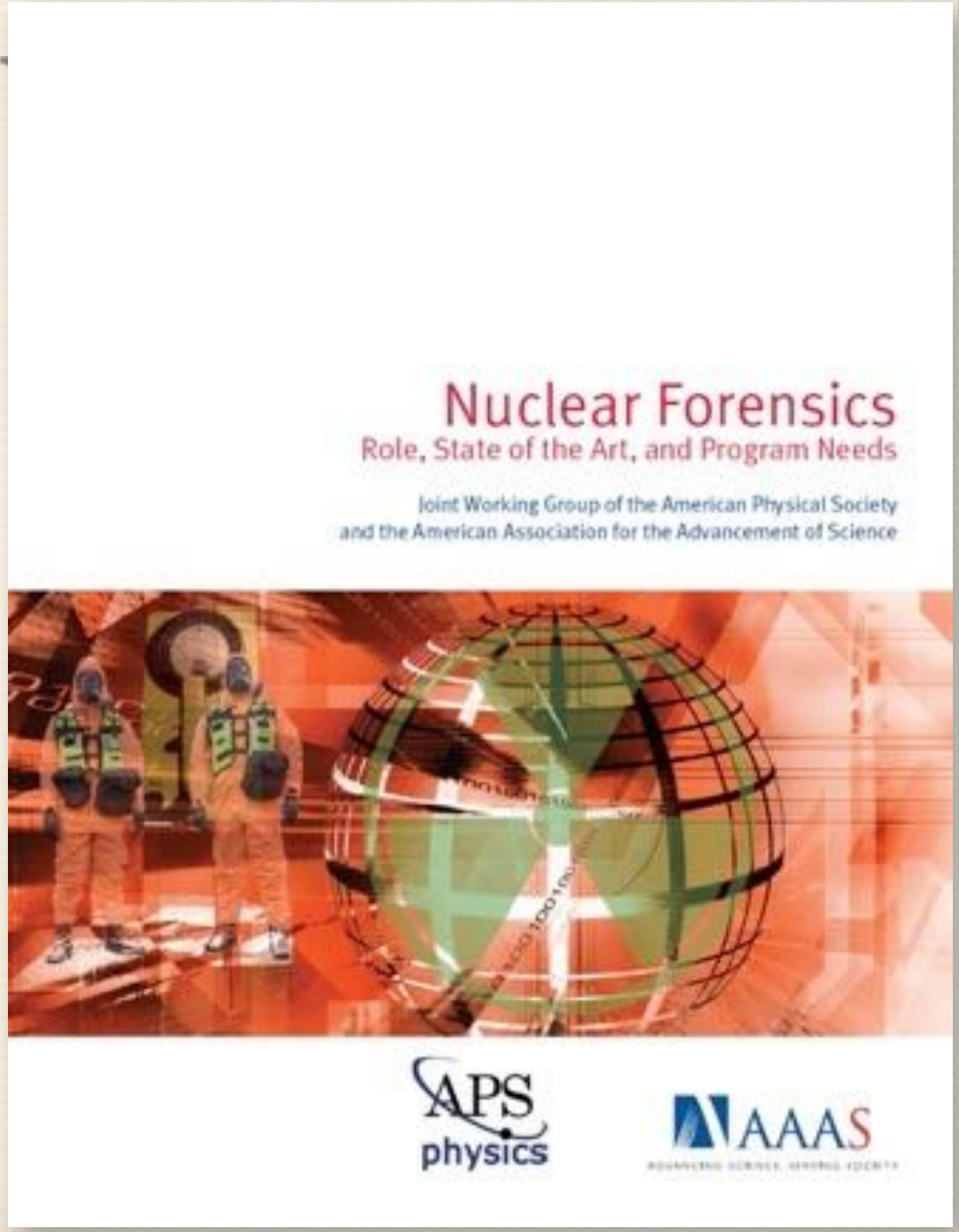
So what do I do?

Find ways to make the system do what I want it to

Expert Panel

Chaired by retired Livermore Director Mike May

Released February 2008



Public briefings

- AAAS Annual Meeting in Boston in February 2008
  - Included separate press conference
- APS Annual Meeting in St. Louis in April 2008

The Washington Post

AN INDEPENDENT NEWSPAPER

Op/Ed in Washington Post on 25 March 2008, penned by panel member Jay Davis

Jay Davis

After A Nuclear 9/11

The appearance of nuclear weapons materials on the black market is a growing global concern, and it is crucial that the United States reinforce its team of nuclear forensics experts and modernize its forensics tools to prepare for or respond to a possible nuclear terrorist attack.

Large quantities of nuclear materials are inadequately secured in several countries, including Russia and Pakistan. Since 1993, there have been more than 1,300 incidents of illicit trafficking of nuclear materials, including plutonium and highly enriched uranium, both of which can be used to develop an atomic bomb. And these are only the incidents we know about.

It is quite possible that a terrorist group could acquire enough nuclear material to build a bomb. Nuclear materials have been discovered by border patrols, seized in police raids from India to, as recently as last fall, Slovakia, and even hidden in a flower garden in Hanover, Germany. With enough stolen material, only a few specialists would be needed to build a nuclear weapon. After that, terrorists would lack only a truck to deliver it.

If a terrorist group were to detonate a nuclear weapon on U.S. soil, the FBI, CIA, Department of Homeland Security and the nation's national labs would race to track down those responsible and prevent any further detonations by that group.

After the Sept. 11 attacks, the time between the fall of the twin towers and our response in Afghanistan was less than one month. But current U.S. nuclear forensics capability — which involves analyzing nuclear radiation and isotopic signatures — can't guarantee definitive information within a month of an attack.

Fibers, fingerprints, hair samples, a truck axle — all standard forensics clues — would have been vaporized in the explosion. Only two primary pieces of evidence would remain: radiation and isotopic signatures.

Radiation and isotopic signatures are the assets that nuclear forensics scientists use to hunt terrorists. Within a few hours, they would know whether the bomb was made of plutonium or uranium, a crucial first step in narrowing the investigation. Within hours to weeks, they would determine key details about the original nuclear material and then estimate the size, weight and complexity of the bomb. Over the next several months, they might be able to identify the source

the United States.

But in our post-Sept. 11 world, we won't have months to respond. There would be enormous pressure to rapidly identify the terrorists and the chain of events leading up to the attack.

With a few changes, the speed and accuracy of nuclear forensics could be significantly improved.

First, we should update our 20th-century program to confront 21st-century enemies. Much of our field and laboratory equipment dates to the Cold War. So do most of our personnel. We need to develop and manufacture advanced, automated radiation analysis equipment that can be deployed to the field and is backed up by improved laboratory measurement. We need enhanced computer simulation and modeling capabilities. And we need to establish a federal initiative to reinvigorate the field of nuclear chemistry.

Second, international collaboration is essential. Nuclear material can have a unique signature depending on its source reactor or fuel facility. A shared and appropriately accessible international database of nuclear samples can help to more quickly match debris from an explosion with its original source.

Third, we must consider what it will take for the world to believe our analysis. The U.S. intelligence community's failures in assessing weapons of mass destruction in Iraq could well result in international skepticism regarding any nuclear forensics investigation we might perform. A group of recognized experts not associated with our federal investigation should be established to provide independent validation of the forensics analysis.

Finally, we need to manage expectations and prepare for the inevitable political pressure to respond quickly after an attack. Through realistic drills, our leaders can become aware of the strengths and limitations of the nation's nuclear forensics capability. Even with these changes, forensics analysis will take time, and results will not be immediately conclusive. Our leaders must recognize that, at times, decisions may need to be deferred or made amid uncertainty.

There has been some good news. Some countries, including Pakistan, are strengthening the critical programs that lock down nuclear material at its source. But we must take additional steps, in case plutonium or uranium slips past the gate.

Jay Davis, a weapons inspector in Iraq after the Persian Gulf War, serves on the Defense Department's Threat Reduction Advisory Committee. He is a founding director of the federal Defense Threat Reduction Agency and recently served on a committee sponsored by the American Physical Society and the American Association for the Advancement of Science that completed the first unclassified review of the nation's nuclear forensics capability.

Editorial in USA Today on 8 April 2008

Our opinion

Nuclear 'return addresses'

During the Cold War, the ultimate U.S. nightmare involved a nuclear attack by the Soviet Union. But the certainty that the United States would retaliate in kind — known as MAD (for mutual assured destruction) — kept nuclear weapons locked in their silos.

Today, the nightmare is that terrorists could obtain a nuclear device and detonate it in a major U.S. city. Such an attack could kill thousands or even millions — and would generate overwhelming pressure for retaliation.

But against whom? Without knowing the "return address" of the nuclear device, it would be impossible to strike back. And if the terrorists' suppliers know the nuclear materials cannot be traced back to them, a policy of MAD loses its deterrent value.

That's why "nuclear forensics" —essentially the science of identifying the DNA of nuclear materials — needs a new and urgent emphasis.

Since the Cold War ended, nuclear material and expertise have proliferated with fewer safeguards. Nuclear materials in the former Soviet Union are not always well secured. Iran is developing nuclear weapons and has links with terrorist networks. The father of Pakistan's nuclear bomb has sold technology and know-how. Ditto for the erratic leader of North Korea. The list goes on.

Given the new realities, it makes sense to focus on being able to identify and trace nuclear materials and those who handle them, much as criminal forensic experts home in on DNA or fingerprints.

A new report by the American Physical Society and the American Association for the Advancement of Science offers a useful blueprint.

At home, the key recommendations involve developing state-of-the-art equipment and training enough scientists with nuclear forensics expertise. Only about 35 to 50 now work at U.S. national laboratories, far fewer than would be optimal to identify the source of an explosion set off by a faceless enemy.

International cooperation on nuclear forensics requires everything from building databases to overcoming suspicions that the United States has ulterior motives. One possible forum is the existing Global Initiative to Combat Nuclear Terrorism, co-chaired by the United States and Russia, which own more than 90% of the world's nuclear weapons and related materials.

The best defense, of course, is to keep those weapons and materials out of the hands of terrorists and rogue regimes in the first place. But if that fails, nothing is more important than the ability to trace a weapon back to its source.

Posted at 12:20 AM/ET, April 08, 2008 in Nuclear weapons - Editoria, Politics - Editoria, Terrorism - Editoria, USA TODAY editoria | Permalink

More Briefings

- Briefed to Depts. of State, Energy, Homeland Security plus National Nuclear Security Administration, Homeland Security Council, National Security Council, Vice President's Office, Office of Management and Budget, STRATCOM, UK Atomic Weapons Establishment
- Also briefed Congress: Rep. Bill Foster, plus staff of SASC, HASC, Sen. Reid, et al
- Over 700 downloads from AAAS website; more from APS website

So what happened?

- Legislation introduced by Rep. Bill Foster (D-IL; particle physicist) to enact 4 of 5 recommendations
- Most eventually made it into law, including $25M over 5 years to train the next generation of forensics experts et al (the Nuclear Science and Security Consortium) hosted by UC Berkeley

What do I do now?

- I am Sandia National Laboratories' "Man in DC"
- I track a variety of policy issues for the lab and connect our lab leadership with policy makers– both inside and outside of government
- I make Sandia "famous*er*"
- I also help train the next generation of policy makers

Sandia National Laboratories

Welcome to Sandia National Laboratories

SITES

Albuquerque, New Mexico

Livermore, California

ACTIVITY LOCATIONS

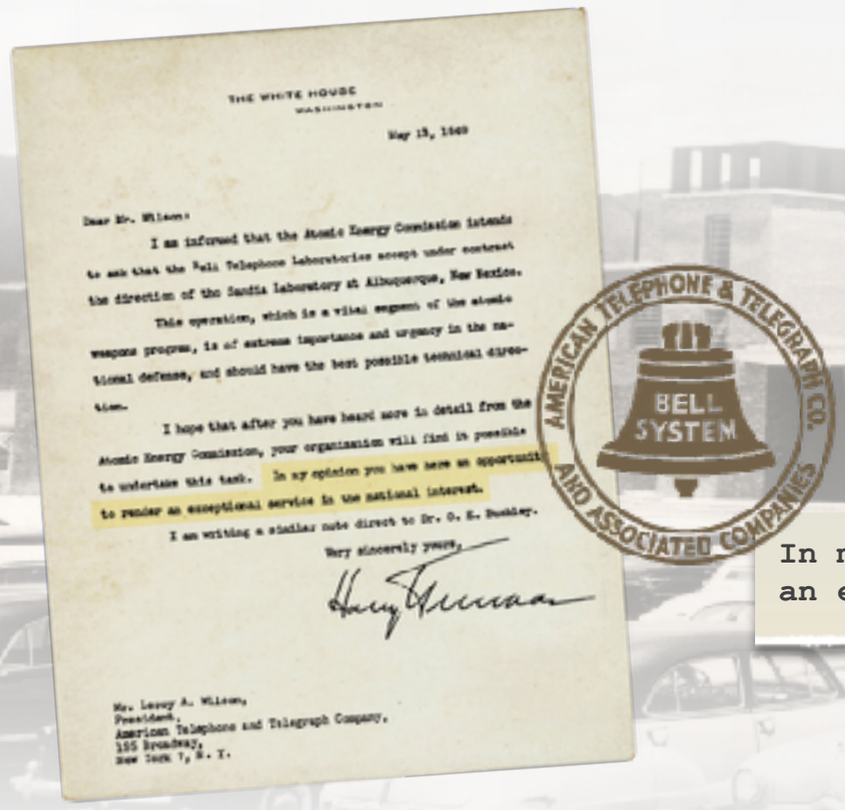
Kauai, Hawaii

Waste Isolation Pilot Plant, Carlsbad, New Mexico

Pantex Plant, Amarillo, Texas

Tonopah, Nevada

Sandia: An FFRDC for nearly seven decades



THE WHITE HOUSE
WASHINGTON

May 13, 1949

Dear Mr. Wilson:

I am informed that the Atomic Energy Commission intends to ask that the Bell Telephone Laboratories accept under contract the direction of the Sandia Laboratory at Albuquerque, New Mexico.

This operation, which is a vital segment of the atomic weapons program, is of extreme importance and urgency in the national defense, and should have the best possible technical direction.

I hope that after you have heard more in detail from the Atomic Energy Commission, your organization will find it possible to undertake this task. In my opinion you have here an opportunity to render an exceptional service in the national interest.

I am writing a similar note direct to Dr. O. E. Buckley.

Very sincerely yours,

Harry Truman

Mr. Leroy A. Wilson,
President,
American Telephone and Telegraph Company,
195 Broadway,
New York 7, N. Y.

AMERICAN TELEPHONE & TELEGRAPH CO.
BELL SYSTEM
AND ASSOCIATED COMPANIES

In my opinion you have here an opportunity to render an exceptional service in the national interest.

JULY 1945
Los Alamos creates Z Division at Sandia Base

NOVEMBER 1, 1949
Sandia Laboratory is established and managed by AT&T

MARCH 8, 1956
Sandia's California site is established

JULY 26, 1993
Martin Marietta wins first Sandia Corporation contract competition and in 1995 merges with Lockheed to become Lockheed Martin

DECEMBER 16, 2016
The NNSA awards the Sandia prime contract to National Technology and Engineering Solutions of Sandia (NTESS), a subsidiary of Honeywell International

MAY 1, 2017
The new prime contract goes into effect

Sandia National Laboratories

Sandia is the largest national laboratory

BUDGET

$3.17 BILLION
FY17 BUDGET

51 PERCENT
NNSA WEAPONS

DEMOGRAPHICS

12,330 MEMBERS
OF THE WORKFORCE

49 PERCENT
TECHNICAL RESEARCH STAFF

ECONOMIC IMPACT

$1.3 BILLION
TOTAL SALARIES

$1.17 BILLION
TOTAL PROCUREMENT

FACILITIES

194 THOUSAND
TOTAL ACRES

7.6 MILLION SQ. FT.
BUILDINGS

38 YEARS
AVERAGE AGE OF FACILITIES

Sandia National Laboratories

Sandia has five major program portfolios

Sandia is about **51% nuclear weapons** and **49% other national security, science, and energy** programs

But what do I really do?

I help Sandia understand what is happening in and important to Washington

I help Washington understand the capabilities and products of Sandia

I help *amplify Sandia's national security impact*

What can you do?

Get involved

What can you do?

Join me!

Policy is an exciting field