An Introduction to U.S. Science and Technology Policy

Talk presented
by
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Association of American Universities

AAAS Leadership Seminar in Science and Technology Policy
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Otto von Bismarck

Chancellor of Germany from 1871-1890

"There are two things you don't want to see being made—sausage and legislation."

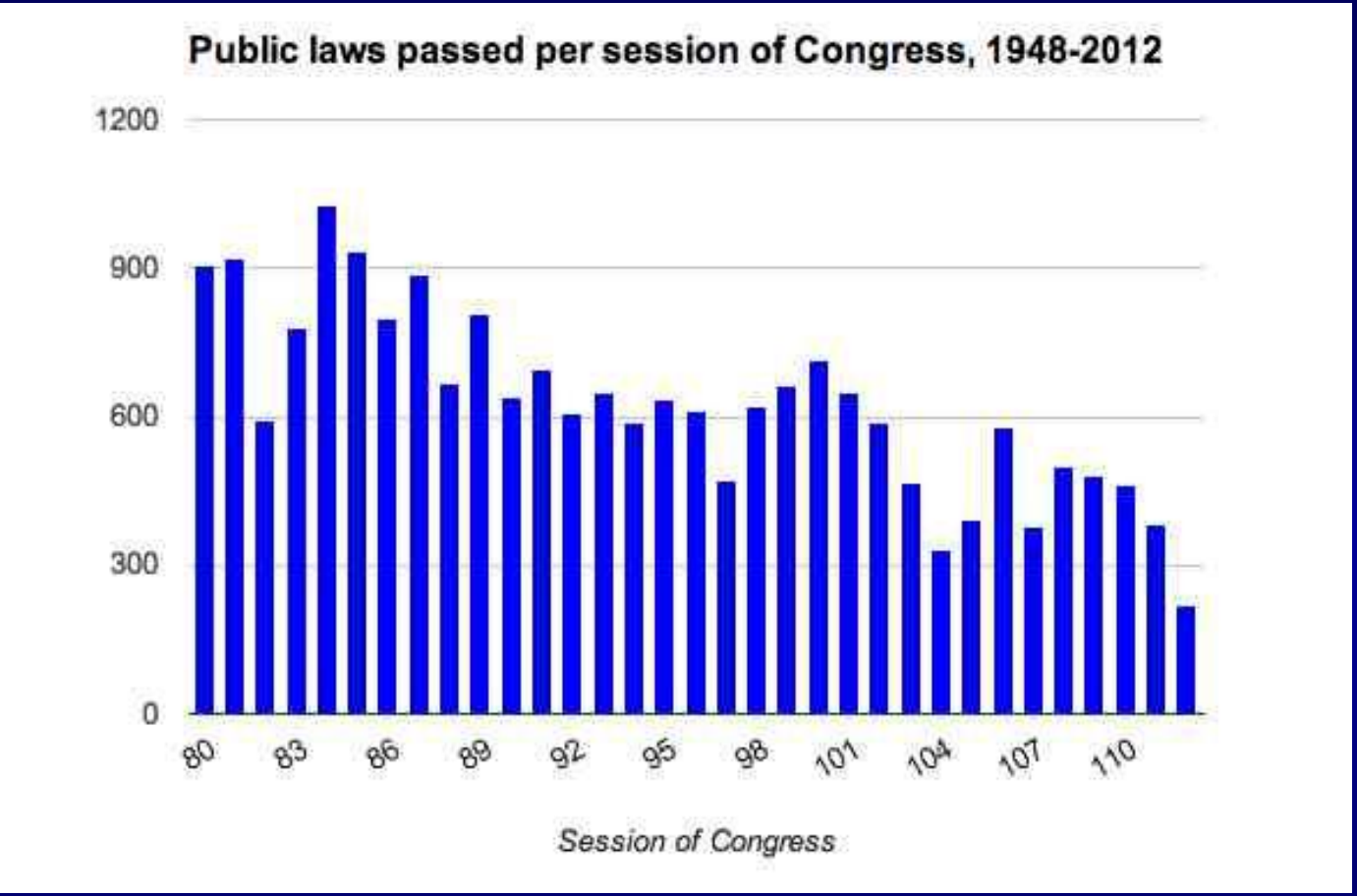
--German Chancellor Otto von Bismarck

Welcome to Washington!

"In a real sausage plant, everybody is on the same team, trying to produce bratwurst or knockwurst. In the legislative sausage factory, at least half the people don't want to make sausage. Or they want to make a different kind. For the last few years, Republicans have said, 'We won't make sausage unless we control the recipe.' "

--Alan Rosenthal, Professor of Public Policy , Rutgers University
New York Times, "If Only Laws Were Like Sausages," December 4, 2010

Legislative Productivity

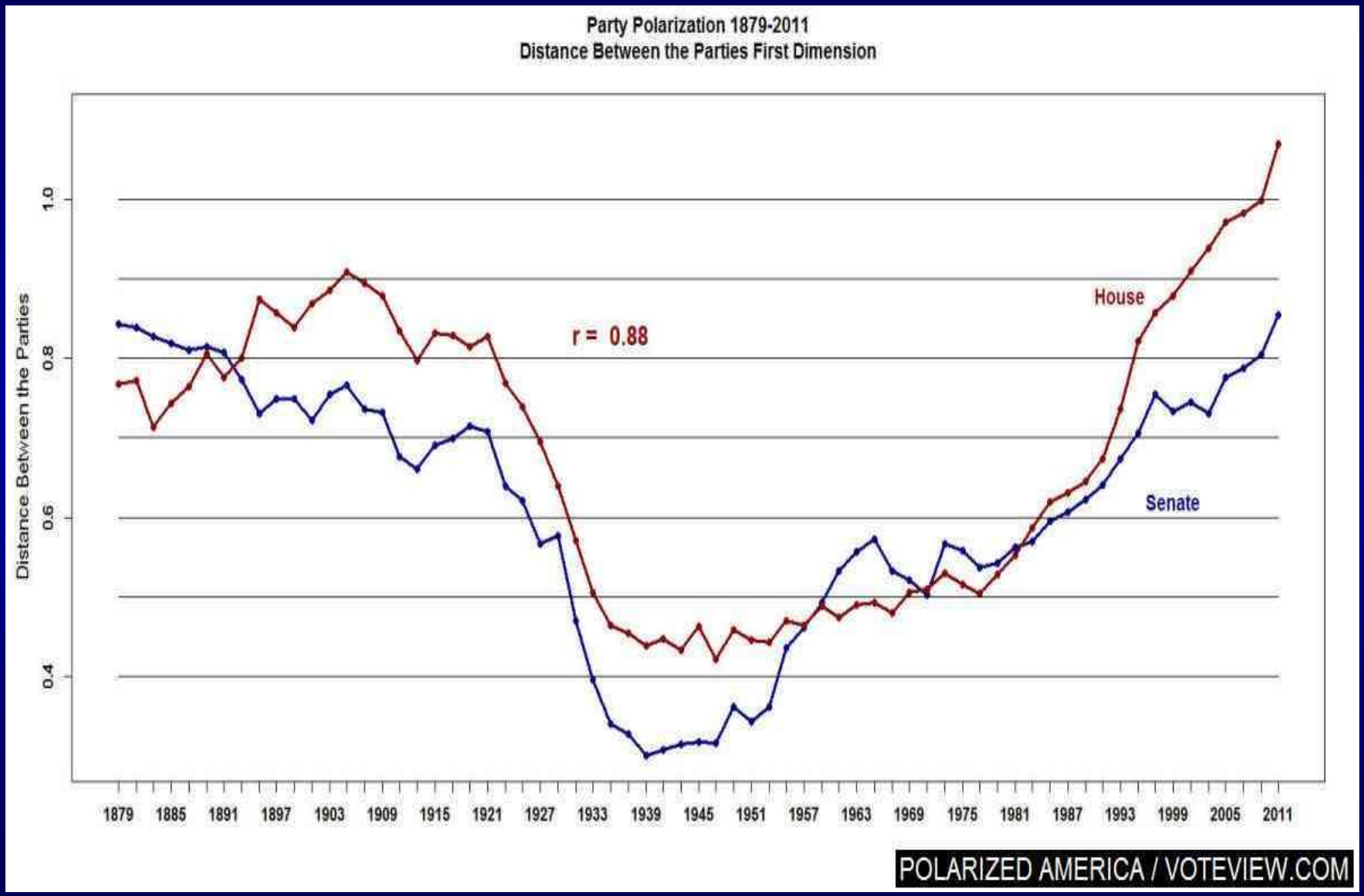


--112th Congress (2011-2012): 283 Public Laws

-- 80th Congress (1947-1948) 900 Public Laws

--113th Congress (as of Sept. 1st) 164 Public Laws

Party Polarization: 1879 - 2011



Overview

- What is science policy? How does it differ from science *for* policy?
- What are the historical origins of U.S. science and technology policy? Why is science policy difficult to understand?
- What is the current context in which policy for science is being made?
- Why does it matters?

About AAU

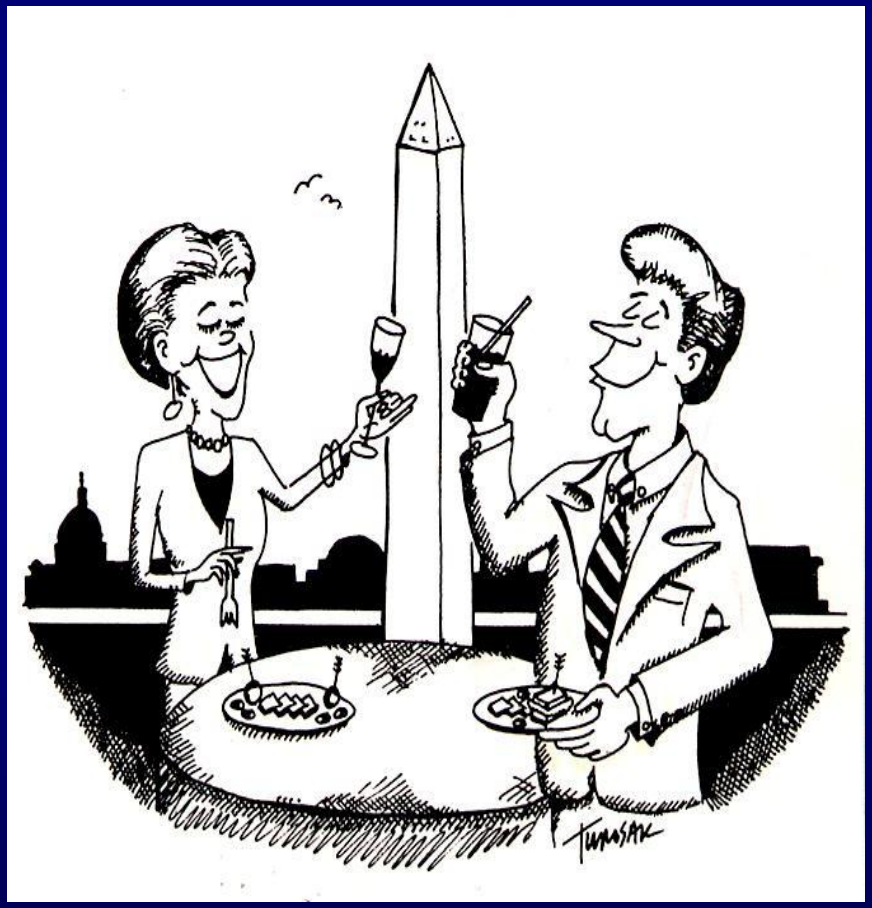
- Founded in 1900
- Composed of 60 leading U.S. & two Canadian research universities
- Voting members are the Presidents and Chancellors
- Membership by invitation only
- Focus on on:
  - Research Funding
  - Science Policy Issues
  - Education

About Me

- Vice President for Policy at the AAU
- Research Funding and Science Policy Issues
  - Focus on innovation, competiveness and energy issues
  - Advocacy, lobbying and coalition building
  - Federal regulations and compliance
  - Proactively shape government and university policy
  - e.g. Undergraduate STEM Education Initiative
- "Cross cultural communications"

  The business of making the work of scientists and engineers relevant to the "layperson"

Two Cultures: Politicians & Scientists



"I double majored in history and English and then went to Harvard law. How about you?"

What is "Science Policy"

- *"National science policy" refers to the set of federal rules, regulations, methods, practices, and guidelines under which scientific research is conducted.*

- *It also refers to the dynamic, complex, and interactive processes and procedures—both inside and outside government—that influence and affect how these rules, regulations, methods, practices, and guidelines are devised and implemented.*

-- ***Beyond* Sputnik: *National Science Policy in the 21st Century***
Neal, Smith, McCormick, University of Michigan Press (2008)

Science Policy vs. Science for Policy?

- "Policy for Science" – decision making about how to fund or structure the systematic pursuit of knowledge
- "Science for Policy" – the use of knowledge to assist or improve decision making
- Grey area in between policy for science and science for policy
- Constant interaction between the two, e.g. climate change and climate change research
- What happens when policy makers don't like what science tells them?
- How does politics come into play?

Science and Science Policy: The Differences

- ‘Science policy’ is very different from the conduct of science itself. While science is ideally value-free and objective, science policy is “concerned with the incentives and the environment for discovery and innovation; more mundanely, science policy deals with the effect of science and technology on society and considers how they can best serve the public. As such, it is highly visible, value-laden, and open to public debate.”*

- The subjective nature of science policy often makes it impossible to prove whether a specific policy is "right" or "wrong.“ Moreover, the evaluation of science policy outcomes is often driven by ideology as opposed to provable facts. This has led many in the scientific community to shy away from engagement in the policy process. Ironically, the scientific voice has thus been absent from debates over major policies affecting the scientific community and its work.

* Phillip A. Griffiths, "Science and the Public Interest," *The Bridge* 23, no. 3 (Fall 1993): 4.

The Role of Science in the Formation of Policy

- Science is an important input into policy formation. In a democratic system, however, it is only *one* input into the process. Many other factors such as economics, ethics, budgetary trade offs, and public opinion must and will be factored into final policy decisions.
- Science is rarely policy-prescriptive.
- While it is important to ensure that policymakers are informed by science, it is important to keep politics out of science.
- Science and the democratic policy-making process have been compared to "…Marriage partners who get along best when they respect each others differences."

A History Lesson in U.S. S&T Policy: Vannevar Bush & Harley Kilgore

Science - The Endless Frontier

"Science, by itself, provides no panacea for individual, social, and economic ills. It can be effective in the national welfare only as a member of the team, whether the conditions be peace or war. But without scientific progress no amount of achievement in other directions can insure our health, prosperity, and security as a nation in the modern world."

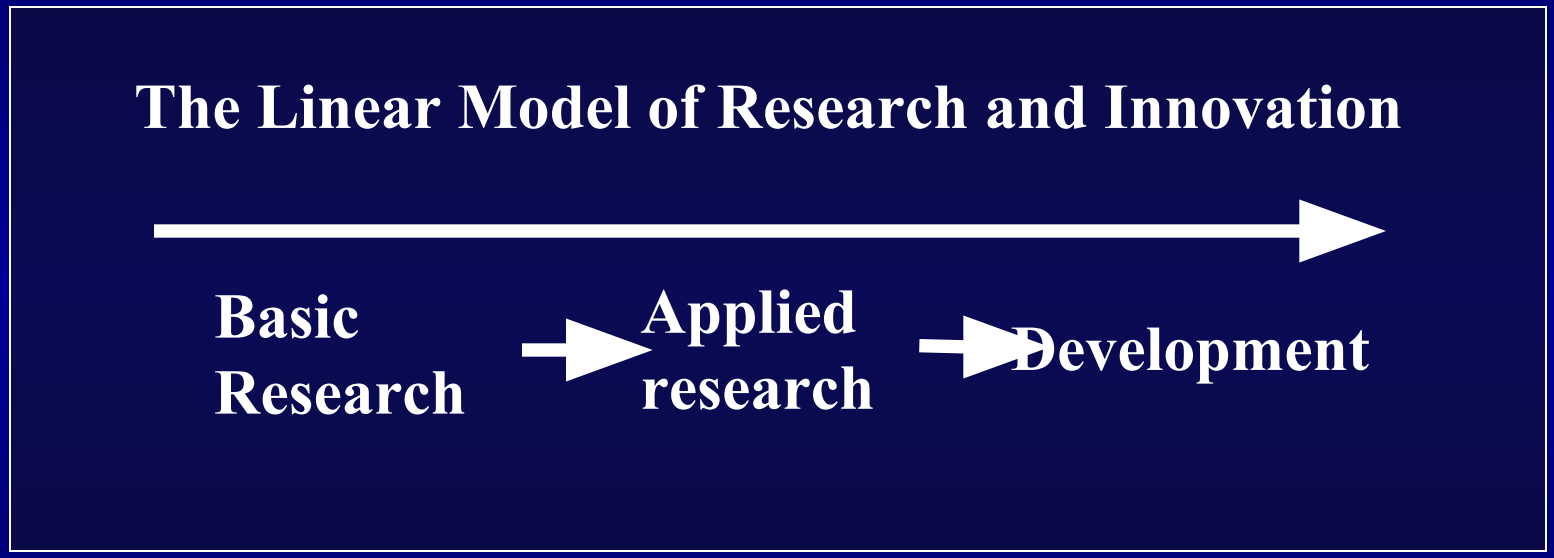
-- July 1945

Historical Considerations: The Bush-Kilgore Debate

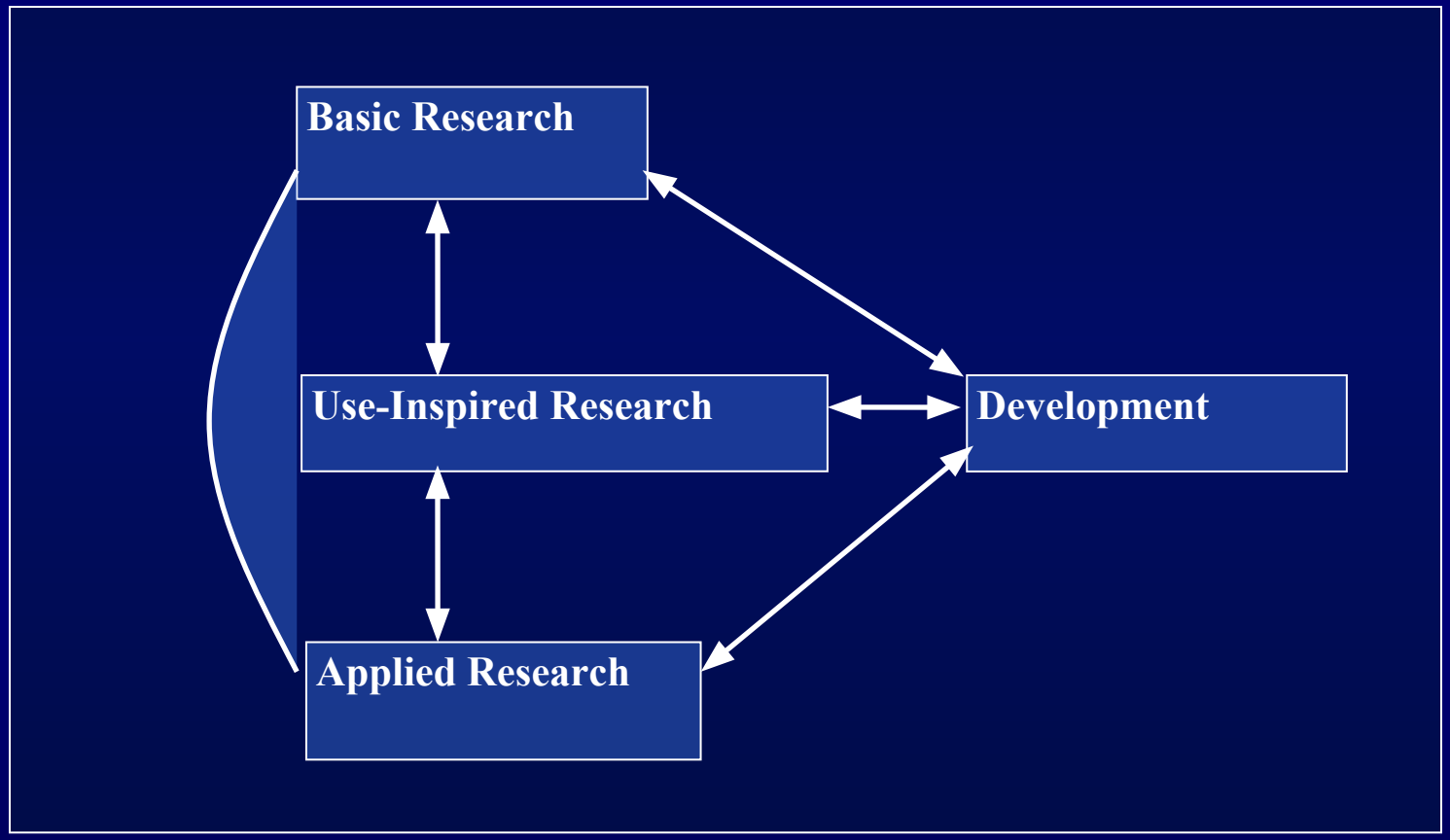
Issues in the Creation of the NSF

- Merit vs. Geographical Diversity
- Who Appoints the NSF Director
- Fundamental vs. Applied Research
- Who Owns the Intellectual Property
- Social Science Research

The Linear Model: Central to Post World War II U.S. Science Policy



A Dynamic and Parallel Model of Research and Innovation



Neal, Smith, McCormick, *Beyond Sputnik: National Science Policy in the 21st Century*, (Ann Arbor, Michigan; University of Michigan Press, 2008), figure 1.3.

The Policy Process is Complex and Counterintuitive

"The processes by which public policies are formed are exceedingly complex. Agenda-setting, the development of alternatives and choices among those alternatives seem to be governed by different forces. Each of them is complicated by itself, and the relations among them add more complications. These processes are dynamic, fluid, and loosely joined."

-- John Kingdon, *Agendas, Alternatives and Public Policies*

"Understanding the process by which a bill becomes a law requires no astrophysics. But understanding the system by which a bill becomes a law requires about the same amount of patience as the study of this technical science."

-- The Complete Idiot's Guide to American Government

Why is Science Policy Even More Difficult to Understand?

Pluralist in Nature…

Why is Science Policy Even More Difficult to Understand?

Pluralist in Nature

- Supported by Multiple Agencies
  12 Federal Departments & 18 Independent Agencies, Commissions and Boards
- Each with their Own Unique Cultures and Missions
- Overseen and Funded by Multiple Congressional Committees

Examples:

Human Subjects in Research; Energy/Environmental Research; International Science.

Oceanographic research

9 federal agencies and 47 Congressional committees and subcommittees have oversight according to Adm. James Watkins.

Why is Science Policy Even More Difficult to Understand?

Made at Multiple Levels…

Levels at Which Science Policy is Made

- **Presidential Level** (Highly Political/Visible)
  - Stem cells, Space Station, Mar Mission, War on Cancer, American Competitiveness Initiative, Obama Innovation Agenda, Key Budget Decisions
- **Congress; OSTP and OMB with Federal Agencies**
  - Most laws including major budget decisions and Congressional appropriations; Regulations; Agency coordination
- **Agency Level** - Establishment of Agency Policies
  - Distribution of research funding
  - COI; Scientific Misconduct; Interpretation of OMB Requirements
- **Individual Level** - Policy Interpretation
  - Export Controls; Visa decisions; Grant award decisions

Why is Science Policy Even More Difficult to Understand?

…Through All Sorts of Mechanisms

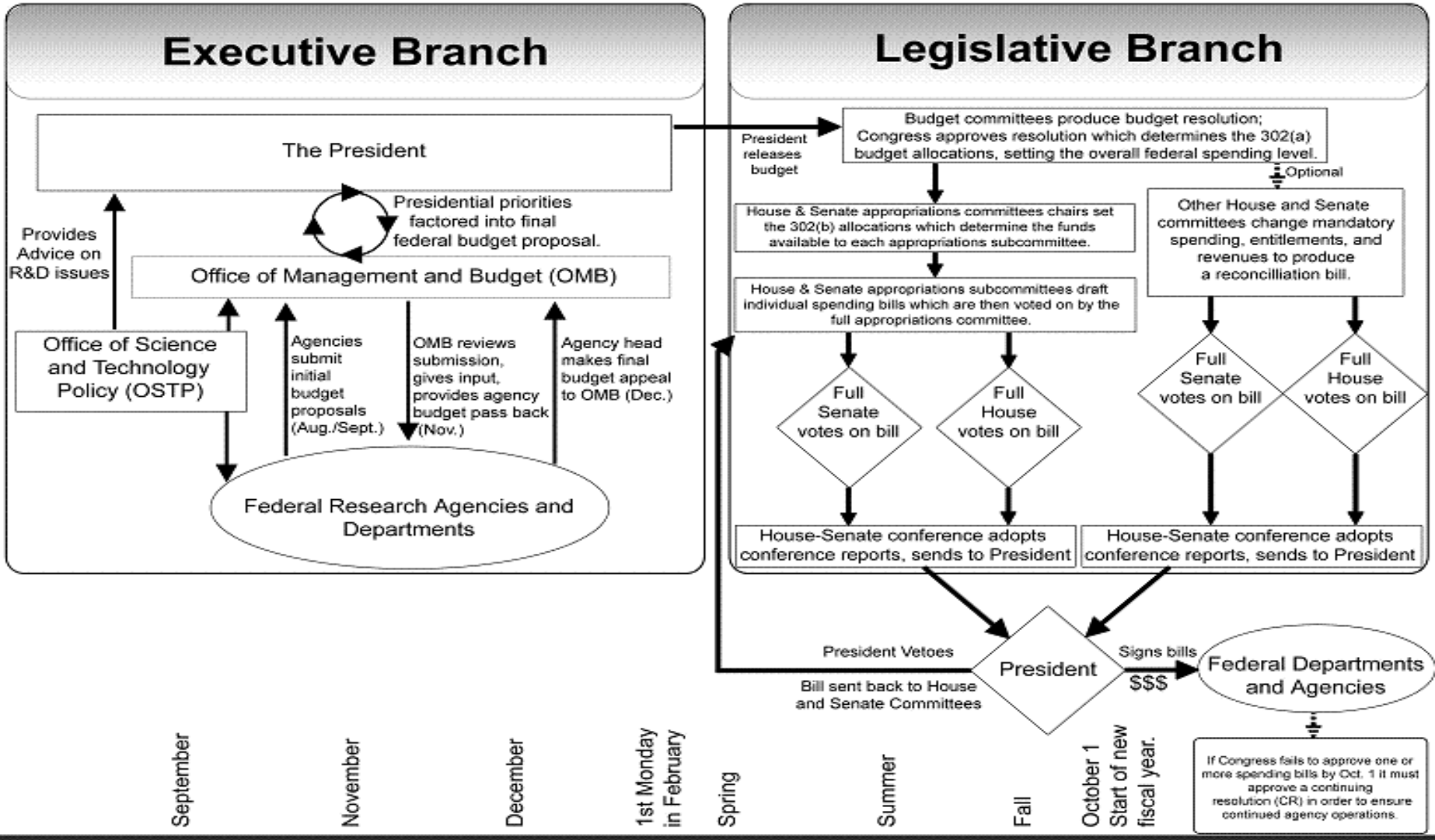
Multiple Mechanisms Used in Making Science Policy

TABLE 4.1 Mechanisms That Determine Science Policy

Office	Mechanisms					
President	Executive directives	Appointments	The budget	Veto authority	Agency coordination	Treaties
Executive branch offices	OMB circulars	Interagency memos				
Agencies	Agency policy	Interpretation of laws	The budget	Rule-making	Implementation	
Congress	Laws, bills, and committee report language	Creating new government entities	The budget/ appropriations bills	Oversight	Senate approval of presidential appointments	
Judiciary	Interpreting laws	Determining constitutionality				

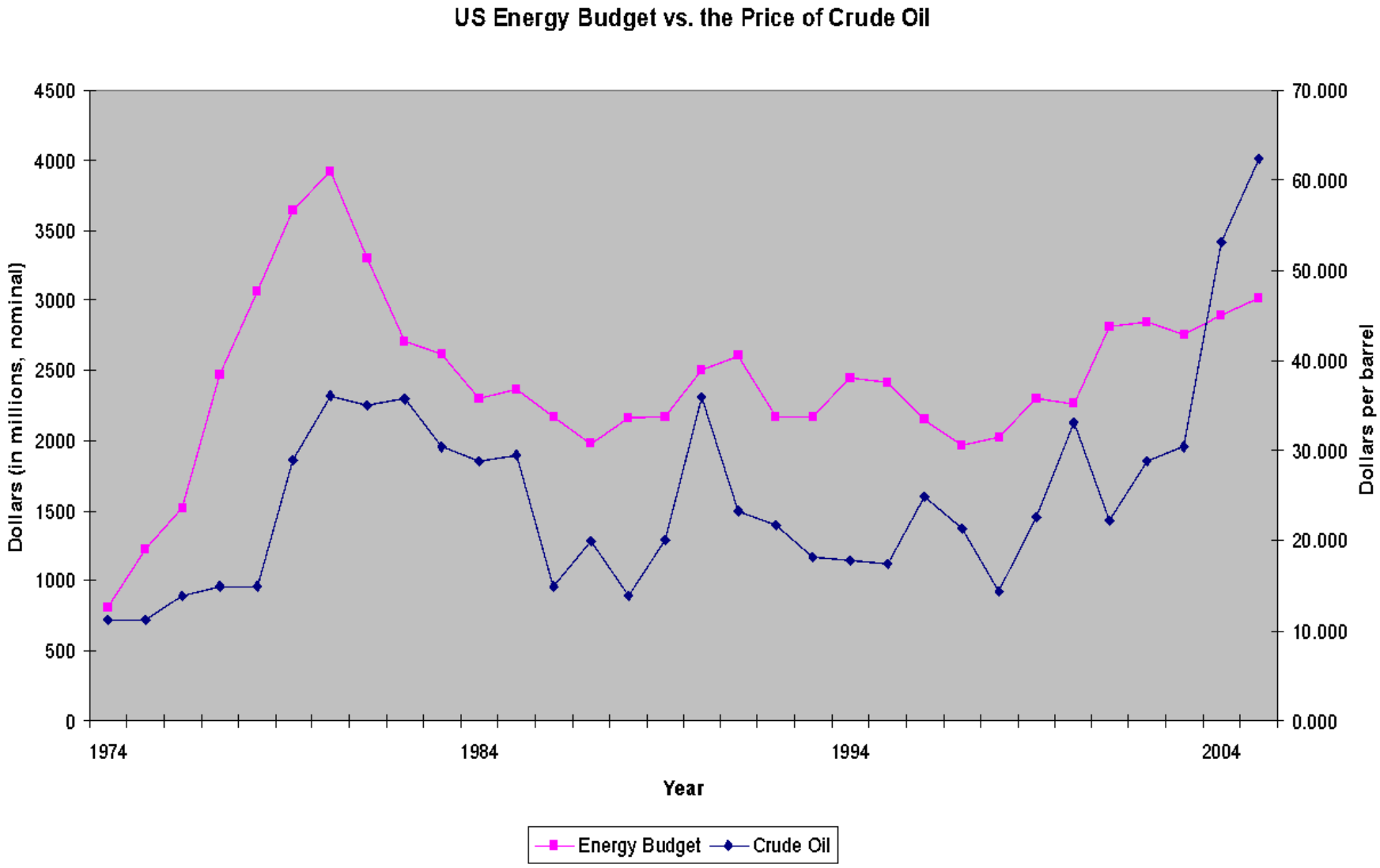
-- *Beyond* Sputnik: *National Science Policy in the 21st Century*, Neal, Smith, McCormick, University of Michigan Press (2008)

The Federal Budget Process



-- *Beyond* Sputnik: *National Science Policy in the 21st Century*, Neal, Smith, McCormick, University of Michigan Press (2008)
Prepared by Brad Nolen

U.S. Energy R&D Spending vs. Price of Crude Oil

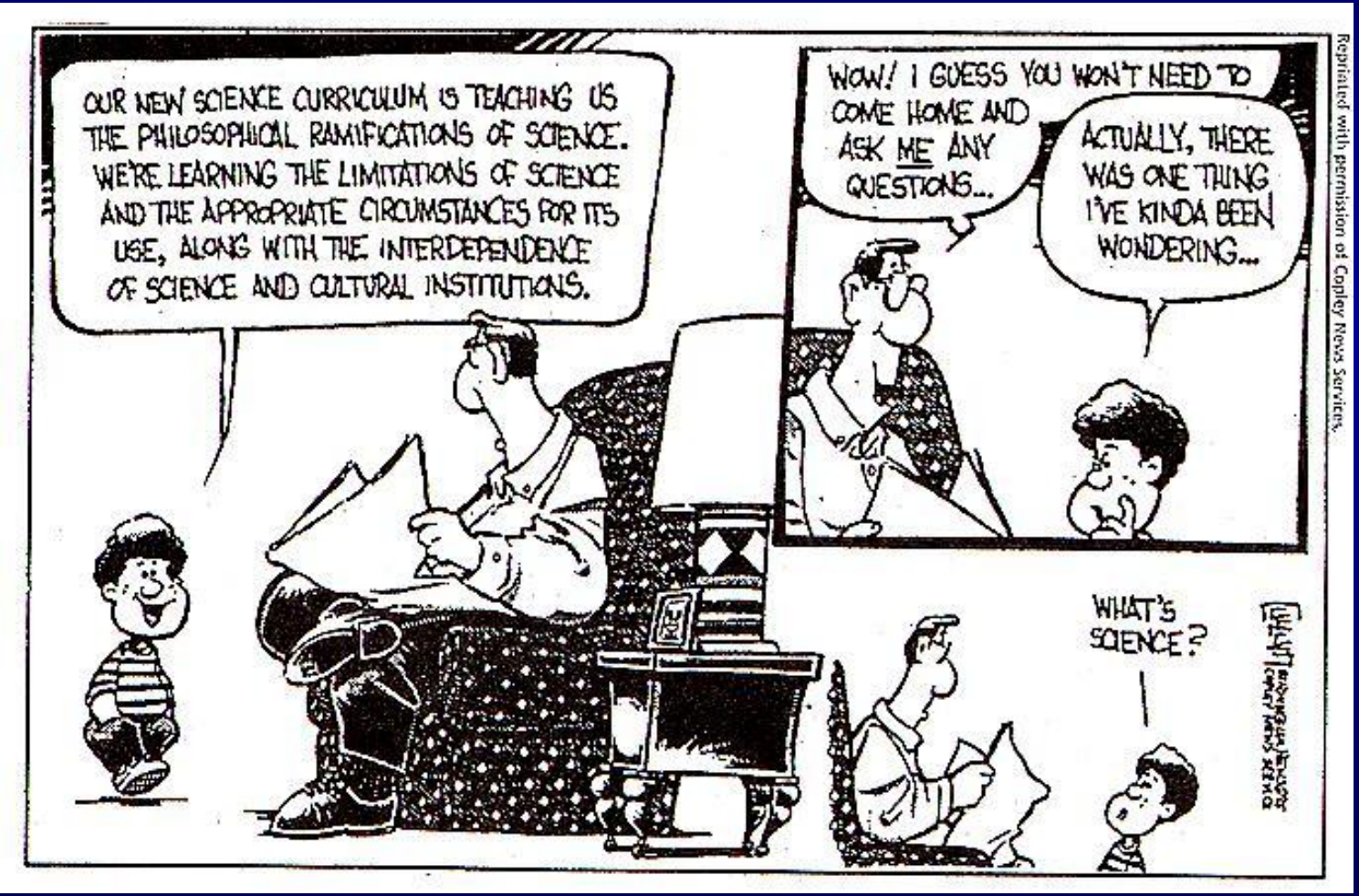


The Federal Regulatory Process

- Federal regulations impact the conduct of science as much or more than the laws Congress enacts
- According to ACE, higher education is the only industry regulated by every federal agency

Why do we need more people with science and engineering backgrounds to engage in the policy?

Many Policymakers Do Not Understand Science



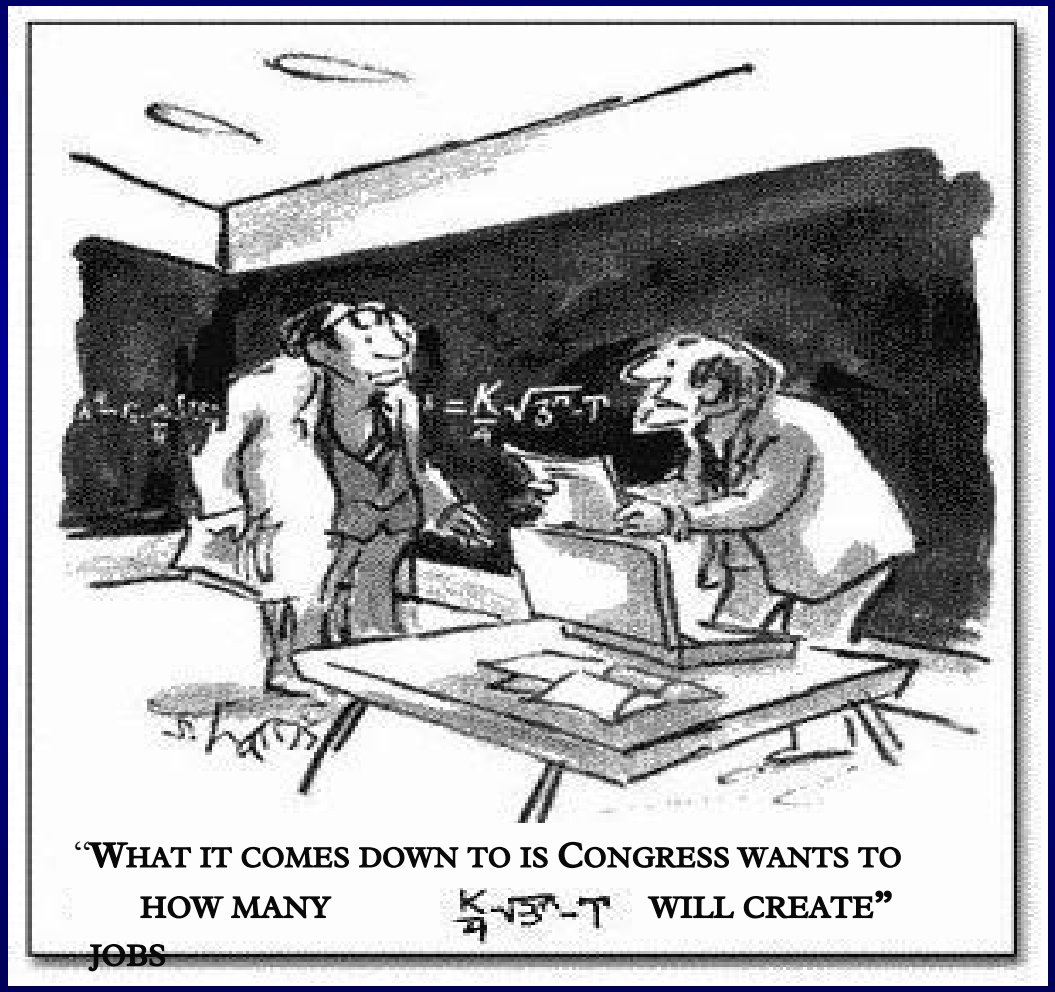
Congressional Profile

- 113th Congress: "One of the most inexperienced in history" *USA Today* (almost 100 new members of Congress)
- 2 in 5 House members (39%) have served for less than 3 years
- The Senate has seen a 43% turnover rate since 2008
- In 1992, 103 members were elected from swing districts versus 35 in 2012
- 114th Congress
  - Over 70 new members of the House and Senate
  - House: 244 Republicans and 184 Democrats (7 seats TBD)
  - Senate: 53 Republicans and 46 Democrats (1 seat TBD)

Few Members Congress come from Science & Engineering Backgrounds

- Less than 5 percent have any background in science or engineering
- According to CRS, there are 2 physicists (soon to be only 1) and 1 microbiologist in the 113th Congress
- 6 members have engineering degrees and 25 have medical degrees
- 226 have law degrees
- 22 members have no educational degree beyond a high school diploma while only 20 have doctoral degrees in any subject

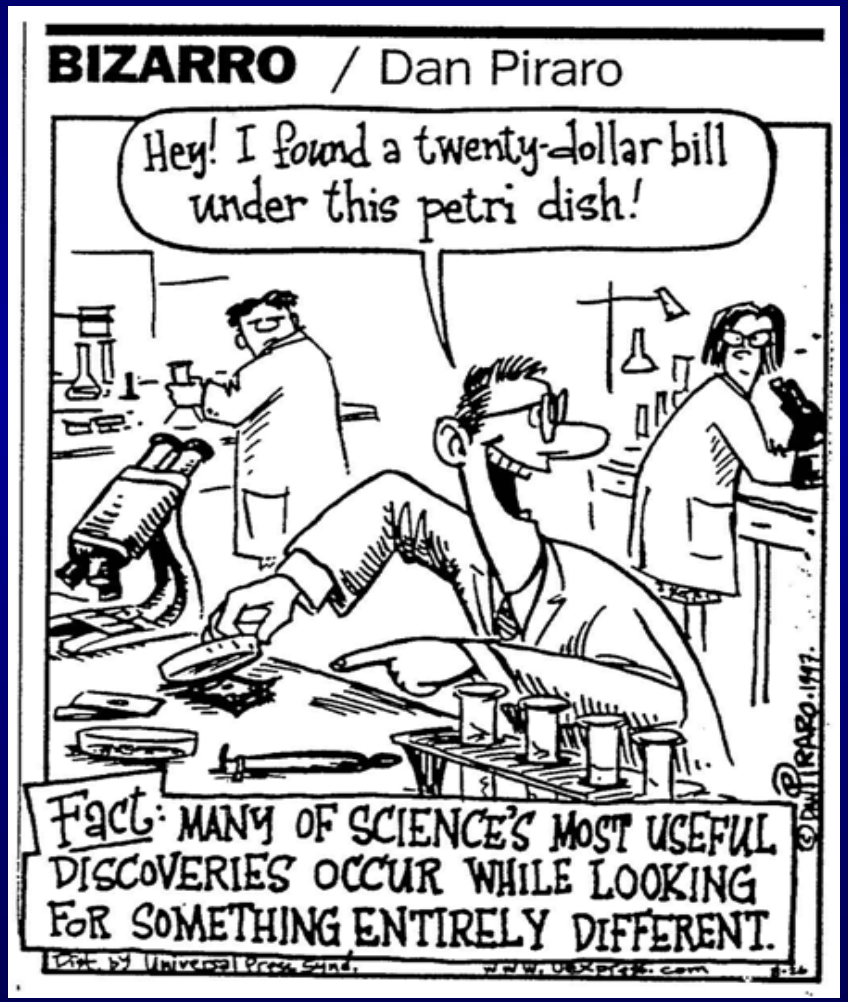
Many Members of Congress View Science as a "Means to and End"



By Cartoonist Sidney Harris
American Scientist

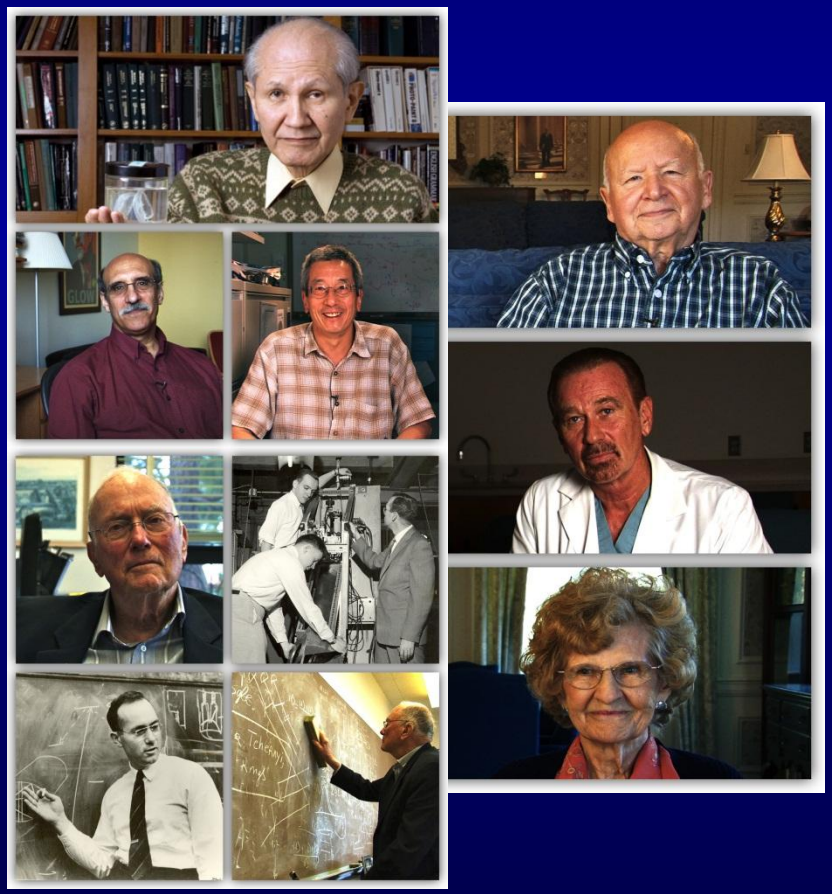
Why Science has a Difficult Time Delivering what Policymakers Want

- Cannot predict the outcomes of science
- Value is often not immediately known
- Investment in science creates jobs in the long-term, but not many in the short-term

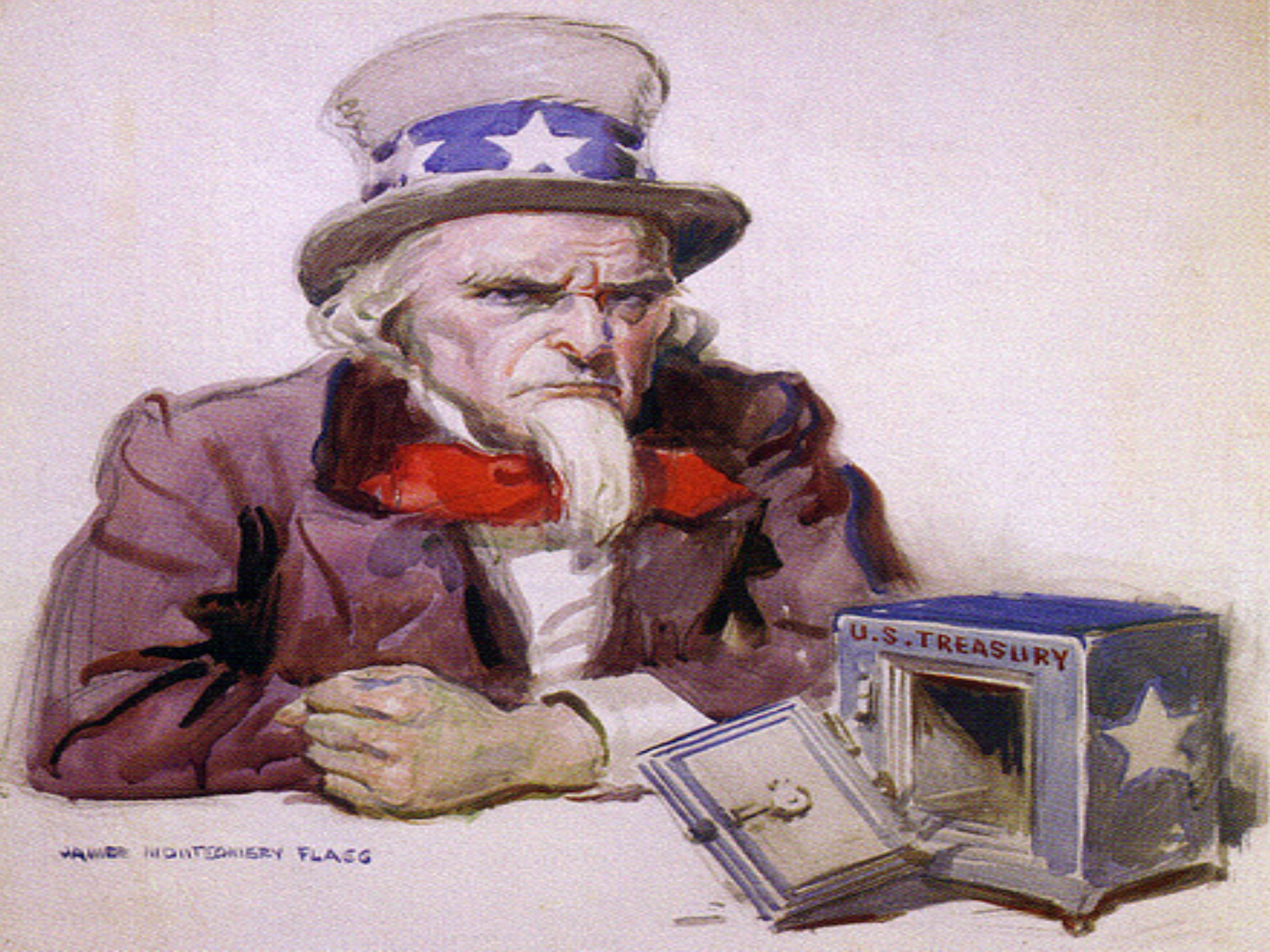


http://www.aau.edu/research/smartphone.aspx

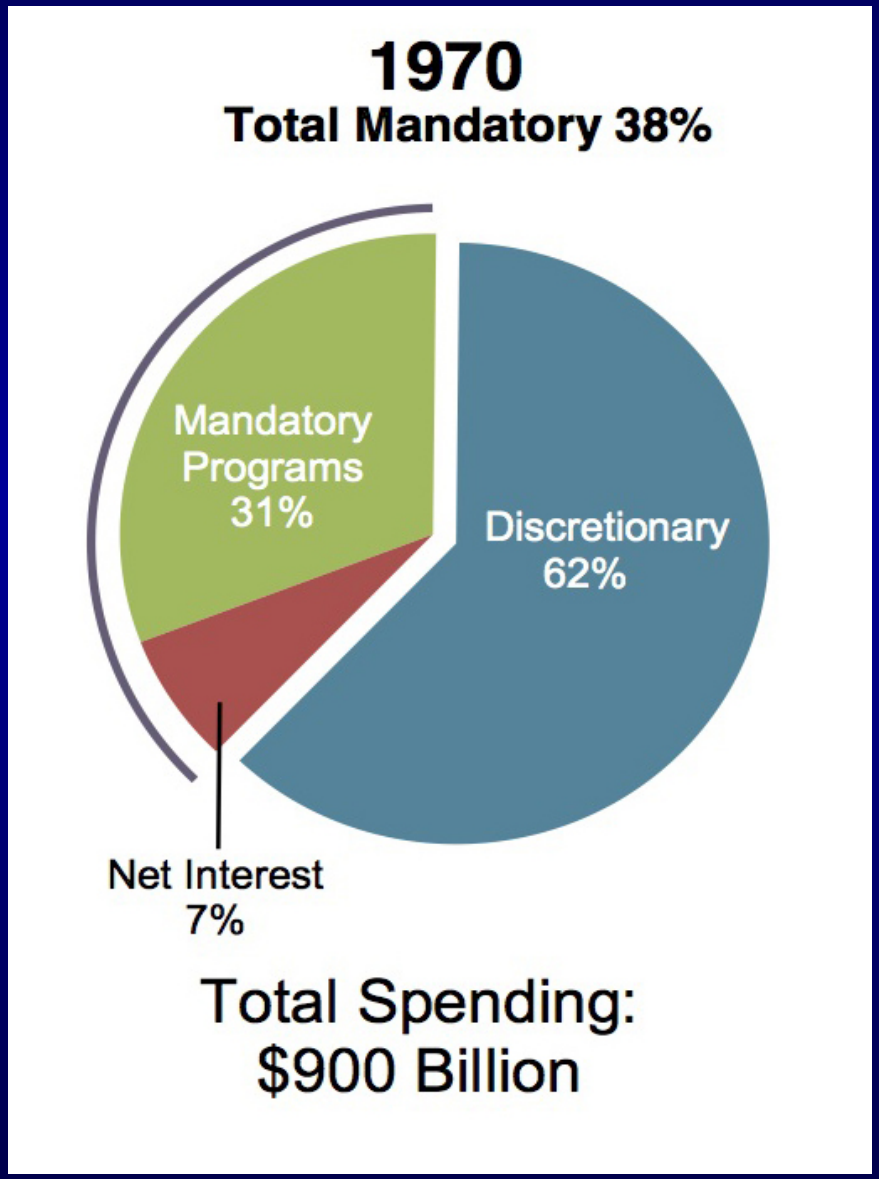
THE GOLDEN GOOSE AWARD

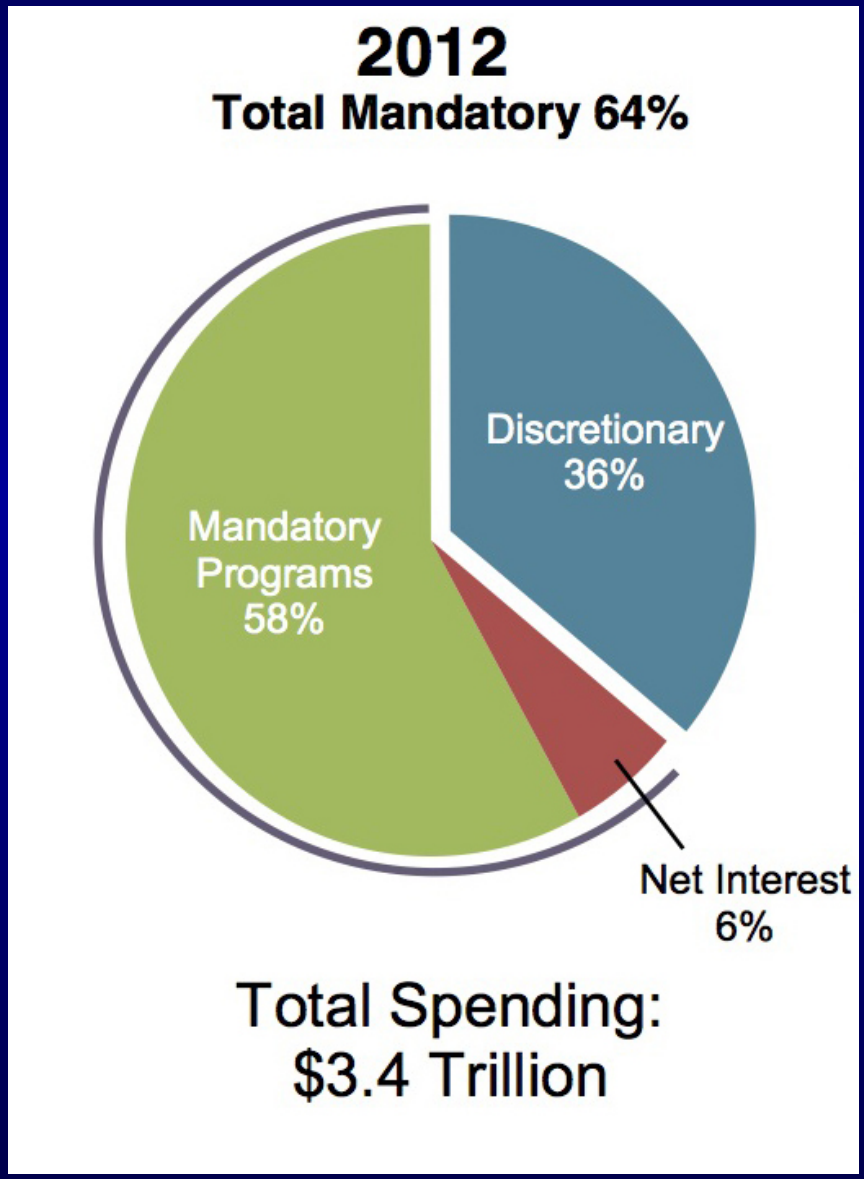



THE
BIG PICTURE

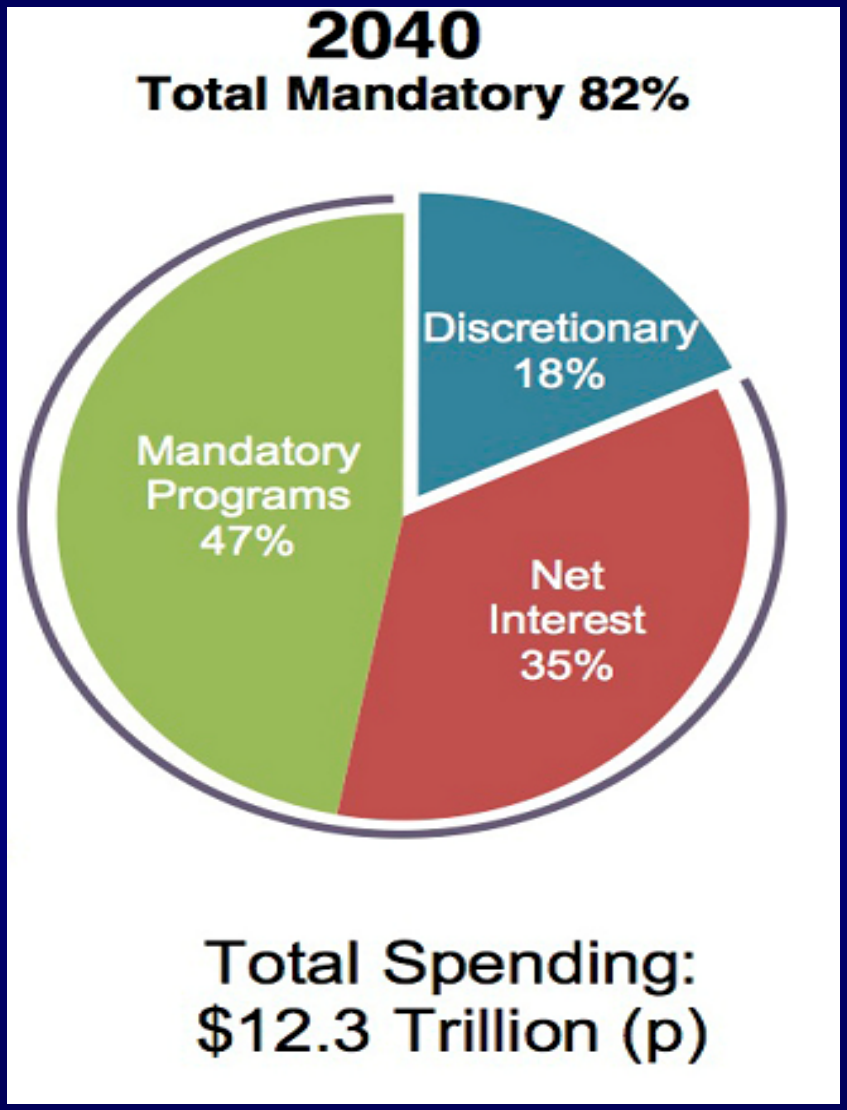

U.S. TREASURY
JAMES MONTGOMERY FLAGG

Growth in Entitlements





Growth in Entitlements

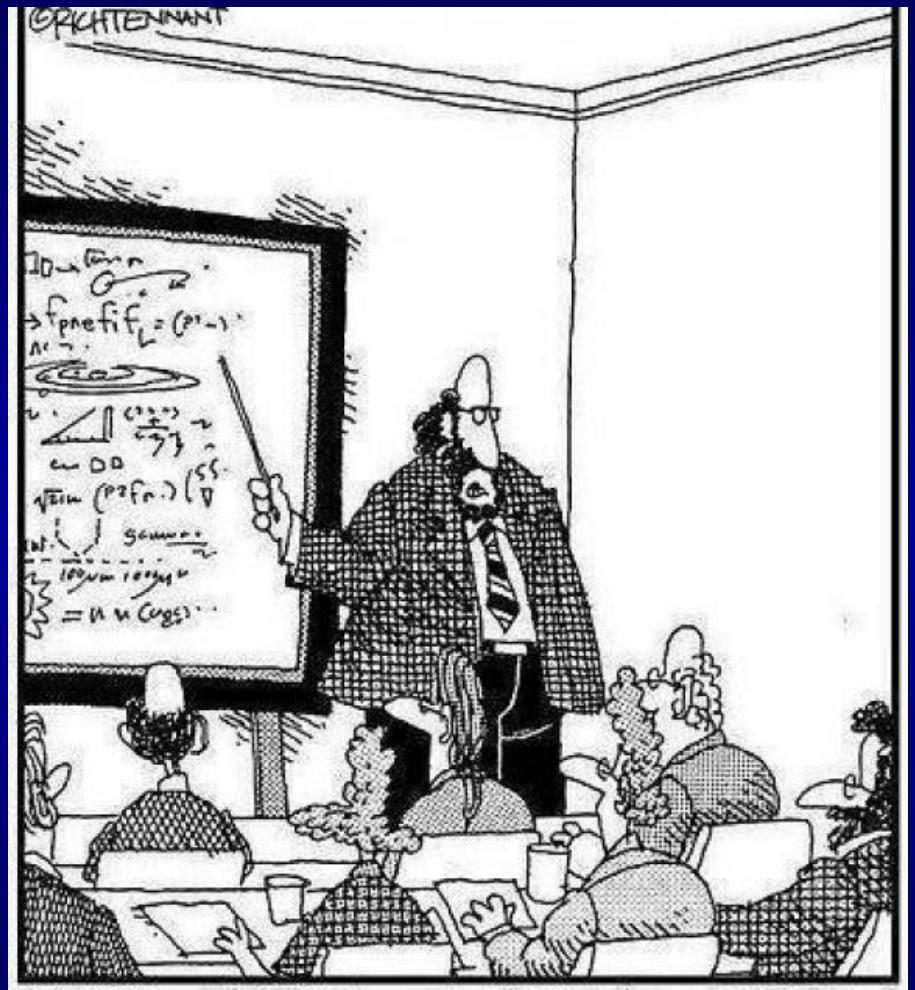


Source: Office of Management and Budget, Government Accountability Office, Congressional Budget Office data via the Peter G. Peterson Foundation.
Data Note: All figures are in constant 2009 dollars. Authors' calculations for 2012.
Produced by Jason Fichtner and Veronique de Rugy, Mercatus Center at George Mason University.

Sequestration and the Growing Innovation Deficit

http://www.innovationdeficit.org

Why Understanding Science Policy Matters!



Discussion and Q&A

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