Science and Technology Policy for Astronomers

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AAS Bahcall Public Policy Fellow
@AAS_Policy

Astro2020 Early Career Focus Session
October 8, 2018

1. **Framing:** Science Policy in general, and in astronomy
2. **How it works:** Federal (science) budget process
3. **Where we are:** Funding, legislation, and major issues in astronomy policy right now
4. **What you can do:** opportunities for astronomers to get (more) engaged in astronomy policy

Framing: Science Policy in general, and in astronomy

Science and Technology Policy: What is it?

Can have a continuous interaction between the two (e.g., climate science).

Policy *for* Science

Government and institutional policies, strategies, and resources that **impact the conduct and practice** of scientific research and the systematic pursuit of knowledge.

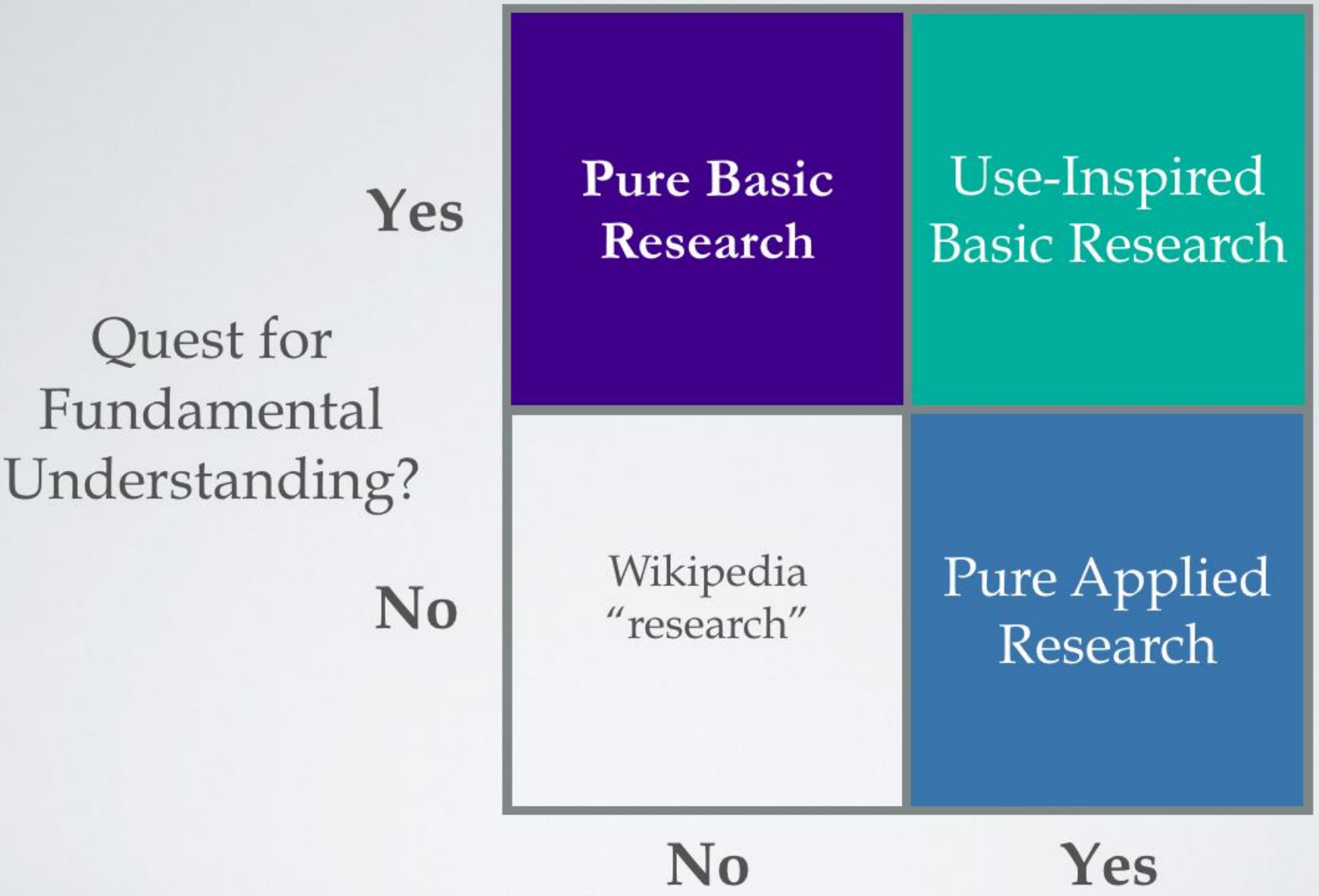
vs.

Science *for* Policy

Scientific methods, findings, and knowledge that **inform and enhance** the development and implementation of government and institutional policies, regulations, and programs.

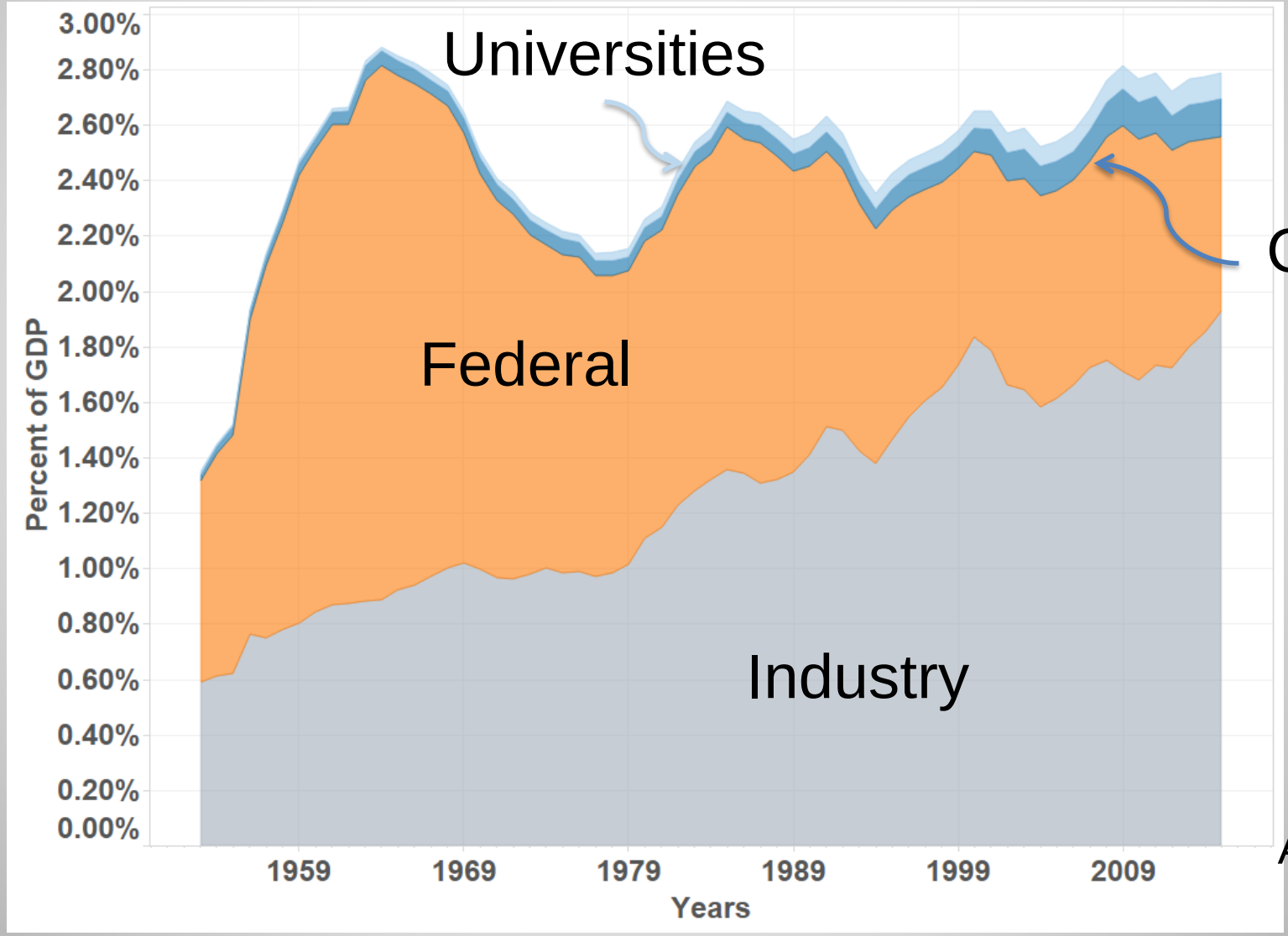
Astronomy mostly lives on this side…

…though space weather, planetary defense, planetary protection, SETI, etc. are stretching us further over here.



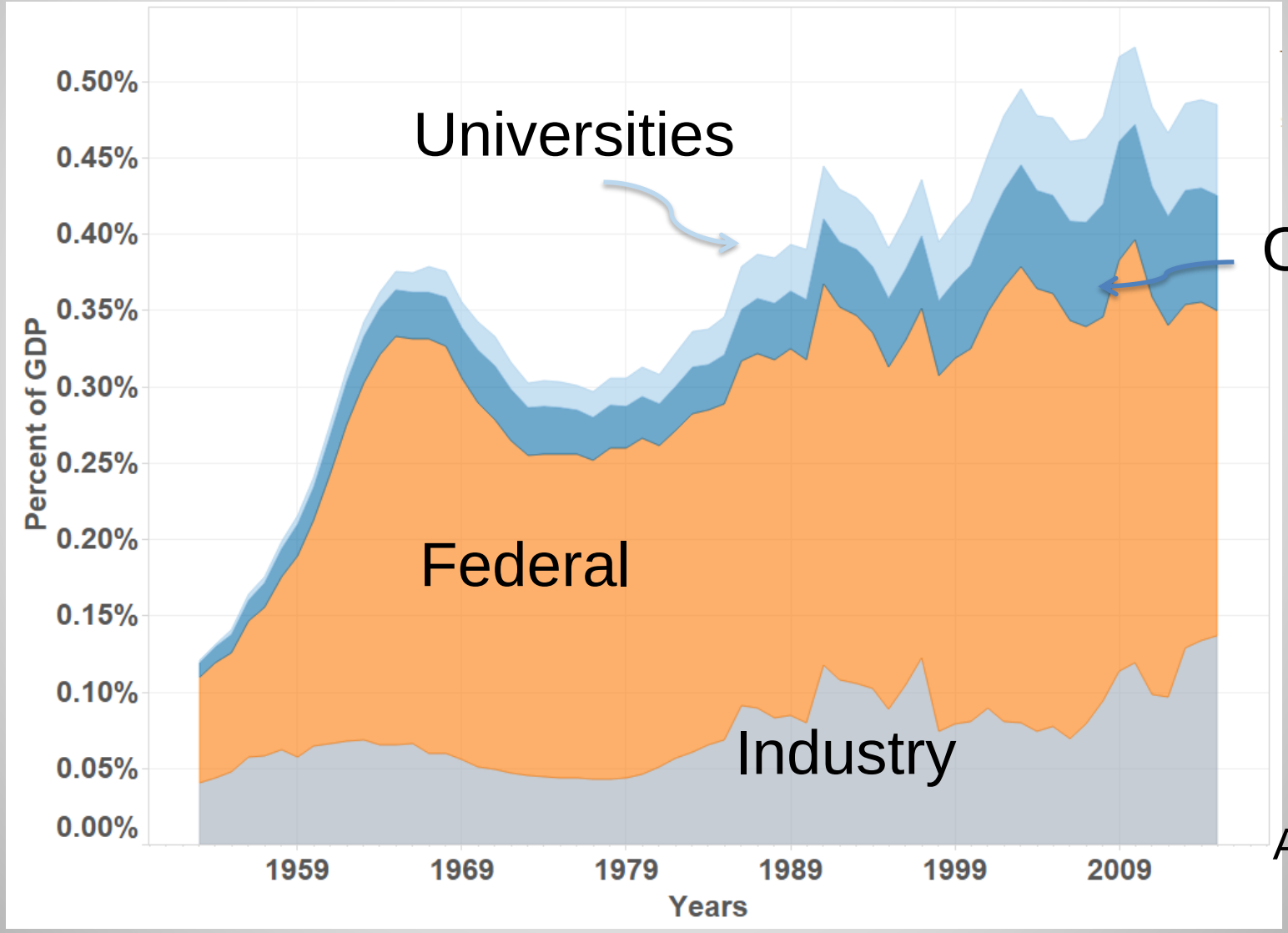
Adapted from "Pasteur's Quadrant"

All R&D Funding Sources in the U.S.

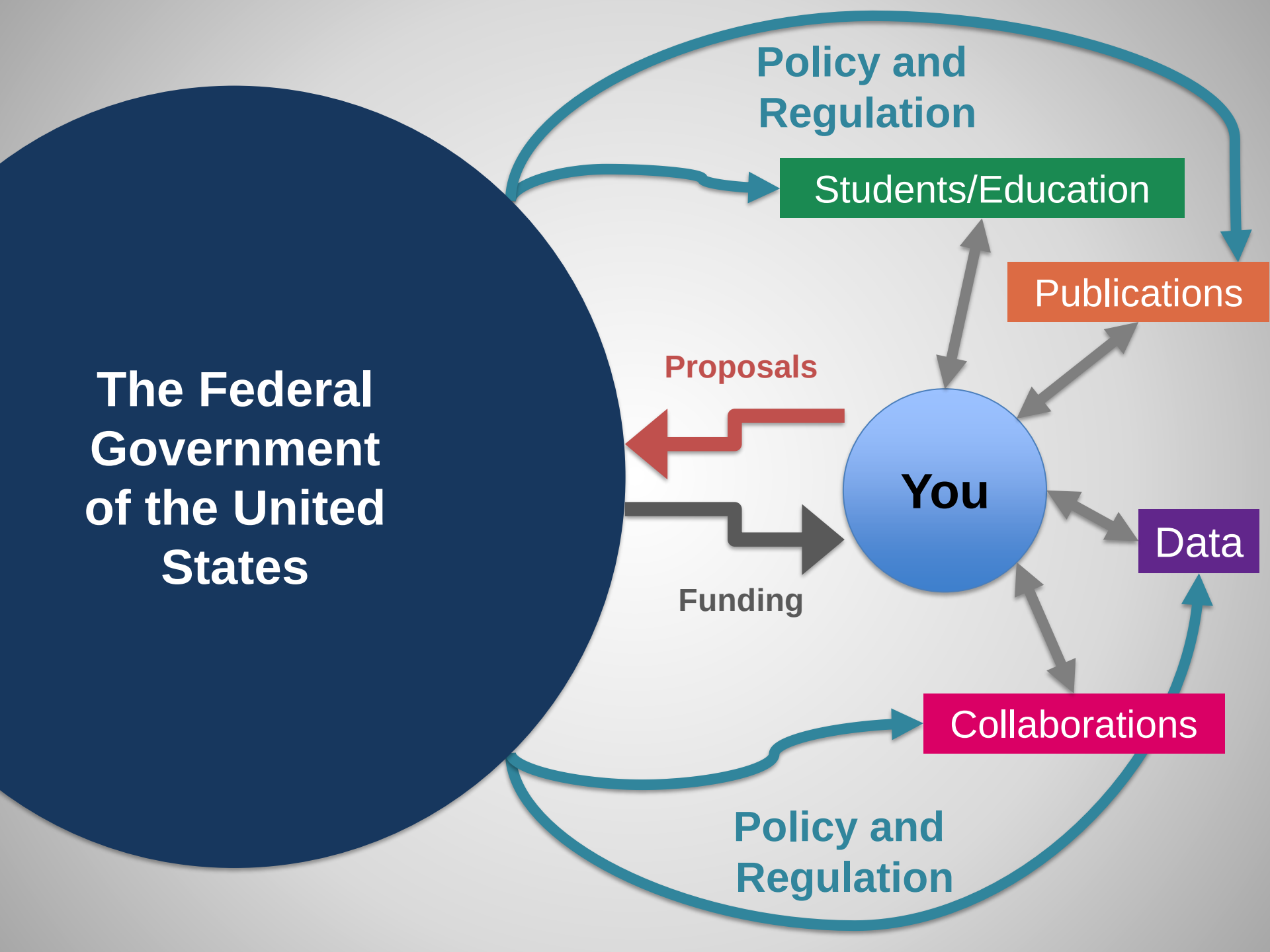


AAAS/NSF

Basic Research Funding Sources in the U.S.



AAAS/N
SF


The Federal Government of the United States
Policy and Regulation
Students/Education
Publications
Proposals
You
Data
Funding
Collaborations
Policy and Regulation

Federal Astronomy Policy Ecosystem

FUNDERS

Department of Energy > Office of Science > High Energy Physics Division > Cosmic Frontier Program

NASA > Science Mission Directorate > Astrophysics Division

NSF > Research and Related Activities > Mathematical and Physical Sciences Directorate (MPS) > Astrophysics Division (AST)

NSF > Major Research Equipment and Facilities Construction (MREFC)

Private Foundations (e.g., Carnegie, Simons, etc.)

CONGRESSIONAL OVERSIGHT

House of Representatives

Appropriations Subcommittees:
Commerce, Justice, and Science
Energy and Water

Authorization Committee:
Science, Space, and Technology

Senate

Appropriations Subcommittees:
Commerce, Justice, and Science
Energy and Water

Authorization Committees:
Commerce, Science, and Transportation
Energy and Natural Resources

OPERATORS

Industry (e.g., Lockheed Martin, Ball, Northrop Grumman)

Contractors/Managing Organizations (e.g., AURA, USRA, AUI)

Institutions (e.g., universities, NASA centers, private labs)

ADVISORS

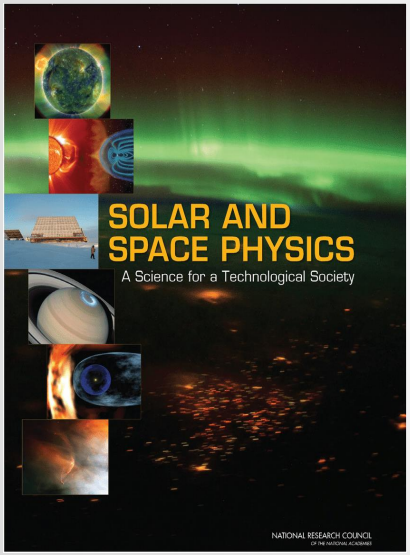
Agency Advisory Committees

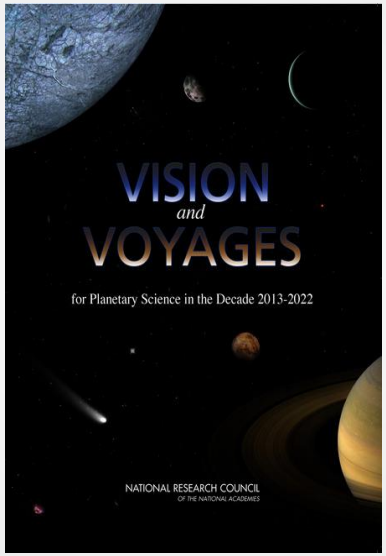
National Academies (e.g., SSB, BPA, CAA, CORF, ad hoc studies)

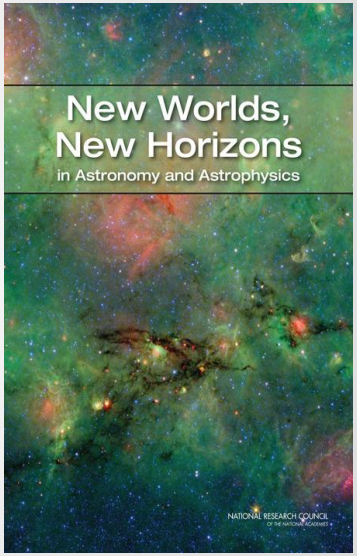
Scientific Societies (e.g., AAS)

Lobbyists (of operators)

Critical Inputs/Rulers







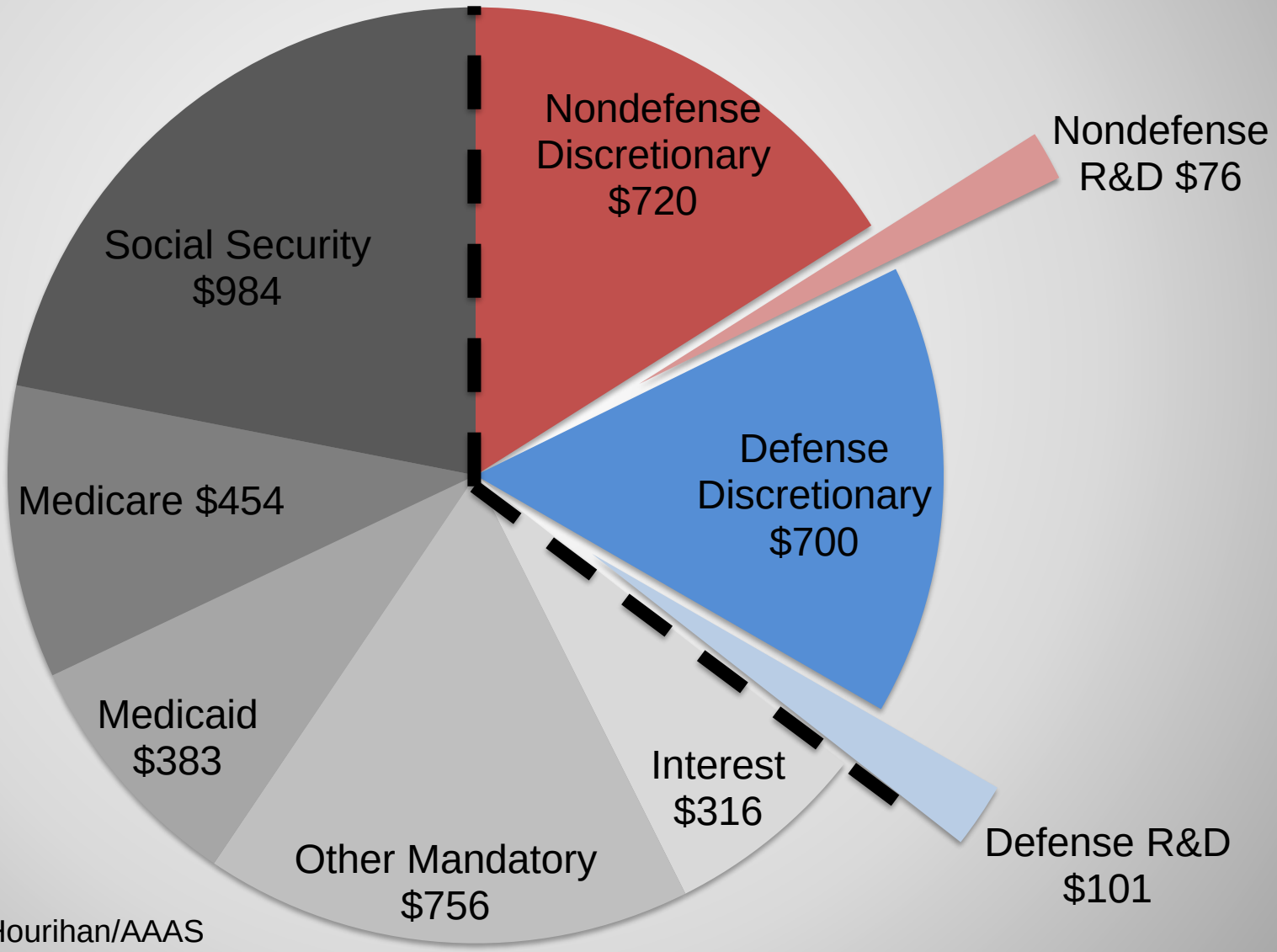
Community-based priority setting

How it works: Federal (science) budget process

With significant attribution to Matt Hourihan/AAAS

Federal Budget: FY 2018

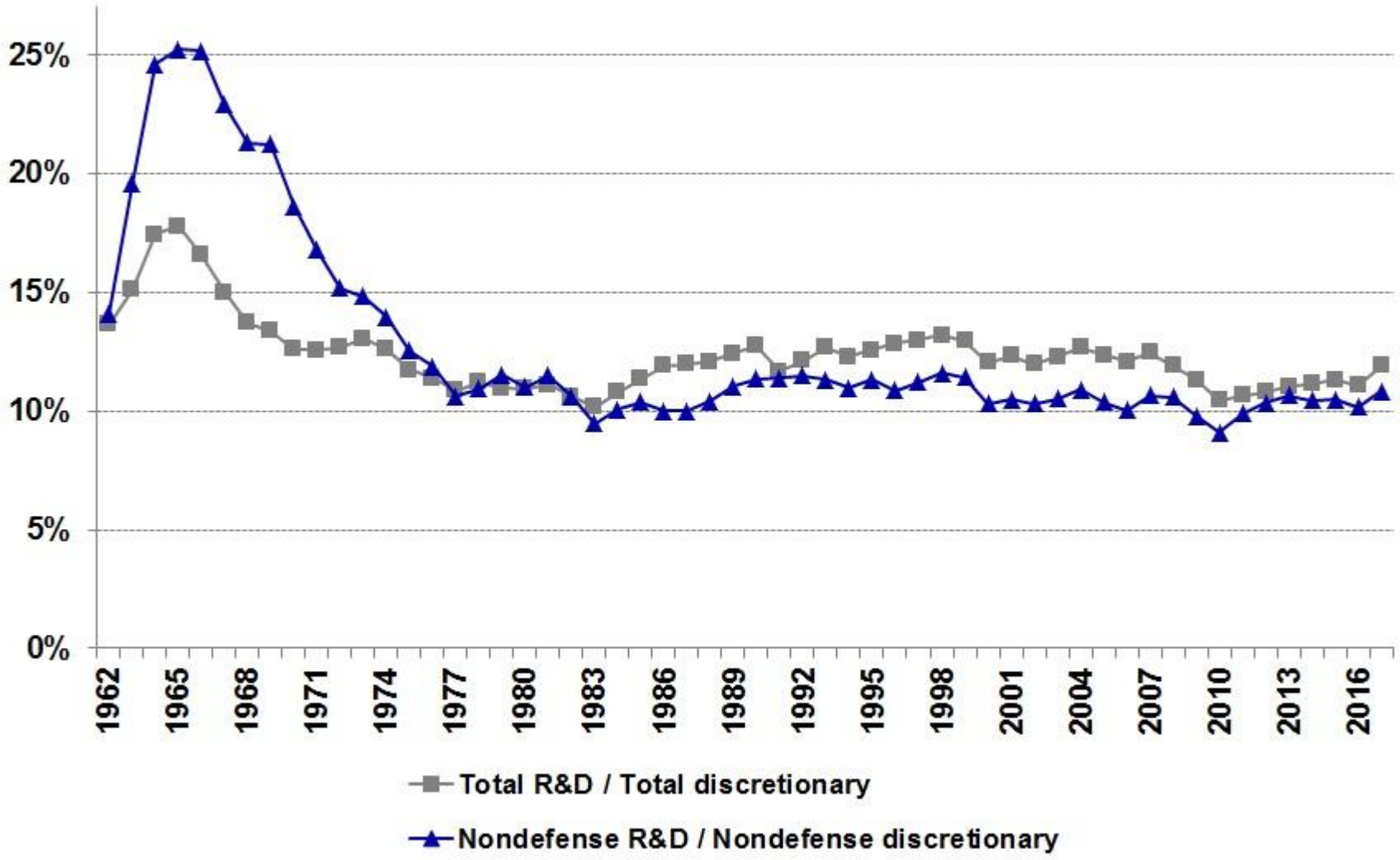
Total outlays: $4.4 trillion



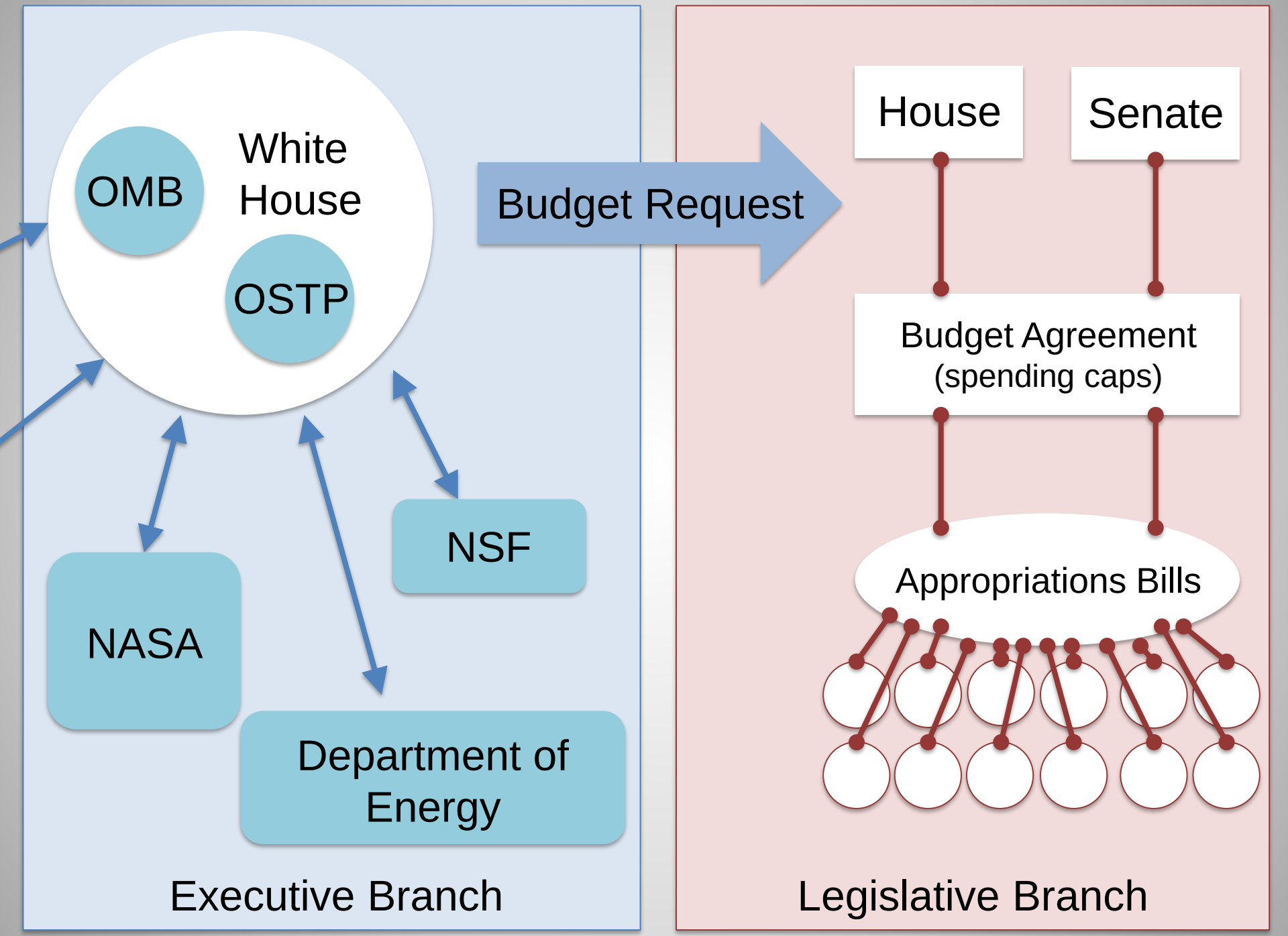
R&D Estimates: Matt Hourihan/AAAS

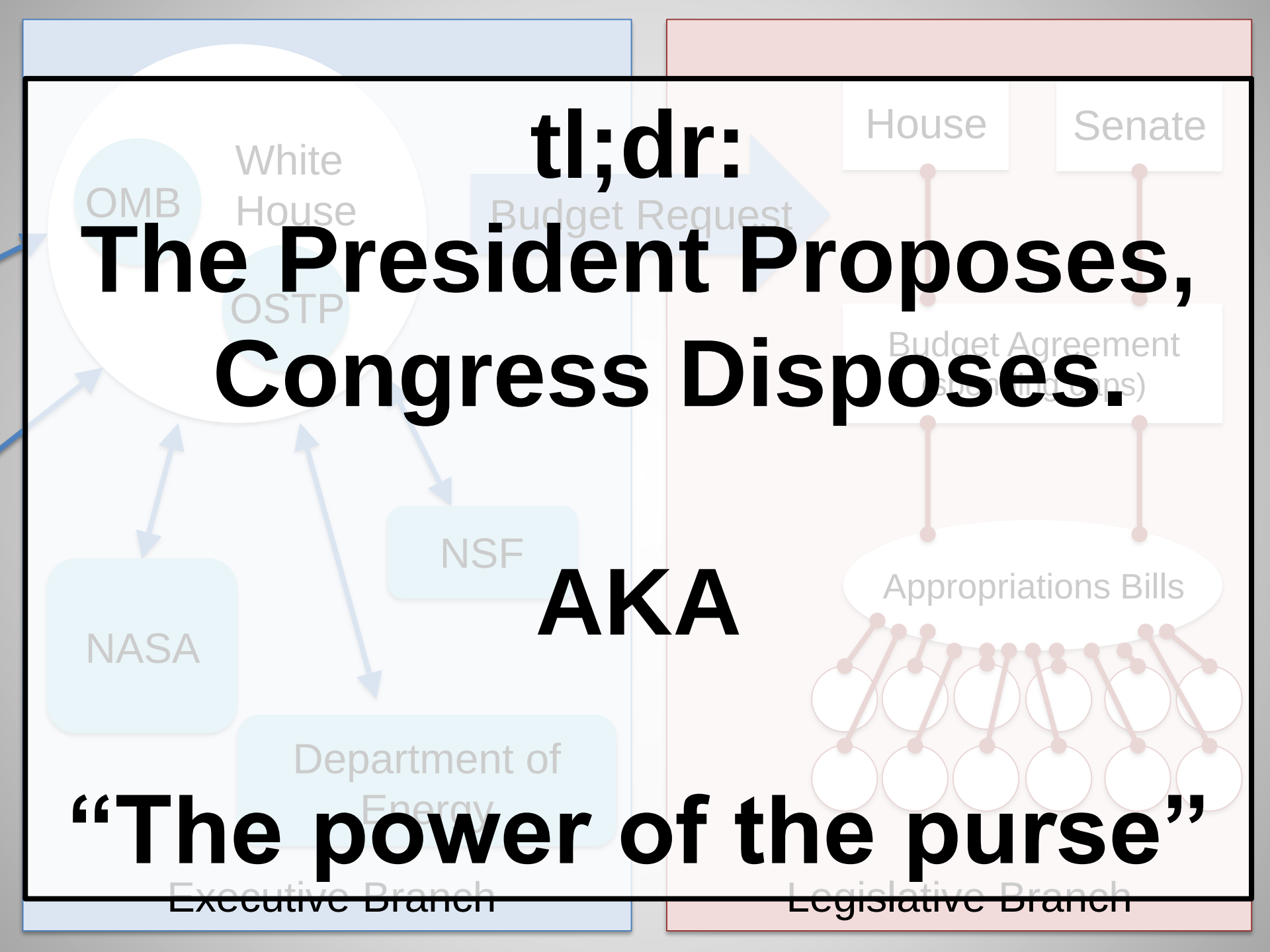
R&D as Percent of Discretionary Spending

percentage of outlays, 1962 - 2017



Source: *Budget of the U.S. Government FY 2017*. © 2016 AAAS


White House
OMB
OSTP
NSF
NASA
Department of Energy
Executive Branch
Budget Request
House
Senate
Budget Agreement
(spending caps)
Appropriations Bills
Legislative Branch


tl;dr:
The President Proposes, Congress Disposes.
AKA
“The power of the purse”
White House
OMB
OSTP
Budget Request
NSF
NASA
Department of Energy
Executive Branch
House
Senate
Budget Agreement
Appropriations Bills
Legislative Branch

The Federal Budget Process

"Regular order" – but highly irregular

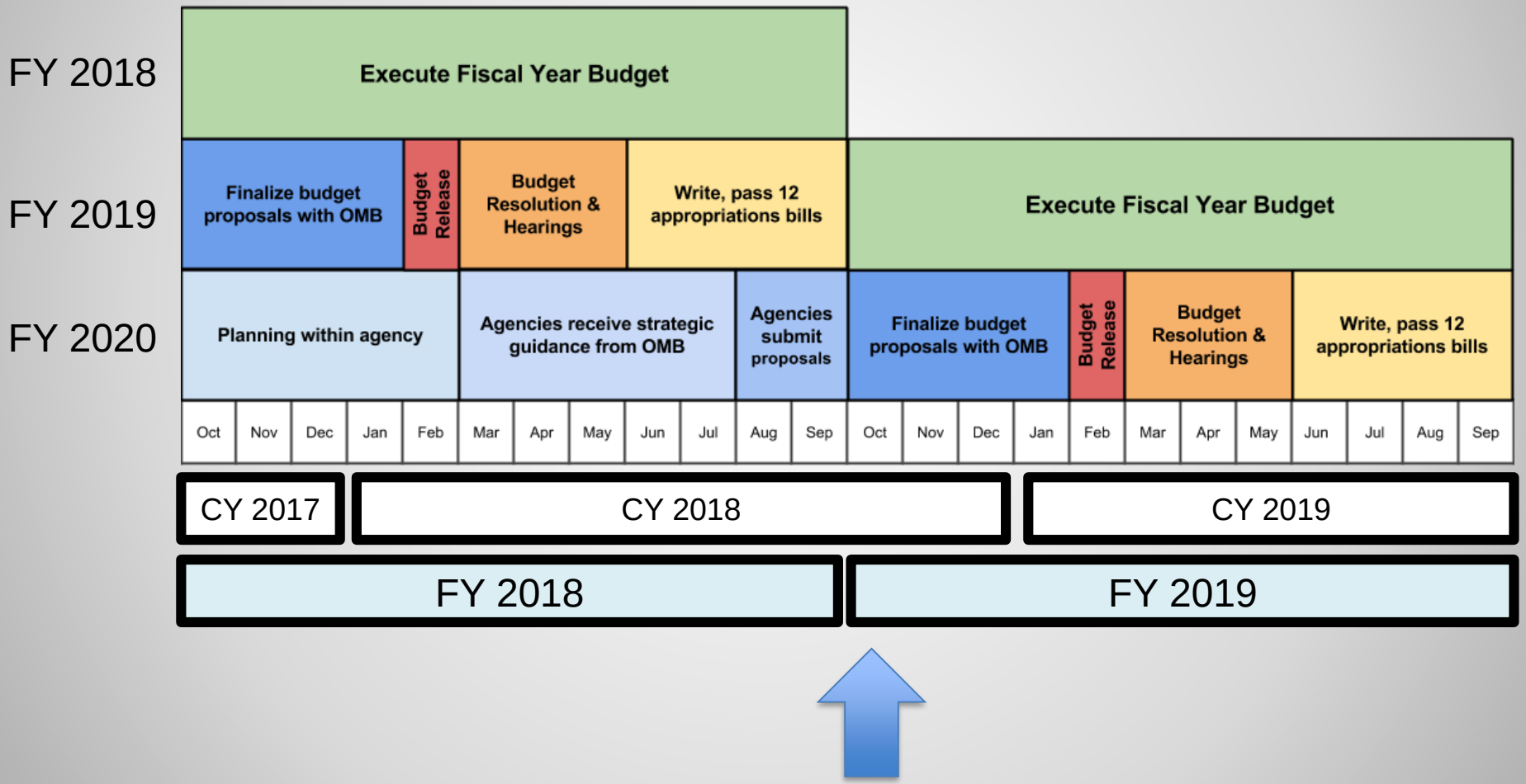
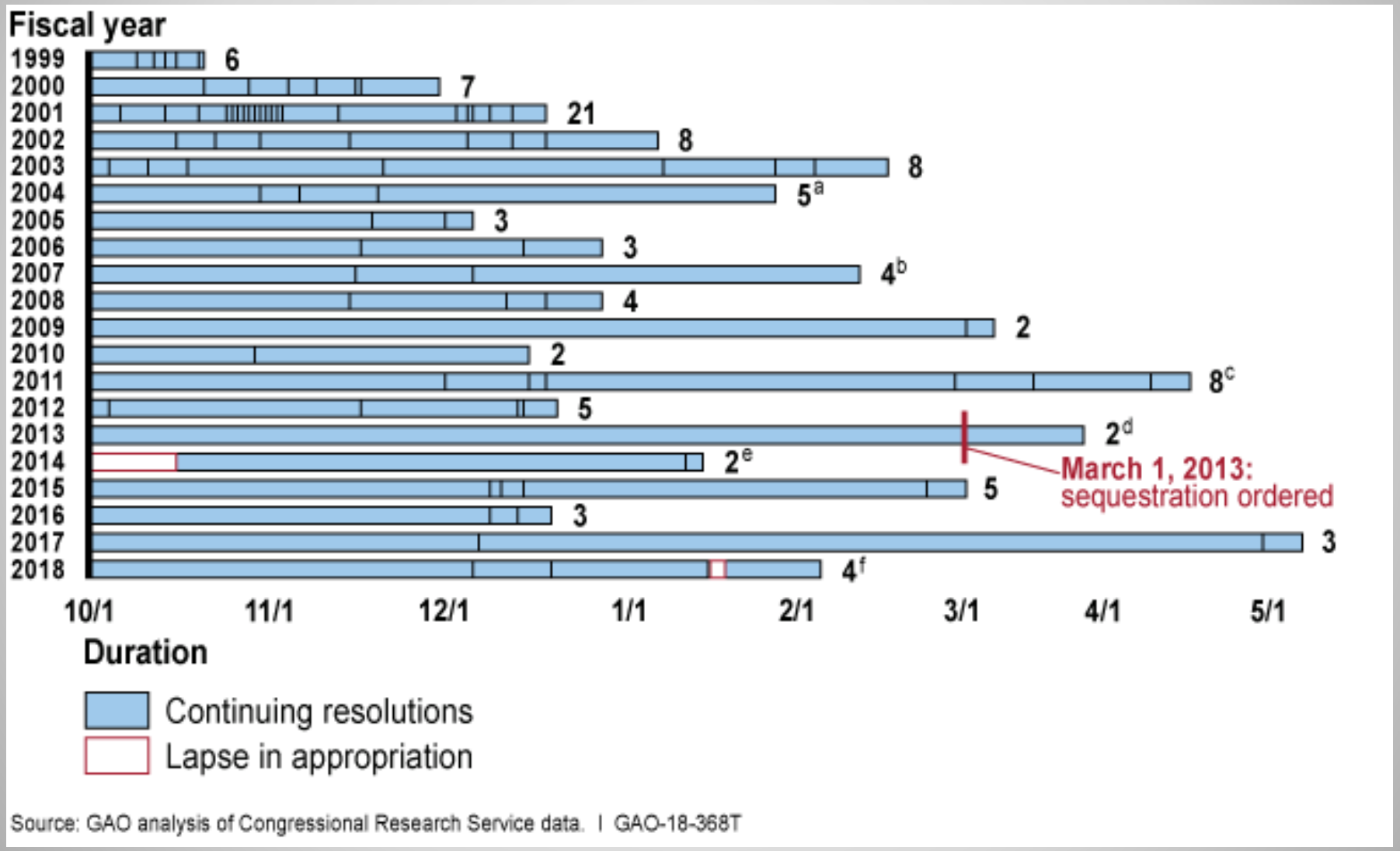


Figure from Kevin Marvel, adapted from Matt Hourihan/AAAS

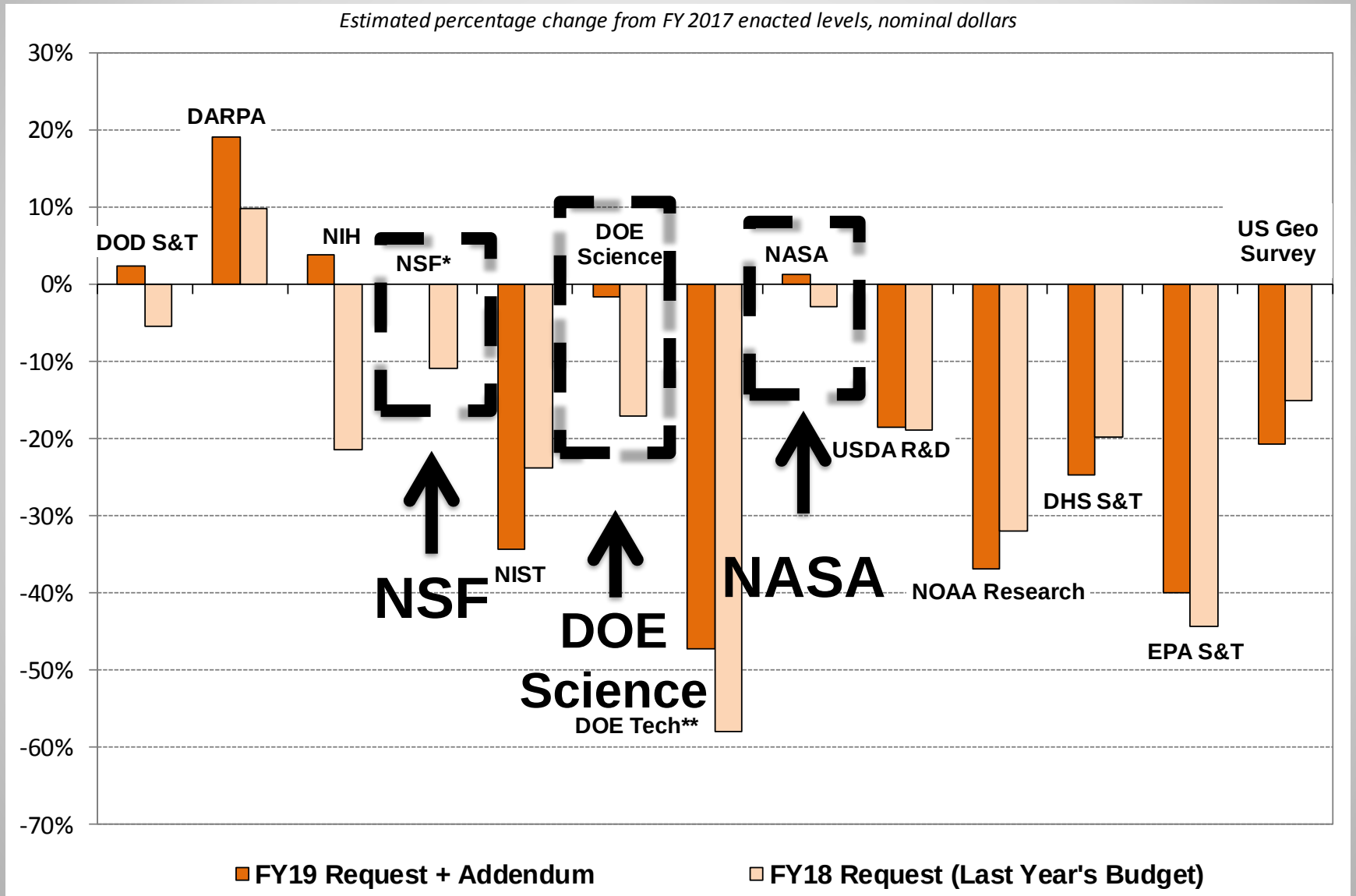
Enter In: Continuing Resolutions (CRs)



Government Accountability Office (GAO), February 2018

Where we are: Funding, legislation, and major issues in astronomy policy right now

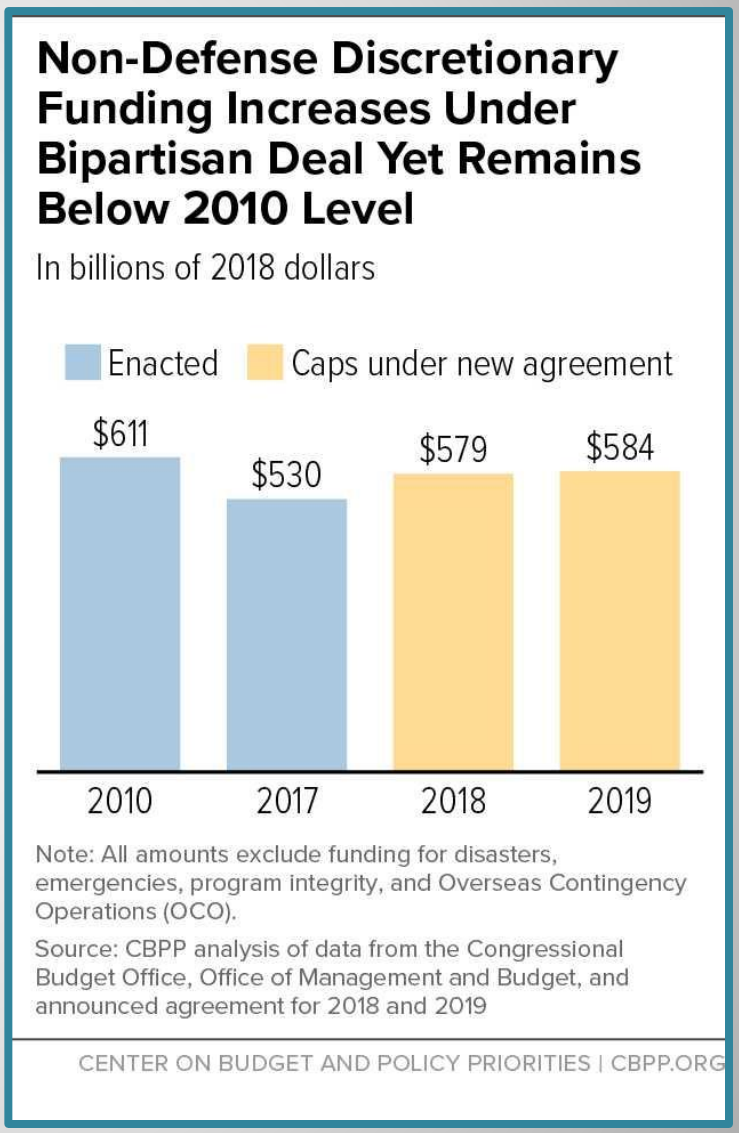
Science Budgets from the Trump Administration



*Flat in the FY19 request. *Includes renewables and efficiency, nuclear, fossil, grid research, cybersecurity, ARPA-E. | AAAS

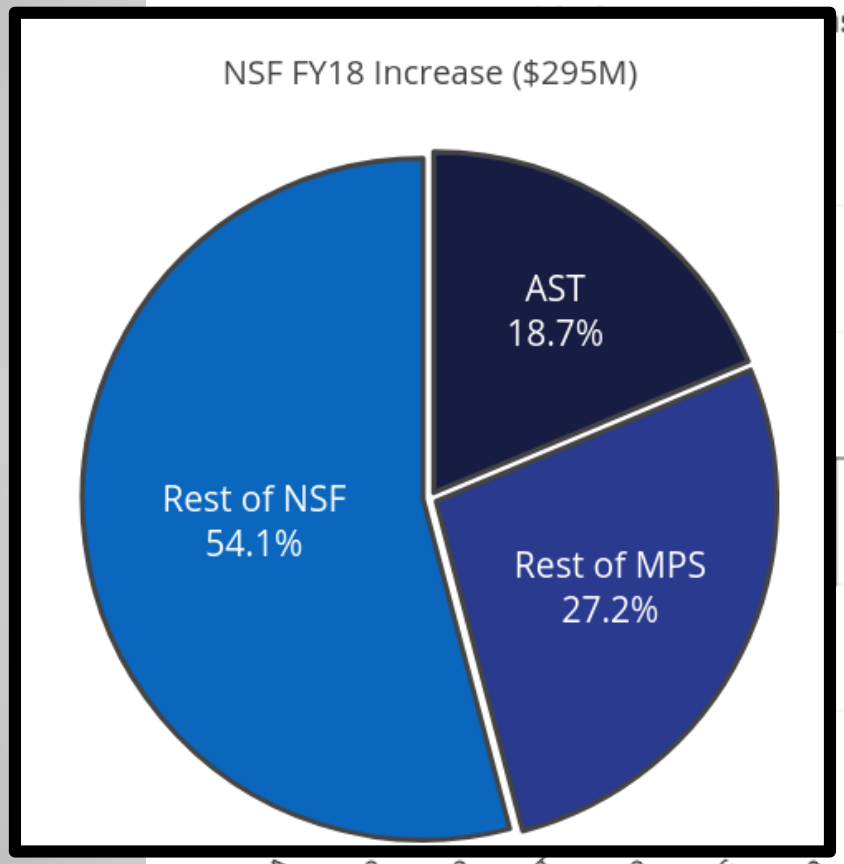
Astronomy in the 109th Congress

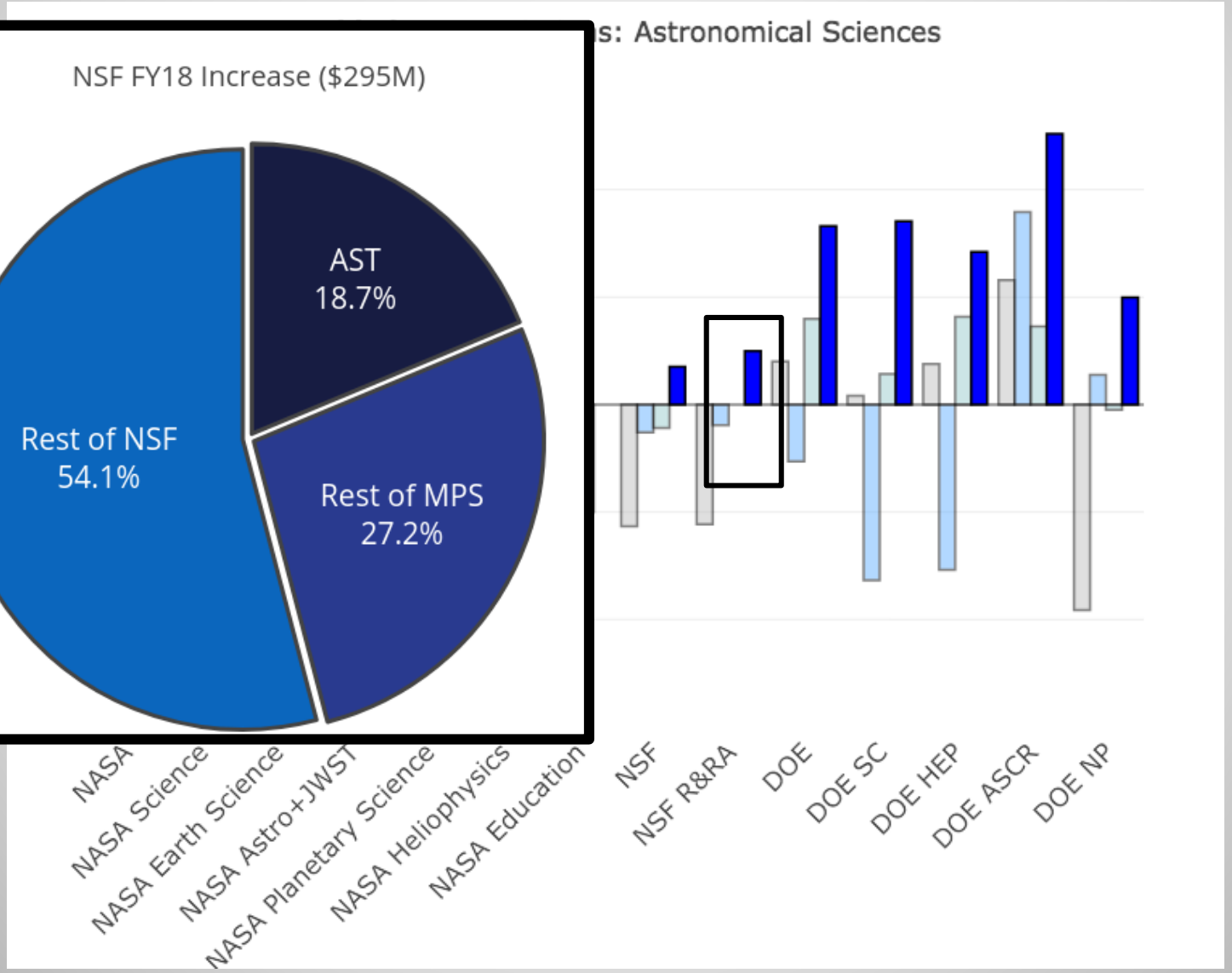
- Largely rejecting Trump proposed cuts to basic science
- Significant interest in **search for life**
  - Added to over-arching NASA mission in 2017 NASA Transition Authorization Act
  - Exoplanet and Astrobiology Science Strategy studies
  - Europa Clipper + Lander
  - SETI/Technosignatures
- Generally supportive and interested



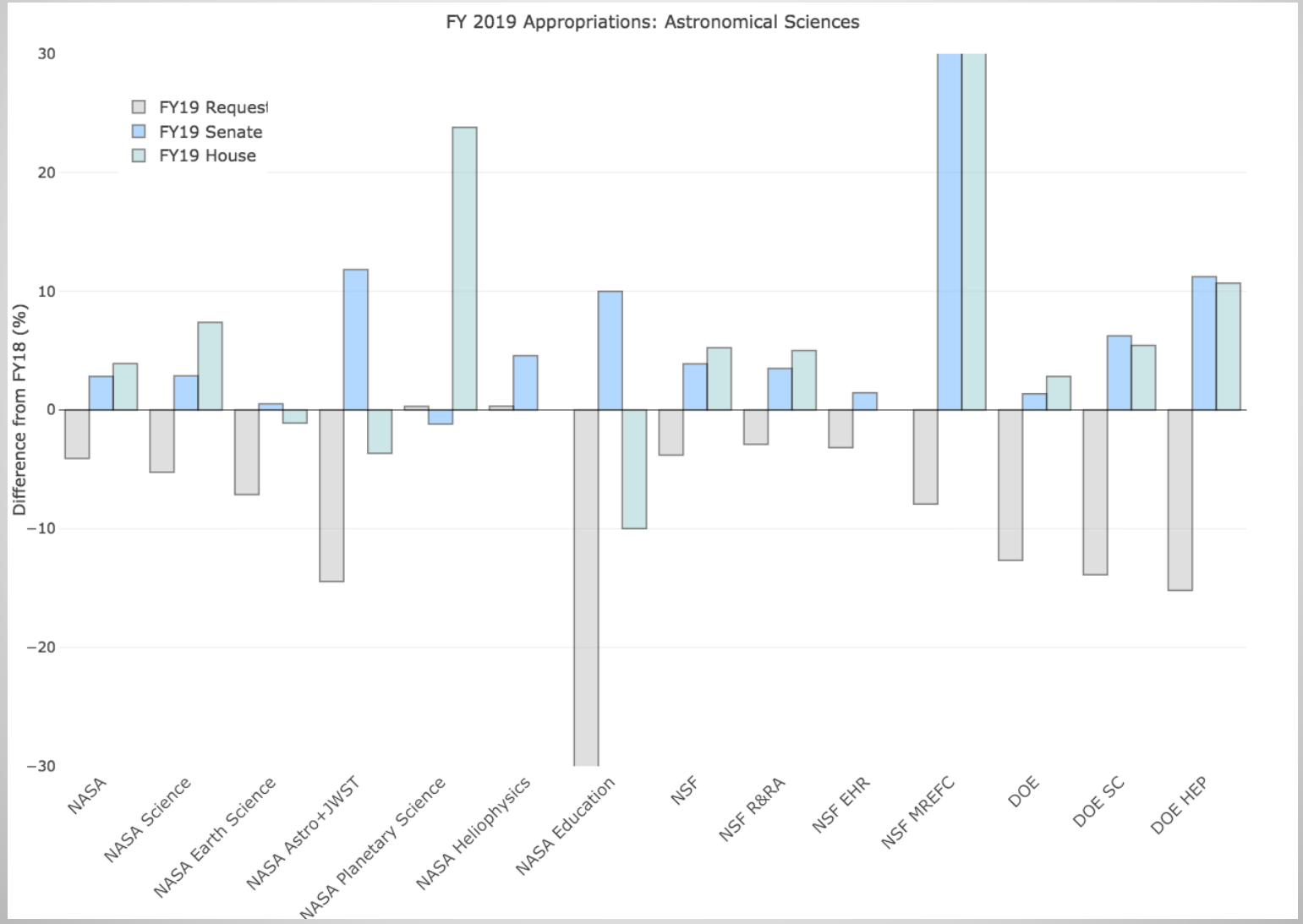
Astronomy in the 109th Congress

FY2018 Funding: Good news





Astronomy in the 109th Congress
FY2019 Funding: TBA (CR through Dec 7)



Astronomy in the 109th Congress

Successful bills and still-active legislation

- *(Passed, technically 108th)* **American Innovation and Competitiveness Act (AICA)**
- *(Passed)* **2017 NASA Transition Authorization Act**
- *(Passed)* **Energy Research and Innovation Act**
- *(Still Active)* **2018 NASA Authorization**
- *(Still Active)* **Space Weather Research and Forecasting Act**
- *(Still Active)* **Combating Sexual Harassment In the Sciences Act,** Introduced 5 October 2018

Major Issue: JWST (NASA Astrophysics)

Current launch date: March 30, 2021

Budget shortfall: **$490 million over two years** (FY20-21)

NASA has a proposal for addressing the budget shortfall, but it will not be public until the FY20 budget request. From NASA Astrophysics Division Director Paul Hertz to AAAC (September):

- Principles
  - NASA understands the Decadal Survey priorities
  - NASA will protect the Explorer and R&A Programs
- NASA believes that the anticipated cost growth on Webb is likely to impact other science missions

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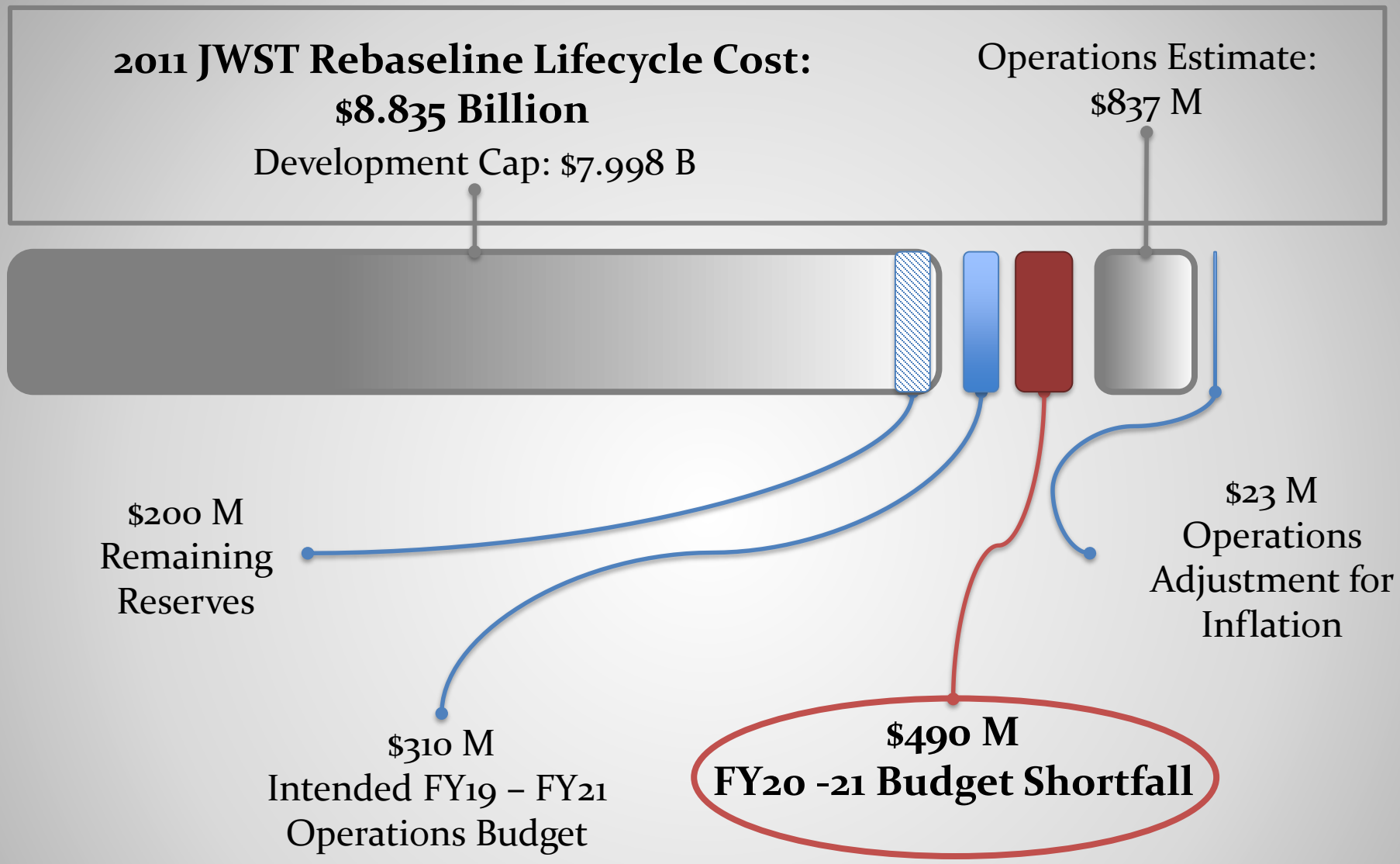
Does this mean only within Astrophysics, or other SMD division missions?



2018 JWST New Baseline Lifecycle Cost: $9.663 Billion

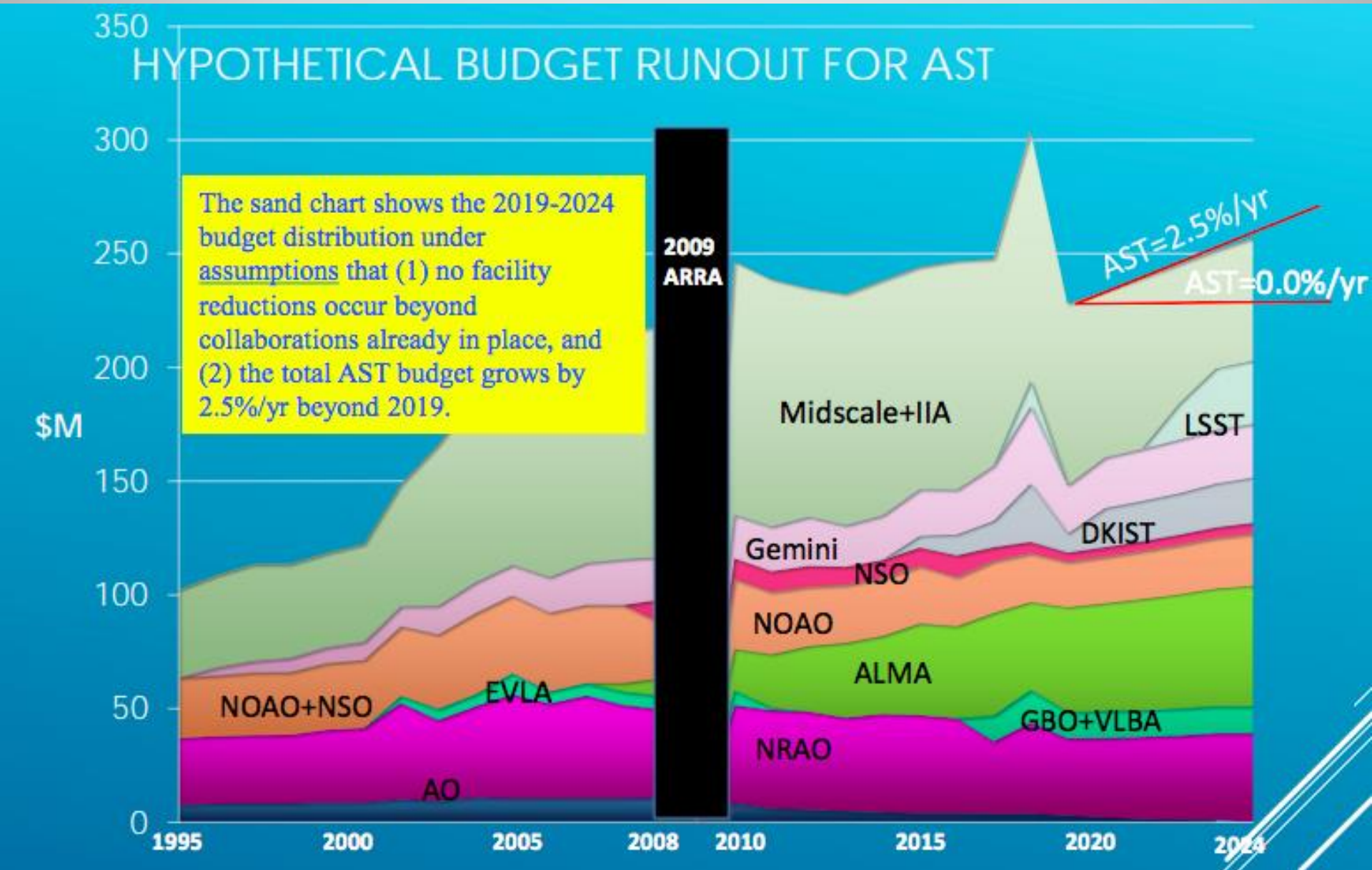
Major Issue: WFIRST (NASA Astrophysics)

A timeline of community input:

- 2011: Top-priority large space mission in Astro2010
- 2012: NASA receives gift telescope assemblies
- 2013: Harrison Report (National Academies)
- 2016: Astrophysics Midterm Review
- 2017: WIETR
- 2018: Proposed Cancellation

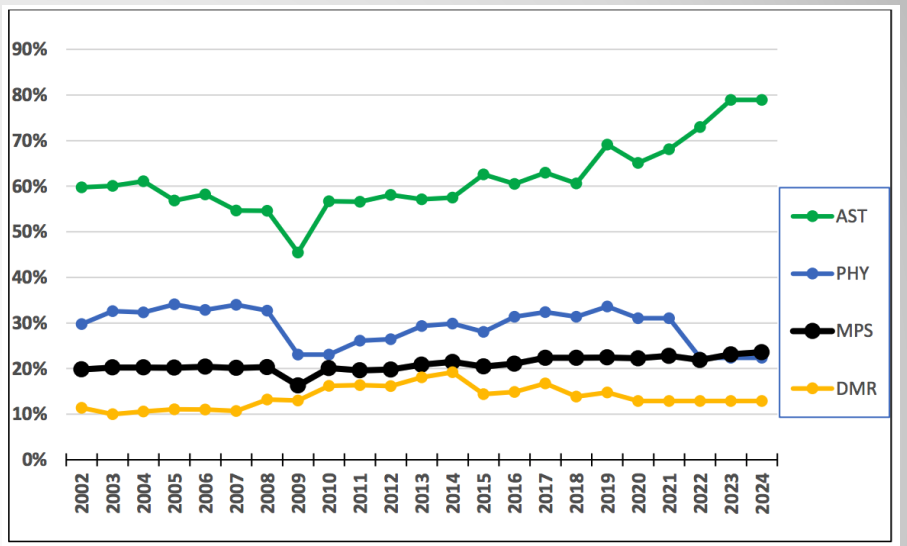
Bottom line: project still proceeding as if it will launch in 2025. Coronagraph is a tech demo. Starshade compatibility maintained. Cap is $3.2 B (for now).

Major Issue: NSF Facilities Operations & Maintenance



Major Issue: NSF Facilities Operations & Maintenance

- NSF funds **construction costs only** of major (>$75 million) through the agency-wide Major Research Equipment and Facility Construction (MREFC) account
- **Operations and maintenance costs (O&M)** are borne by the division (or directorate) using the facility



- For last 10 years, NSF budget has been flat, even as costs to build, operate, and maintain leading-edge facilities has grown.
- This model necessitates having major projects lined up maintain the budget line (a feature, not a bug)
- Astronomy in particular has and continues to facing mounting pressures on grants and O&M costs. Right now, there is not space in the NSF AST budget for the coming LSST “wedge.”
    - Recent NSB report, “Study of O&M Costs for NSF Facilities” (May)

Science/Astronomy in Congress

In general

What motivates a member of Congress?

- Media
- Personal Conviction/Issues
- District

Science/Astronomy in Congress

In general

Given the generally **bipartisan support** of basic research, particularly for astronomy, and the **relatively small size of the necessary budgets**, individual members of Congress with the right combinations of personal conviction and district interest can have **significant impact** on the policies funding and governing astronomy…

…for better or for worse.

Some examples:

- Senator Robert Byrd (D-WV) (Green Bank and NSF MREFC)
- Senator Barbara Mikulski (D-MD) (HST and JWST)
- Senator Richard Bryan (R-NV) (canceling SETI)
  - But Representative Lamar Smith (R-TX) might succeed in bringing SETI back
- Representative John Culberson (R-TX) (Europa Clipper+Lander)

Science/Astronomy in Congress

In general

Given the generally **bipartisan support** of basic research, particularly for astronomy, and the **relatively small size of the necessary budgets**, individual members of Congress with the right combinations of personal conviction and district interest can have **significant impact** on the policies funding and governing astronomy…

…for better or for worse.

Engagement with policymakers on astronomy policy thus represents an **opportunity and a responsibility** unique even just within science policy.

What you can do: opportunities for astronomers to get (more) engaged in astronomy policy

In general, science and engineering enjoy a broad base of support!

The only reason that science lacks support is that **other priorities rank higher**.

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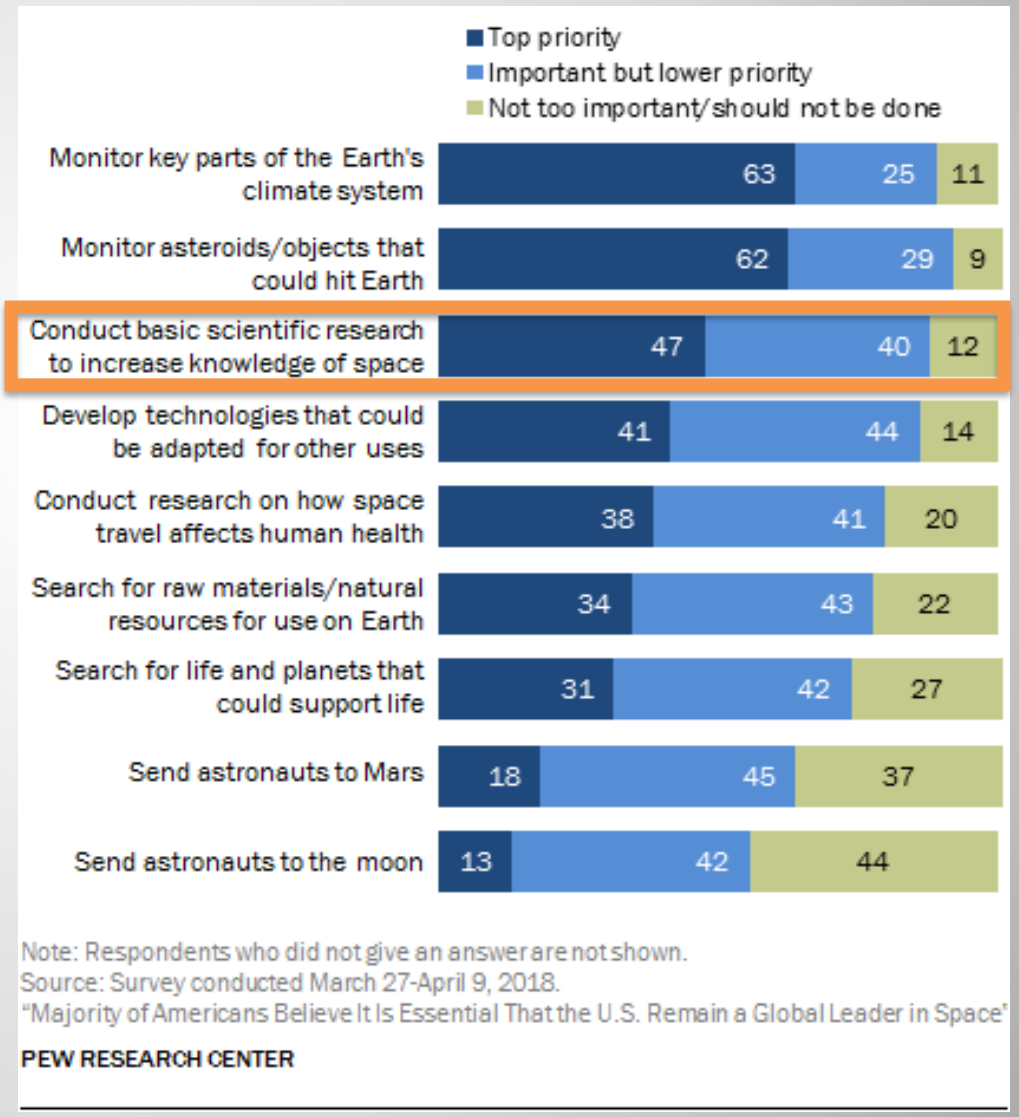
The only reason that science lacks support is that **other priorities rank higher**.

People who say the government should have a major role in…

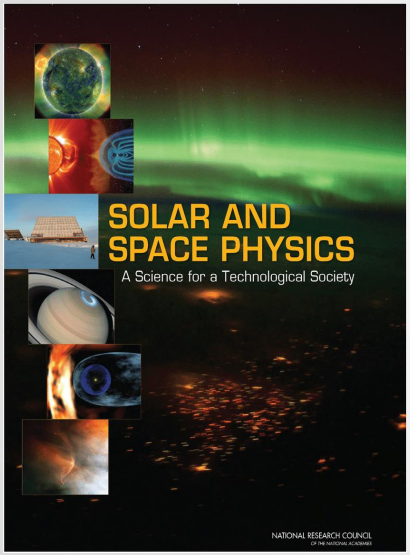
In general, science and engineering enjoy a broad base of support!

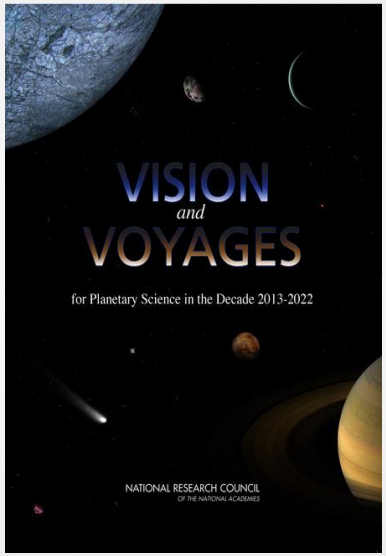
The only reason that science lacks support is that **other priorities rank higher**.

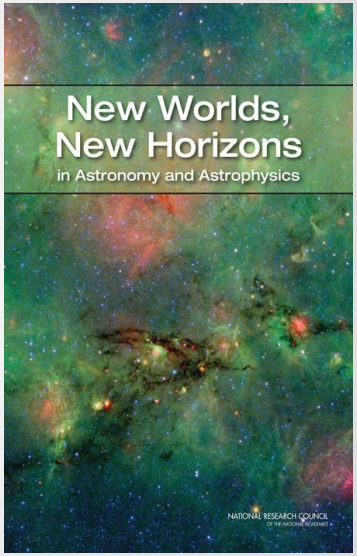
% of U.S. adults who say each of the following should be a top priority for NASA:



Critical Inputs/Rulers







Community-based priority-setting

Want to do something?
Actions to take

1. **Serve on an advisory committee**
    1. Federal: Every division, directorate, agency has them
    2. Non-governmental: observatory users' committees, boards of operators/nonprofits, institutional committees, etc.
    3. Usually have to be at a faculty level, but not always for subcommittees
    4. Start by listening to their public meetings
2. **Talk to your elected officials**
    1. Professional societies organize coordinated visits with training
    2. Invite your representatives to visit your institution
    3. Get to know your university's Federal Relations Office
3. **Get organized**
    1. Start/join a local chapter of a science policy organization.

Want to do something?

Places to start

1. **Organizations you're already in**
   - Professional Societies
   - Institutional Federal Relations Office
2. **(Some) Organizations you may want to check out**
   - Nonpartisan/Non-activist (mostly)
     - American Association for the Advancement of Science (AAAS)
     - Engineers and Scientists Engaging in Policy (ESEP)
     - Engineers and Scientists Acting Locally (ESAL)
   - Lean partisan/activist (arguably, in some cases)
     - March for Science
     - 500 Women Scientists
     - Science for the People
     - Union of Concerned Scientists
3. **News sources for astronomy+ policy news**
   - American Institute of Physics (AIP) FYI
   - SpaceNews
   - SpacePolicyOnline
   - AAS Policy Blog

Want to do more?
Actions to take

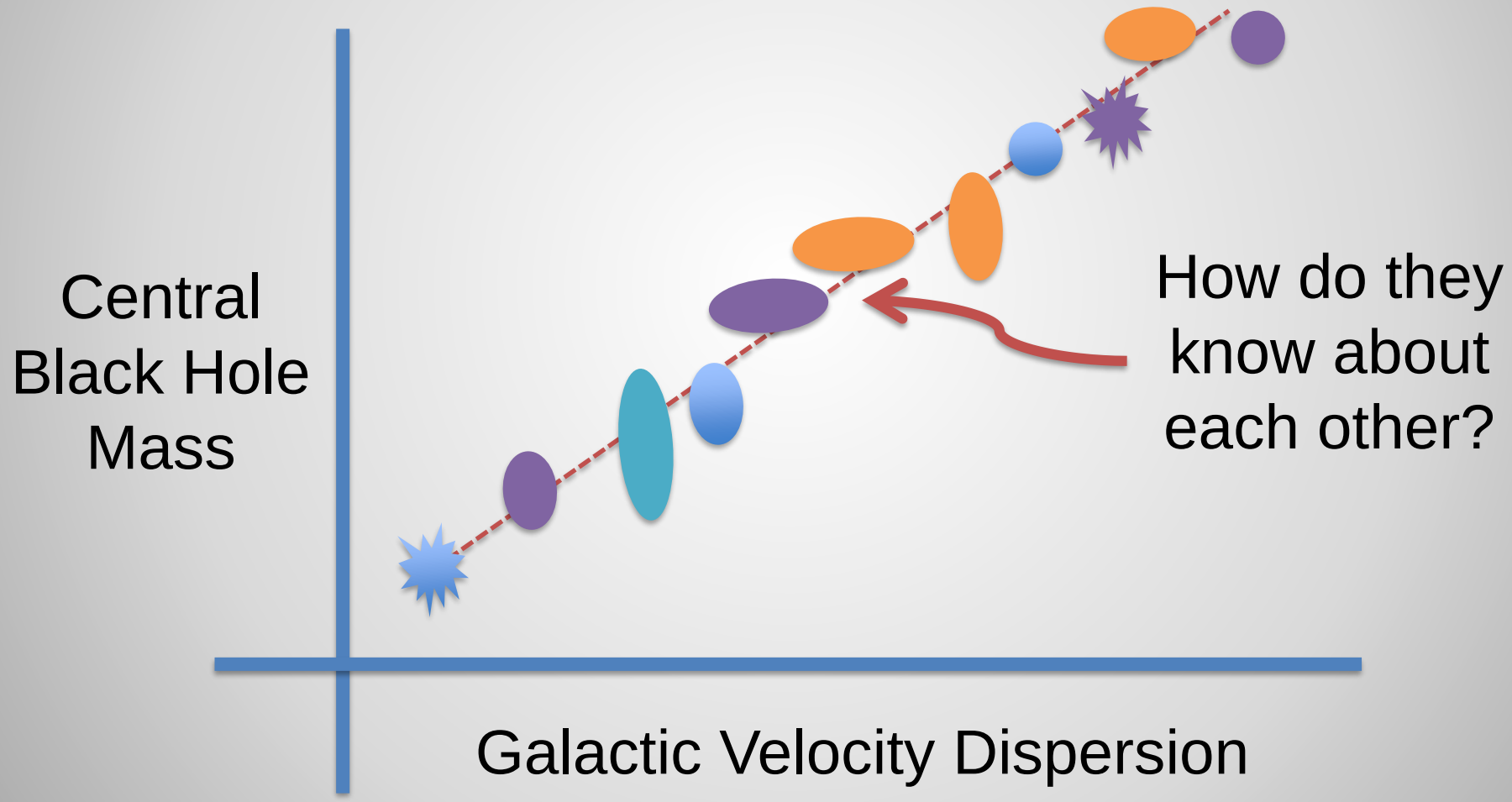
1. **Student (undergrad/grad) opportunities**
    1. Birkner Fellowship (Space Studies Board)
    2. Mirzayan Fellowship
2. **Post-PhD (Postdoc/faculty) opportunities**
    1. AAAS Science and Technology Fellowship Program
        1. Congressional and Executive Branch
        2. Can go through AAAS or some individual societies
    2. California Science and Technology Policy Fellowship
    3. Agency rotator (Intergovernmental Personnel Act)

Want to do *even* more? (careers in science policy)

1. Executive Agencies
    1. Science agencies
    2. Regulatory/service agencies
2. Congressional Research Service
3. Office of Management and Budget
4. Congressional Staffer
5. Advocacy Organizations
6. Professional Societies
7. Be an Elected Official

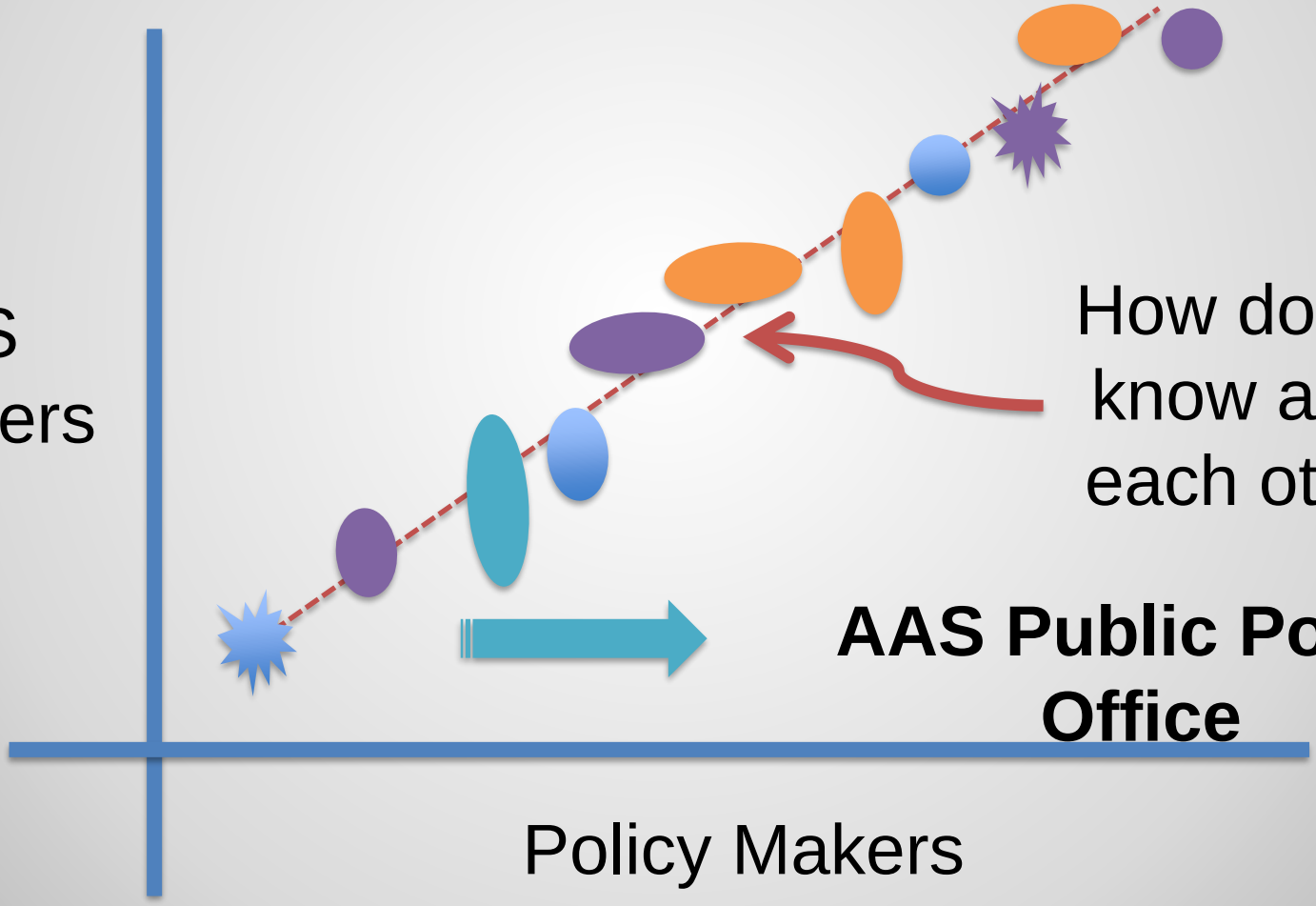
Extra Slides

Science Policy



My highly accurate version of Gültekin et al. 2009

Advocacy at the AAS



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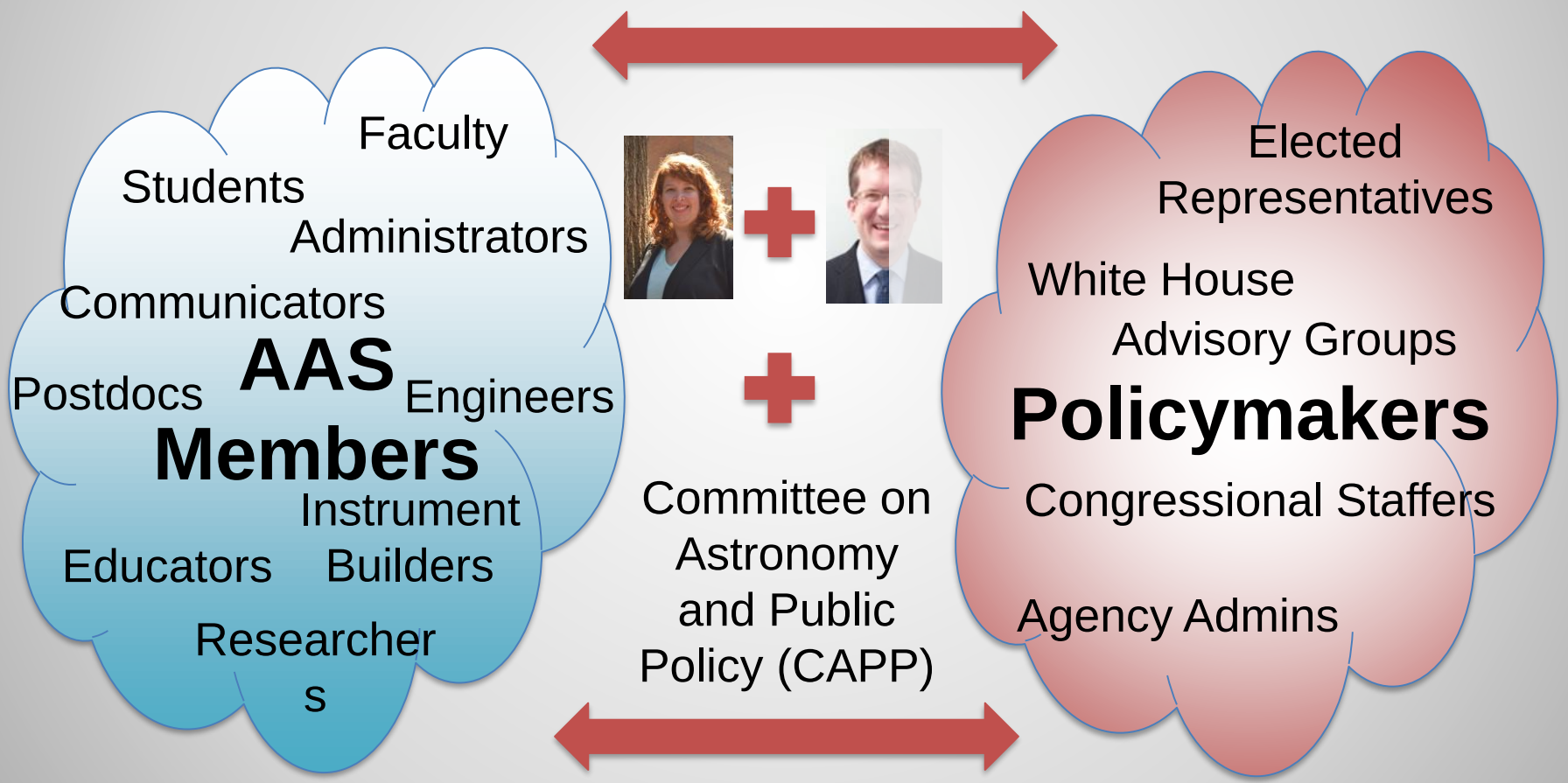


Advocacy at the AAS

AAS Members
Science Community

Policymakers

Advocacy at the AAS: Policymakers

Our messages to policymakers are often coordinated with science and research coalitions.

- **Physical Sciences Education Coalition (PSEPC)**
- **Task Force on American Innovation (TFAI)**
- **Coalition for Aerospace and Science**
- **Coalition for the NSF (CNSF)**
- **USCAS**
- **GATF**

Talking to your elected officials

- Be an example of the science work being done in your district/state.
- Tell them about your work/education and about **the role of federal support** in that work.
- Politics is *always* local.

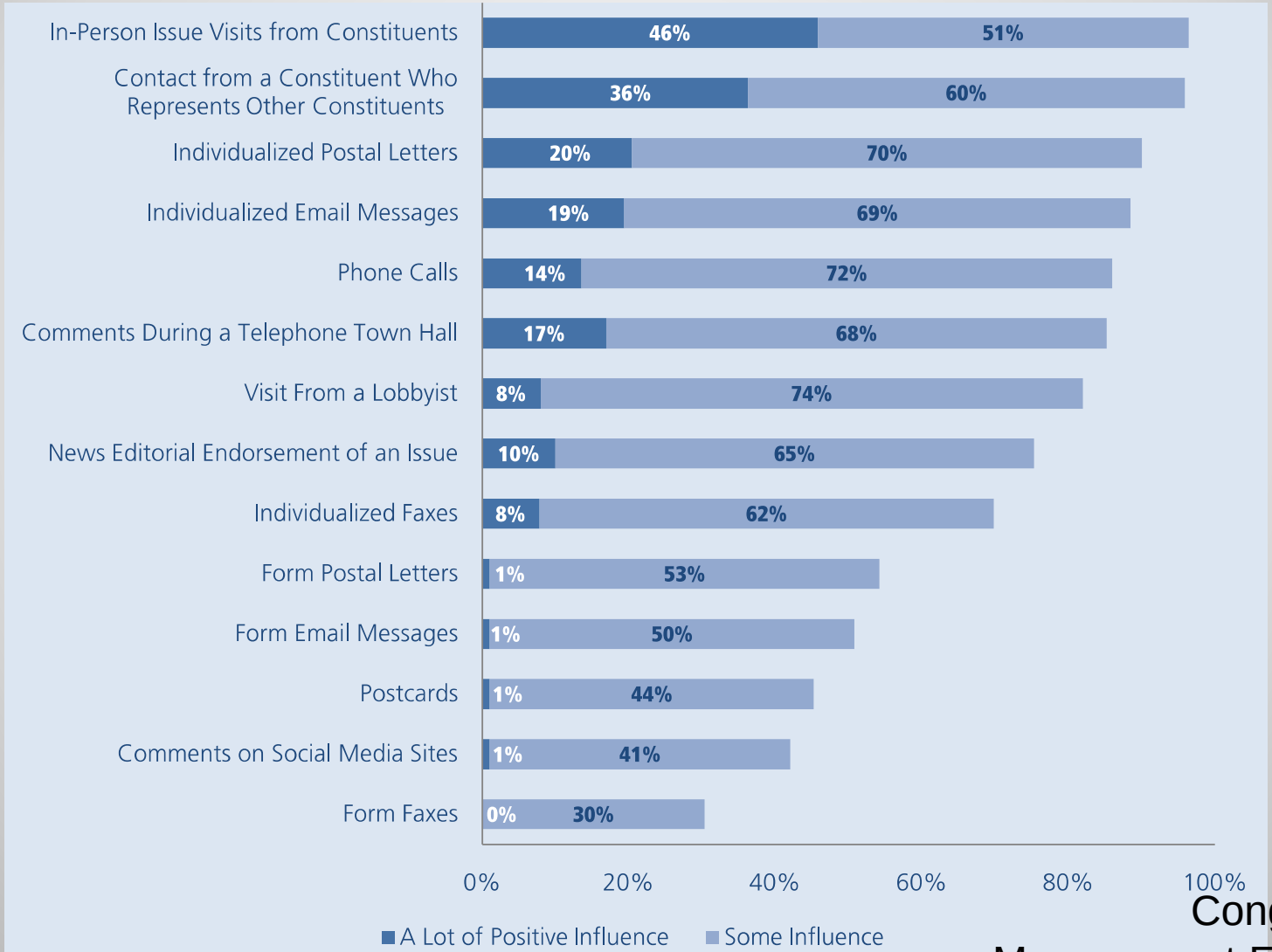
AAS Congressional Visits Day

2016

2017

As a private citizen, you are never a lobbyist.

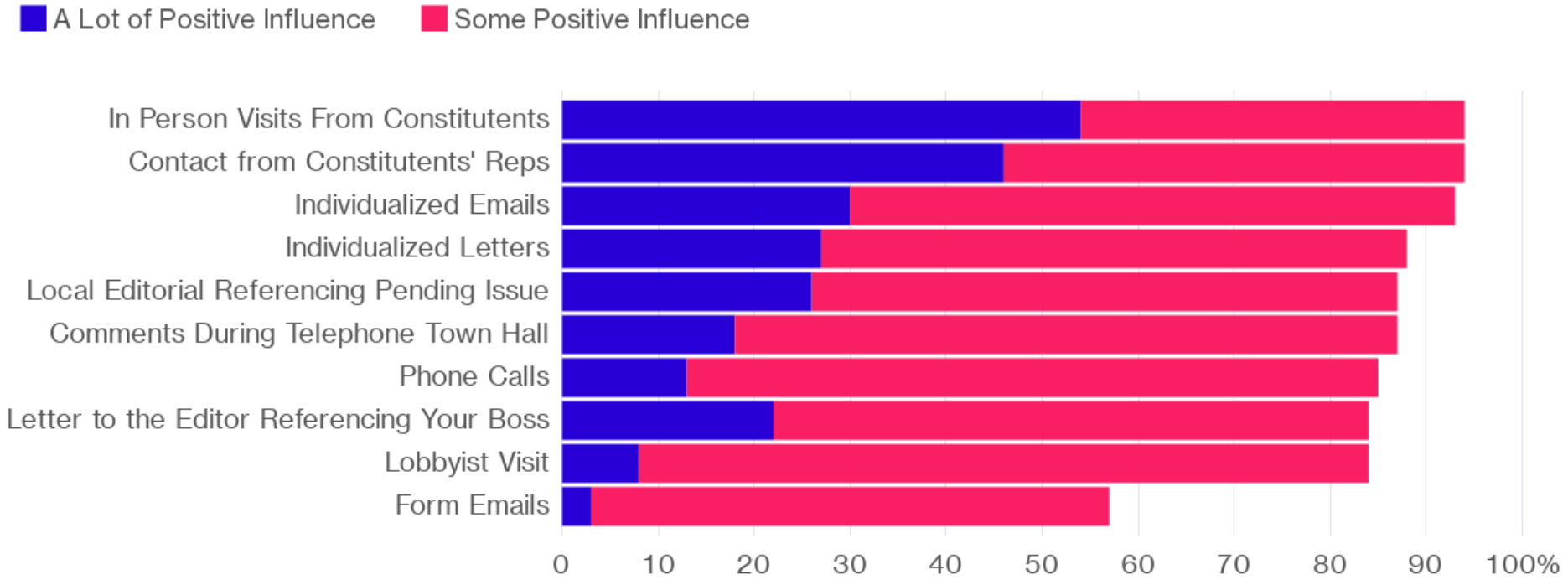
If a Member/Senator has not already arrived at a firm decision, how much influence might different advocacy strategies in the DC office have?



Congressional Management Foundation

Want To Be Heard? Show Up!

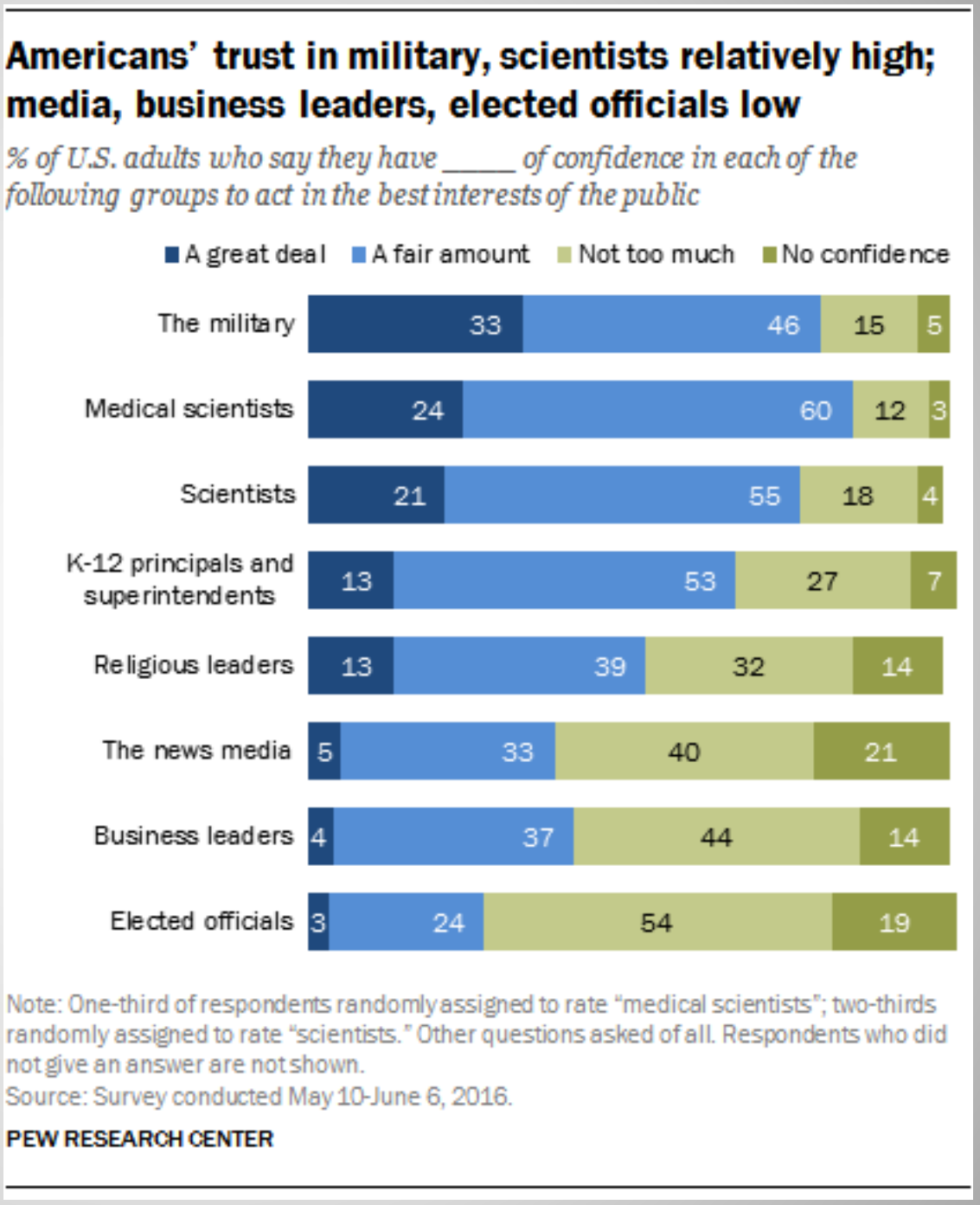
Influence on Washington D.C.-based congressional staffers by communication type.



Source: Congressional Management Foundation
*Bars do not add up to 100 because not all surveyed categories are displayed

Bloomberg

The public trusts scientists!



Advocating for Science

1. Do no harm
   - We don’t advocate cutting other science/projects. If one discipline is targeted, we all lose.
   - We don’t advocate partisan solutions
   - We don’t present science as an entitlement
2. Remember your audience
3. Your reputation as a scientist **matters**

National Science Board (NSB) National Science and Engineering Indicators 2018