

Current Trends and Near Futures in Federal Science Funding

Mitch Ambrose

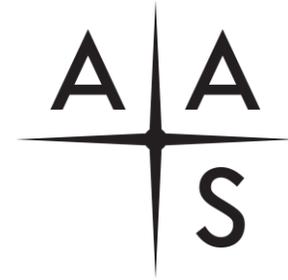
Director of FYI

November 3, 2021

Outline

- Quick background on AIP and FYI
- Tour through major pending legislation
- Some historical budget context

What is
AIP?

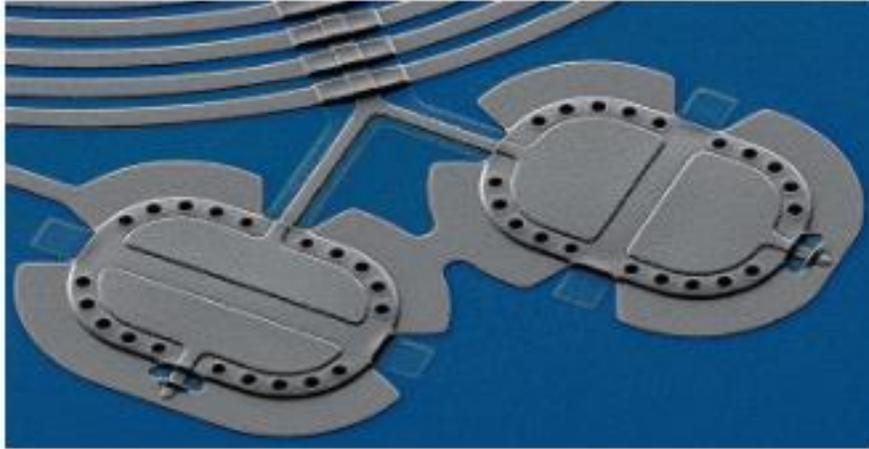


OPTICA



What is FYI?

FYI Bulletin



FY22 Budget Outlook: National Institute of Standards and Technology

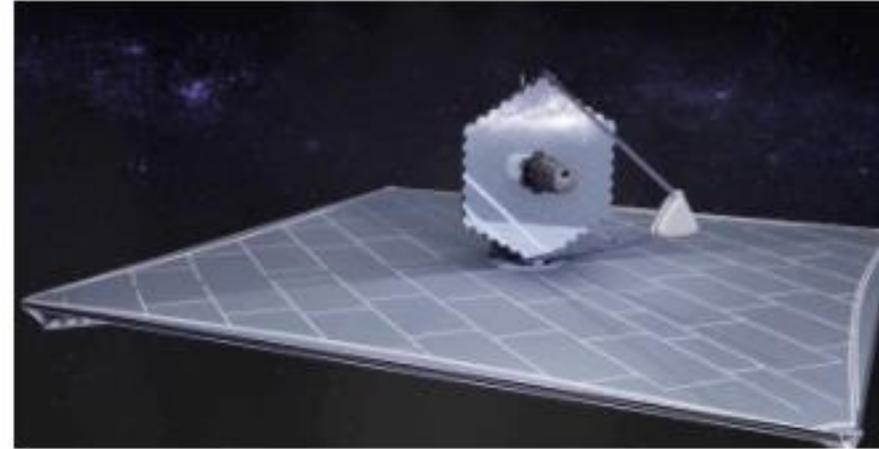
November 2, 2021



FY22 Budget Outlook: National Institutes of Health

October 27, 2021

FYI This Week



The Week of November 1, 2021

- Astro2020 Arrives
- UN Climate Conference Begins
- Democrats Pare Back Science Spending in Reconciliation Bill
- Plus: Upcoming Events / Opportunities / Around the Web

[FYI THIS WEEK ARCHIVE](#)

Major Pending Legislation

1. Endless Frontier Act
2. U.S. Innovation and Competition Act
3. NSF for the Future Act
4. DOE Science for the Future Act
5. Science Revitalization Act
6. National Defense Authorization Act
7. CHIPS for America Act
8. Build Back Better Act

Major Pending Legislation

Poll: Which of these bills have you heard of?

Major Pending Legislation

1. Endless Frontier Act
2. U.S. Innovation and Competition Act
3. NSF for the Future Act
4. DOE Science for the Future Act
- ~~5. Science Revitalization Act [not a real bill]~~
6. National Defense Authorization Act
7. CHIPS for America Act
8. Build Back Better Act

Endless Frontier Act (EFA)



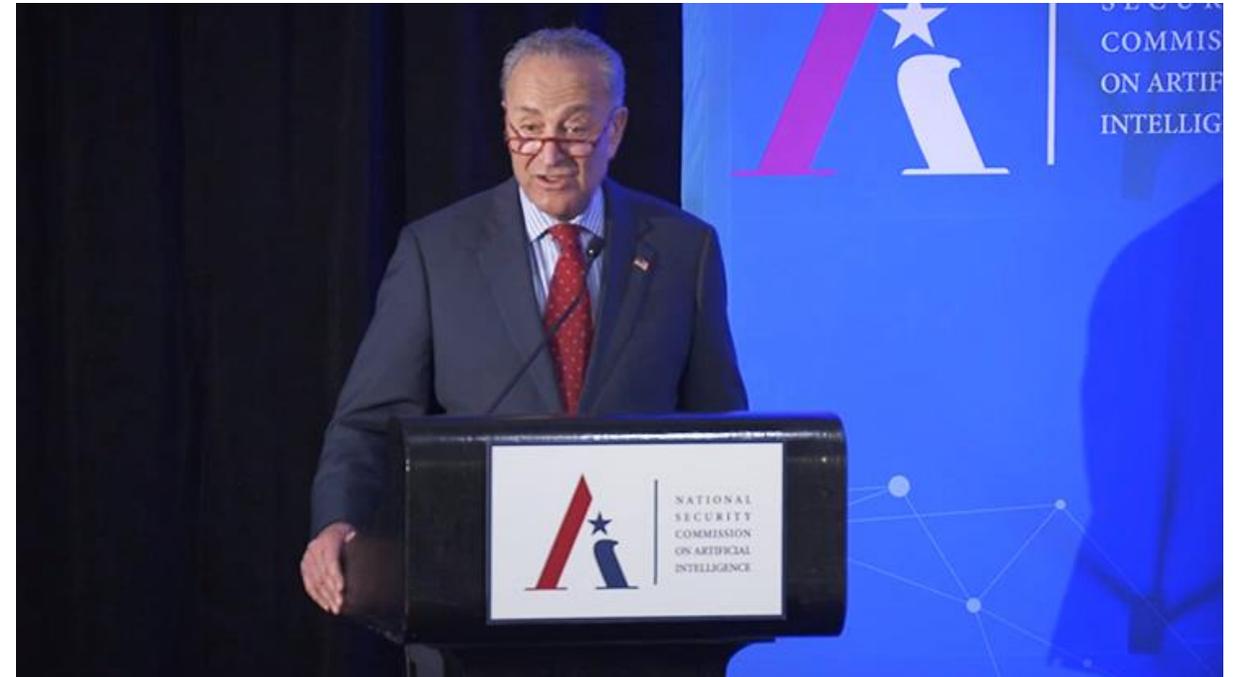
Senate Majority Leader Chuck Schumer (D-NY)



Sen. Todd Young (R-IN)

Schumer speech at NSCAI conference in Nov. 2019

- Floats idea of adding a technology directorate to the National Science Foundation and renaming it the National Science and Technology Foundation (NSTF)
- National Security Commission on AI later proposed Congress create a National Technology Foundation
- Creating a new agency is very difficult politically, so question became where to fit the technology directorate within the current agency structure



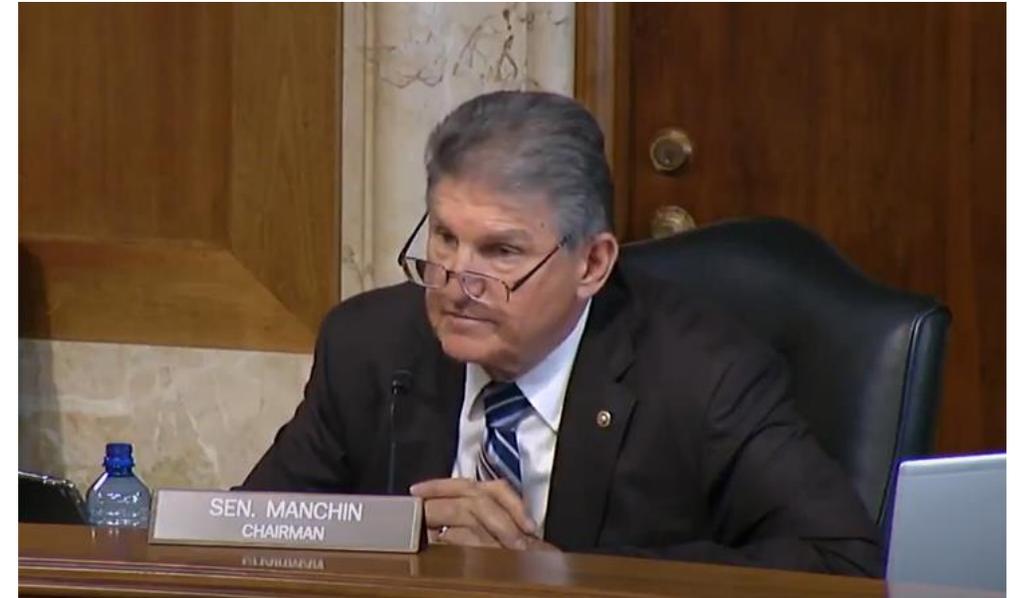
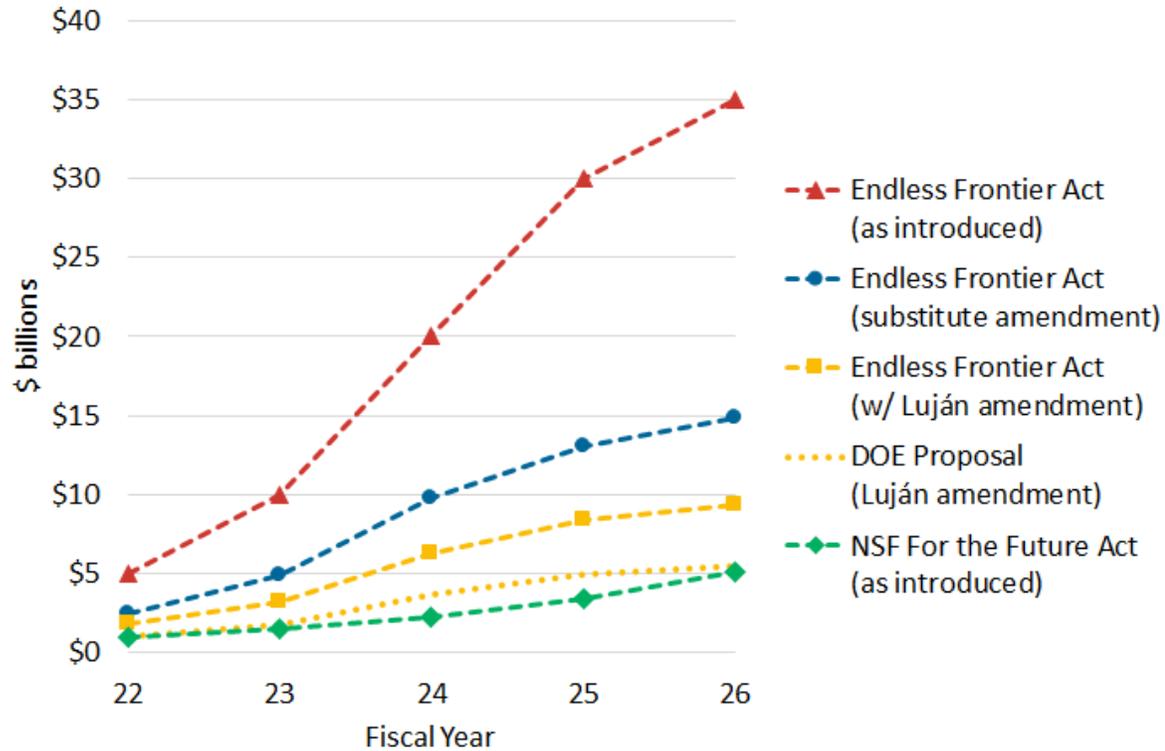
<https://www.aip.org/fyi/2019/schumer-floats-proposal-major-new-research-funding-entity>

10 Key Technology Focus Areas in EFA

- Artificial intelligence, machine learning, autonomy, and related advances
- High performance computing, semiconductors, and advanced computer hardware and software
- Quantum information science and technology
- Robotics, automation, and advanced manufacturing
- Natural and anthropogenic disaster prevention or mitigation
- Advanced communications technology and immersive technology
- Biotechnology, medical technology, genomics, and synthetic biology
- Data storage, data management, distributed ledger technologies, and cybersecurity, including biometrics
- Advanced energy and industrial efficiency technologies
- Advanced materials science, including composites and 2D materials

Carve out added for DOE

New NSF Directorate Budget Proposals



<https://www.aip.org/fyi/2021/manchin-seeks-include-doe-endless-frontier-push>

U.S. Innovation and Competition Act (USICA)

- Endless Frontier Act
- Creating Helpful Incentives to Produce Semiconductors (CHIPS) for America Fund
- Strategic Competition Act
- Safeguarding American Innovation Act
- NASA Reauthorization Act
- Various trade provisions
- And much more

U.S. Innovation and Competition Act (USICA)

- It's important to keep in mind that the USICA will not itself provide any money to NSF or DOE if it is passed!
- The bill's funding targets are **just recommendations** to the appropriations committees
- One **key exception** is that the bill would directly appropriate \$52 billion to implement the CHIPS for America Act

CHIPS Act Fund in USICA

| MANDATORY FUNDS (\$ in billions) | | | | | | | |
|--|-------------|------------|------------|------------|------------|-------------|--------------------------|
| Activity | FY22 | FY23 | FY24 | FY25 | FY26 | Total | Duration of Funds |
| Semiconductor Manufacturing Subsidies | 19.0 | 5.0 | 5.0 | 5.0 | 5.0 | 39.0 | Available until expended |
| National Semiconductor Technology Center (NSTC) | 2.0 | 2.0 | 1.3 | 1.1 | 1.8 | 11.2 | |
| NIST Advanced Packaging Manufacturing Program | 2.5 | | | | | | |
| NIST Microelectronics Research / Manufacturing USA Institute | 0.5 | | | | | | |
| DOD National Network for Microelectronics R&D | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 2.0 | One year |
| Multilateral Semiconductors Security Fund | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.5 | Four years |
| Total | 24.5 | 7.5 | 6.8 | 6.6 | 7.3 | 52.7 | - |

Programs authorized through the National Defense Authorization Act for Fiscal Year 2021

<https://www.aip.org/fyi/2021/new-microelectronics-initiative-sets-possible-funding-infusion>

House Science Committee Response to EFA/USICA

- NSF for the Future Act
- DOE Science for the Future Act
- NIST for the Future Act
- Regional Innovation Act



House Science Committee Chair
Eddie Bernice Johnson (D-TX) and
Ranking Member Frank Lucas (R-OK)

NSF for the Future Act

(g) *FOCUS AREAS.*—In consultation with the Assistant Director, the Board, and other Federal agencies and taking into account advice under subsection (e), the Director shall identify, and regularly update, up to 5 focus areas to guide activities under this section. In selecting such focus areas, the Director shall consider the following societal challenges:

- (1) Climate change and environmental sustainability.
- (2) Global competitiveness and domestic job creation in critical technologies.
- (3) Cybersecurity.
- (4) National security.
- (5) STEM education and workforce.
- (6) Social and economic inequality.

Will Congress pass a compromise bill?



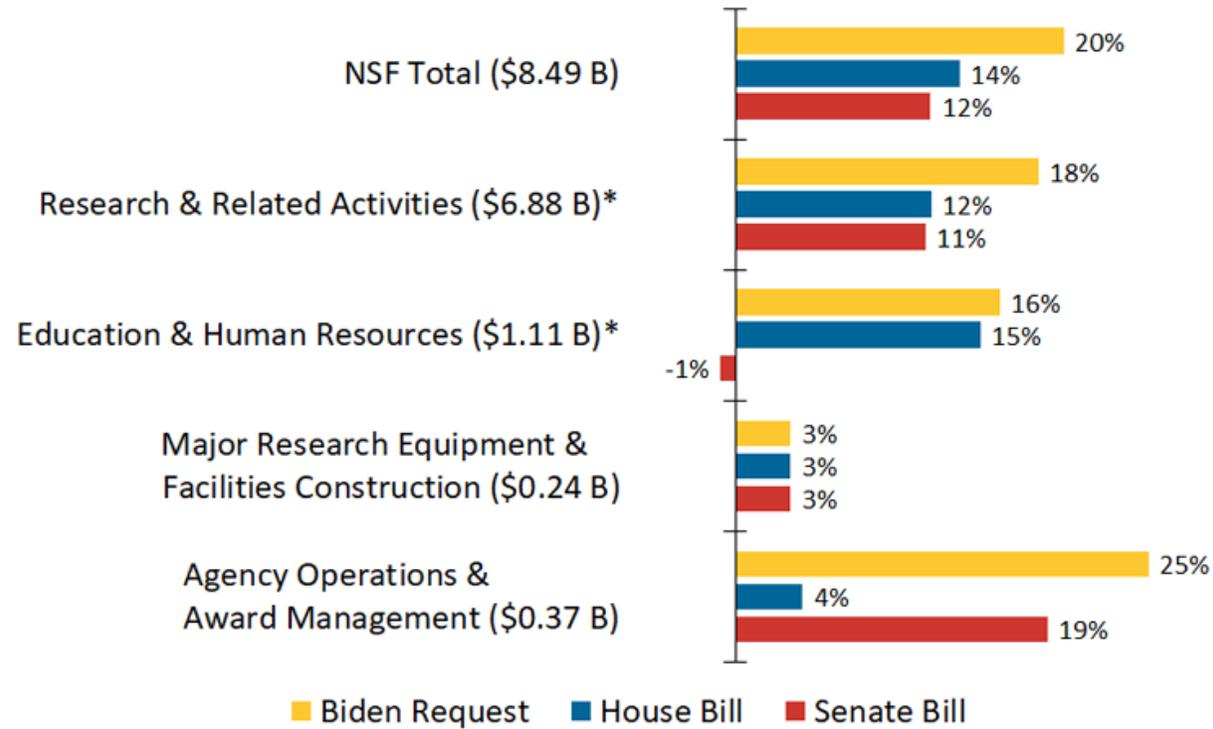
The image is a screenshot of a news article from National Journal. At the top left is the 'NJ NATIONAL JOURNAL' logo. To the right of the logo is a navigation menu with links for 'DAILY DAYBOOK', 'HOTLINE', 'RACE TRACKER', 'ALMANAC', 'PRESENTATIONS', and 'EVENTS'. Below these are links for 'BEST PRACTICES', 'WASHINGTON IN THE INFORMATION AGE', 'REDISTRICTING HUB', and 'NJ VIGNETTE'. On the far right of the navigation bar are social media icons for Facebook, Twitter, and LinkedIn, along with a 'LOGIN' button and a '★ BRIEFCASE' link. Below the navigation bar, the date 'WEDNESDAY, NOVEMBER 03, 2023' is displayed. The main headline of the article is 'Bipartisanship on Chinese tech hits a snag'. Below the headline is a sub-headline: 'Consensus on Congress's flagship bipartisan issue looks increasingly elusive, as the GOP expresses frustration over Democratic reluctance to tighten restrictions on research and technology flowing to China.' Below the text is a photograph showing two men in profile, looking towards the right. The man in the foreground has grey hair, and the man behind him has glasses. At the bottom of the photo is a caption: 'House Foreign Affairs Committee ranking member Michael McCaul, joined at left by Chairman Gregory Meeks, at a hearing in September (AP Photo/J. Scott Applewhite)'. The 'ASSOCIATED PRESS' logo is visible in the bottom right corner of the photo.

What is the funding outlook?

- House and Senate appropriators have generally endorsed the NSF technology directorate concept in their bills for fiscal year 2022
- There is also funding to start the directorate in Democrats' reconciliation bill, the Build Back Better Act

FY22 Budget Proposals: National Science Foundation

\$ in () are the FY21 estimates



* Figures account for consolidation of the Graduate Research Fellowship Program budget in the EHR directorate.

| FY22 National Science Foundation Appropriations (\$ millions, COVID-19 response and recovery funds excluded) | | | | | | | | | | |
|---|----------------|------------------|-----------------|-----------------|--------------|-----------------|--------------|-----------------|-------|-----------------|
| Account | FY20 Actual | FY21 Estimate | FY22 Request | Change 21-22 | House | Change 21-22 | Senate | Change 21-22 | Final | Change 21-22 |
| NSF ¹ | 8,210 | 8,487 | 10,169 | 20% | 9,634 | 14% | 9,487 | 12% | | |
| Research and Related Activities² | 6,603 | 6,880 | 8,140 | 18% | 7,696 | 12% | 7,667 | 11% | | |
| Mathematical and Physical Sciences | 1,530 | 1,580 | 1,691 | 7% | - | - | - | - | | |
| Geosciences | 994 | 1,004 | 1,195 | 19% | - | - | - | - | | |
| Polar Programs | 481 | 483 | 506 | 5% | - | - | - | - | | |
| Engineering | 754 | 762 | 917 | 20% | - | - | - | - | | |
| Technology, Innovation, and Partnerships (proposed) ³ | 352 | 365 | 865 | 137% | **- | - | **865 | 137% | | |

<https://www.aip.org/fyi/federal-science-budget-tracker>

Build Back Better Act (latest version)

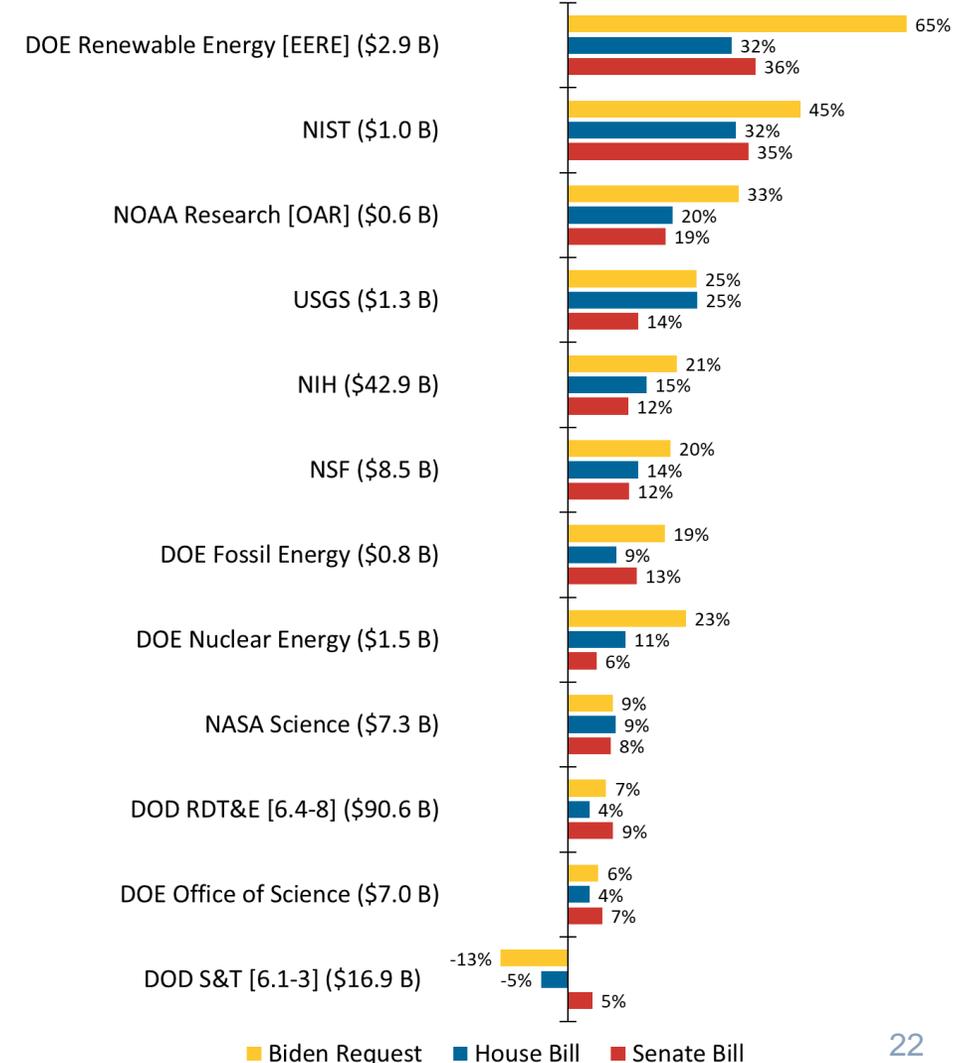
- **NSF:** \$3.5 billion, of which \$1.5 billion is for standing up the agency's proposed Technology, Innovation, and Partnerships directorate. Of the remainder, \$500 million is for climate research and another \$500 million is for infrastructure
- **DOE Office of Science:** \$985 million entirely dedicated to domestic fusion energy R&D efforts and low-dose radiation research
- **NASA:** \$1.1 billion, with \$750 million dedicated to infrastructure and facilities modernization and \$365 million for climate-related R&D
- **NIST:** \$1.25 billion, of which \$650 million is dedicated to facilities maintenance and upgrades and remainder is mostly for manufacturing programs
- **NOAA:** \$759 million, split between research grants, data and computing infrastructure, and climate services and education activities
- **USGS:** \$150 million, split evenly between a 3D elevation mapping program, water resources research institutes, and climate science centers

- Large budget increases proposed across science agencies for FY22
- But the final amounts could be significantly lower, since Democrats and Republicans still haven't agreed on overall spending limits for the year

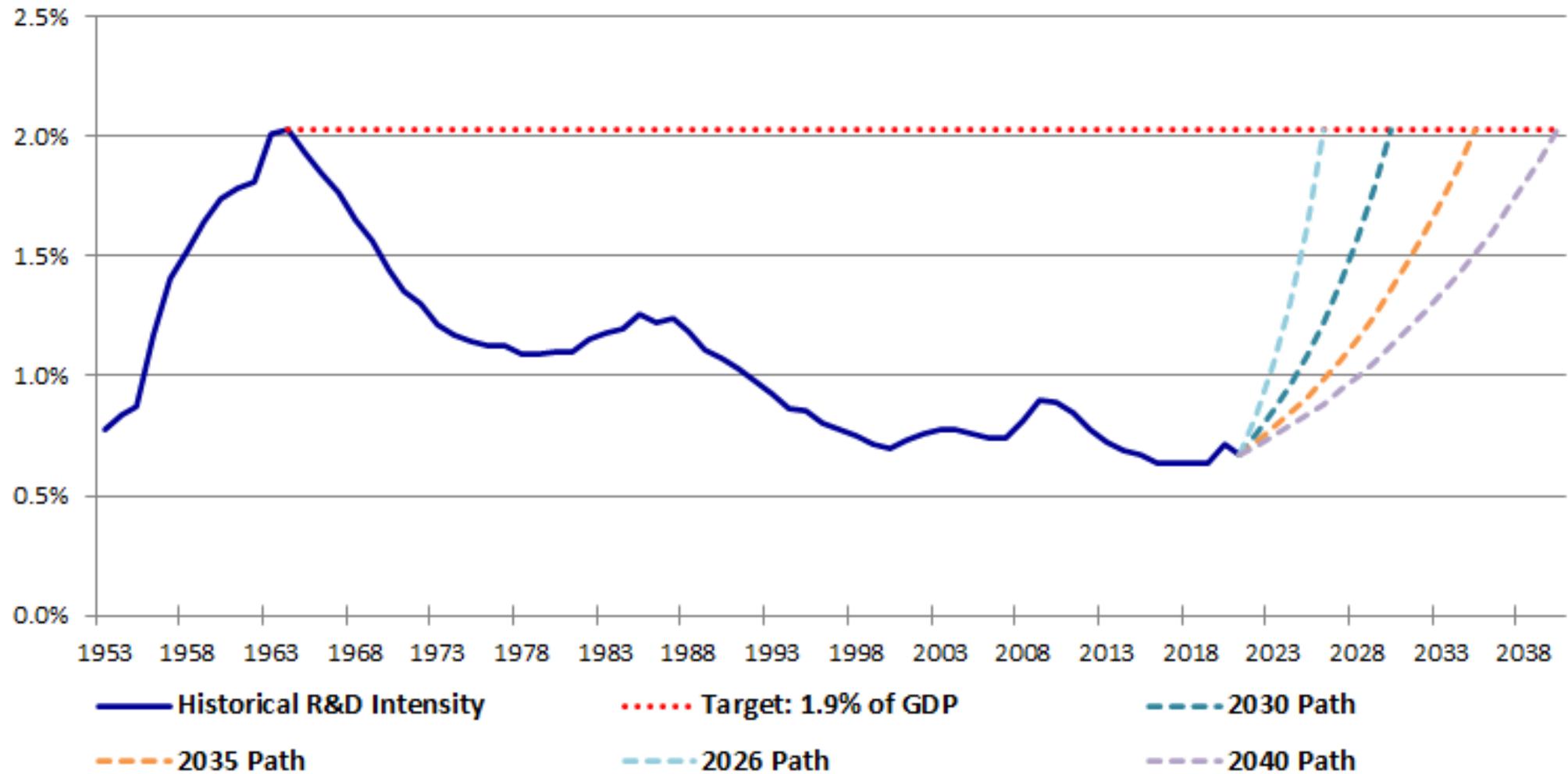
FY22 Discretionary Budget Proposals

% change from F21 enacted

\$ in () are FY21 amounts

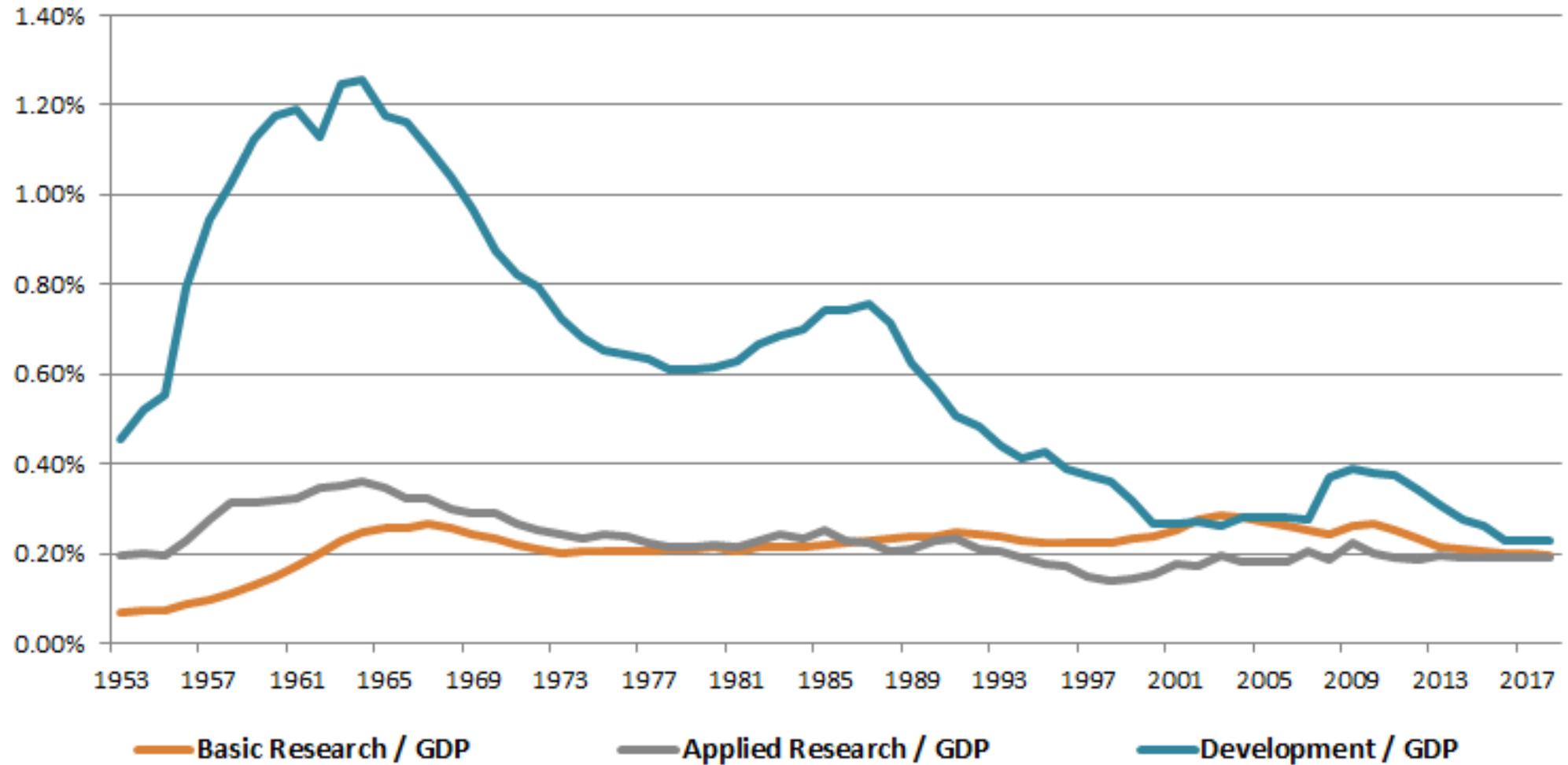


Federal R&D Growth: Back to Peak



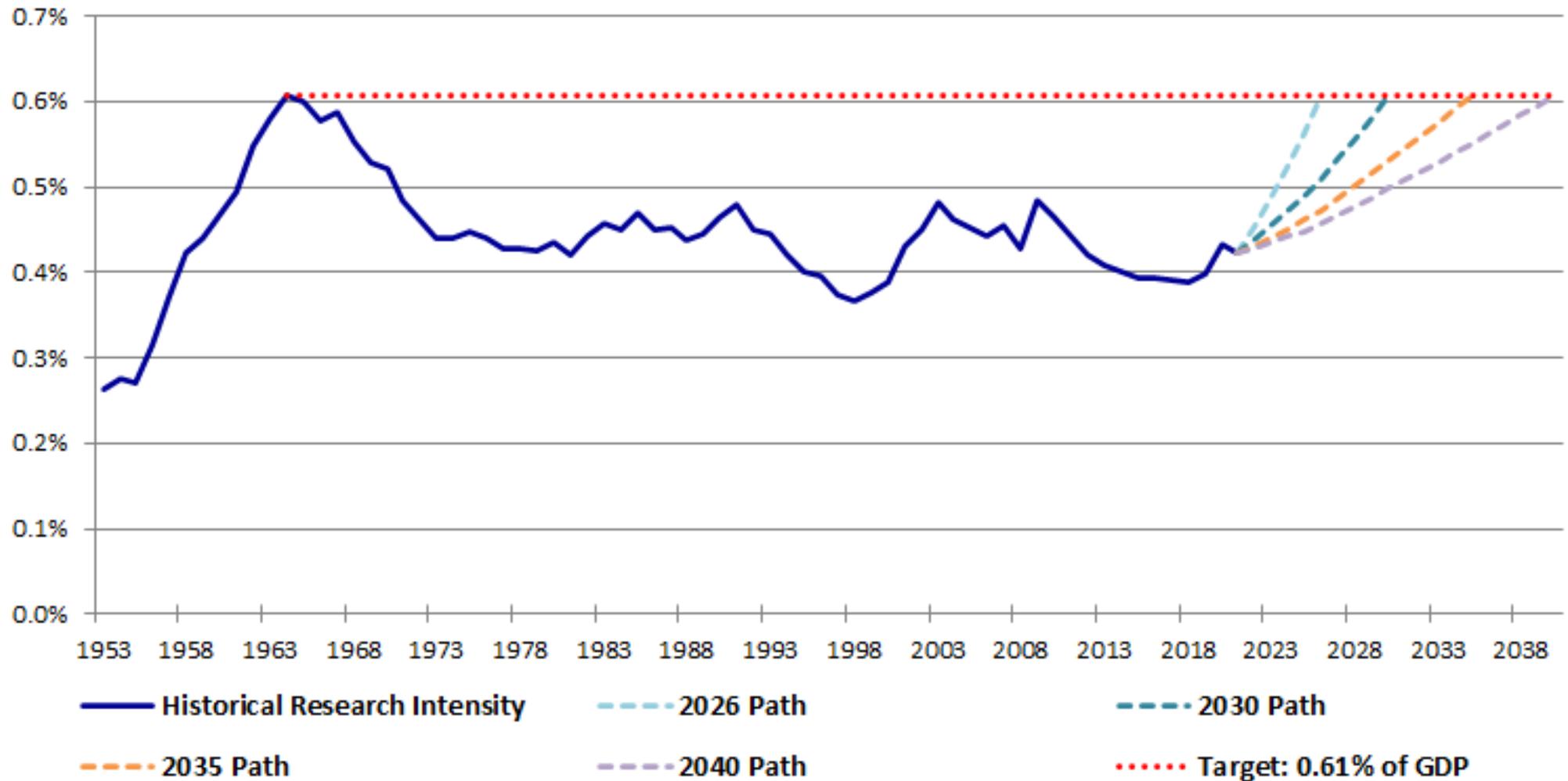
AAAS analysis based on NCSSES and CBO data.

Government R&D as a Share of GDP by Type, 1953-2018



Source: National Science Foundation, *National Patterns of R&D Resources* series. © 2020 AAAS

Back to Peak: Federal Research Only



AAAS analysis based on NCSSES and CBO data.



**Sign up for
science policy news**

Subscribe to FYI
<https://www.aip.org/subscribe-fyi>

Follow us on Twitter
@FYIscipolicy



Sign up for
science policy news

Questions?

mambrose@aip.org