

Federal Funding Trends

What's Happening with Federal Research Funding, And What It Means for You

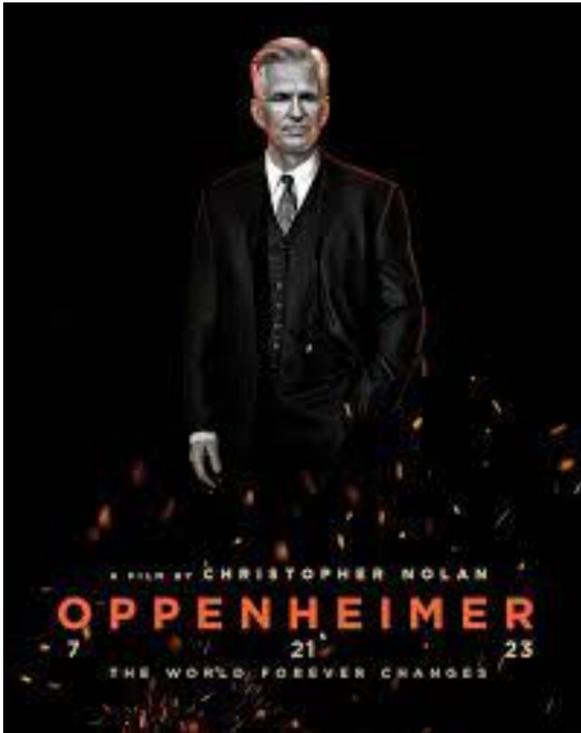


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Where Does Federal Research Funding Come From?

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Hint: If You Saw Oppenheimer, You Already Know Where It All Started



- Vannevar Bush (portrayed by Matthew Modine, pictured here) is tasked with continuing and expanding the post-WW II R&D momentum
- Advocates for greater federal investments in R&D, and in particular pushes for what will eventually become the National Science Foundation
- Authors "The Endless Frontier: The Next 75 Years in Science," which becomes the guiding doctrine for federal research investment in fundamental science at universities across the country
- Today, nearly every federal agency invests in university-executed research activities

Where Does Research Funding Come From?

From Your Tax Dollars—Thank You! (And Some Other Places)

Federal Government (54.8%)



National Institutes
of Health



NATIONAL
ENDOWMENT
FOR THE ARTS



Universities (25%)



State Governments (5.3%)



Business (5.7%)



Non-Profit (6.2%)



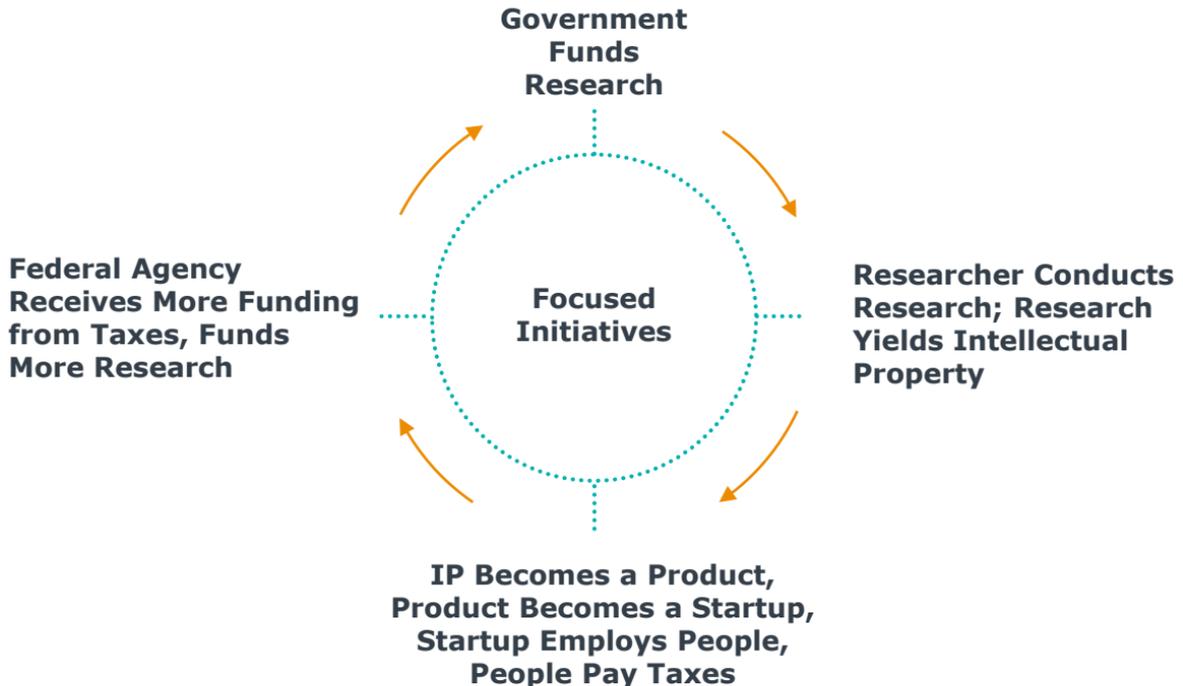
Other (3%)



How It Supposed to Work



And the Way It Has Worked for Most of the Last 60 Years



What's Changing in Federal Funding



The Quantitative Evidence Is Not Definitive...



Data Sources EAB Reviewed

- Federal agency budgets and strategic documents
- Appropriating committee hearings
- Agency proposal data (e.g., Grants.gov)
- Higher Education Research and Development (HERD) survey

Limitations of Data

- Allocation discretion at program officer level
- Cannot drill down to tactical decisions or determine causality
- Annual opportunity volatility
- Insufficient granularity

...But All Signs Suggest Agencies Are Shifting Dollars Toward Large and Complex Opportunities



Lagging Indicators

- Increase in multi-PI awards (especially for high-dollar opportunities)
- Increase in number of centers and center-level awards
- Increase in limited submission opportunities
- Increase in agency rhetoric about “interdisciplinarity,” “convergence,” and “collaborative” research



Agency Rationale

- Reduce agency **administrative burden**
- Yield greater impact and **return on investment**
- Gain **political cover** from demands to explicitly fund “national priorities”
- **De-risk** agency investments by investing in universities most likely to “succeed”



When I was at NSF, I saw a shifting or reshuffling of existing research dollars toward larger opportunities that required multiple PIs and aligned with multidisciplinary areas of interest for the agency.”

*Former Program Officer,
National Science Foundation*

How the Game is Played Today

TAMU's "Station Domination" Designed to Increase Funding Success Rate

The Washington Post

A little bit of Aggieland has taken over Metro Center this month

October 25, 2016

"Mary Billingsley noticed something odd as she walked into Metro Center subway station earlier this month. There was an ad for Texas A&M University. And another ad. And another.

In fact, every single ad in the Metro station — from the turnstiles to the walls — was for the Texas university 1,400 miles from Washington.

...Potential students might see the ads, yes, but **hopefully so will people who grant research funds, like from the National Science Foundation.**"



TEXAS A&M UNIVERSITY.

Source: Kelly J, "A Little Bit of Aggieland Has Taken Over Metro Center This Month," *The Washington Post*, October 26, 2016; Texas A&M University, "Texas A&M Takes Over Washington D.C. Metro," October 31, 2016; EAB interviews and analysis.

EXPENDITURES

\$27.5B

HHS expenditures for FY 2021

- More than half of all federal agency funding for research universities

FUNDING MECHANISMS



Strategy Set at the Institute Level

- 27 NIH centers and institutes, plus 11 other operating divisions
- Institutes broken down by different focus areas (e.g., aging, cancer)
- Funding cascades from each institute, and most offer each grant type

TYPES OF EARLY-CAREER FUNDING



K-Grant (K99)

- NIH Pathway to Independence Award
- Two-phase, 5-year support grant that sets PIs up to eventually pursue R-grants
- Outstanding postdocs also eligible



R-Grants

- R01 is the most common NIH award, considered a career award
- Other R-grants include small projects, conferences, clinical trials planning

How to Succeed with NIH

Agency Funding Trends, Priorities, and Pathways



Start with Philanthropy

Most medical researchers get their first grant from a philanthropic group or research foundation—these grants are smaller but help PIs conduct essential basic research that can scale into an area of expertise funded by NIH

Merit Matters (A Lot)



NIH review panels strongly consider track record and outputs when making funding decisions—publications, citations, and connections to other successful investigators all play a role in R-grant funding decisions



P/U: Process Improvement

Mid and late-career PIs can pursue P and U grants, which are aimed at large interdisciplinary teams—these grants also usually cross and institute and a center, looking to bring about new research in a new or more efficient way

Clinical Trials are the Peak



While not all NIH funded research concludes in clinical trials, such pursuits are considered the “most impactful” research outputs from the agency, and often involve partnerships with industry

Securing Next-Level Federal Funding



Major Stepping Stones Further Out of Reach

Tough Competition for Major Awards



16%

Success rate for NIH R01-equivalent awards for first time applicants (FY2017)

17%

Success rate for NSF CAREER award applicants (2017)



Finding Success at a Later Age

35.7

Average age PIs (with PhD only) receive first R01 in FY1980

42.6

Average age PIs (with PhD only) receive first R01 in FY2016

Essential to Supporting the Research Economy



NIH Research Project Grant Program (R01)

- Oldest and most commonly awarded NIH grant
- Average award was \$499K in FY2016
- Generally awarded for 3-5 years, with option for renewal
- Three annual submission dates

NSF CAREER Program

- Most prestigious award in support of early-career faculty
- Minimum award is \$400–500K for a 5-year period
- Single-PI project
- One annual deadline in summer

Source: [Success Rates & Funding Rates R01-equivalent Grants, New \(Type 1\)](#); [NSF CAREER Program: A gateway to get faculty hooked on BI](#); [Retention Rates for First-Time R01 Awardees](#); [NIH FY2016 By The Numbers](#); [FAQs for the CAREER Program for Submission in Years 2017 – 2019](#); [NIH Average Age and Degree of NIH R01-Equivalent First-Time Awardees 1980 – 2016](#).

A Boot Camp Centered Around the R01

Mentored Research Academy Supports First-Time PIs



Precipitating Factors



Economic Downturn

Increased uncertainty around federal funding



Faculty Feedback

Faculty surveys showed demand for mentorship



Intense Competition

Low success rates for first-time PIs applying for R01

Mentored Research Academy: R01 Boot Camp



Proposal Development



Mentorship



Peer Support

Case in Brief: University of Michigan Medical School

- Public, Doctoral University: Highest Research Activity located in Ann Arbor, Michigan
- \$1.40B+ in research expenditures in FY2016
- During the economic recession, leadership at the University of Michigan Medical School decided to invest specifically in supporting early-career faculty to secure major funding
- Created the Mentored Research Academy: R01 Boot Camp to support first-time PIs applying for an R01 (or equivalent) through mentorship, proposal development, and peer support
- Program participants have higher success rates (35%) and often win awards at an earlier age over average first-time R01 recipients



Beyond Proposal Development and Editing

Connecting Faculty with Peers, Mentors, and Experts



Components of the Mentored Research Academy

SUPPORT NETWORK



Peer Cohort and Faculty Coach

- Participants are placed in teams of 3-4 with one faculty coach
- Teams meet monthly to cover specific topics and support each other's proposal development



Internal Subject Matter Expert (ISME)

- Participants select an expert faculty member in their field to advise them during the program
- ISMEs provide guidance on research plans, feedback on proposal drafts, and assists with development of a "chalk talk"



External Subject Matter Expert (ESME)

- ISMEs help participants identify an external expert to review a near-final copy of the proposal
- Research office coordinates review and compensates ESME

GRANTSMANSHIP



Workshops

- Trainings offered on specific skills needed to write successful R01 application
- Topics include grant writing, budgeting, and even time management

Creating Structure Leading Up to Submission

Program Events and Milestones Prepare Participants



Program Timeline

January

- Program kick-off
- Meet peer group and coach
- **Create and discuss research roadmaps**

May

- Boot camp manager sends mid-program progress report to participant's department chair
- **Begin final proposal writing**

October/November

- Mock panel review
- Closing ceremony
- **Deadline for new R01 proposals**
- Program evaluation
- Final progress reports

Spring Semester

- Workshops on writing R01 proposal, budgets, and biostats
- Participant Chalk Talk presentations
- **Draft proposal development and peer editing**

Summer/Early Fall Semester

- Proposal writing
- **Submit proposal for external review**

Ongoing Program Activities:

- Peer group meetings
- Internal Subject Matter Expert (ISME) consultations

Generating Success Across Multiple Metrics

Participants See Higher Success, at Younger Age



“

“The group dynamic forces everyone to think critically about their grants and to proactively write well in advance. Seeing others’ grants was very helpful to get new ideas on ways to approach writing, and there was a ton of critical feedback.”

Scott Leiser, Assistant Professor
Molecular & Integrative Physiology and Internal Medicine

”

Program Participants See Success

~66%

Percentage of program participants who receive their first R01 before the age of 42 (the average age of all first-time R01 applicants)

35%

Percentage of participants (who submit proposals) that are awarded their first R01 within 12 months of completing the program

\$106M

Total new award funding that first four program cohorts (2013-2017) have brought in as PIs

EXPENDITURES

\$5.4B

NSF expenditures for FY 2021

- Does not include imbedded funding for the new Directorate of Technology, Innovation, and Partnerships (TIP)

FUNDING MECHANISMS



Strategy Set at the Director Level

- NSF strategy has historically been bottom-up, set at the Directorate-level
- Now, NSF appears more top-down, with the Director setting a broader direction and the Directorates executing on those mandates

TYPES OF EARLY-CAREER FUNDING



CAREER Awards

- The standard career award, establishes a foundation for new researchers to build from
- Specific parameters, and direct cost restrictions
- Time to achieve is getting longer, success rates lower



Others

- Awards available for infrastructure
- Awards available for undergraduate research programs and doctoral training

How to Succeed with NSF

Agency Funding Trends, Priorities, and Pathways



Looking for Impact

Broader Impact statements are an important part of NSF applications and anecdotally can account for upwards of 25% of a proposal's likelihood of receiving funding—however, it is easy to overlook this an ancillary component of the proposal

Investment > Seed Funds



NSF is increasingly moving toward a model where they want to fund research that has already started and showed early progress versus being the initial funder of an individual's success—think of them more as a Series B funder and less of an angel investor



MSI Collaborations

There is more funding available nowadays to collaborate with minority-serving institutions (MSIs) such as HBCUs and HSIs—some of this funding can be accessed through direct grants, others through passthrough

Bigger, Faster, Pricier



Everything at NSF is growing in scope—bigger projects, faster turnaround times, with more funding to cover higher costs—let's explore this more on the next slide...

NSF: The US Commercialization Agency?

How an Expanded Role for NSF Changes Tech Transfer at Universities

Engines

- Funded by the CHIPS and Science Act in 2022
- Regional, competition-based funding for economic consortia
- Focused on innovation capacity, ecosystems

AI Institutes

- Originated in 2019 with funding from multiple federal agencies
- Regional, competition-based funding
- Focused on six research themes: trustworthiness, cybersecurity, climate and ag, neural and cognition, decision-making, and learning expansion

Tech Hubs

- Funded by the CHIPS and Science Act in 2022 (technically part of EDA under Commerce)
- Regional, competition-based funding for economic consortia
- Focused on innovation capacity, ecosystems

What Does All That Mean?



Industrial Policy is the New Way of Things



Big, Regional Competitions Are Where the Money Is



Agencies More Aligned Than Ever Before



Government Funds then Buys Intellectual Property



Ecosystems Require More than Just a University

Support to Secure NSF CAREER Awards

Prep Program Guides Faculty Through Proposal Process



Why Focus on the CAREER Award?



Most prestigious award NSF offers for junior faculty



Application requires sections beyond those of a traditional proposal



Annual application deadline allows for longer-term planning

Case in Brief: University of Arizona



- Public, Doctoral University: Highest Research Activity located in Tucson, Arizona
- \$600M+ in research expenditures in FY2016
- Office for Research, Discovery, & Innovation wanted to increase success in securing highly competitive grants and develop a strong talent pipeline
- Created the NSF CAREER Grant Preparation Program to support early-career faculty in developing successful NSF CAREER proposals
- Since program inception, nearly all NSF CAREER recipients have participated in one part of the program

From Engagement to Submission

Targeting Faculty Members at the Right Time

Interested Faculty



Engage

(Fall Semester)

- Research office invites all faculty to introductory workshops about NSF CAREER Award
- 2017 Sessions:
 - Introduction & Recipients Panel
 - Broader Impacts vs. Education Plan

Potential Submitters



Commit

(Early Spring Semester)

- Faculty apply to be placed into small, directorate-specific writing groups
- Groups are supported by faculty coaches and research development office professionals
- Groups meet monthly to work on education plan, project description, project summary, plan for DC trip, and identify internal reviewers
- Coaches and staff provide resources for educational plan and departmental letter

Committed Applicants



Submit

(Late Spring Semester, Summer)

- Faculty receive additional coaching and support including an option for a full red team (final edit) review by experts on their full project description, project summary, budget justification, biosketch, and references cited
- Research development associates provide review and edits before and after the red team review
- Federal relations consultants prepare faculty for trip to DC
- Faculty travel to DC to meet with NSF program officers
- Faculty incorporate feedback from review and DC meetings to finalize their proposals



NSF CAREER
Award Recipient

Increasing Success in Securing NSF CAREERS

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Lessons Learned: Program Adapts...

Start Early in Academic Year

- Program begins in the fall semester
- Prior to 2016, program began in the spring semester



Fewer Workshops, More Proposal Development

- Currently offer two workshops
- Previous years included as many as six workshops



Focus on Research Plan

- Past programming focused on education plan
- Adjusted to enhance technical aspects while still providing support for education plan



...To Ensure Success



Program Participants See CAREER Award Success

Nearly all NSF CAREER award winners since the program launch have either participated in prep program or worked one-on-one with research staff



Building a Talent Pipeline

Over **50%** of grants-active early-career faculty have worked with the research office, often spurred by word of mouth from past CAREER program participants



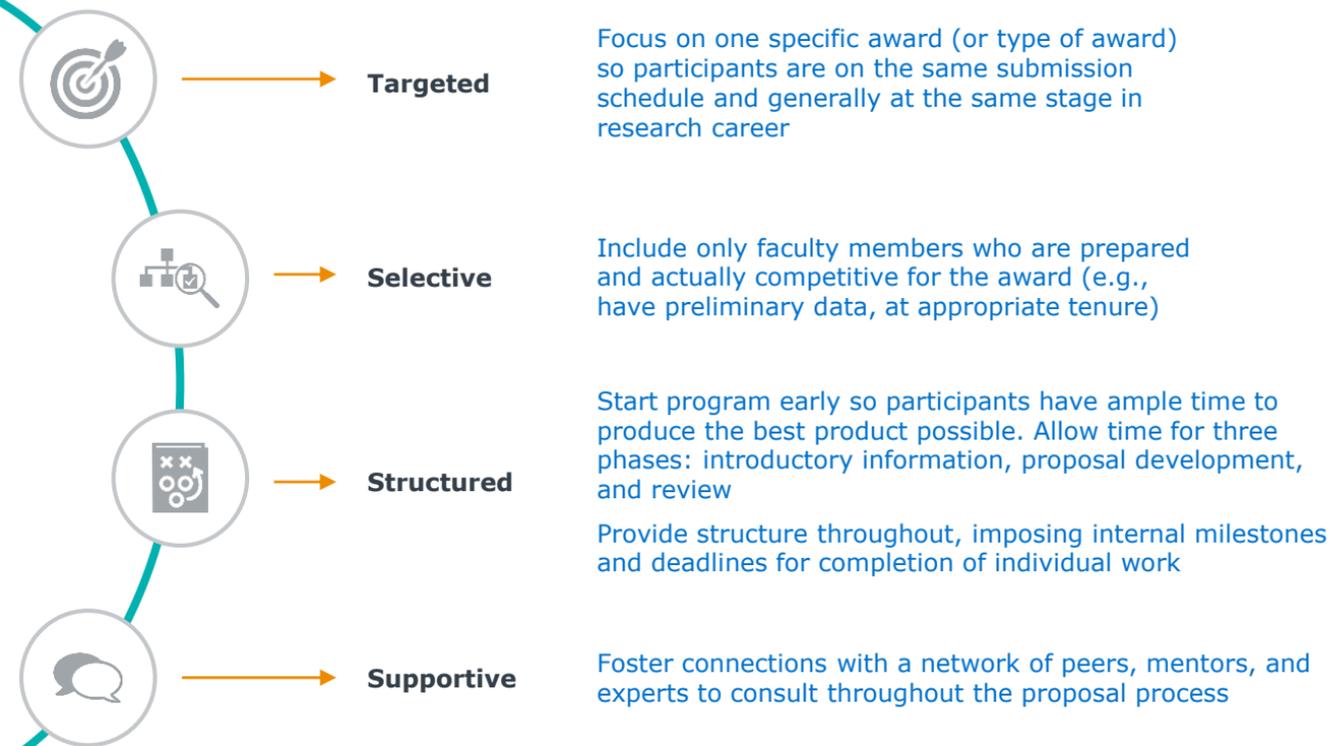
Instilling Good Grantsmanship

Help early-career faculty develop skills to be used beyond the CAREER Award



Setting Up For Success

Key Considerations in Creating a Targeted Prep Program



EXPENDITURES

\$11.4B

Combined DOD, DOE, and NASA expenditures for FY 2021

- DOD is the second-largest funding agency with \$7.4B
- Their combined expenditures comprise about 25% of total federal research outlay

FUNDING MECHANISMS



Strategy Set at the Executive and Legislative Levels

- Mission-driven take their research funding cues from the White House and Congressional funding packages
- Directors and Under-Secretaries largely set funding strategy based on federal priorities, and different units push RFPs for specific workorders and projects

What Do Mission-Driven Agencies Fund?

Understanding Overlaps Between Traditional and Mission-Driven Agencies

Research Terrain

Breast Cancer Research

Traditional Funders



Mission-Driven Funders



Solar Capture Research



AI and Quantum Research



How to Succeed with Mission-Driven Agencies

Agency Funding Trends, Priorities, and Pathways



Who You Know

Mission-driven agencies are highly relationship based, and strong connections often help secure funding—government relations offices and lobbyists are essential to cultivating these relationships for individual PIs and universities

Who Knows You

Similarly, individual PI success can translate into university success, and sharing connections can create more funding opportunities for more PIs—but the inverse is true too that one mistake can harm an entire institution's reputation



On Time, On Budget

Mission-driven agency work often feels more like contract work than grant work—this means stricter deadlines, more interim reports, stricter budget lines, and higher overall expectations out outputs

Apply, Develop, Repeat

Many mission-driven agency projects have an applied research component, requiring both individual buy-in and institutional capacity—it's also good to note here that some project results cannot be published



Going Beyond Basic Training



Preparing Faculty to Secure Federal Funds from Mission Agencies



Mission Agencies Boot Camp



Case in Brief: Rochester Institute of Technology

- Private, Doctoral University: Moderate Research Activity located in Rochester, New York
- \$45M+ in research expenditures in FY2016
- Research office sought to increase faculty engagement with mission-driven agencies
- Created the “Mission Agencies Boot Camp” to provide faculty with training and support to pursue support from mission-driven agencies
- Launched in 2018, the inaugural boot camp received faculty praise and filled a critical training gap

Putting Pen to Paper

Application Process Makes Researchers Articulate Ideas, Plan

White Paper Components



Cover Sheet

Includes basic information about PI, their department, and the project



Narrative

Includes a 100-word overview of the project, answers to Heilmeier Catechism, and details about which agency and program officers are targets for the project



Slides (optional)

Up to three slides can be utilized for the presentation portion of the boot camp



Heilmeier Catechism

Former DARPA Director George Heilmeier developed the following set of questions to help evaluate proposed research:

1. What are you trying to do?
2. What is the current practice?
3. What is new in your approach and why do you think this will be successful?
4. What is the significance of your research if successful?
5. What are the risks and how will you mitigate those risks?
6. What are the metrics for success for your research?

Boot Camp Mirrors Real Experience

Sessions Prepare Faculty to Work with Program Officers



Learning From an Expert

Session features a speaker with significant experience and expertise with mission-driven agencies



Getting Multiple Perspectives

Panel discussion features multiple successful researchers who share their experience and lessons learned



Developing a Pitch

Participants work with peers and experts to hone their pitch to mission agencies



Vying for Financial Support

Participants present their pitches to a “Shark Tank” style panel, competing for financial support

Pitching to the “Sharks”

- Participants learn to communicate their ideas and answer questions in the moment
- Session prepares participants for conversations with program officers



Securing Travel Funding

Participants with successful pitches receive funding to travel to meet with program officers

Takeaways and Next Steps



Connect with the Experts in the Office of Research

The Office of Research can support you in identifying funding opportunities, constructing and submitting proposals, and managing awards.



Think About the Whole Federal Pie

With unprecedented levels of federal overlap, there are likely multiple agencies funding research in your discipline—cast a wide net when looking for research opportunities.



Recruit Others and Practice Your Skills

Successful proposals are about repetition—honing the skills of developing strong proposals and managing through the review process—and these skills can be trained and developed individually and in cohorts, as well as through mentorship

External Resources

- **Read agency strategic plans:** each federal agency and most directorates/ institutes maintain a strategic plan with strong clues into what they are looking to fund
- **Attend agency webinars:** similarly most agencies host webinars or put out announcements about new funding priorities
- **Network, network, network:** the role of partnerships and mentorship are growing and conferences are great opportunities to identify potential collaborators



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