Opportunities to Engage in Basic Research at the DoD

Dr. Bindu Nair
Director of the Basic Research Office
Office of the Under Secretary for
Research and Engineering

24 October 2023

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How does DoD define Basic Research?

DoD policy states that basic research is the "*systematic study directed toward greater knowledge or understanding of the fundamental aspects of phenomena and of observable facts…*"

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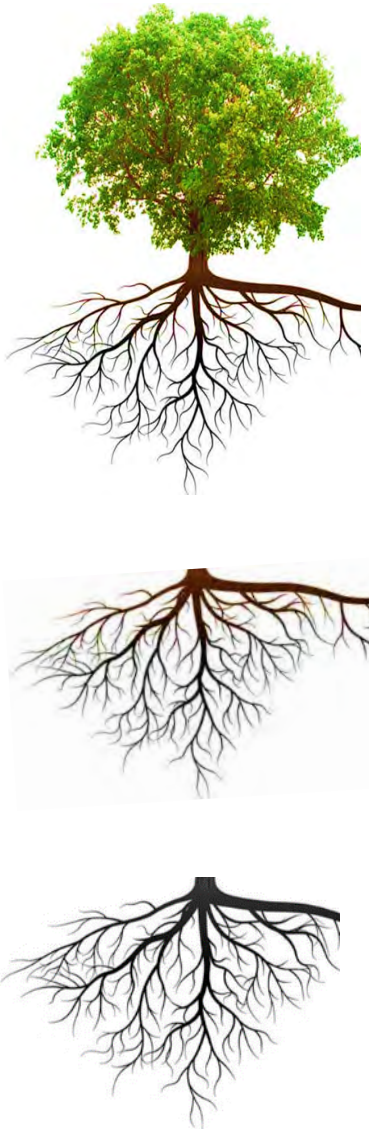
How does DoD define Basic Research?



- 6.7 Operational Systems Development
- 6.6 RDT&E Management Support
- 6.5 System Development Demonstration
- 6.4 Advanced Component Development Prototypes
- 6.3 Advanced Technology Development
- 6.2 Applied Research
- 6.1 Basic Research

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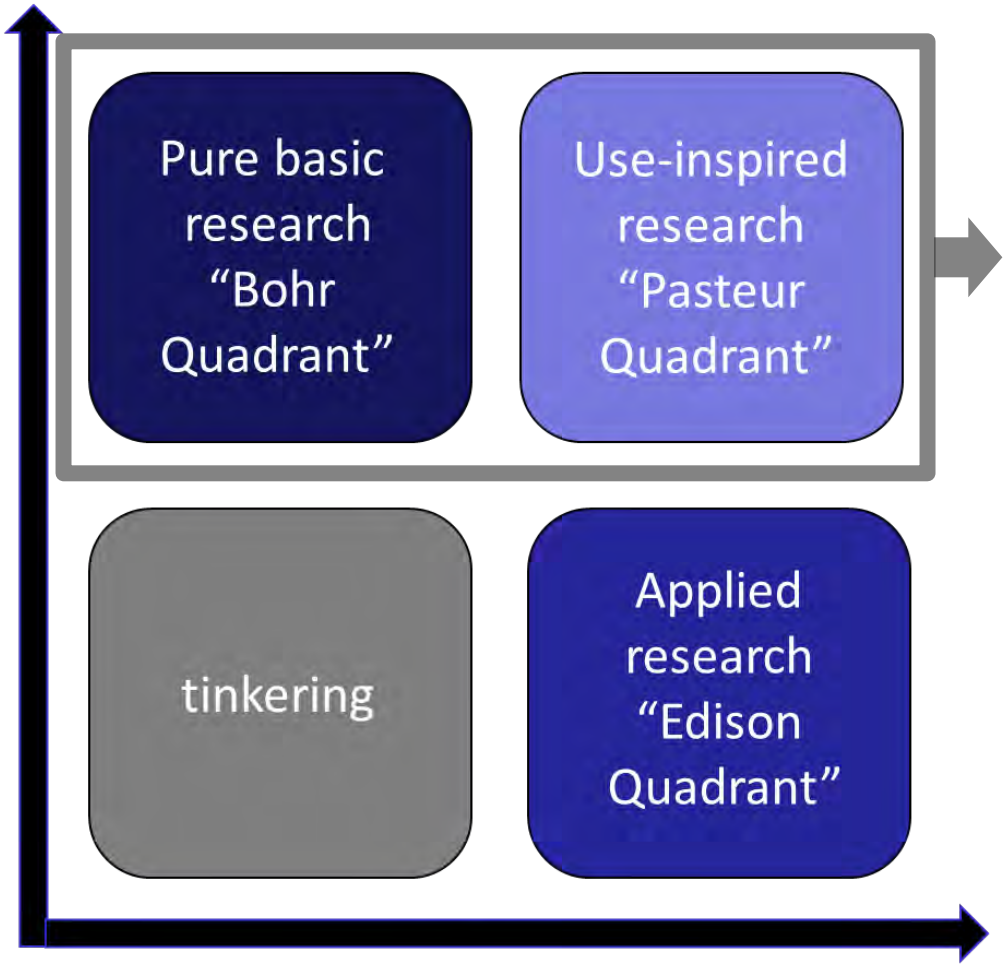
Why DoD Funds Basic Research

Quest for fundamental understanding

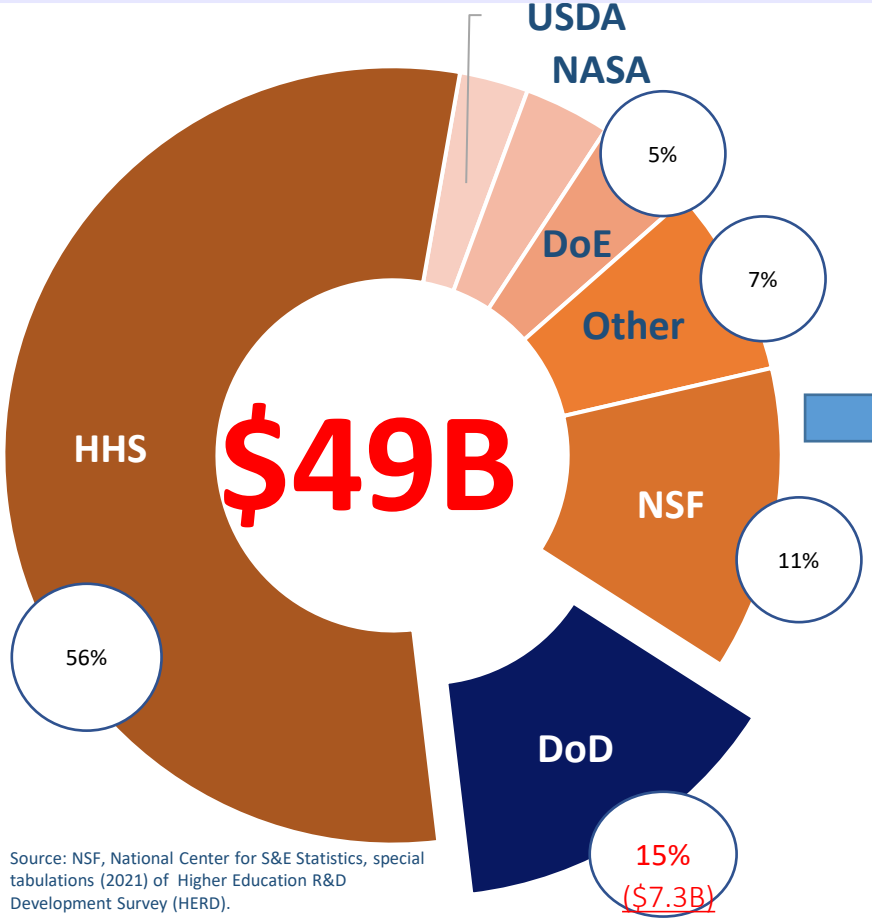


DoD 6.1 Basic Research

Donald Stokes: 'Pasteur's Quadrant'

Federal Academic R&D Expenditures Across the USG

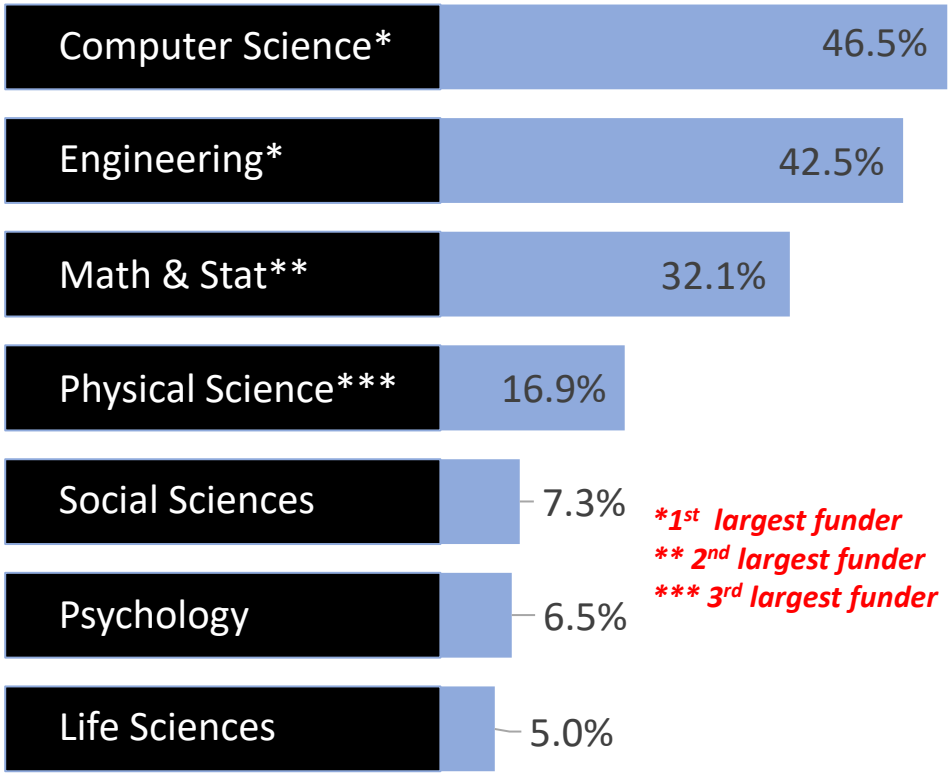
Academic R&D Expenditures by Federal Agency (2021)



Source: NSF, National Center for S&E Statistics, special tabulations (2021) of Higher Education R&D Development Survey (HERD).

Top Field Areas *funded by DoD (% of total federal R&D expenditures)*

Major funder of basic research in math, physics, and engineering



*1st largest funder
** 2nd largest funder
*** 3rd largest funder

In 2021, DoD had the second largest Academic R&D Expenditures and prioritized funding areas like math and physical sciences.

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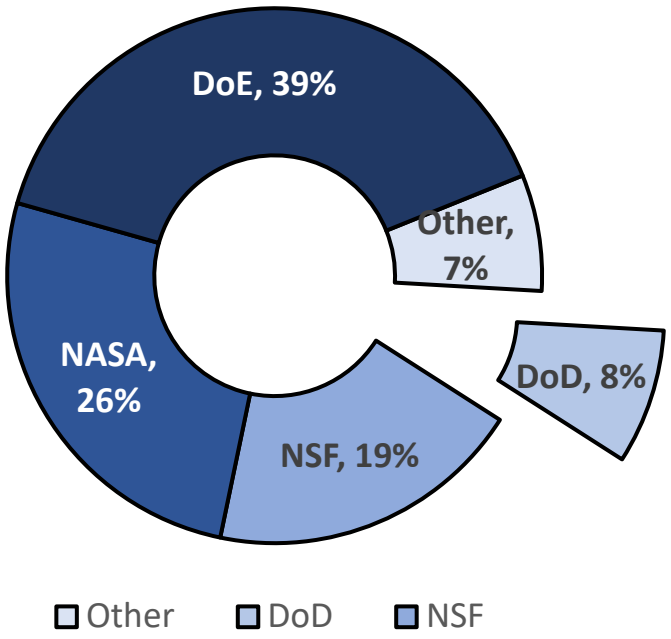
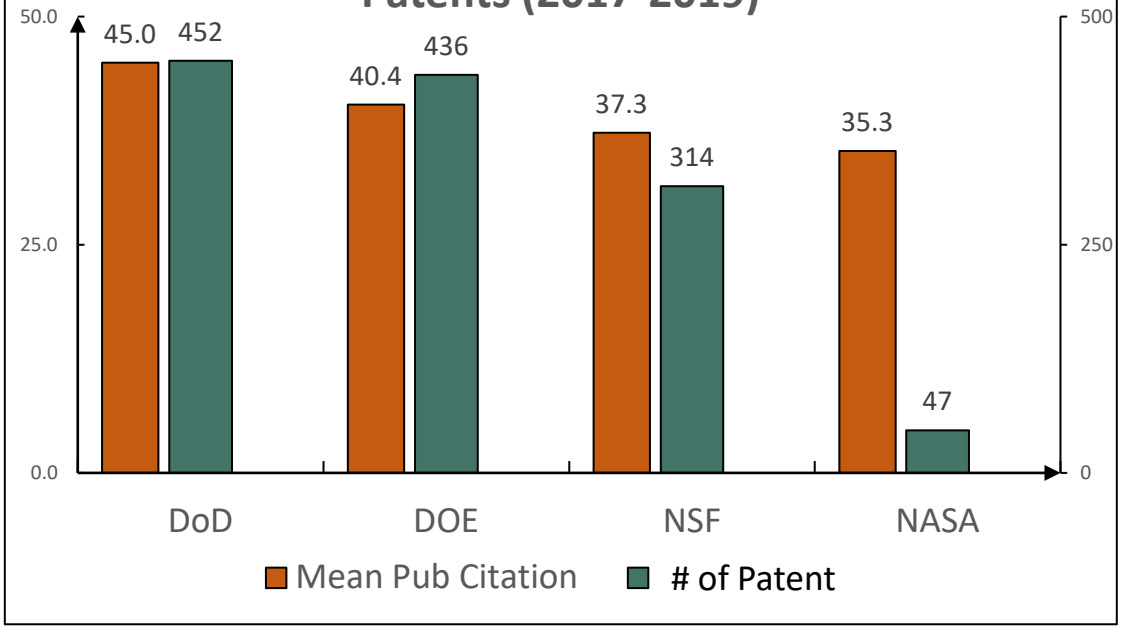
Revealing Indicators of DoD Innovation

Average % Federal Obligations in Physical Sciences 2013-2015



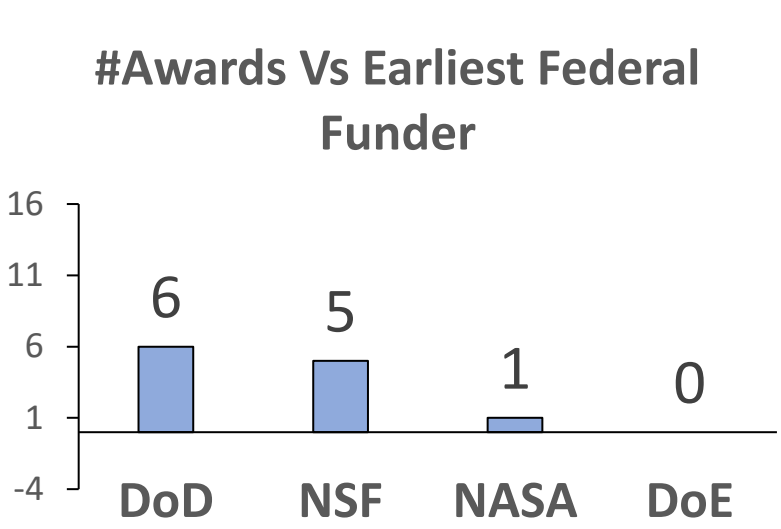
Mean Physical Sciences Pub Citations and Patents (2017-2019)



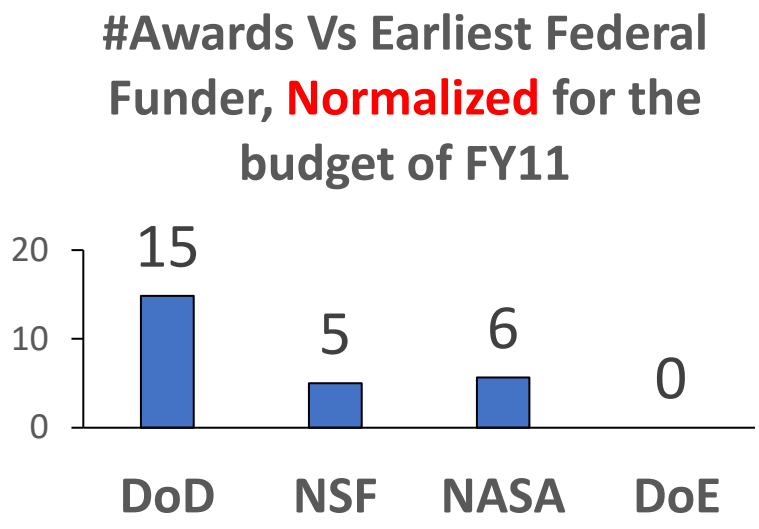
DoD is < 10% of the Federal Physical Science Budget, but is leading in cited research and patents

DoD Is Top Early Funder for Top Cited Authors in Physical Science in 2019

DoD more than often serves as an early funder for many of the corresponding authors of these highly cited papers in Physical Science in 2019, as discerned from their CVs and using the Dimensions.ai grant database

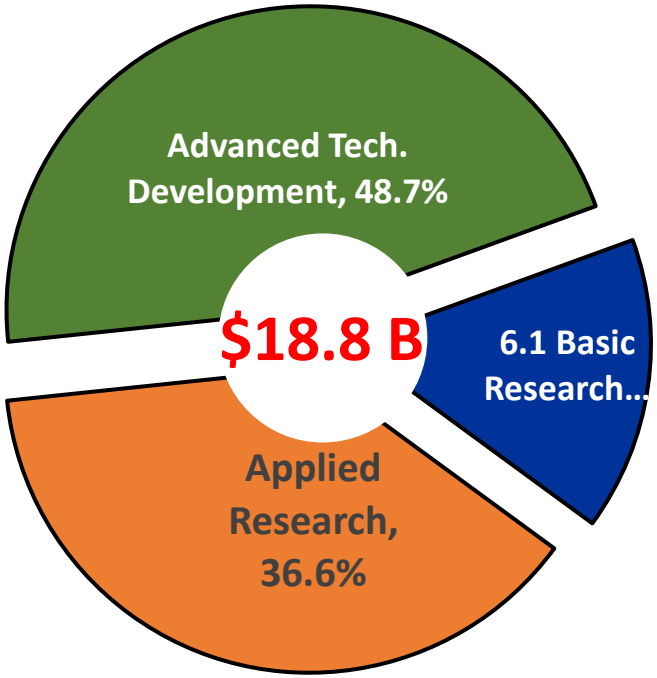


Normalized

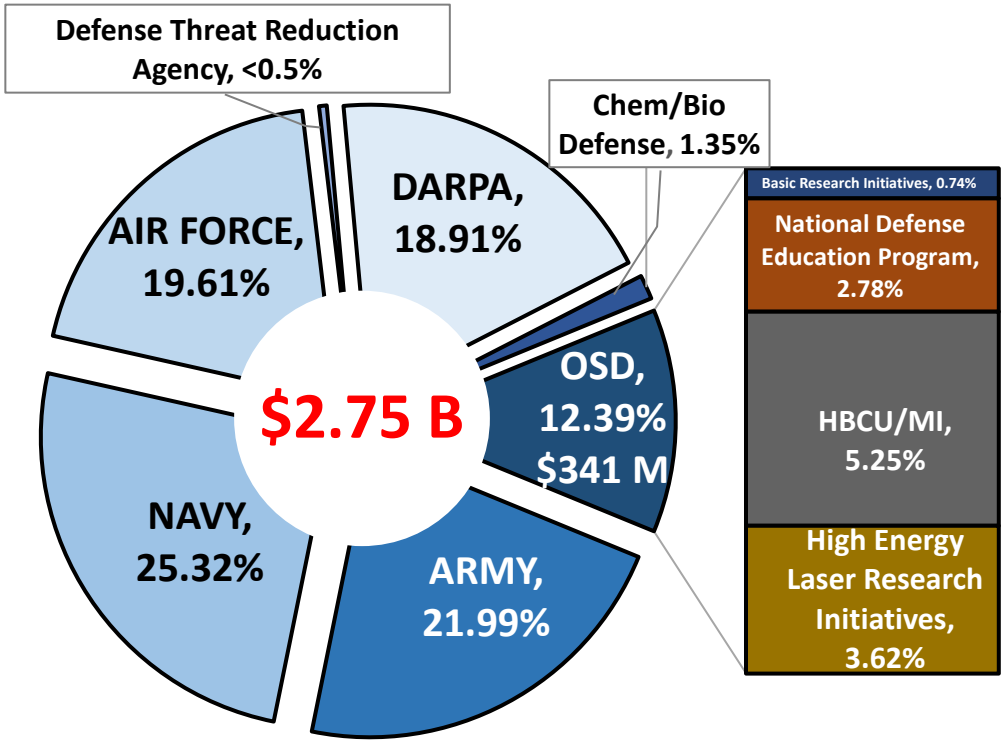


DoD's S&T Budget (FY2022 Enacted)

DoD S&T Budget (6.1-6.3)



DoD Basic Research Budget (6.1)



DoD's S&T Budget (6.1-6.3) is $18.8 B
Basic Research (6.1) primarily funds extramural programs (over two-thirds). Some Applied Research (6.2) funds are also allocated for academia through programs like UARCS.

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Ways To Engage with tri-Service Program Officers

Email preferred for most POs

Phone (hit or miss due to travel)

Air Force Office of Scientific Research (AFOSR)	Army Research Office (ARO)	Office of Naval Research (ONR)
https://www.wpafb.af.mil/afrl/afosr/ On grants.gov search using keyword(s) "Research Interests of the Air Force Office of Scientific Research" to see the latest core announcement. The current funding opportunity number for general research interests is **FA9550-23-S-0001**.	*https://www.aro.army.mil/* Select "Collaborate with Us"; then "Funded Research"; then "Learn More"; and then "ARL Broad Agency Announcement (BAA)" to see the most recent ARO Core Broad Agency Announcement for Fundamental Research for 21 November 2022 - 20 November 2027, **W911NF-23-S-0001**.	*https://www.onr.navy.mil/* Select "Work With Us" and then "Funding Opportunities/Announcements" and then select FY23 Long Range Broad Agency Announcement for Navy and Marine Corps Science and Technology, **N00014-23-S-B001**. Navigate to https://www.nre.navy.mil/our-research/onr-technology-and-research for a list of ONR-sponsored research. Select a technology area which will provide program officer and specific program details.

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Basic Research Investments Across DoD

Pre-doctoral Fellowships

- NDSEG
- Minerva Training Grants
- SMART

Research Funding to University Laboratories

- VBFF
- Minerva projects
- MURI
- Single-Investigator Awards
- Young Investigator Program

Expanding the Research Base

- DEPSCoR
- HBCU/MI

Equipment and Facility Funding

- DURIP

Transition to DoD

- Minerva transition to Professional Military Schools
- LUCI
- UARCS

Technology Transfer

- SBIR/STTR
- Manufacturing Institutes

Service Programs green **OSD Programs purple** **Cross- Service Programs orange**

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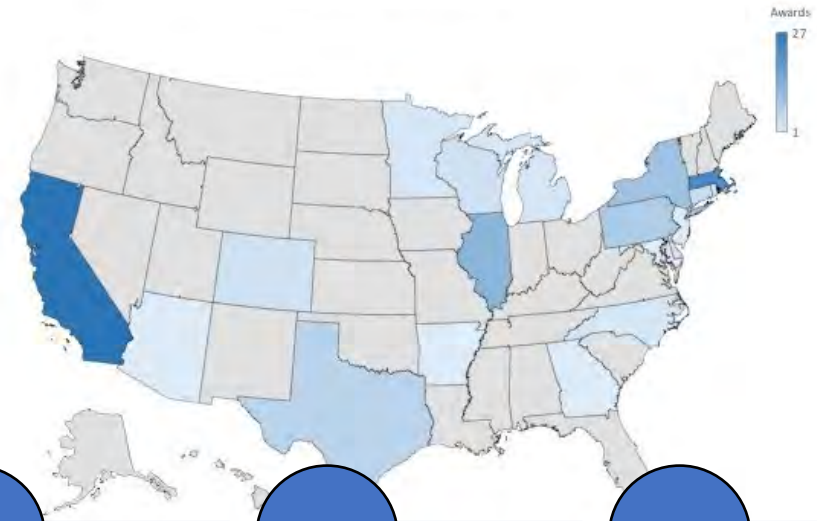
Vannevar Bush Faculty Fellowship

Defense Department's largest single-investigator program:
5-year fellowship with up to $3M for research with potentially extraordinary outcomes

Program Goals:

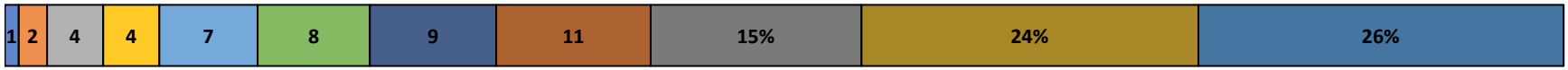
- VBFF supports transformative, high-risk, basic research
- Attract distinguished, productive, and creative candidates and sustain career-long association between Fellows and DoD
- Establish a group of experts that can study and advise DoD on emerging scientific and technical challenges

Years: 2008-2021



111	45	$333M
Awards	Universities	Award Dollars

% of Awards per Discipline



- Remote sensing
- Photonics
- Fluid Dynamics
- Networks/ AI
- Physics
- Nanoscience
- Bio-Engineering
- Cognitive Sciences
- Applied Math
- Quantum
- Materials

Success Stories
Dr. John Rogers, 2009 VBFF Fellow

Looking back at Prof. John Rogers impact in electronics materials....

Northwestern University
VBFF Class of 2009

"The VBFF fellowship was a real game-changer for my programs. This funding mechanism is unique -- long-term, sustained commitments to the very best breakthrough ideas and the most promising scientists, all in the broader context of grand challenges in national defense. " -**John Rogers**

DARPA

Macroelectronics

(- 2009)

Pre-fellowship 2009 — **Funded By DARPA**

Science

Epidermal Electronics

(2009- 2011)

Wins Fellowship — •Publishes Paper •1rst Cited Pubs - 3256

PATENTED PATENTED PATENTED

Transient Devices Designed to undergo programmable transformations

Netherlands

PNAS

(2012-2013)

Rogers Patents research — •Cited in patents (59) •Cited in policy docs (2)

SHARP

(2015)

Clinical Trials — A Pilot Study of Seizure Detection in Neonates

SIBEL

(2018)

Startup company founded (2015) — Post Doc Founds Spinoff

U.S.ARMY

BARDA

Deep tissue Biomechanics

(2021-)

Transitioned in Army (2020) — New fundamental Questions 2021 and beyond)

(10 year span)

Technology transition of 2009 Research revealed new fundamental questions.

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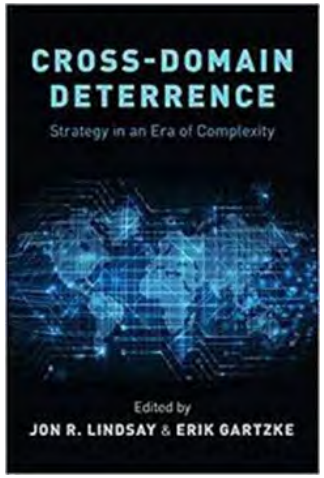
Minerva Research Initiative

Program Goals:

- Connect social science insights and methods to improve decision-making
- Build fundamental understanding of social, cultural, and psychological forces that shap strategically important regions of the world
- Help DoD better understand and prepare for future challenges, particularly those prioritized in th National Defense Strategy.

Prof Eric Gartzke's Minerva project "Deterring Complex Threats: The Effects of Asymmetry, Interdependence, Multi-polarity on International Strategy."

MINERVA RESEARCH INITIATIVE



Sec Austin expresses "Under what I call 'integrated deterrence,' the U.S. military isn't meant to stand apart, but to buttress U.S. diplomacy and advance a foreign policy that employs all instruments of our national power".

Source: https://www.washingtonpost.com/opinions/lloyd-austin-us-deter-threat-war/2021/05/05/bed8af58-add9-11eb-b476-c3b287e52a01_story.html

Defense University Research Instrumentation Program

Funding mechanism for purchasing research instrumentation and equipment so that university labs can conduct high-quality research

DURIP awards are made to research institutions with current DoD basic research grants

Range: $50,000 to $3,000,000

Fiscal Year 2025
Competition: Opens Fall/Winter 2023

Three Previous DURIP Awardees

Nick Glumac

University of Illinois
Flash X-Ray System
ONR

Claudia Fajardo-Hansford

Western Michigan University
Plasma-Assisted Combustion Diagnostics
AFOSR

Suzanne Shontz

University of Kansas
Graphics Processing Unit (GPU) Infrastructure
ARO

More Information:
ONR: https://www.onr.navy.mil/en/Education-Outreach/Sponsored-Research/University-Research-Initiatives/DURIP
ARO: https://www.arl.army.mil/business/broad-agency-announcements/
AFSOR: https://www.afrl.af.mil/About-Us/Fact-Sheets/Fact-Sheet-Display/Article/2282120/afosr-funding-opportunities-university-research-initiative-uri/

Fiscal Year 23 Competition **(announced Nov. 2022)**

147	77	$59M
Awards	Universities	Budget

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Multidisciplinary University Research Initiative

Tri-service program that supports basic research teams intersecting with more than one traditional science and engineering discipline

Program Goals:

Educate scientists and engineers in the interdisciplinary areas important to national defense

Promote close interaction with Service laboratories

Complement other DoD programs that support university research through the single-investigator awards.

MURI awards are 3-5 years, with teams funded up to $1.5M/year.

White paper inquiries and questions
Late Spring

→

White papers due
Early Summer

→ Success ~12-40%

Full proposals due
Late Summer

→ Success ~16-50%

Selection of Projects
Early Fall

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Investing in the Next DoD Workforce Generation

The Department has several workforce development programs that engage with the next generation of scientist and engineers.

SMART
SCIENCE, MATHEMATICS, AND RESEARCH FOR TRANSFORMATION
PART OF THE NATIONAL DEFENSE EDUCATION PROGRAM

NDSEG
NATIONAL DEFENSE SCIENCE AND ENGINEERING GRADUATE FELLOWSHIP PROGRAM

SMART Scholarship	NDSEG Fellowship	HBCU/MI
The Science, Mathematics, and Research for Transformation (SMART) Scholarship-for-Service Program, funded by the DoD, is a combined educational and workforce development opportunity for STEM students. https://www.smartscholarship.org/	The NSDEG fellowship supports graduate students in science and engineering disciplines of military importance. http://www.ndsegfellowships.org	Aimed to foster workforce diversity and entry of underrepresented minorities into STEM disciplines important to national defense.

THANK YOU

http://basicresearch.defense.gov

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https://www.linkedin.com/company/dod-basic-research-office

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