



Basic Research at the Department of Defense

June 23, 2021

Dr. Bindu Nair

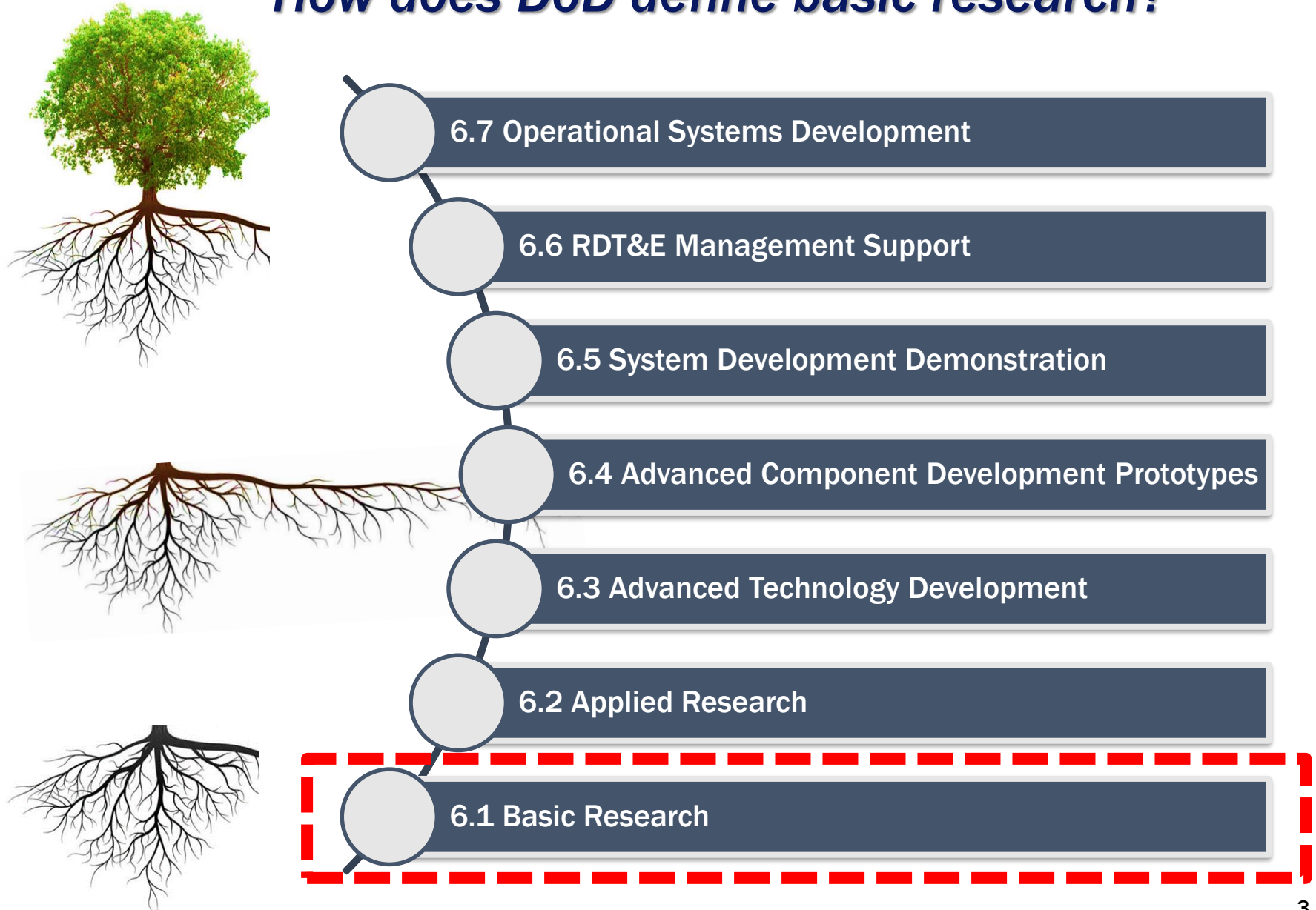
Director, Basic Research Office
OUSD(R&E)/DDRE(RT)



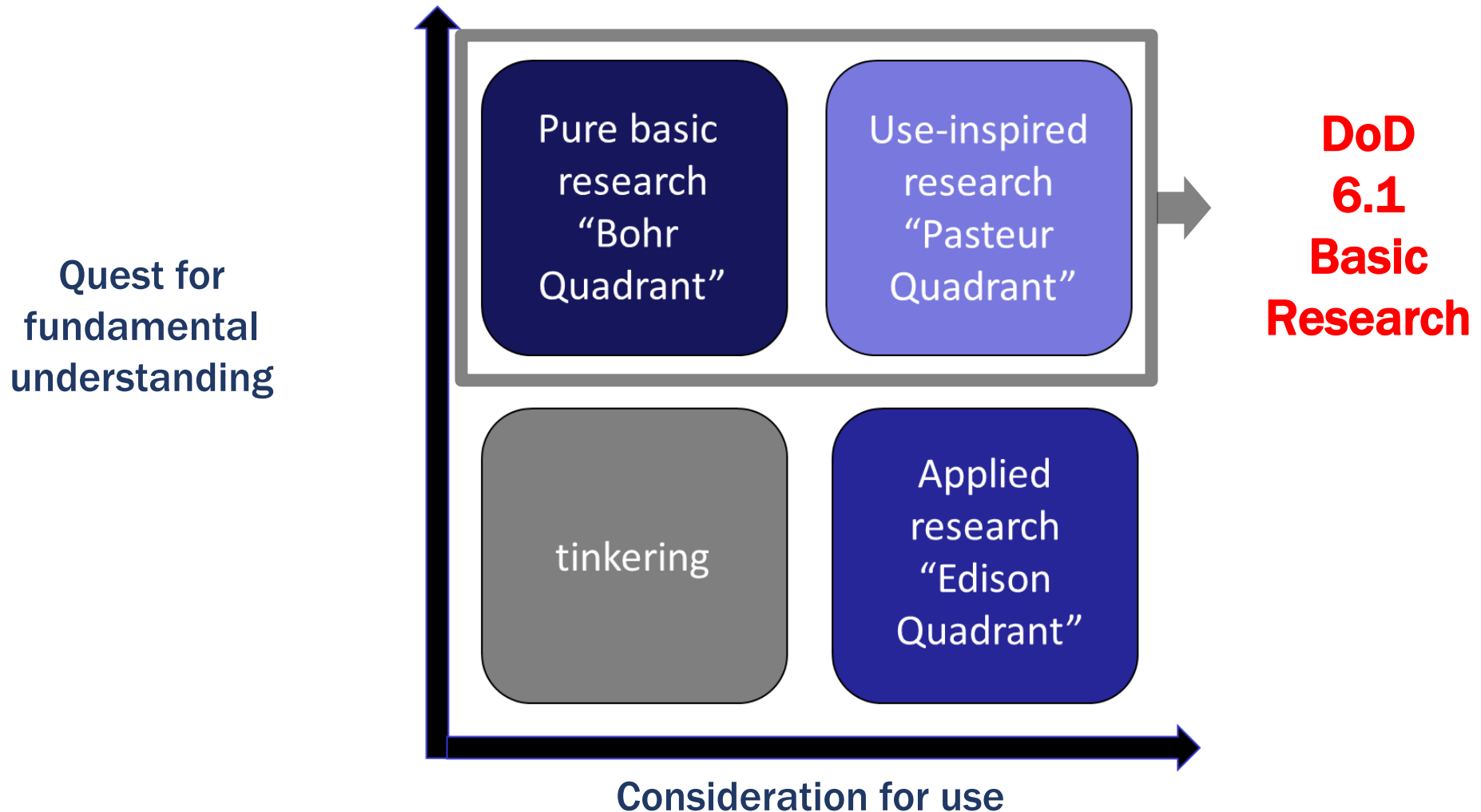
How does DoD define Basic Research?

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...*”

How does DoD define *basic* research?



Why DoD Funds Basic Research

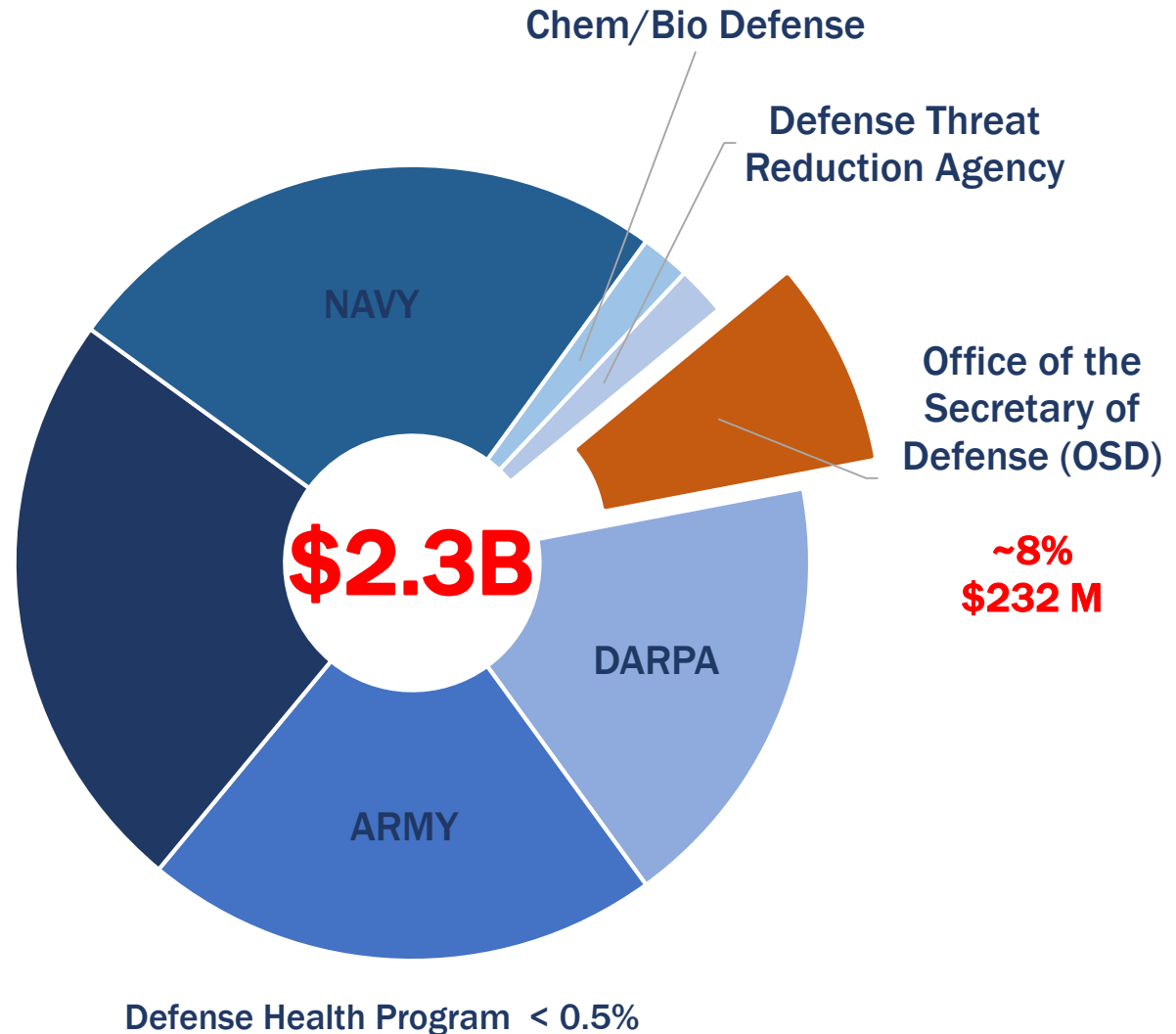


The Truth about Funding

***PRECONCEIVED NOTION #1:
DOD HAS LARGE BUDGET; VAST RESOURCES FOR
RESEARCH FUNDING***

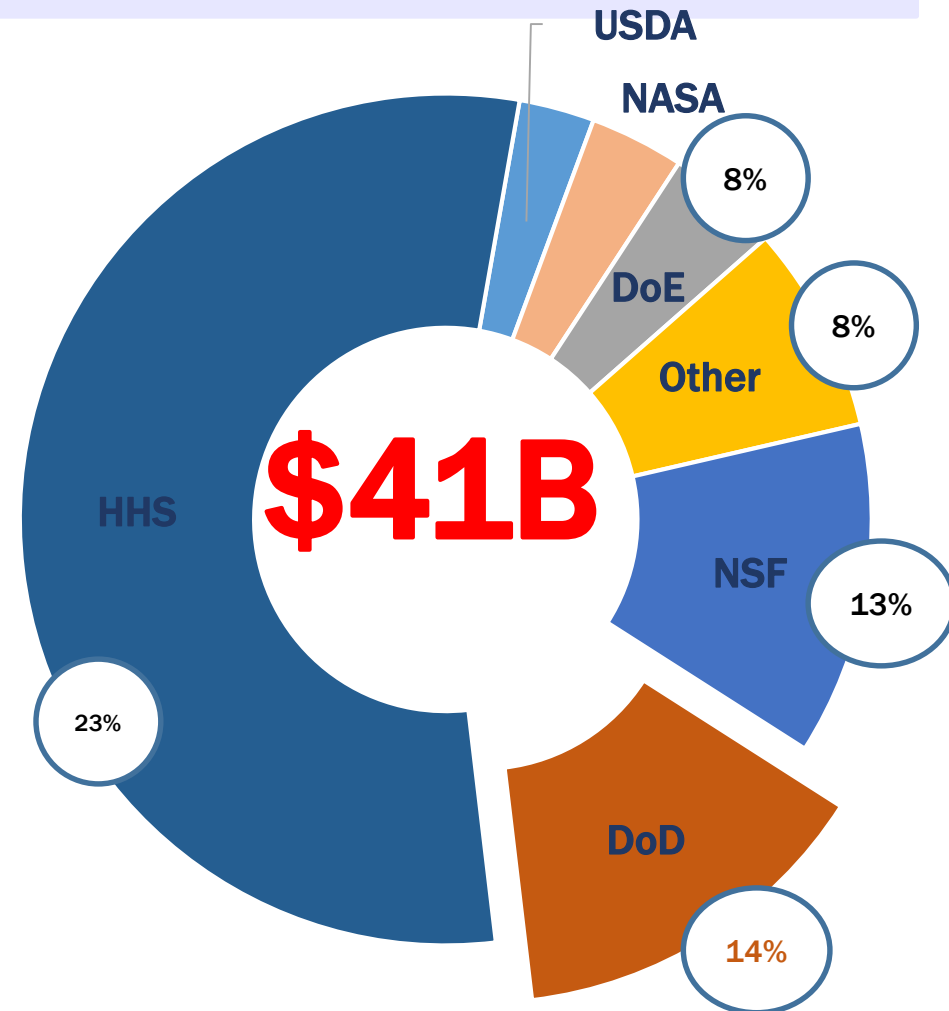
Funding across the DoD Basic Research Enterprise

- Over two-thirds of funds to extramural programs
- Major funder of basic research in math, physics, and engineering
- **3rd largest** funder of basic research to universities

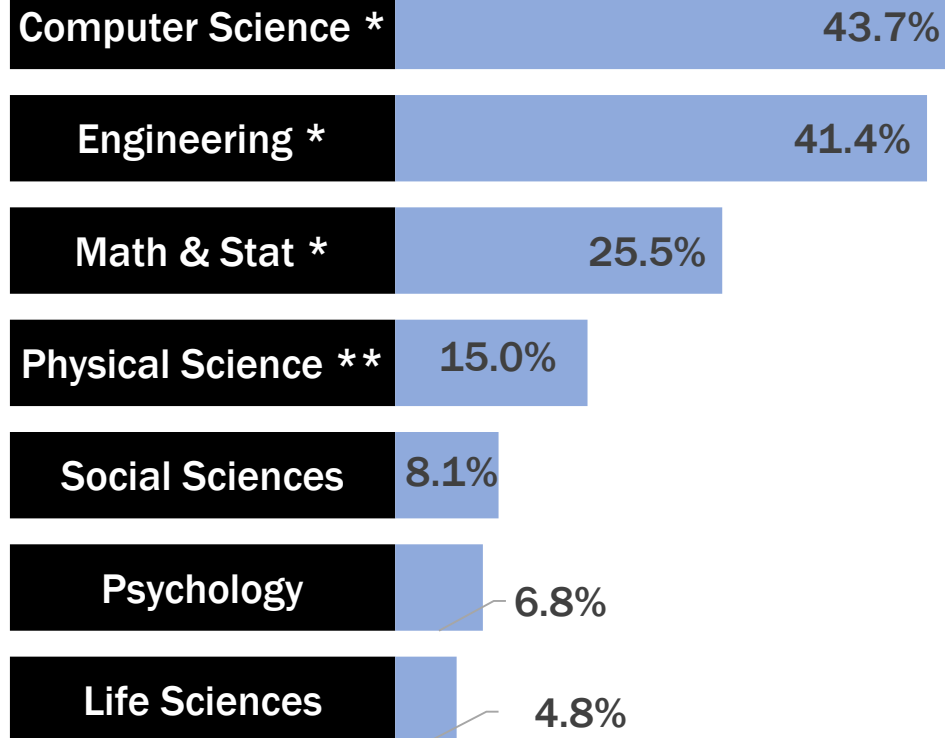


Academic R&D Funds by Agency

Research Budget by Federal Agencies



Top Areas *funded by DoD out of entire \$41B budget*



*1st largest funder
 ** 3rd largest funder

The Truth about the Funding Process

***PRECONCIEVED NOTION #2:
DoD PROGRAM OFFICERS ARE HARD TO ENGAGE***

Ways To Engage with tri-Service Program Officers



Email preferred for most POs



Phone (hit or miss due to travel)

AFOSR	ARO	ONR
<p>https://www.wpafb.af.mil/afri/afosr/</p> <p>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 FA9550-19-S-0003</p>	<p>https://www.aro.army.mil/</p> <p>Select “Broad Agency Announcements” in the “Business” section to see the most recent ARO Core Broad Agency Announcement for Fundamental Research for 1 April 2017 - 31 March 2022</p>	<p>https://www.onr.navy.mil/</p> <p>Select “Work With Us” then “Funding Opportunities” and then “BAAs, FOAs and Special Program Announcements” to see the Long Range Broad Agency Announcement for Navy and Marine Corps Science and Technology, N00014-21-S-B001. Navigate to https://www.onr.navy.mil/our-research/our-program-managers for a list of program officers and their specific program.</p>

Basic Research Investments Across DoD



Pre-doctoral Fellowships

- **NDSEG**
- Minerva Training Grants



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

- **I-Corps**



Ongoing Programs

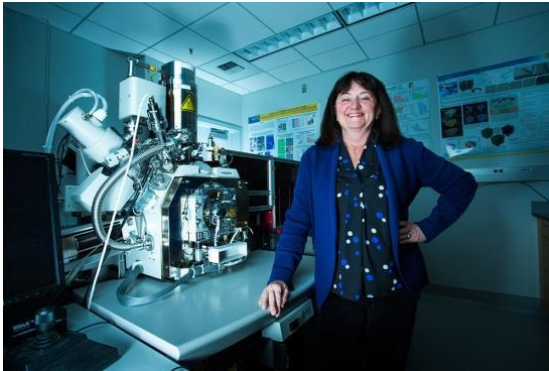


Vannevar Bush Faculty Fellowship

VBFF Fellow make transformative discoveries and transform their careers

University Of California Santa Barbara
Prof. Tresa Pollock VBFF Fellow (2017)

Topic: Structural Materials



**Supported 3 Graduates
 And 1 Postdoc**

38 High Impact Publications
Citing VBFF and 1 patent ~2.5 years

Select Publications

1. **Science Magazine (2020)**: Multiplicity of dislocation pathways in a refractory multiprincipal element alloy
2. **Nature Communications (2020)**: A defect-resistant Co-Ni superalloy for 3D printing
3. **Science Magazine (2020)**: Closing the science gap in 3D metal printing
4. **Acta Materialia (2019)**: Dislocation dynamics in a nickel-based superalloy via in-situ transmission scanning electron microscopy
5. **Acta Materialia (2017)**: On slip initiation in equiaxed α/β Ti-6Al-4V

**Research Highlight: Professor Pollock
 Collaborated with NRL Scientists to Make
 Breakthroughs in Multiprincipal Alloys**



Science 02 Oct 2020:
 Vol. 370, Issue 6512, pp. 95-101

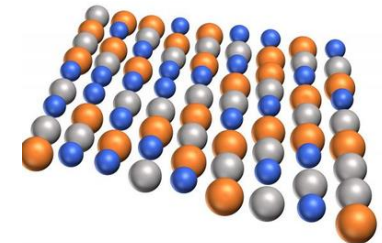


Image: Mutiprincipal Alloys



**Laboratory University
 Collaboration Initiative
 Fellow:
 Keith Knipling**

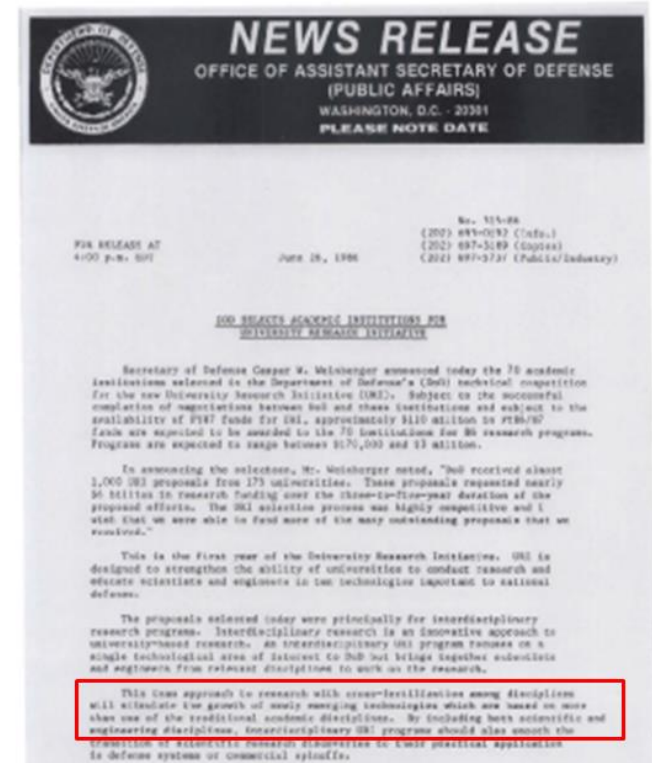
**Applications: state-of-the-art spacecraft,
 submarines, nuclear reactors, jet aircraft**

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 rapid technology transition directly to Service applications
- 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.



1986 Press Release: “This team approach in research with cross-facilitation among disciplines will stimulate the growth of newly emerging technologies....

Multidisciplinary University Research Initiative

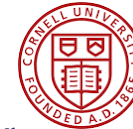
Tri-service program that supports basic research teams intersecting with more than one traditional science and engineering discipline

FY 2020 Budget:
\$185 million for
26 research
teams



Lead: Cornell University
PI: Dr. Robert Bruce van Dover

AFOSR 2017 MURI
Scientific Autonomous Reasoning
Agent: Integrating
Materials Theory, Experiment and
Computation



White paper
inquiries and
questions
Spring



White papers
due
**Late May – early
June**



Full proposals
due
Late Summer



Selection of
Proposals
Early winter

Success
~12-40%

Success
~16-50%

Selected topics from most recent funding call:

Bio-architected Responsive Materials with 3D Nanoscale Order, Nonlinear Optical Material Design with Extreme Interband Nonlinearities, Synthetic Quantum Matter, Irregular Metamaterial Networks, Self-learning for Real-world Perception

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 \$1,500,000

Fiscal Year 2022
Competition: Opens Spring 2021

Fiscal Year 20 Competition (announced Nov. 2019)

172

Awards

91

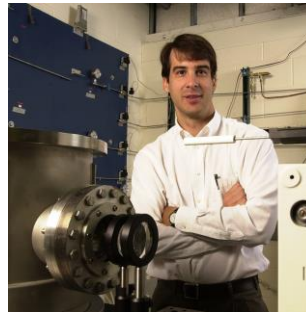
Universities

\$48.9M

Budget

Three Fiscal Year 2020 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/>

AFOSR: <https://www.afrl.af.mil/About-Us/Fact-Sheets/Fact-Sheet-Display/Article/2282120/afosr-funding-opportunities-university-research-initiative-uri/>

Minerva Research Initiative

DoD's basic social sciences program to better understand the social and cultural forces shaping security

Program Goals:

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

Power Projection, Deterrence Strategies, and Escalation Dynamics in an Era of Challenging Near Peers, Rogue States, and Terrorist and Insurgent Organizations



co-PI: Dr. Victor Asal
Institution: SUNY Albany



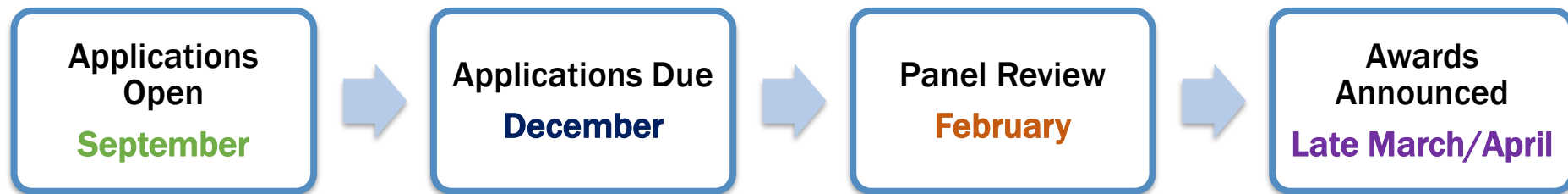
Project average budget of \$1.5 million lasting 3 to 4 years

National Defense Science and Engineering Graduate Fellowship

The NDSEG fellowship supports graduate students in science and engineering disciplines of military importance

Funding for 3 years:

- Covers full tuition, mandatory fees, & health insurance cost up to \$1200/year, travel costs up to \$500 for the fellowship duration
- Fellows also receive a monthly stipend of \$3200.



Informational webinar, project descriptions available on website

National Defense Science and Engineering Graduate Fellowship

The NDSEG fellowship supports graduate students in science and engineering disciplines of military importance

Since its inception in 1989...

3,600 Fellowships Awarded

15 Disciplines Supported

FY 2019

166

Awards

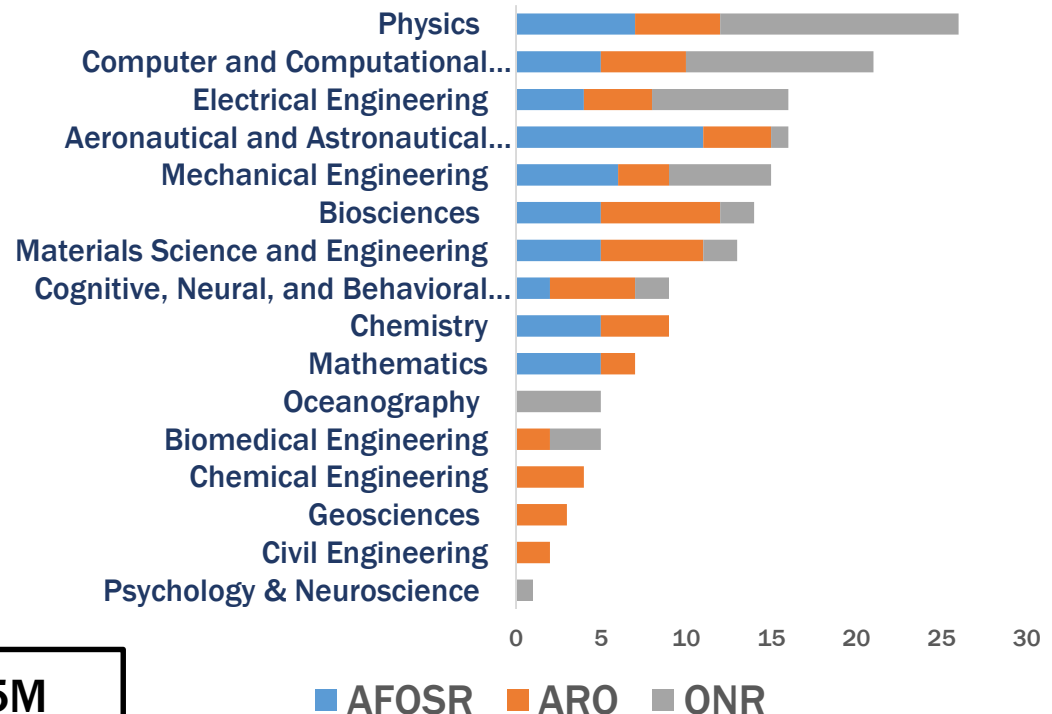
65

Universities

\$45M

Budget

FY 2019 NDSEG Fellows Disciplines



THANK YOU



<https://basicresearch.defense.gov/Pilots/DEPSCoR-Defense-Established-Program-to-Stimulate-Competitive-Research/>



@DoD_STIx