



Basic Research at the Department of Defense

University of Florida
October 17, 2018

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Office of the Under Secretary for Research and Engineering
Department of Defense



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?

TABLE A-3. DoD STANDARD FUNDING CATEGORIES

6.1 Basic Research

6.2 Applied Research

6.3 Advanced Technology Development

6.4 Advanced Component Development and Prototypes

6.5 System Development and Demonstration

6.6 RDT&E Management Support

6.7 Operational Systems Development

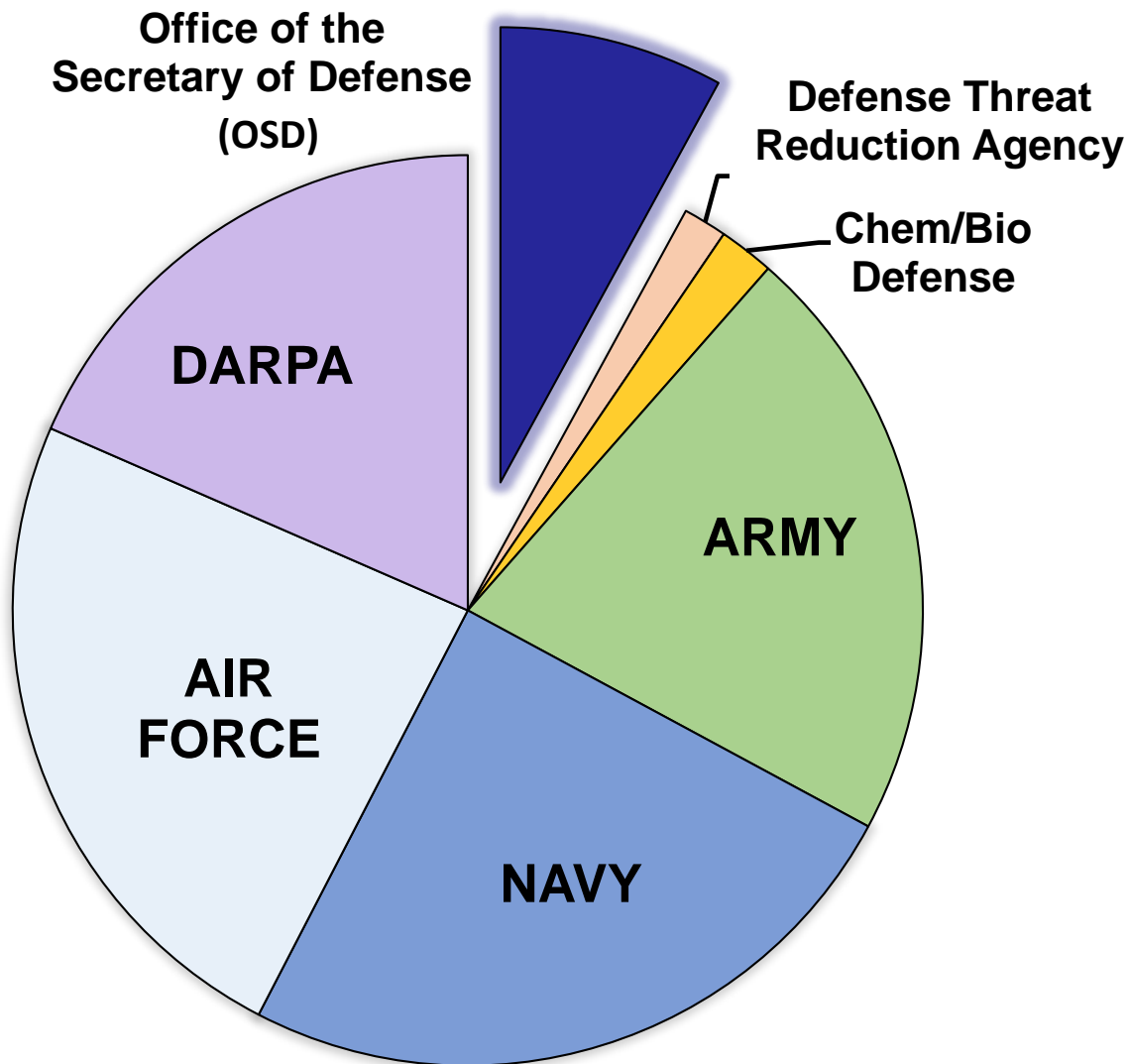
Note. (DAU, 2016)



Funding across the DoD Basic Research Enterprise

Total 6.1 funds
\$2.3B

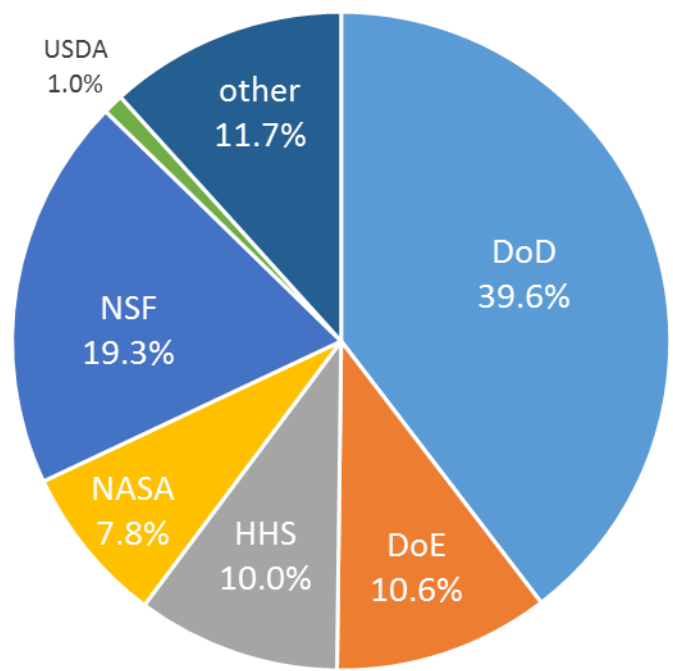
- Over two-thirds of funds to extramural programs
- Major funder of basic research in math, physics, and engineering



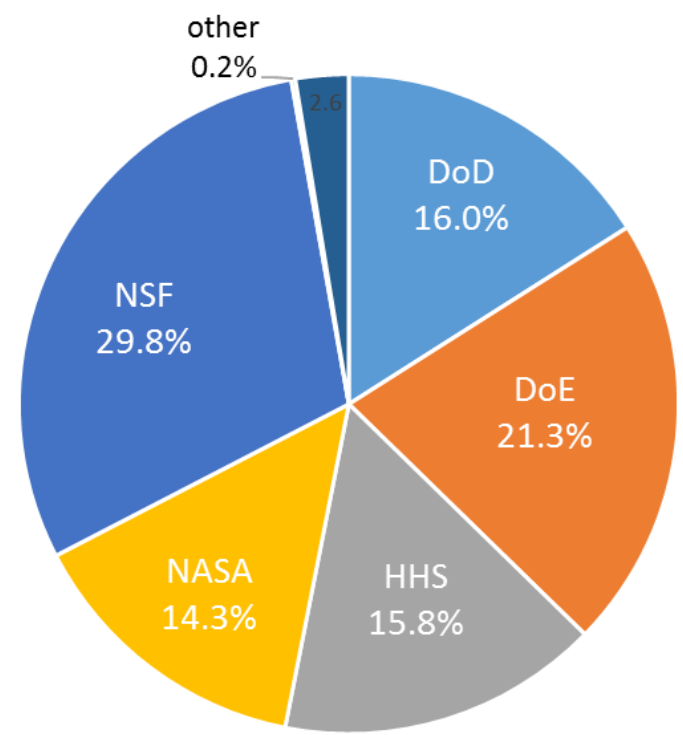


Basic Research Funding by Agency

Engineering



Physical Sciences

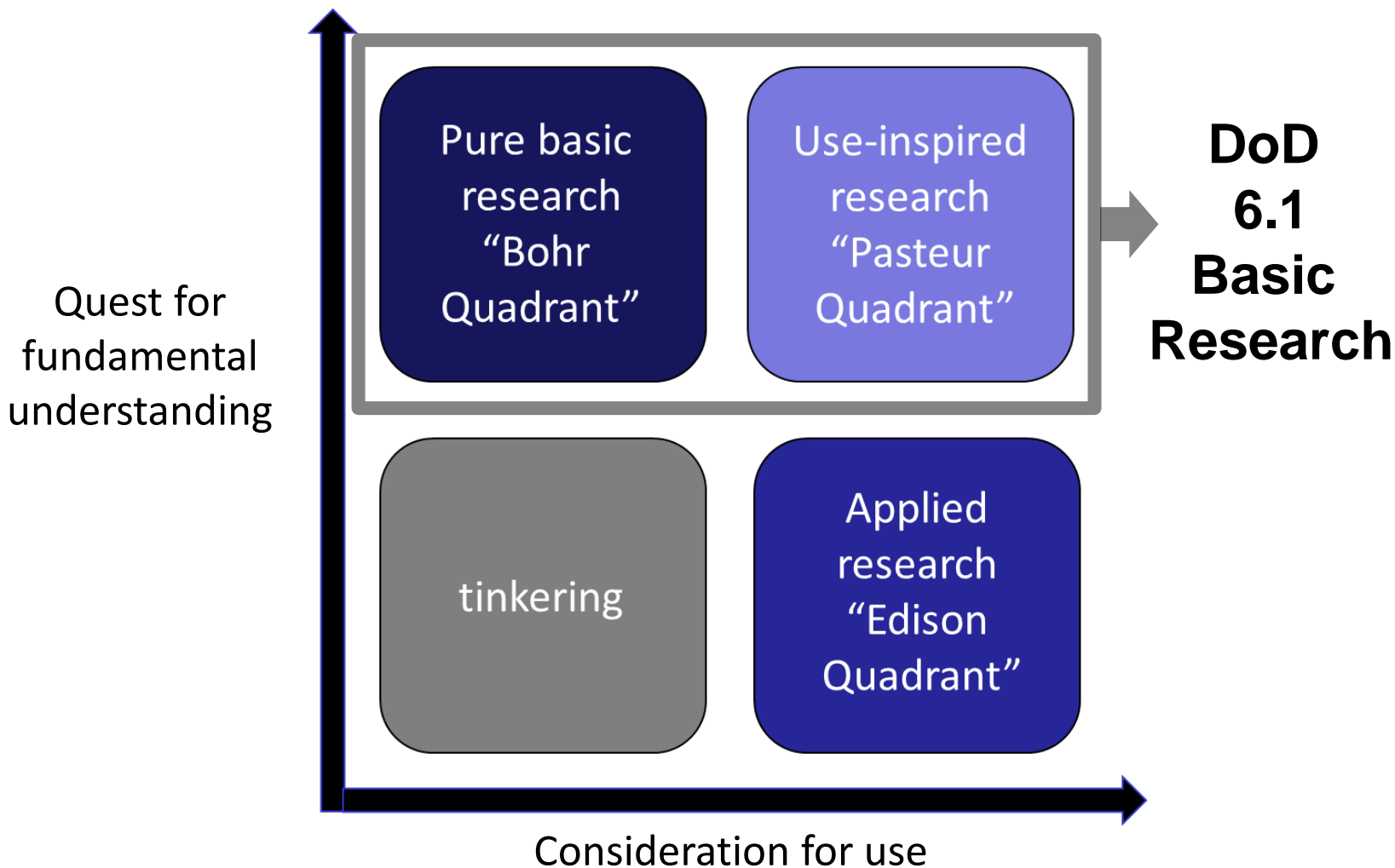


DoD third largest funder of basic research to universities

Source: NSF, National Center for S&E Statistics, special tabulations (2017) of Higher Education R&D Development Survey (HERD).



Donald Stokes: 'Pasteur's Quadrant.'





Oversee and Connect

Across DoD Offices & Agencies



With Other
Government Agencies



NIST
National Institute of
Standards and Technology
U.S. Department of Commerce



With Institutions of
Higher Education



Cultivate and Collaborate

Vannevar Bush Faculty Fellowship

Minerva Research Initiative

Multi-University Research Initiatives
(MURIs)

National Defense Science and
Engineering Graduate Fellowship



Programs to develop ideas and people



Ongoing Programs

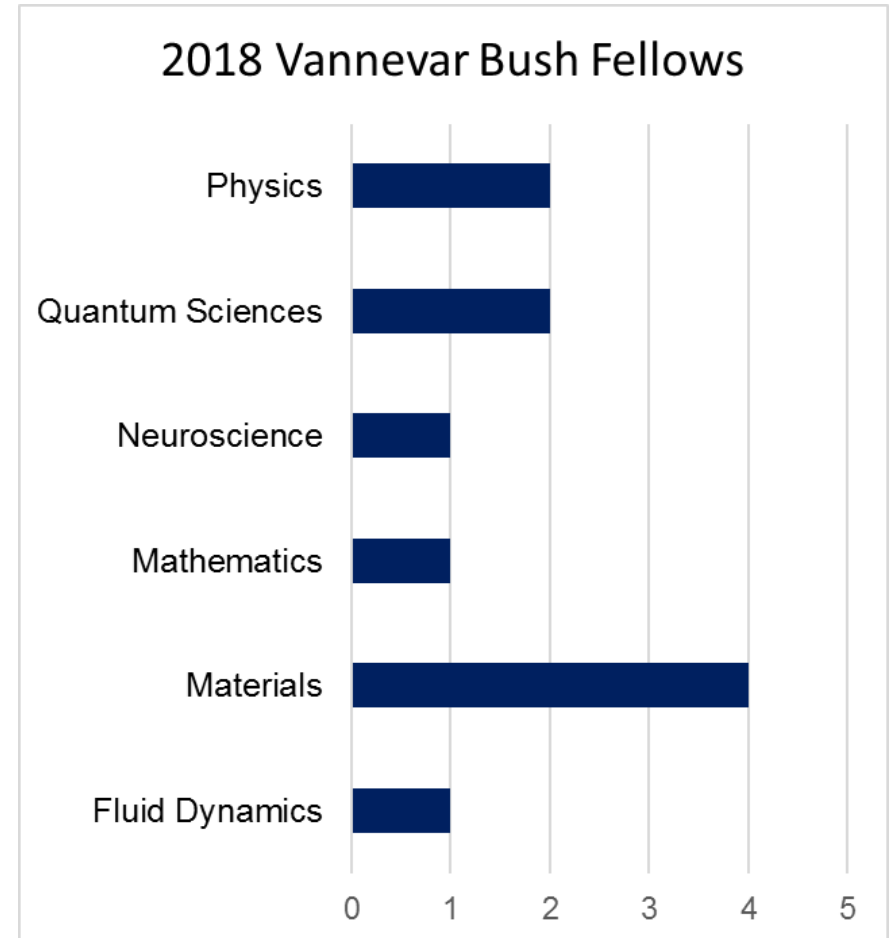


Vannevar Bush Faculty Fellowship

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

Program Goals:

- Support 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
- Areas of interest also include: fluid dynamics, physics, materials science, oceanography, engineered/synthetic biology, and others with high potential

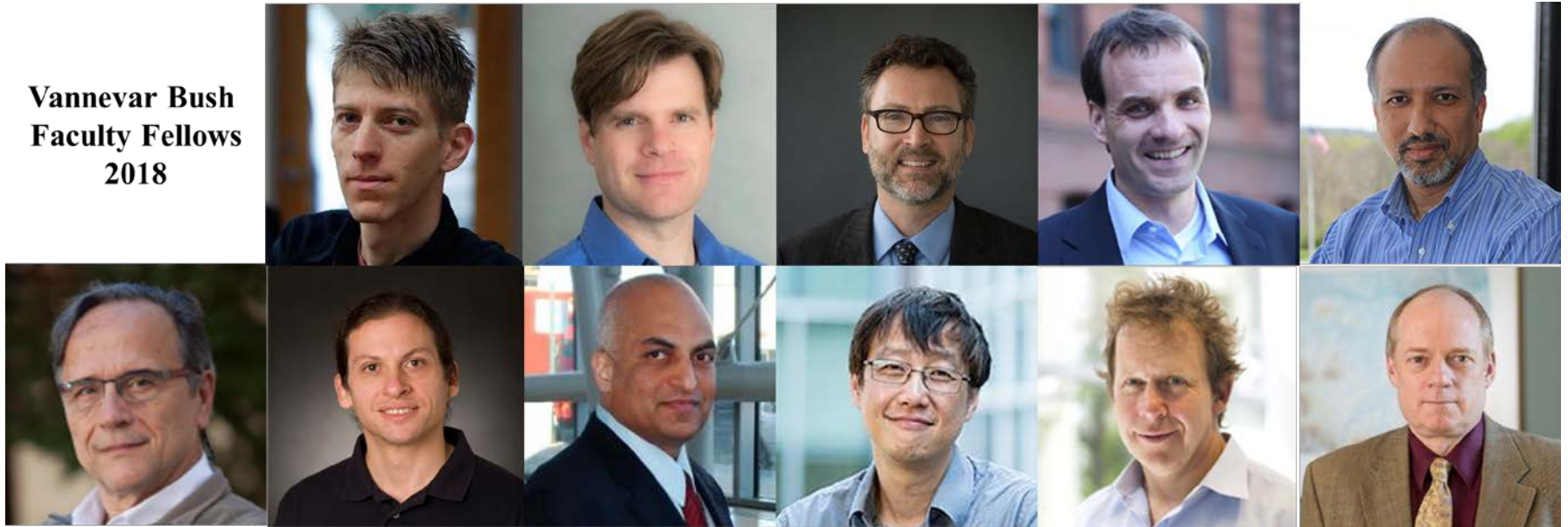




Vannevar Bush Faculty Fellowship

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**Vannevar Bush
Faculty Fellows
2018**



FOA
posted by
ONR

early summer



White
papers
due

Late summer



Full
proposals
due

winter



Selection of
2019 Class

spring

[Informational webinar, project descriptions available on website](#)



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 historical forces that shape strategically important regions of the world

Institutional Reform, Social Change, and Stability in Sahelian Africa



Leonardo Villalón, UF

White papers due

Early Summer



Full proposals due

Late Summer



Awardees announced

Fall



www.minerva.defense.gov



Multidisciplinary University Research Initiative (MURI)

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.



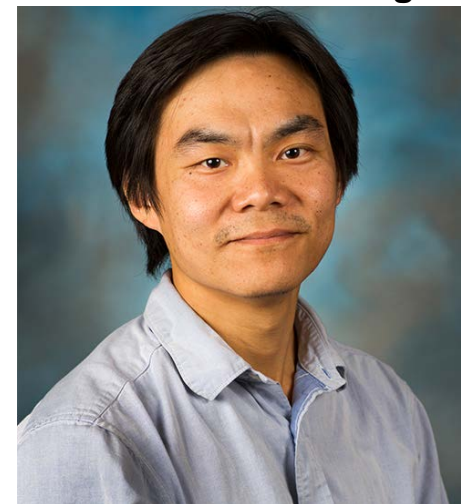
1986 Press Release: "This team approach in research with cross-facilitation among disciplines will stimulate the growth of newly emerging technologies...."



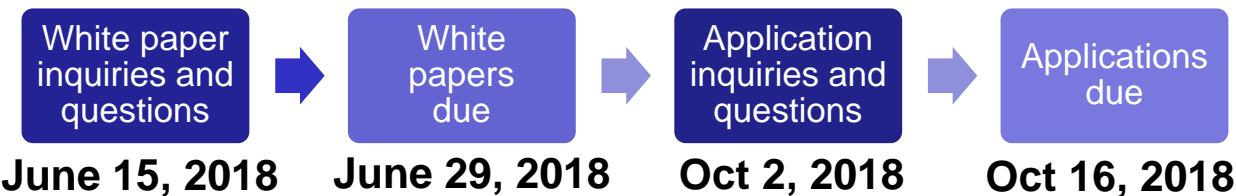
Multidisciplinary University Research Initiative (MURI)

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

ARO 2018 MURI Towards a Multi-Scale Theory on Coupled Human Mobility and Environmental Change



Lead PI: Rachata Muneeppeerakul
UF participating faculty:
Jeff Johnson
Rafael Muñoz-Carpena



Selected topics from most recent funding call:

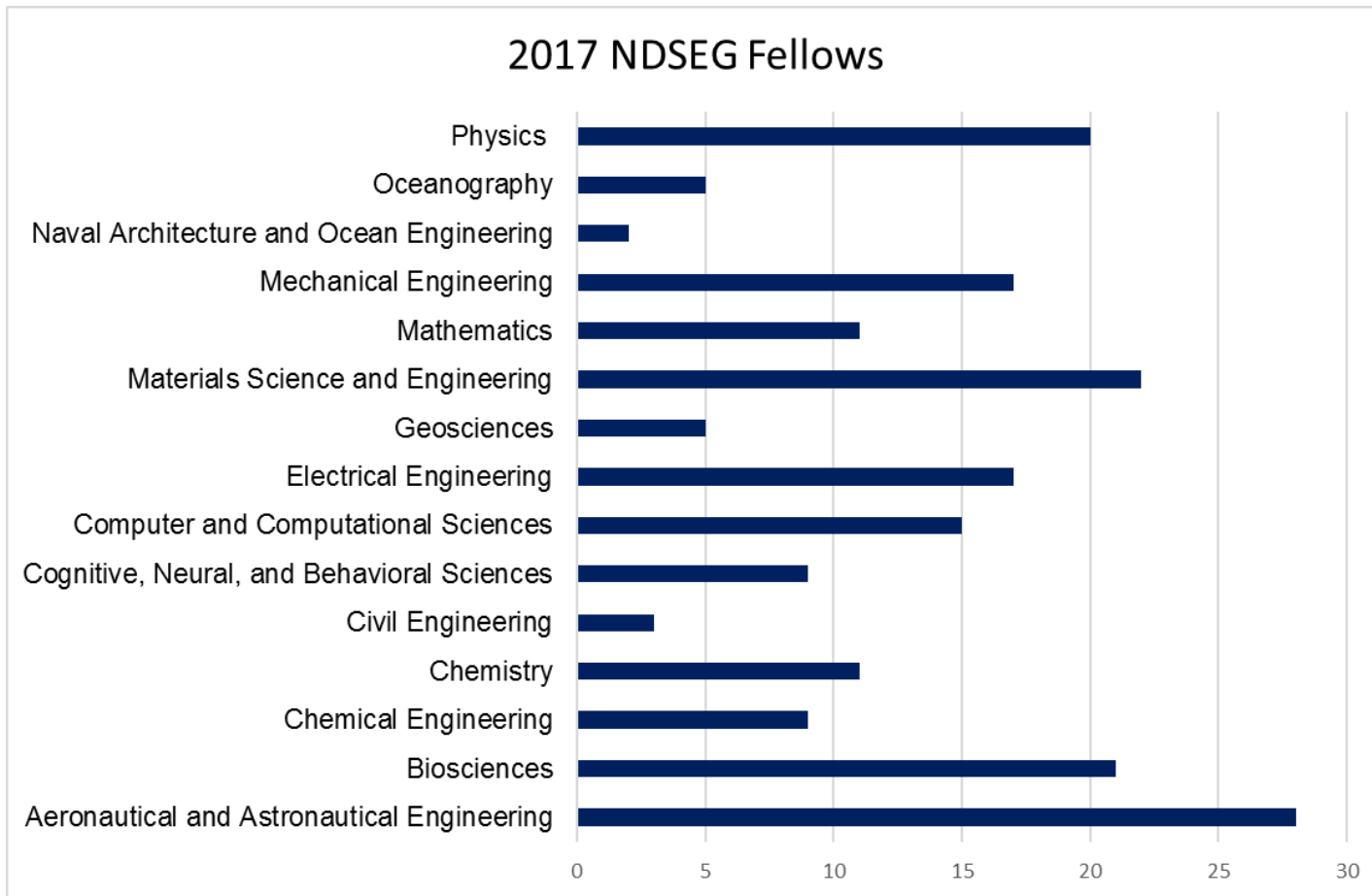
- Foundations of Emergent Computation and Self-Organized Adaptation
- Active Perception and Knowledge Exploitation in Navigation and Spatial Awareness
- 2D Heterostructures for Flexible, Lightweight Electronics and Optoelectronics

Full list: <https://www.grants.gov/custom/viewOppDetails.jsp?oppld=302058>



National Defense Science and Engineering Graduate Fellowship

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



<http://www.ndsegfellowships.org>

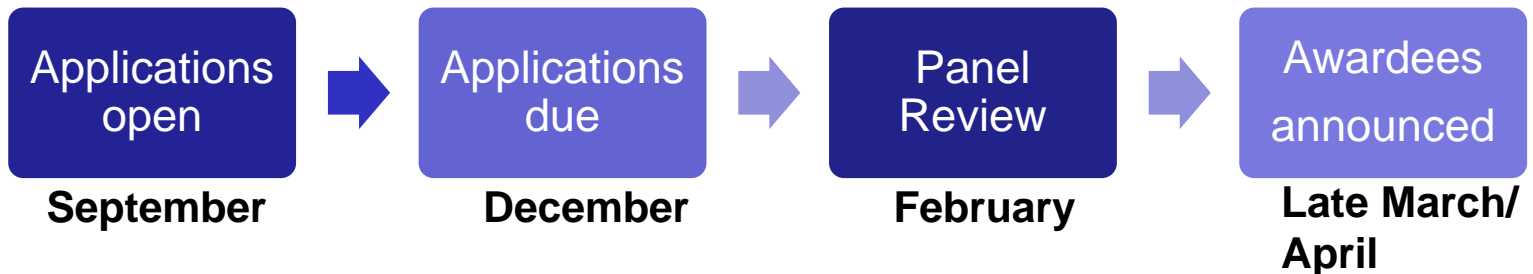


National Defense Science and Engineering Graduate Fellowship

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For three years:

Covers full tuition, mandatory fees, & health insurance cost up to \$1200/year, travel costs up to \$5,00 for the fellowship duration
Fellows also receive a monthly stipend of \$3200.



University of Florida 2017 NDSEG Fellows

Nicholas Sholl, Mechanical Engineering

Alexander Miller, Aeronautical & Astronautical Engineering

<http://www.ndsegfellowships.org/>



Pilot Programs

How does the Basic Research Office think about creating new collaborations and pathways to enrich the research ecosystem?



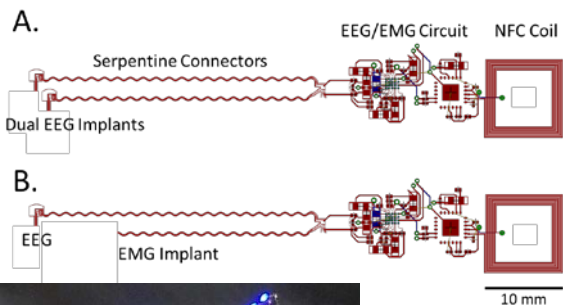
Laboratory University Collaboration Initiative (LUCI)

Supports collaborations between Vannevar Bush Fellows or MURI PIs and DoD researchers to understand and address long term DoD needs

Program Goals:

- Encourage collaboration to support high-risk basic science and build stronger relationships between universities and DoD labs
- Awards of \$600K awarded over 3 years

John Rogers: 2008 VB Fellow
Cameron Good: 2017 LUCI Fellow



Established in-house
animal model of PTSD

Chris Voigt: 2014 VB Fellow
Bryn Adams: 2016 LUCI Fellow



Engineered system
to enable efficient
DNA delivery into a
range of bacteria
isolated from human
gut, human skin,
and soil samples

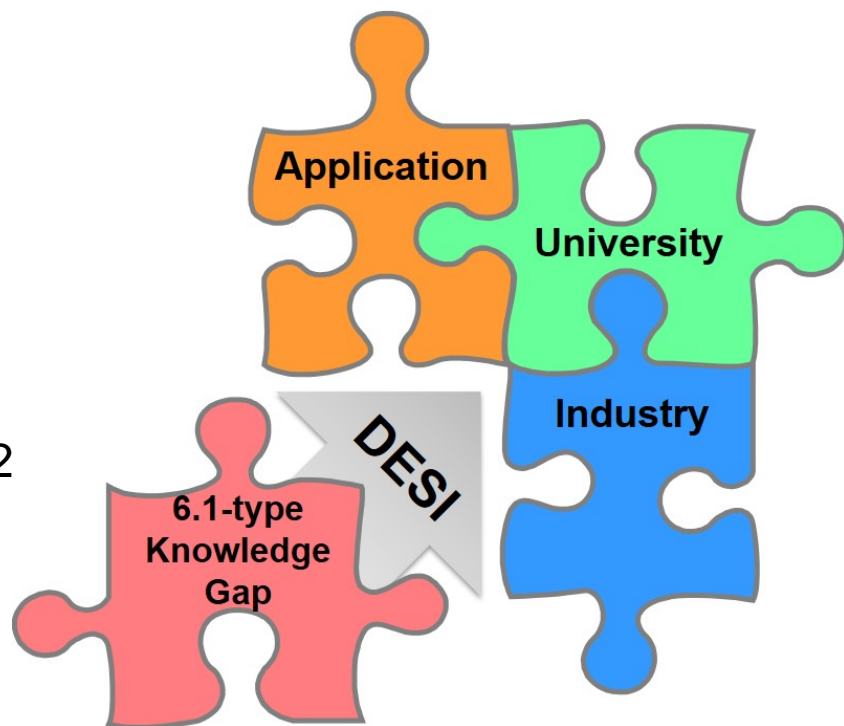


Defense Enterprise Science Initiative (DESI)

Supports use-inspired basic research by university-industry teams to look for new solutions and accelerate innovation in DoD capabilities

Program Goals

- Pilot to incentivize academia and industry to collaborate and share ideas and know-how
- Fund research that focuses on breakthrough defense capabilities
- 5 teams funded each with up to \$1.5M over 2 years
 - Power Beaming
 - Highly Maneuverable Autonomous UAVs
 - Soft Active Composites
 - Metamaterial-based Antennas
 - Remote Sensing



*DESI featured on FedNewsRadio – more info on DESI site



I-CORPS @ DoD

Fosters the commercialization of technologies derived from government-funded basic research

Program Goals

- In partnership with NSF, provide researchers with entrepreneurship training and mentorship
- Immerse research teams in intensive, curriculum-based program
- Create connections and knowledge platforms that advance and sustain innovation



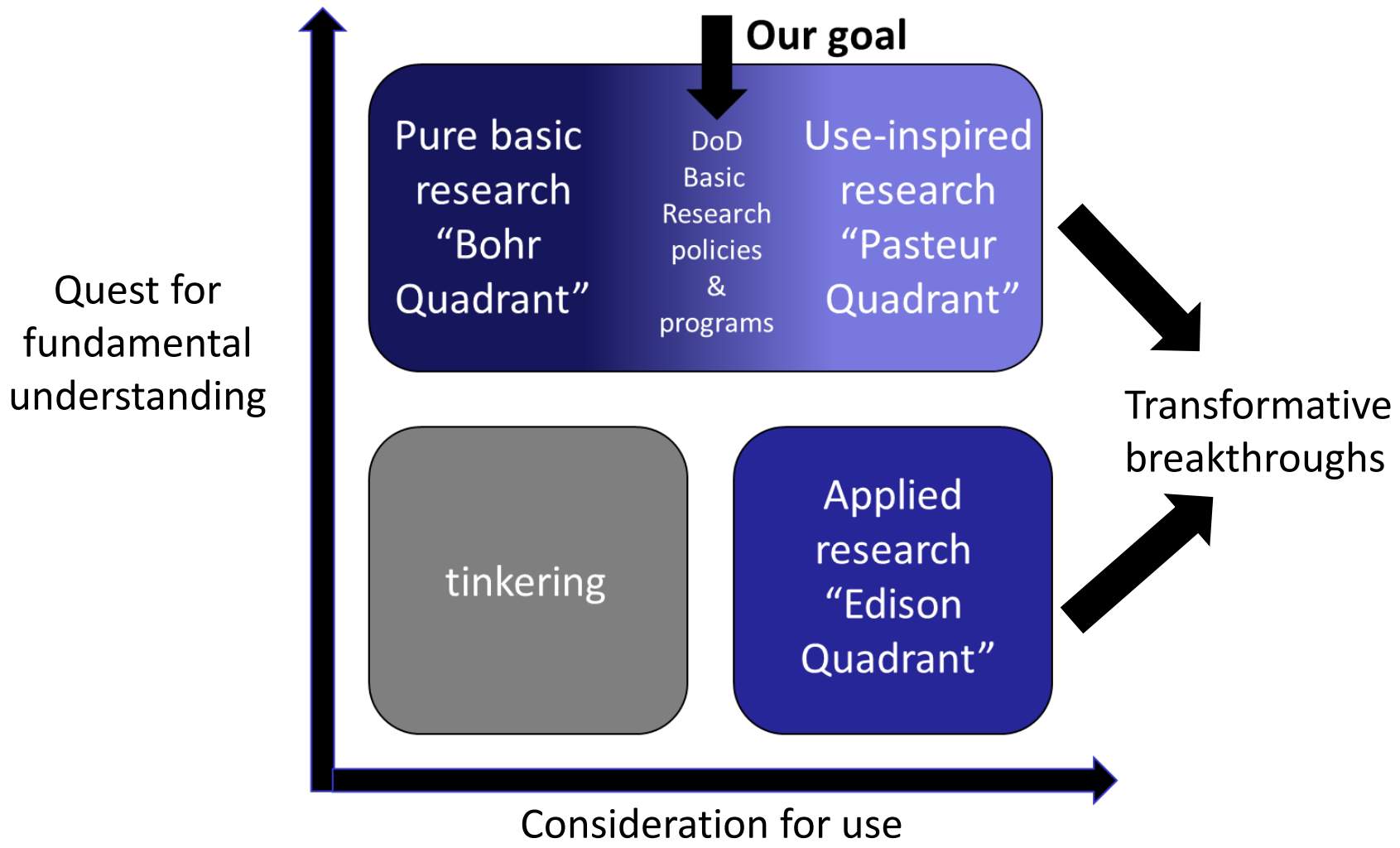
Natural Fiber Welding attracted \$1.4 million in venture capital investments and applied for a DoD SBIR award. NFW produces high value materials from low cost, naturally occurring fibers.



<http://www.naturalfiberwelding.com/>



Donald Stokes: 'Pasteur's Quadrant.'





THANK YOU



<http://basicresearch.defense.gov>



@DoD_STIx