



DIRECTOR'S REMARKS

Sethuraman Panchanathan
National Science Foundation
National Science Board Meeting
February 15, 2023



NSB Gains **Eight New Members**. Welcome!



Deborah Loewenberg Ball



Vicki L. Chandler



Dorota A. Grejner-Brzezinska



Marvi Ann Matos Rodriguez



Keivan G. Stassun



Merlin Theodore



Wanda Elaine Ward



Bevlee A. Watford



Updates from the Hill

**The Fiscal Year 2023
Appropriations Act,**
signed into law on December 29

\$9.9 Billion in Funding for NSF



Updates from the Hill

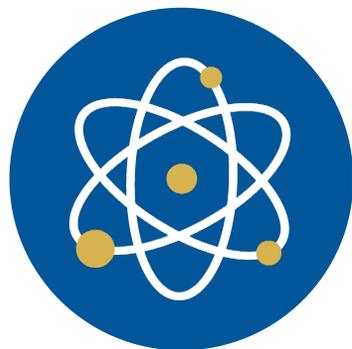


Wichita State University Campus of Applied Sciences and Technology



Franklin Military Academy





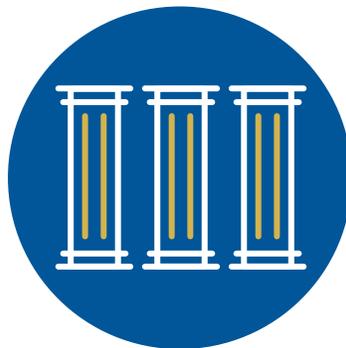
NSB Vision 2030

Research benefits

STEM talent

Geography of innovation

Global S&E community



NSF Vision

Advancing research

Accessibility and inclusivity

Global leadership

Translation, Innovation,
Partnerships (TIP)



Administration Pillars

Pandemic response

Economic recovery

Racial equity

Climate change



NSF's 3 Major Priorities



STRENGTHENING
ESTABLISHED NSF

With **investments that expand the frontiers of knowledge and technology.**



INSPIRING THE MISSING
MILLIONS

Using **interventions and capacity building** that enhance and broaden participation.



ACCELERATING TECHNOLOGY
AND INNOVATION

Through innovative, **cross-cutting partnerships** and programs.





Alexandra Isern

*Directorate for
Geosciences (GEO)*



Margaret Martonosi

*Directorate for Computer
and Information Science
and Engineering (CISE)*



Susan Margulies

*Directorate for
Engineering (ENG)*



James L. Moore III

*Directorate for STEM
Education (EDU)*



Changing Our View of Earth



**Atmospheric and
Geospace Science**



**Earth
Science**



**Polar
Programs**

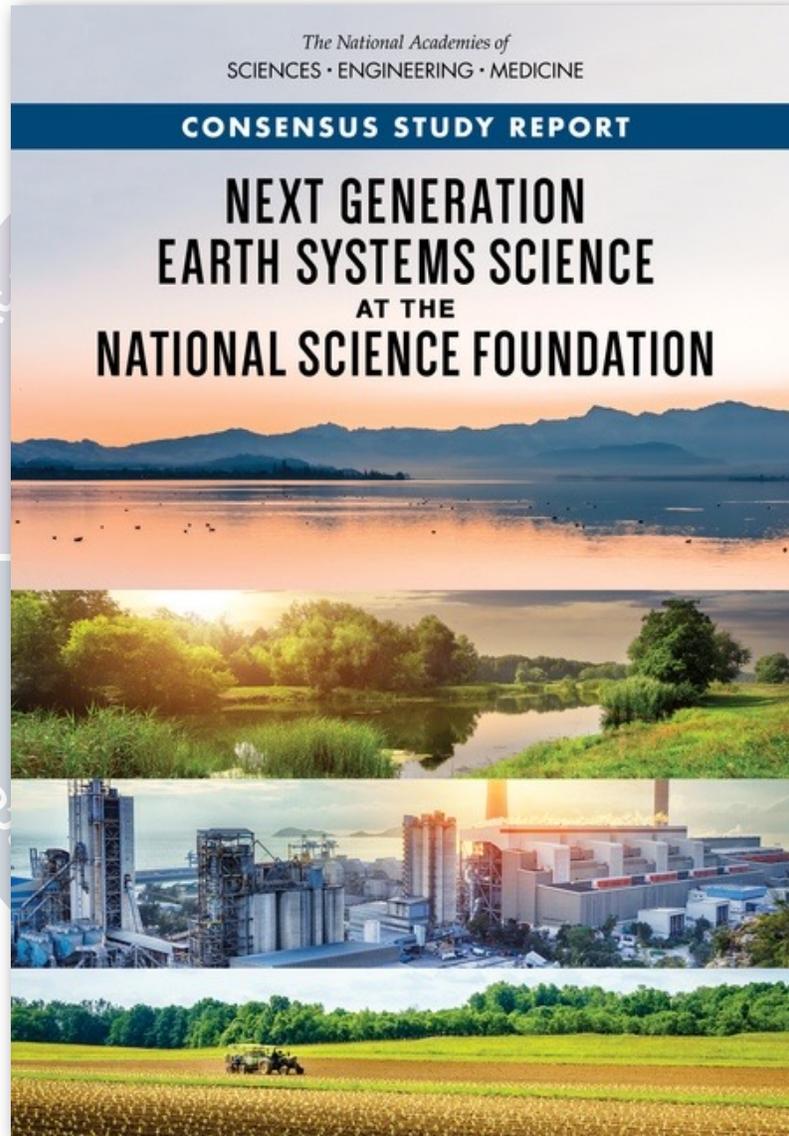


**Ocean
Science**

Changing Our View of Earth



Changing Our View of Earth



RISE-ing to The Challenge

R **Blurring disciplinary boundaries** to catalyze critical research efforts

I **Enabling innovative approaches** to cross-cutting and convergent investments

S **Fostering synergy and partnerships** across NSF, the U.S., and around the world

E **Ensuring inclusive and equitable** geoscience education



Transcending Boundaries for a Resilient Earth





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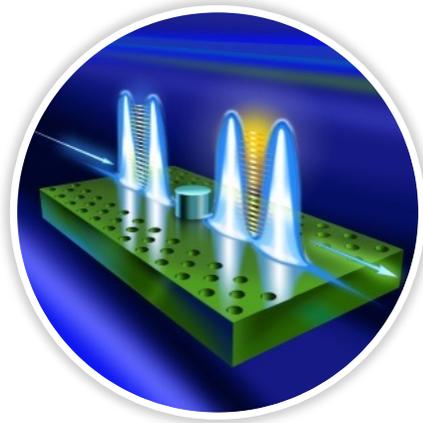
Cybersecurity is Relevant Everywhere Computing is Present



Emerging Technologies Pose New Cybersecurity Vulnerabilities



Computer vision
(virtual/augmented reality)



New computing models
(quantum, neuromorphic)



Autonomous systems
(self-driving cars, robots, drones)



Data & The Artificial Intelligence revolution



Socio-technical
(climate change, privacy, fairness, bias)

Emerging Technologies Pose New Cybersecurity Vulnerabilities



Damage of cybercrime projected to be **\$10.5 Trillion/yr.** by 2025

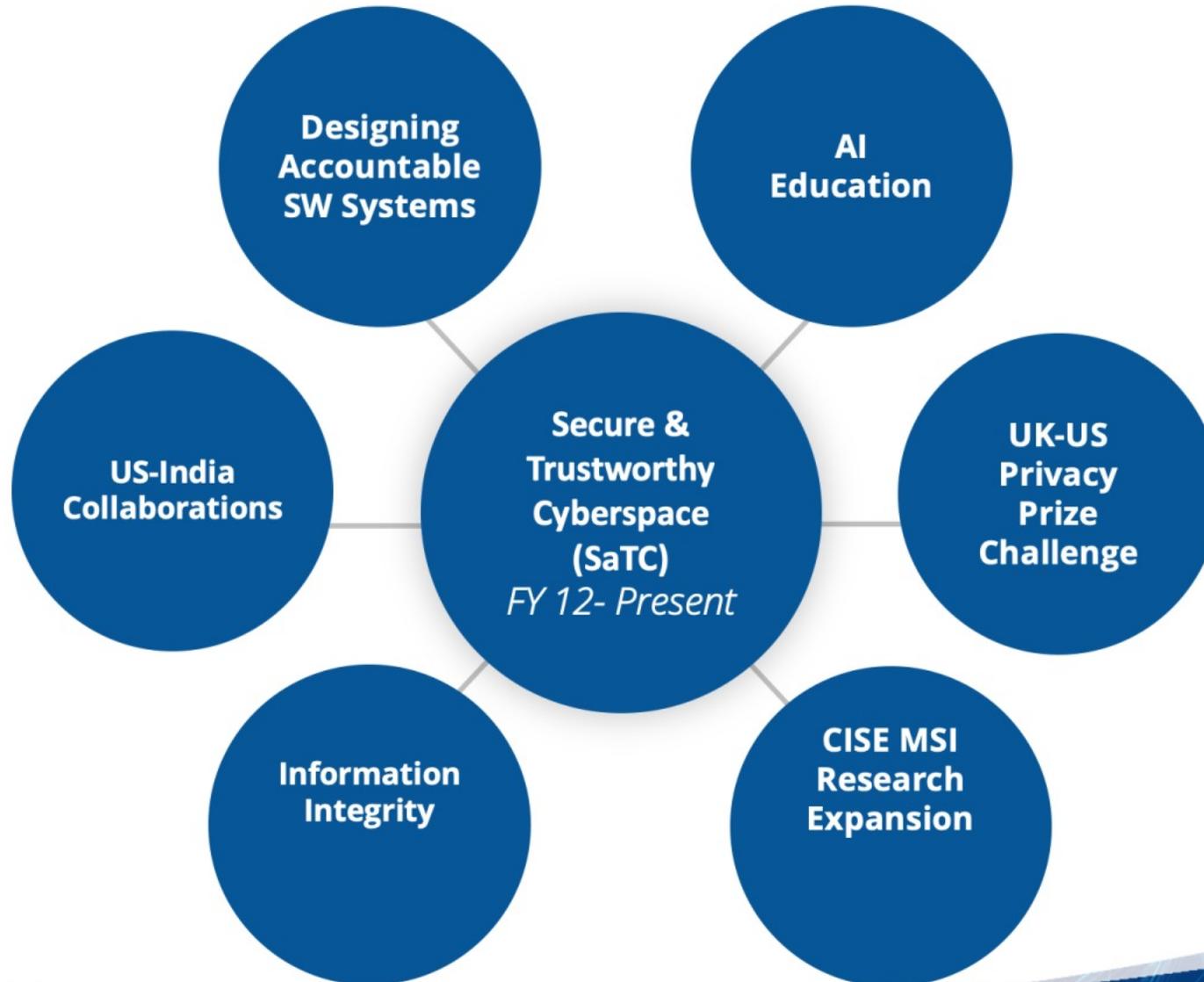
(>1.5X the entire FY22 US federal budget of **\$6.27 trillion**)



SaTC as a Launching Point for Solutions



SaTC as a Launching Point for Solutions

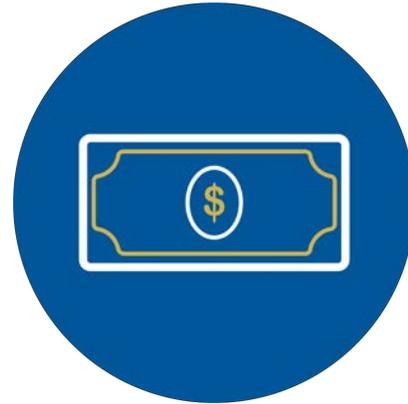


Benefits to Society



**Differential Privacy:
Trustworthy data
stewardship**

*United States Census
Bureau,
Google, Apple*



**Zero-knowledge proofs:
Trustworthy
cryptocurrencies**

Zcash



**SEED:
Hands-on Security
Labs**

*1000 Institutions
worldwide*

2023 to the Future

SaTC 2.0: Reboot in Progress!

ENGAGING STAKEHOLDERS

Internal	Interagency	External
Portfolio and gap analysis Agency-wide Engagement	NITRD interagency working groups	Industry, non-profits, international Research community listening sessions and workshops



2023 to the Future

SaTC 2.0: Reboot in Progress!

Reimagining SaTC to support its
second decade of impact





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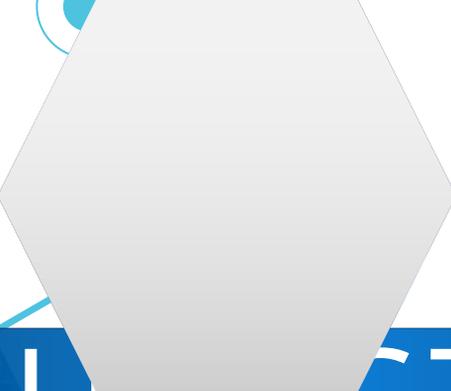
Emerging and Critical Technologies



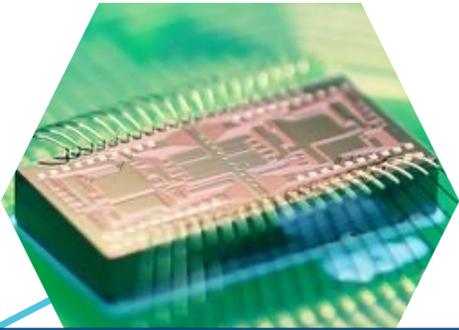
Advanced Manufacturing



Advanced Wireless



Artificial Intelligence



Semiconductors and Microelectronics



Biotechnology

Quantum Information Technology

MANUFACTURING



Future Manufacturing Program

- **Cross-directorate effort** led by Engineering
- **Catalyzing new manufacturing capabilities** that do not exist today
- **\$100-million portfolio** spans
 - Bio manufacturing
 - Cyber manufacturing
 - Eco manufacturing



Manufacturing the Future

Click Chemistry

Building functional structures within living cells and tissues

Combining AI, Robotics, Multiscale Modeling

Enabling assembly of 2D materials into complex 3D quantum material architectures

Sustainable Chemical Manufacturing

Modeling adaptable chemical supply chains

Foundry Partnerships

Developing and scaling new manufacturing methods

E4USA

Making engineering education accessible anywhere

5,000 students in 82 schools in 24 states and territories

Bio
Manufacturing

Cyber
Manufacturing

Eco
Manufacturing

Lab to
Fab

Workforce
Development





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EDU's Broadening Participation Efforts



LSAMP
1991



HBCU-UP
1998



ADVANCE
2000



HSI
2008



**Program for Women
and Girls**
1993



AGEP
1998



TCUP
2001



EDU's Broadening Participation Efforts

STEM Degrees Award to Persons from Underrepresented Groups

2020

26%

Bachelor's Degree

24%

Master's Degree

16%

Doctoral Degree

37%

Underrepresented Groups among 18- to 34-year-olds
In U.S. Population (2021)

Program for Women
and Girls
1993

HBCU-UP
1998

AGEP
2000

TCUP
2008





Events of 2020

A Call to
Action



NSF Vision



NSB Vision 2030



Racial Equity in STEM Education Program

- Examines racial inequities in **STEM** to develop effective research-based practices, policies, and outcomes
- All proposals must **address just two goals:**
 - Systemic barriers to opportunities
 - How these barriers impact access, retention, and success



Accelerating Change Through Inclusion

Involving the Community

Proposals are led or co-developed by individuals and communities most impacted

Responding to Key Issues

1,400 Participants in First Meeting

Evolving and Growing

Serving as a model for future programs





GEO

Shifting to a new scientific paradigm to build a resilient planet



CISE

Catalyzing cybersecurity solutions for the future



ENG

Engineering the future of manufacturing for U.S. competitiveness



EDU

Inspiring bold research to accelerate advances in diversity, equity, and inclusion



Sean Jones

*Directorate for Mathematical
and Physical Sciences (MPS)*



Alicia Knoedler

*Office of Integrative
Activities (OIA)*



Sylvia Butterfield

*Directorate for Social,
Behavioral, and Economic
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Simon Malcomber

*Directorate for Biological
Sciences (BIO)*

2020: An Opportunity for New Approaches



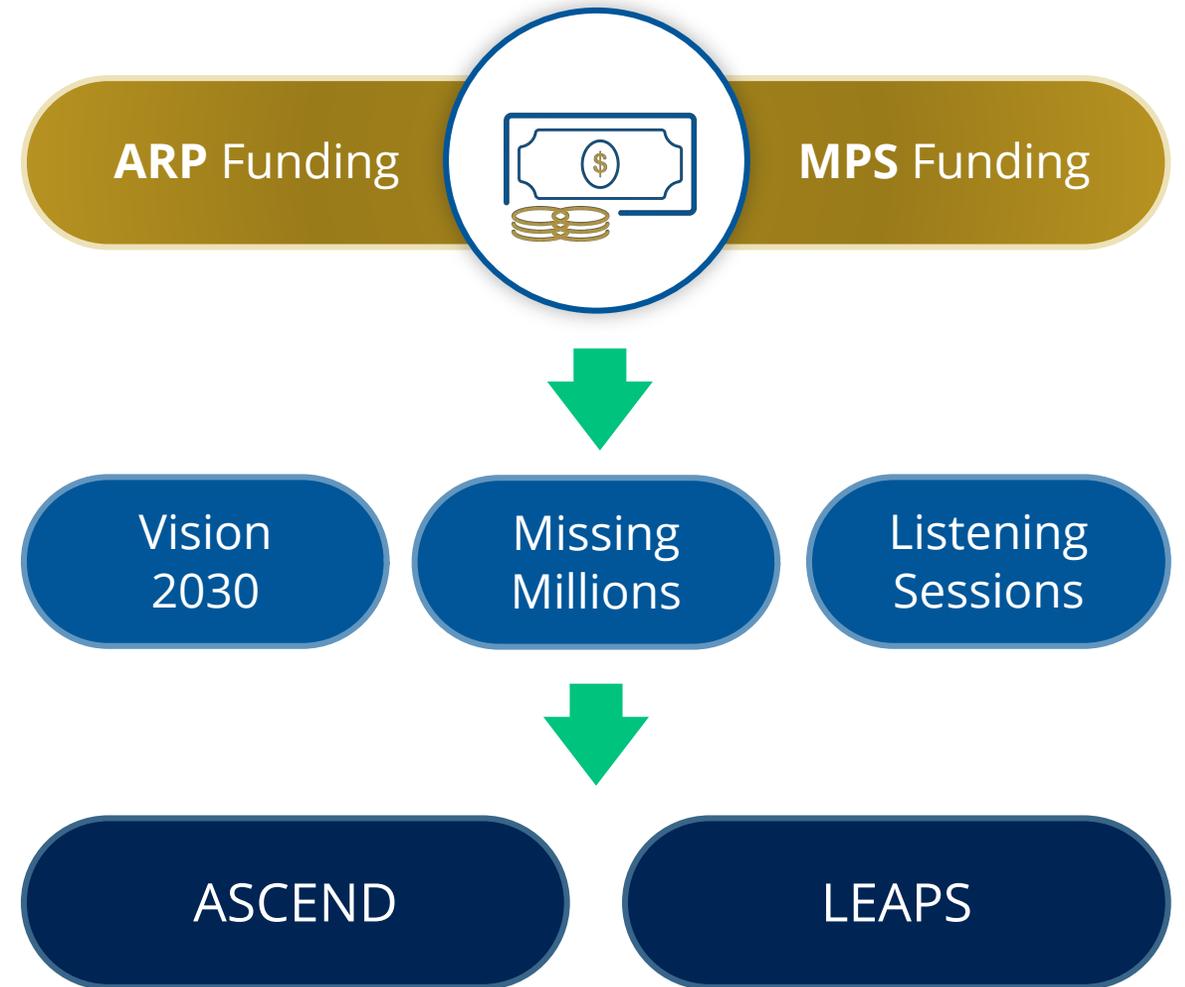
Percentage of Underrepresented Groups in STEM in General Population Compared to PhD holders in MPS Disciplines

11% PIs from URG across MPS Award Portfolio



No Time to Wait

- **Reprioritized and evaluated current efforts** to make broadening participation a critical priority
- Used new and existing funding opportunities to **create new programs**
- **Designed and implemented** MPS Ascending Postdoctoral Research Fellowship (**ASCEND**) and Launching Early-career Academic Pathways in MPS (**LEAPS**) for both long and short-term impact



Building a Brighter Future for All

ASCEND

11% PIs from URM across MPS

80% ASCEND PIs from URM

LEAPS

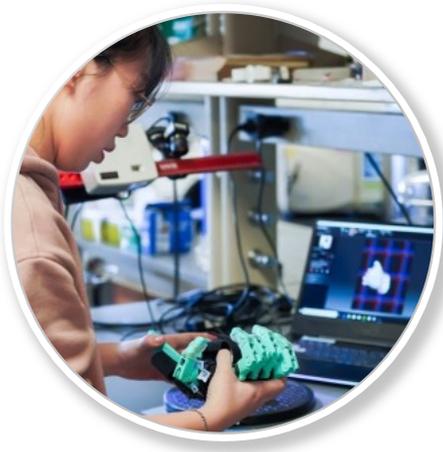
32% LEAPS PIs from URM

87% LEAPS Non-R1

25% Non-R1 across MPS



Watershed Impact: New Partnership Models



Partnerships for
Research and
Education in
Materials
(**PREM**)



Partnerships in
Astronomy and
Astrophysics
Research and
Education
(**PAARE**)



Partnerships for
Research and
Education in
Chemistry
(**PREC**)



Partnerships for
Research in and
Education in
Physics
(**PREP**)



Partnerships for
Research
Innovation in the
Mathematical
Sciences
(**PRIMES**)

Watershed Impact: New Partnership Models



Dr. Jacob Gayles,
Assistant Professor U. of South Florida

- **PREM Undergraduate Student Researcher**, California State University Northridge

- **Researcher**, Max Planck Institute

- **PhD**, Texas A&M University

- Specializes in **quantum materials and magnetic interfaces**



Partnerships for Research and Education in Materials (PREM)



Partnerships in Astronomy and Astrophysics Research and Education (PAARE)



Partnerships for Research and Education in Chemistry (PREC)



Partnerships for Research and Education in Physics (PREP)



Partnerships for Research Innovation in the Mathematical Sciences (PRIMES)





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Success in Research Funding Shouldn't be Taken for Granted

"I don't see myself and my work in that solicitation."

- Early career PI

"My SRO is the VP of Academic Affairs"

- Tribal college faculty member

"It never occurred to me that institutions didn't have the same access to resources."

- R1 faculty member, NSF AC meeting

"I did not realize that I could talk to a Program Officer."

- PI at regional HSI

"I have to create my own budget"

- PI at a small college

"I had to manage my own federal award. It was horrible. I will never submit another proposal again"

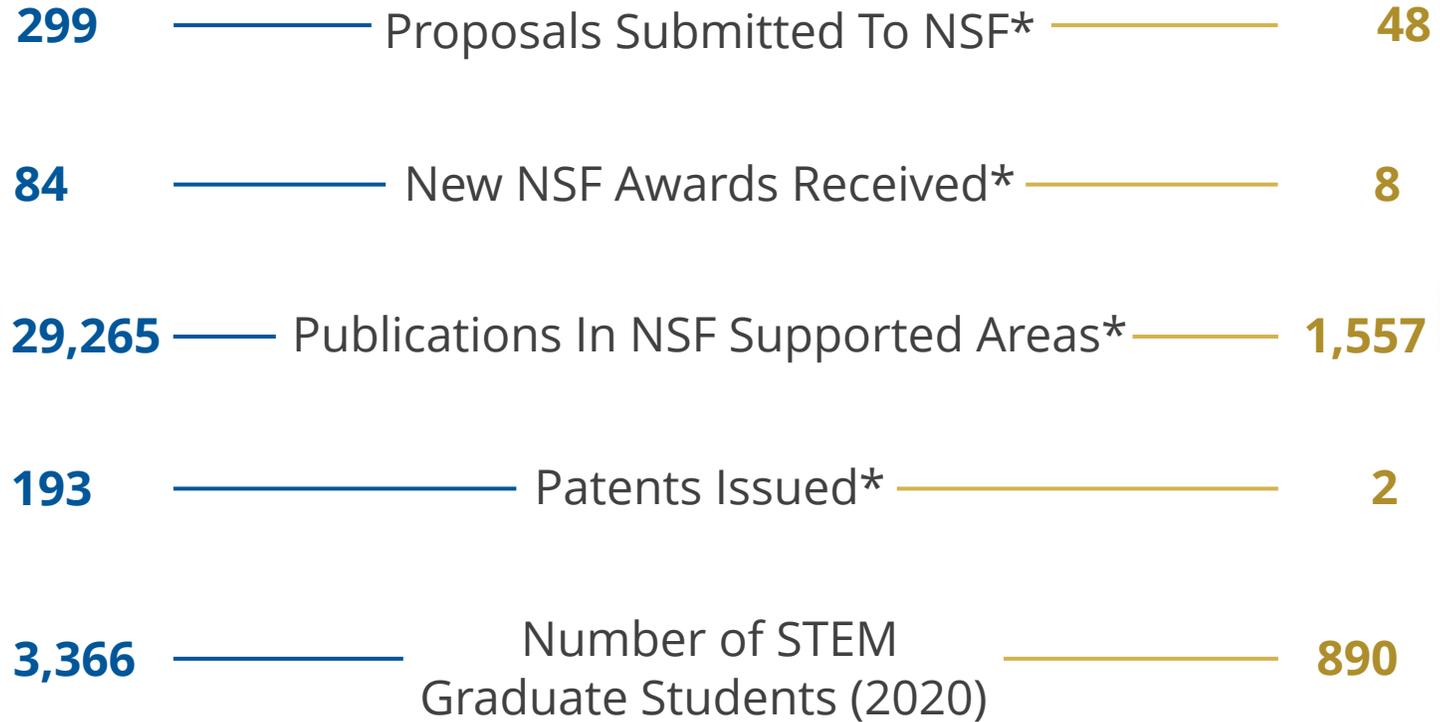
- PI at an R2



The U.S. Research Enterprise: A Snapshot

**Research
Very High
(R1)
Institution**

Research Enterprise
Staff = 241



**Emerging
Research
Institution**

Research Enterprise
Staff = 10

*Numbers represent a 2-year average (2021-2022)



Growing Research Access for Nationally Transformative Equity and Diversity (GRANTED)

- **Mitigates barriers** to competitiveness and **enhances research capacity** at emerging and underserved research institutions
- **Invests in research capacity solutions** that are transferrable and adaptable
- **Supported Activities Include:**
 - Scale research administrative support and infrastructure
 - Support research administration leadership
 - Partner with national and regional professional societies



Opportunities Everywhere: What's Next

- **Initiate Dialogues with Disparate Communities:** DCL for GRANTED Convenings – March 15
- **Scale Efforts to Reach Broader Audiences:** Funding opportunity under development
- **Address Gaps Within the Research Enterprise:** Partnering with professional societies to raise the profile of research enterprise positions and encourage intentional workforce development



Opportunities Everywhere: What's Next

Let me just say THANK YOU. **This is so very needed** for those of us trying to lead the research and equity mission at ERIs!

Excellent initiative to network universities and other research institutions for distributed developments, thank you.

Thank you for launching this program! Thank you, thank you, thank you. It's really challenging for emerging and MSIs to know about which organizations are out there, to connect with mentors, and to leverage resources (together).
Thank you for recognizing and supporting this, NSF!





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A Challenge and an Opportunity



2019 SBE portfolio review confirms:

Few proposals from MSIs

MSIs have **innovative ideas, qualified researchers**

But many MSIs **lack established research infrastructure**



SBE's Build and Broaden

- Supports **all SBE disciplines**
- Proposals must come from **PIs at an MSI**, or
- PIs who are **partnering with researchers at MSIs**

At least 50% of award must go to the MSI



3 Years of Growth

FY 20

planning and
workshop awards

**11 MSIs + 60
personnel** (\$1.2m)

FY 21

full research
awards

**43 MSIs + 734
personnel** (\$6.3m +
\$9.8m from ARP)

FY 22

full research
awards

**20 MSIs + 393
personnel** (\$8m)



Expanding the NSF Community

More PIs who have **never** applied for or received funding from SBE

Partnerships **among** MSIs and **between** MSIs and other institutions

46 PIs/Co-PIs: first NSF award *ever* (**67% from MSIs**)

Since Aug., 80 new reviewers (**>50% from MSIs**)



Expanding the NSF Community



Andrea Silva, University of North Texas

Examining food environments in rural and urban communities





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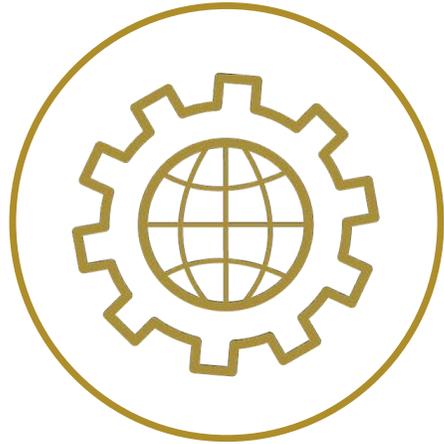
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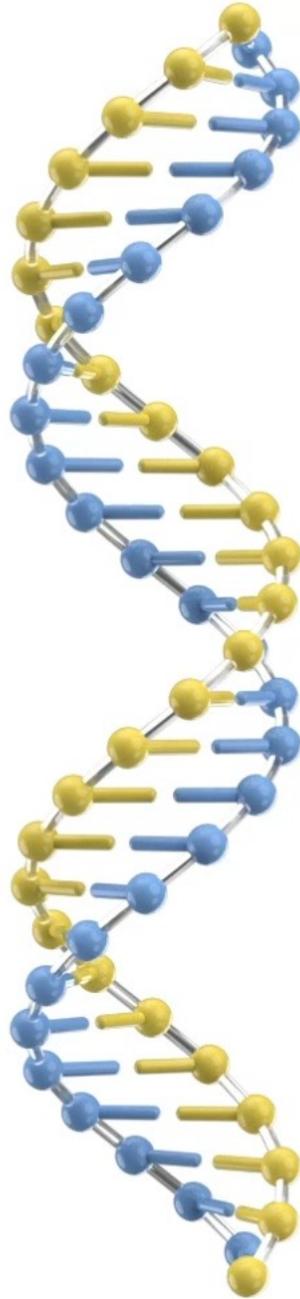


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**CURIOSITY-DRIVEN,
DISCOVERY-BASED
EXPLORATIONS**



**USE-INSPIRED,
SOLUTIONS-FOCUSED
INNOVATIONS**

What we Need:

A community of researchers

An understanding of translation for biology

**Fundamental
Biodiversity and
Conservation
Research**

**Conservation
and Climate
Mitigation**

Valley of Death

Discovery

Impact

P A C S P

Partnership to Advance Conservation Science and Practice

In conjunction
with the Paul G.
Allen Family
Foundation

21% of lead PIs
had no prior NSF
submissions
59% had no prior
NSF funding

Creating a
launchpad for
the future





MPS

Diversifying the next generation of STEM leadership



OIA

Unleashing talent and ideas everywhere through robust research infrastructure



SBE

Energizing STEM research capacity through enhanced access and opportunity



BIO

Powering translation through partnerships



