Advancing Technology, Innovation and Partnerships

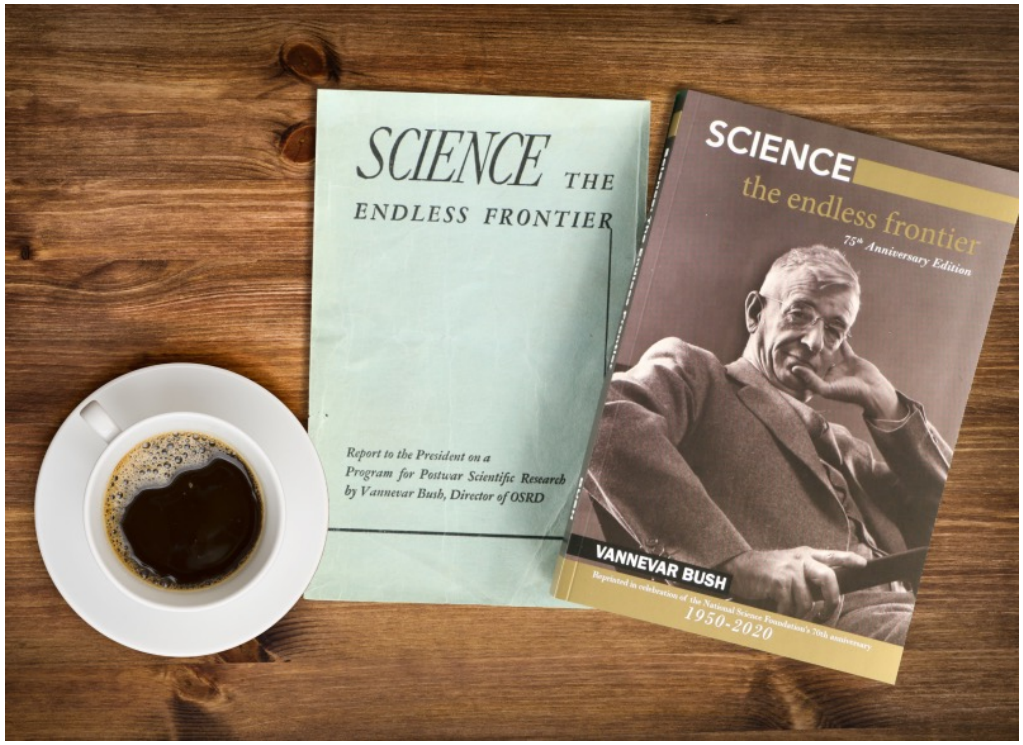
Erwin Gianchandani
NSF Assistant Director for Technology, Innovation and Partnerships

September 27, 2022
21st Oklahoma Supercomputing Symposium

Today's agenda

- Inspiration, vision
- Mission, functions, programs
- Status, advanced CI

75 years ago: *The Endless Frontier*



A defining moment

A defining moment: global competition

- Advanced manufacturing
- Advanced wireless
- Artificial intelligence
- Biotechnology
- Quantum information science
- Semiconductors and microelectronics
- …

A defining moment

A defining moment: socioeconomic challenges

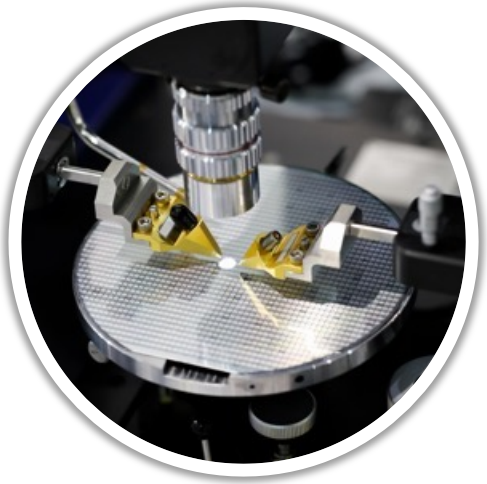
Changing climate

Equitable access to education, health care

Critical and resilient infrastructure

A defining moment

An evolving research, innovation ecosystem



Pace of discovery accelerated by data, emerging technologies

Demand for societal impact

Opportunity to leverage partnerships

Catalyzing a paradigm shift

Today

- Largely investigator-driven
- Primarily academic research teams
- Stream of discoveries improve prosperity, resilience, quality of life

Catalyzing a paradigm shift

Today	Tomorrow
• Largely investigator-driven	• Users / beneficiaries engaged in shaping, conducting research
• Primarily academic research teams	• Multi-sector teams – academia, industry, government, civil society, communities of practice
• Stream of discoveries improve prosperity, resilience, quality of life	• Important societal and/or economic problems drive research pursuits

Catalyzing a paradigm shift

Today	Tomorrow
• Largely investigator-driven	• Users / beneficiaries engaged in shaping, conducting research
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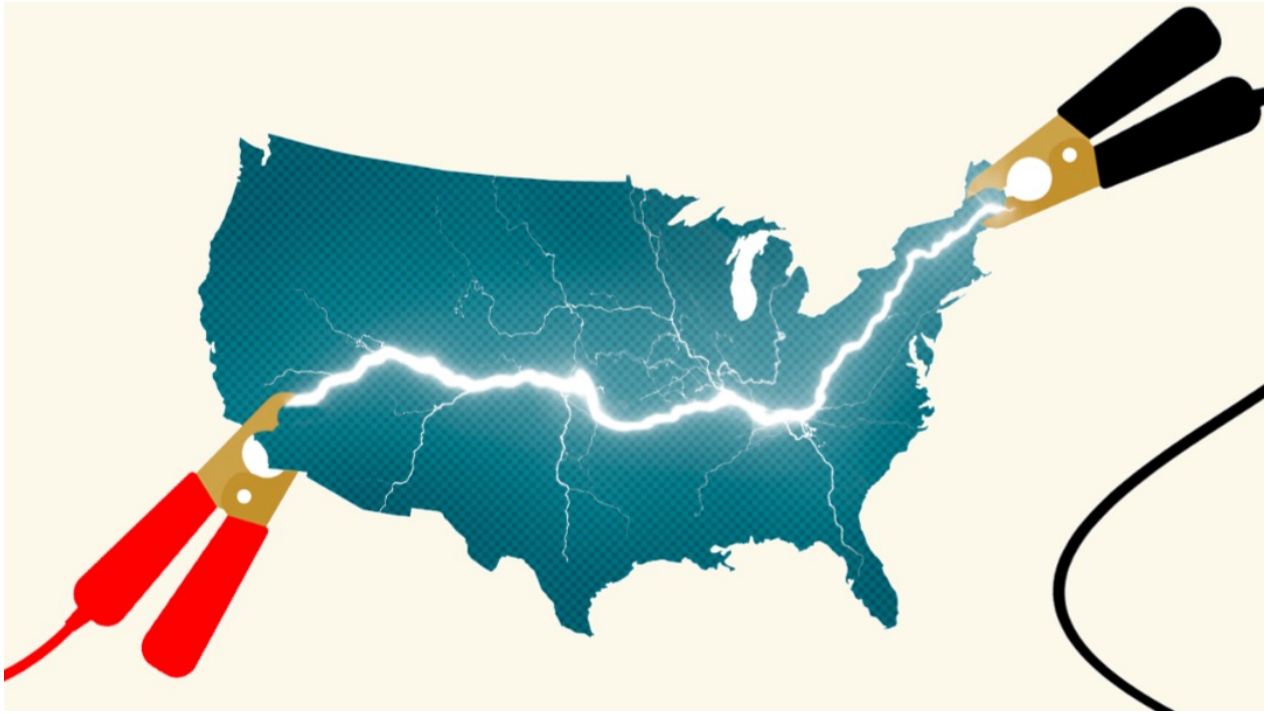
• Stream of discoveries improve prosperity, resilience, quality of life	• Important societal and/or economic problems drive research pursuits
"Technology / supply push"	+ ***"Market / demand pull"***

Today: *Jump-Starting America*



CHIPS and Science Act of 2022

- Appropriates $54 billion for semiconductors incentives, R&D, workforce development
- Authorizes NSF, DOE, NIST, NASA
- Authorizes $81B for NSF:
  - +$36B for the agency
  - Of that, +$20B for TIP
- Authorizes a new NSF Directorate for Technology, Innovation and Partnerships

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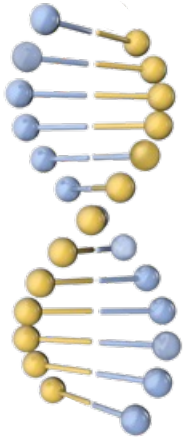
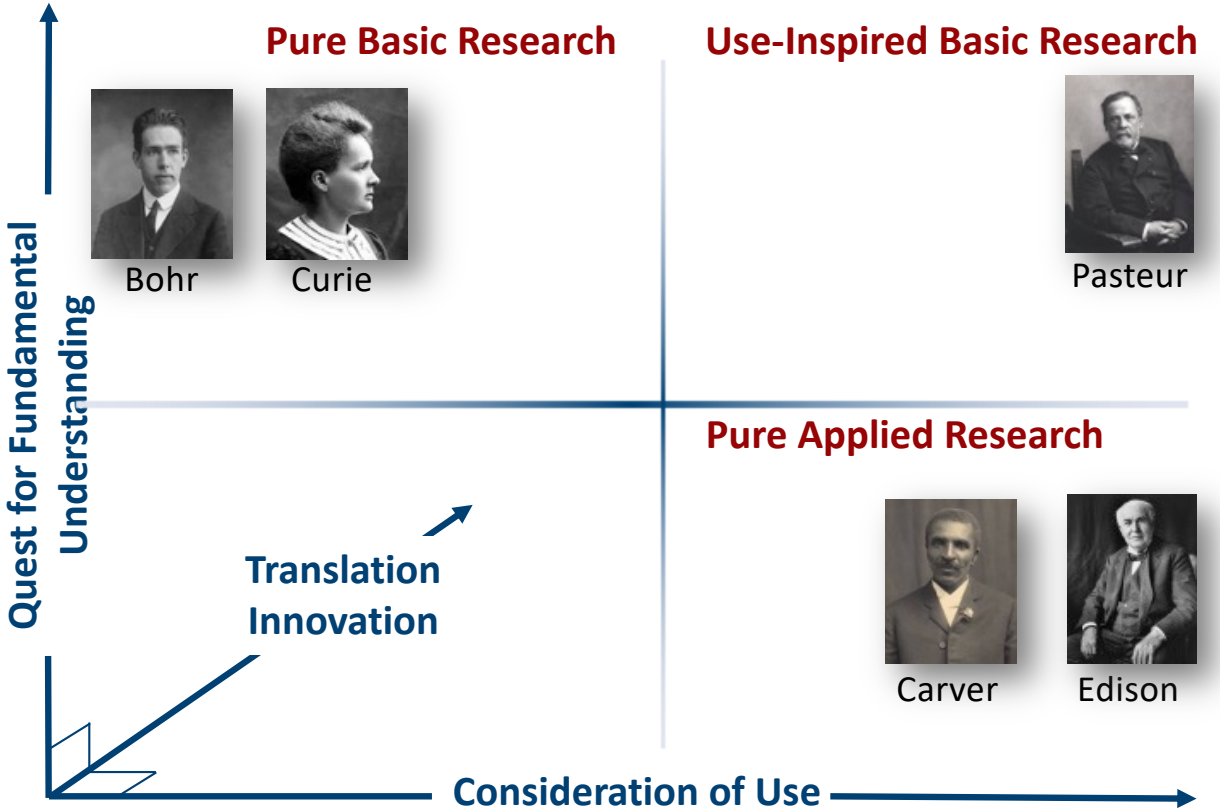
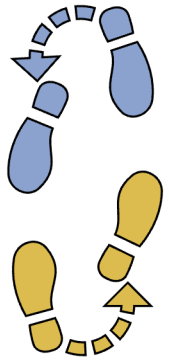
NSF mission


Promote the progress of science
NSF
Advance the national health, prosperity and welfare
Secure the national defense

Meeting our moment with an intentional focus







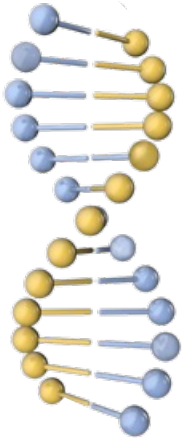
CURIOSITY-DRIVEN, DISCOVERY-BASED EXPLORATIONS

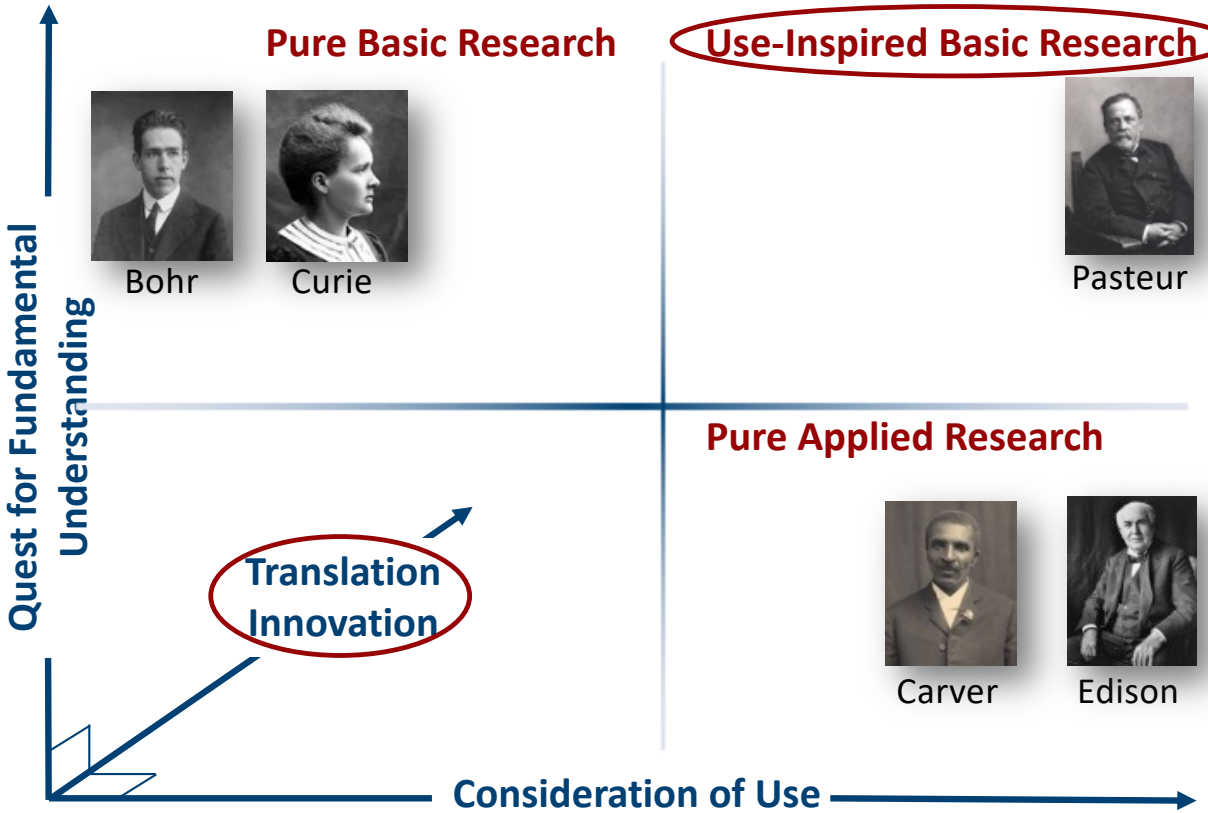
The Milky Way's Black Hole

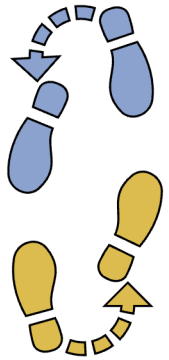
COVID-19 Response

USE-INSPIRED, SOLUTIONS-FOCUSED INNOVATIONS

Meeting our moment with an intentional focus







NSF's existing directorates and offices

A new “horizontal” to enhance use-inspired and translational research

Realigned investments

New investments

Partnerships as a Foundation

Accelerate Partnerships

Partnerships: A timely, illustrative example

Intel to Invest at Least $20 Billion in New Chip Factories in Ohio

Building up U.S. chip production has been a focus of lawmakers and companies alike amid a global shortage of the crucial components.

"To help develop and attract a pipeline of skilled talent from within the region, Intel plans to invest approximately $100 million over the next decade in partnership with Ohio universities, community colleges and the U.S. National Science Foundation [ranging] from collaborative research projects to building semiconductor-specific curricula for associate and undergraduate degree programs."

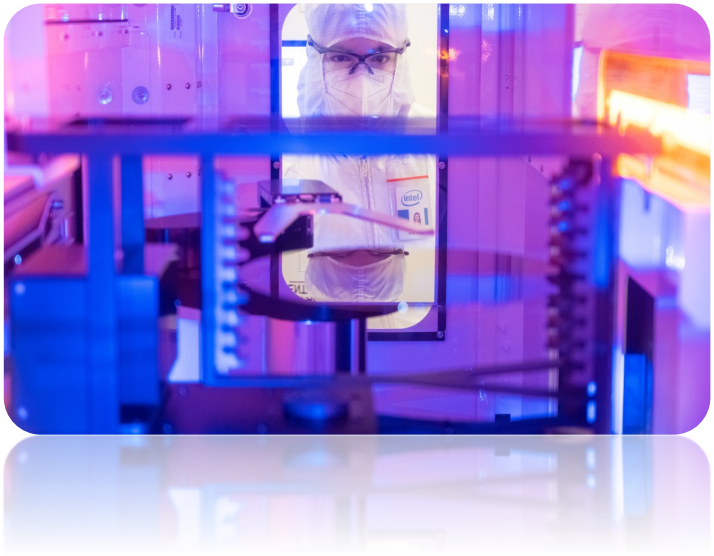
intel NSF

"Significant investments such as this one will allow us to harness the best ideas from around the country to drive future semiconductor design and manufacturing as well as develop a diverse, next-generation semiconductor workforce, reaffirming U.S. competitiveness in this vital area. Today's announcement builds on our long history of collaboration with industry like Intel to accelerate fundamental research and rapidly bring solutions to market."

- Sethuraman Panchanathan
U.S. National Science Foundation Director

NSF, Intel partners to fund the development of a high-quality manufacturing workforce

Partnerships latest news



More information @ beta.nsf.gov/tip/latest

$10 Million Investment

- To advance education and training for semiconductor manufacturing and design.
- To improve equitable STEM education at:
  - Two-year colleges;
  - Four-year universities, including minority-serving institutions.

Realigned investments

New investments

Innovation & Technology Ecosystems

- Convergence Accelerator
- Emerging Technologies
- Regional Innovation
- Experiential & Entrepreneurial Learning

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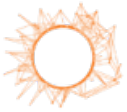
Convergence Accelerator

Track A

Open Knowledge Networks

Track B

AI and the Future of Work



Track C

Quantum Technology

Track D

AI-Innovation Data Sharing & Modeling

Track E

Networked Blue Economy

Track F

Trust & Authenticity in Communication Systems

2019 COHORT
Phase 2

2020 COHORT
Phase 2

2021 COHORT
Phase 1

Track G

Securely Operating Through 5G Infrastructure (joint with DOD)

Track H

Enhancing Opportunities for Persons with Disabilities

Track I

Sustainable Materials for Global Challenges

Track J

Food & Nutrition Security

Track K

Track Topic: TBD

Track L

Track Topic: TBD

2022 COHORT

FUTURE COHORT

NSF Convergence Accelerator, DOD partner to advance 5G technologies

Convergence Accelerator

latest news

$12 Million Investment

- 16 multidisciplinary teams in Track G: Securely Operating Through 5G Infrastructure.
- Supports enhancement and augmentations to 5G infrastructure, while meeting security and resilience requirements.

More information @ beta.nsf.gov/tip/latest

Realigned investments

New investments

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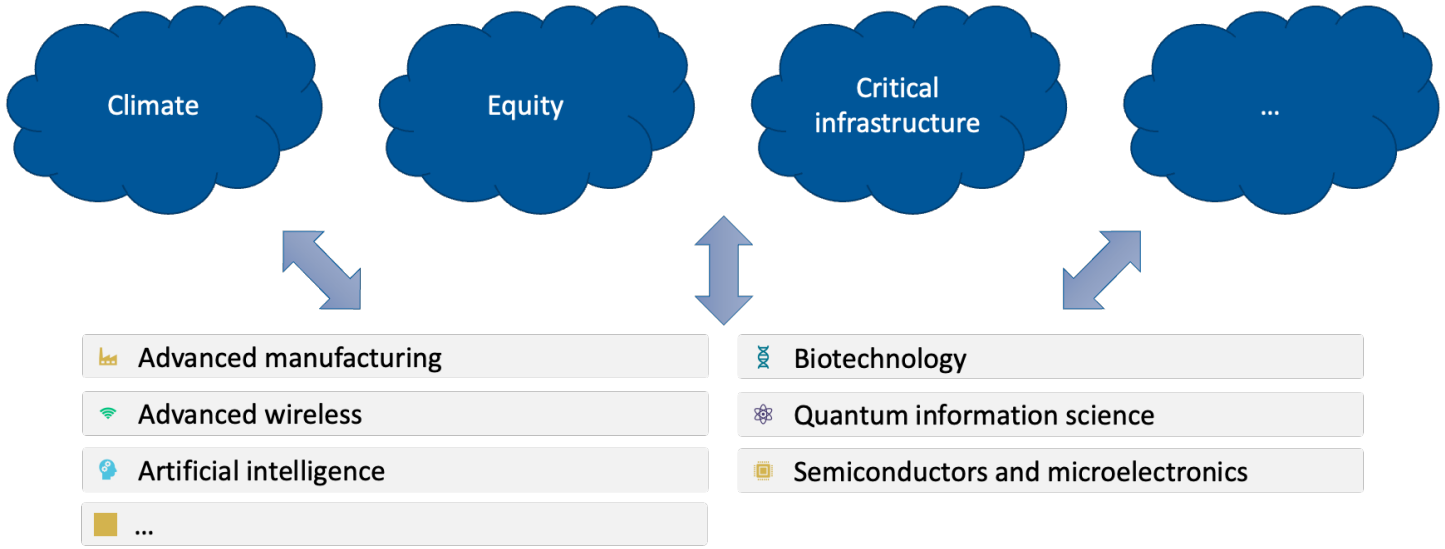
NSF Regional Innovation Engines (NSF Engines)

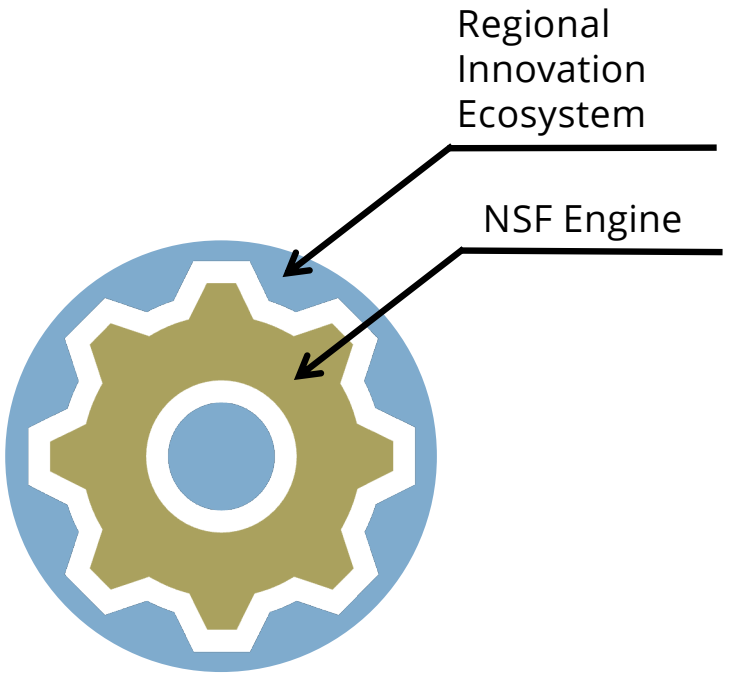
- Cultivate new regional innovation ecosystems throughout the U.S.
- Address major scientific/technological goals while solving societal challenges
- Balance technical and geographic innovation



What is an NSF Engine?

A multi-sector **coalition** of regional partners working together to catalyze a **regional innovation ecosystem** in a **topic area** of regional relevance and national and societal significance.

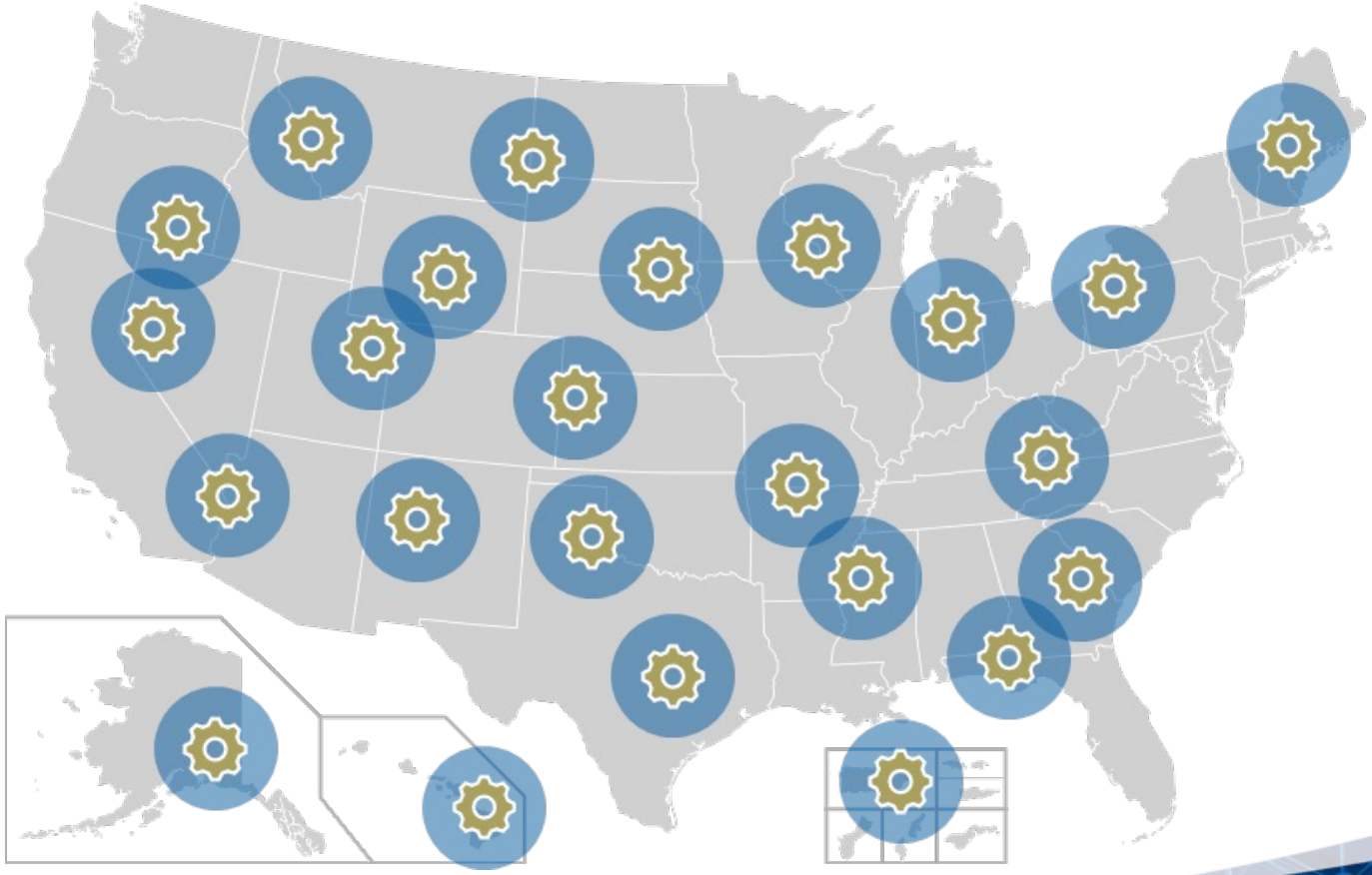
Engines are led by CEOs and include partners from industry, institutions of higher education, government, and non-profit and community organizations.



NSF Engines: Intentionally different

- A different scale
- Iterative co-design/co-creation through intentional engagement of broad, diverse stakeholders (“users”)
- Cohort-based training
- Milestone requirements for continued funding
- Focused success expectations:
  - Regional development
  - Individual and geographic diversity, including mentoring
  - Scaling and sustainability
  - Active participation and engagement
  - IP ownership extends to all contributing parties
  - Changing culture
  - Practitioner/entrepreneur development
  - Integrative/additive
- Evaluation of the overall approach

NSF Engines: Expanding innovation across the US



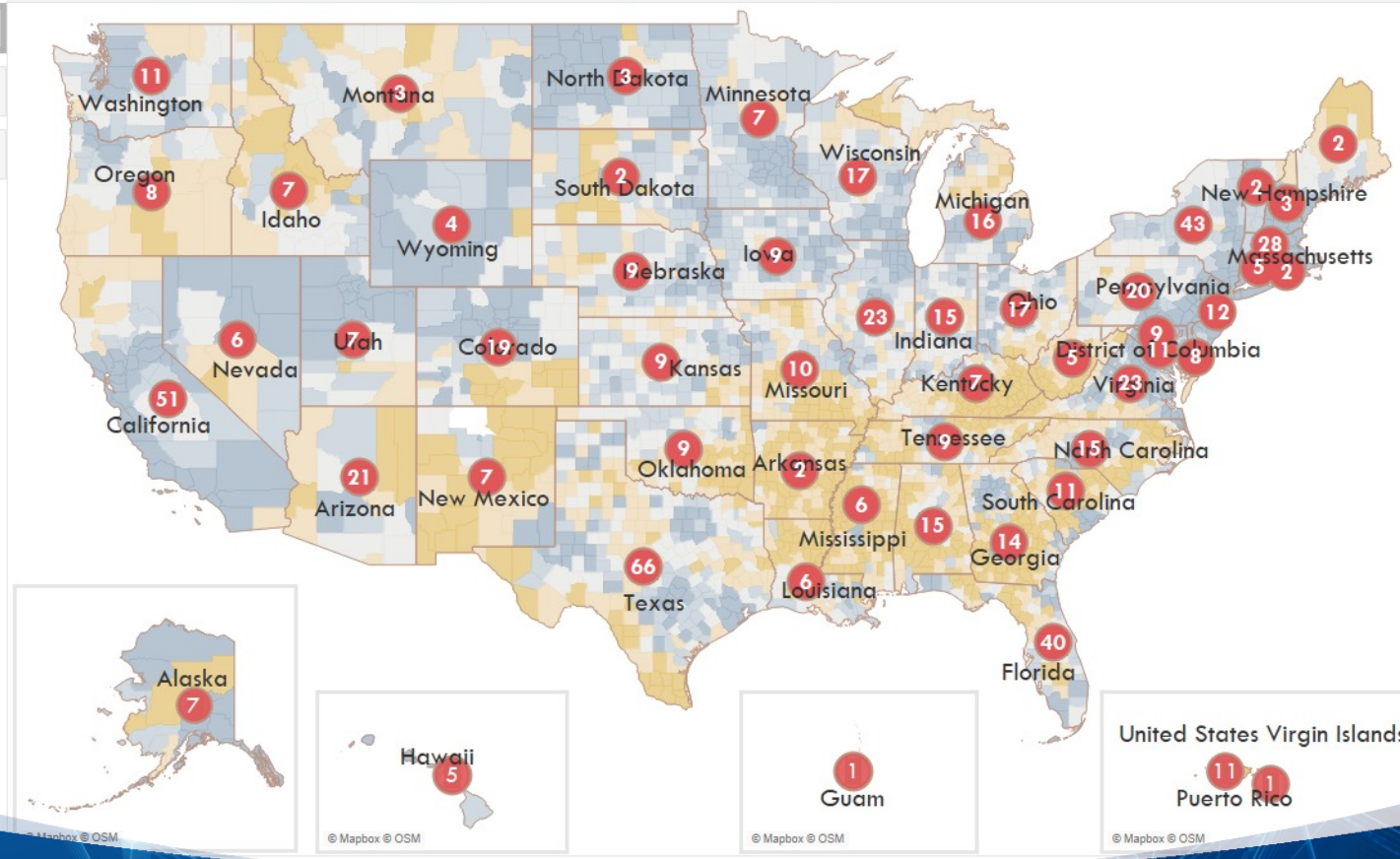
National Science Foundation
Regional Innovation Engines Program

Concept Outlines Explorer

Search by Theme (and more) | Search By State | Overview

Map View of Submissions by Lead Organization State

By Organization State
By Lead Organization
By Region of Service

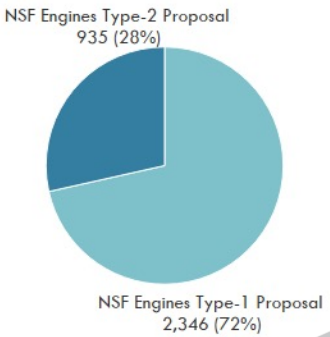


Filter(s):

NSF Engines Type
All

Concept Outline Submission Metrics

Number of Submissions Advancing	679
Number of Distinct Submitting Organizations	518
States and US Territories Submitting	54



To access the full list of all accepted concept outlines, please check https://airtable.com/...

National Science Foundation
Regional Innovation Engines Program

Concept Outlines Explorer

Search By Theme (and more) | Search By State | Overview

Search All

NSF Engines Type
All

State Name
All

Submission Organization
All

Submission ID
All

Keywords *(free text)*
All

States Footpring *(using state abbreviation)*
All

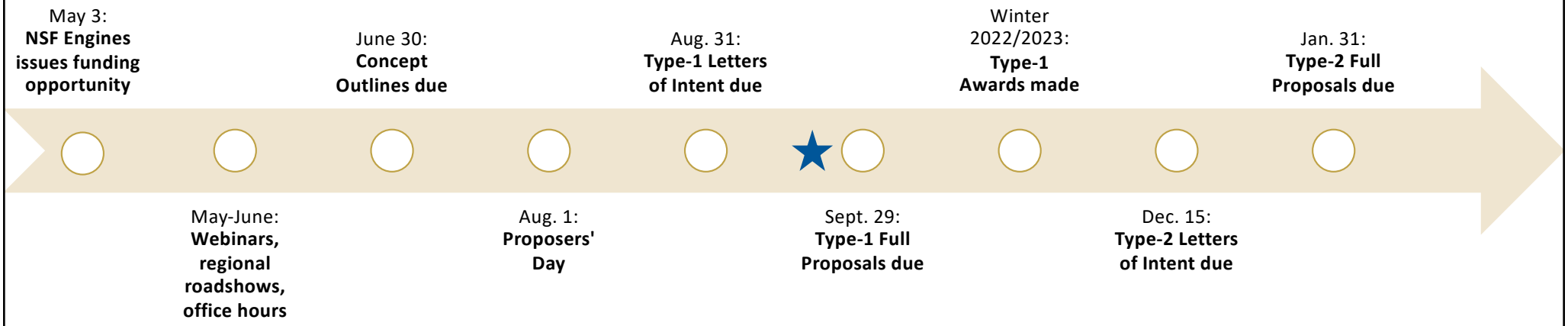
Submission Theme

Theme Count Control
10 to 103
and Null values

Number of Submissions: 679

ID	NSF Engines Type	Submission Title	Organization Name	Last Name	Region Of Service	States	Topic Summary	Keywords	
INQ-22-00640	Type 1 Proposal	Bridging the Gap in the Digi..	XLerateHealth	Willmot	The region of service..	KY,WV,SC..	The Engine proposes to ca..	virtual care,digital health,access,equity,southeast	
INQ-22-00925	Type 1 Proposal	Carbon-negative cementitiou..	Worcester Polytechnic Ins..	Eggleston	New England	MA	The Engine proposes to cr..	carbon negative,construction material,polysiloxanes,additive manufacturing,in..	
INQ-22-00907	Type 1 Proposal	NSF Engines: Type-1: A Ga..	Worcester Polytechnic Ins..	Smith	Southern New Engla..	MA,RI,CT	The Engine proposes the i..	Null	
INQ-22-00636	Type 1 Proposal	ICoN: Integrative Connectivit..	Worcester Polytechnic Ins..	Wyglinski	New England (CT, M..	CT,MA,ME,..	The Engine proposes to o..	connectivity,integrative,new england,wireless,workforce development	
INQ-22-00491	Type 1 Proposal	NSF Engines: Type-1: WPI – ..	Worcester Polytechnic Ins..	Woolridge	Central MA, the sout..	MA	The engine proposes to w..	biotech manufacturing,tech workforce development,biomedical ecosystem,bio..	
INQ-22-01119	Type 1 Proposal	A statewide innovation engin..	WiSys	Sanga	WI	WI	The Engine proposes to w..	agriculture,sustainability,technology,commercialization,startup	
INQ-22-00444	Type 2 Proposal	NSF Engines: Type-2: Advan..	Wichita State University	Tomblin	Kansas with a focus ..	KS	The Engine proposes to e..	artificial intelligence,machine learning,hypersonics,lightning	
INQ-22-00457	Type 1 Proposal	NSF Engines: Type-1: West ..	Western Michigan Univer..	Atilhan	Western Michigan	MI	The Engine proposes to w..	per- and polyfluoroalkyl substances,pfas,wastewater,environment,remediation	
INQ-22-00772	Type 1 Proposal	"AI3 West Living Laboratory..	Western Maricopa Coalit..	Hoffman	The Greater Phoenix..	AZ	The Engine proposes to le..	artificial intelligence,robotics,cognitive applications,health technology,fintech	
	Type 2 Proposal	NSF Engines: Type-2: Using ..	Western Kentucky Univer..	Brown	South, the Midwest, ..	KY	The Engine proposes lever..	aiot,agritech,commercialization,urban economic development	
	2 Proposal	NSF Engines: Type 2: Resear..	Western Fire Chiefs Asso..	Van Ballego..	Western United Stat..	CA,CO,W..	The Engine proposes to bu..	wildland fire,wildland fire urban	

NSF Engines: Timeline and status



Realigned investments

New investments

Innovation & Technology Ecosystems

- Convergence Accelerator
- Emerging Technologies
- Regional Innovation
- Experiential & Entrepreneurial Learning

Partnerships as a Foundation

- Accelerate Partnerships

Realigned investments

New investments

Technology Translation

- I-Corps
- PFI
- SBIR/STTR
- Innovative Pathways

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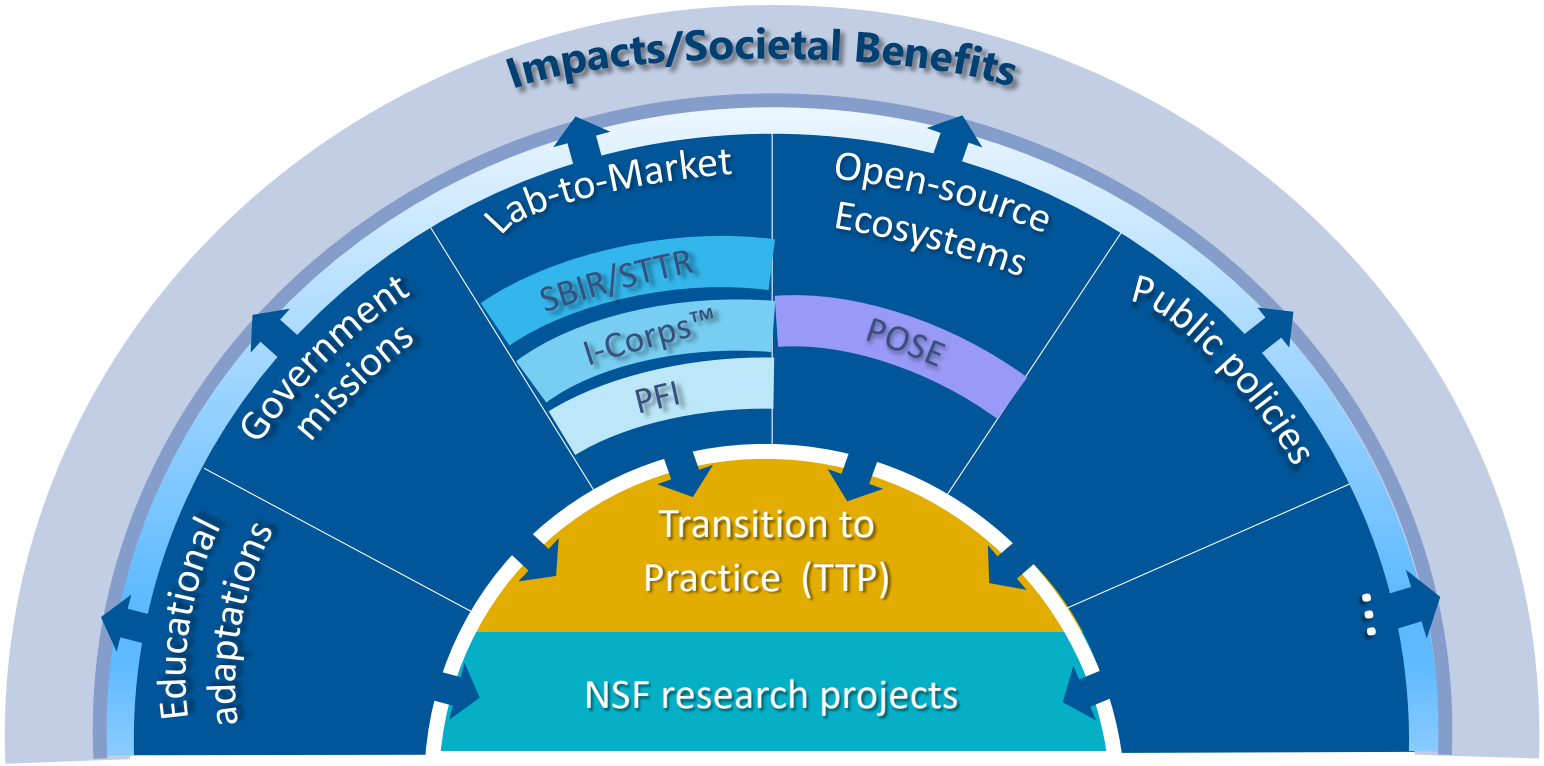
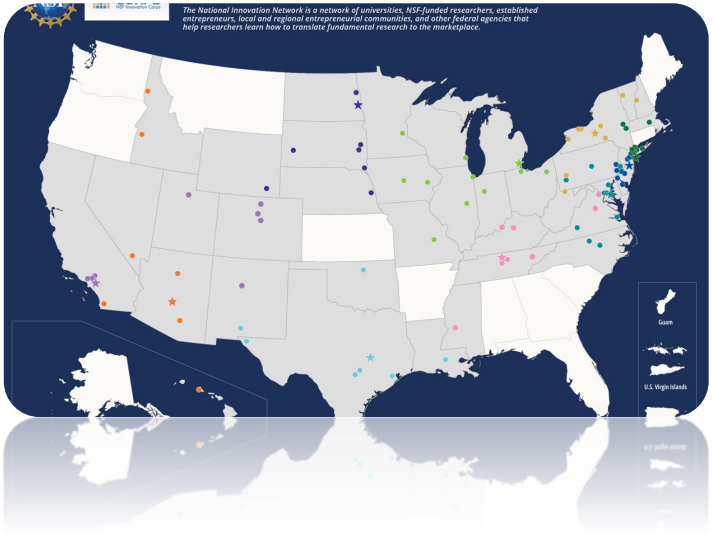
Research Impacts



NSF expands the National Innovation Network with 5 new I-Corps Hubs

I-Corps™ latest news



$15 Million Investment

- I-Corps Hubs work collaboratively to build and sustain a diverse and inclusive innovation ecosystem across the U.S.
- Each Hub receives up to $3 million investment per year for five years.
- Now, a total of 10 regional I-Corps Hubs with nearly 100 universities scale the NSF-led National Innovation Network

More information @ beta.nsf.gov/tip/latest

Realigned investments

New investments

Technology Translation

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Partnerships as a Foundation

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“Designing in” DEIA

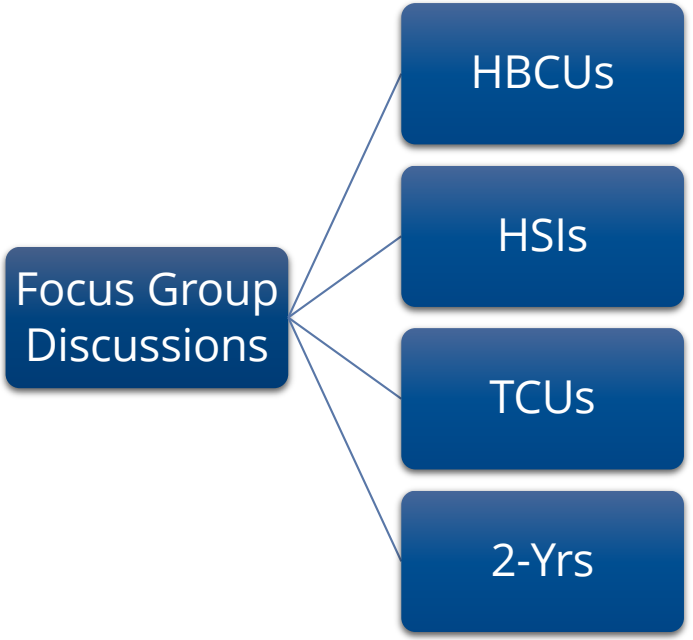
GOAL:
To ensure the successful inclusion of minority-serving institutions, two-year institutions, and other academic institutions underrepresented in the NSF portfolio in the NSF Engines program.

OBJECTIVES:

1. Emphasize the essential role that MSIs will play in realizing the mission of the NSF Engines

2. Gather insight from participating institutions about how they can benefit from and best contribute to the NSF Engines

3. Address the questions, concerns, and challenges about engaging in the NSF Engines, or TIP more generally



259 participants
143 different organizations

“Designing in” DEIA

Challenges to building strong **partnerships**

Need for **capacity building** at small institutions

Issues related to **NSF policy**

Challenges due to **geographic isolation**

The value of **mentoring**

Today's agenda

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Ramping up TIP

Jan. 21: NSF + Intel announce semiconductor workforce partnership

Feb. 15: Pathways to enable Open-Source Ecosystems launches

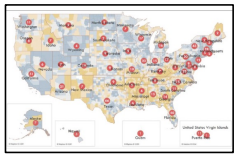
March 16: NSF establishes TIP

May 3: NSF Engines program launches

Privacy-Enhancing Technologies
PRIZE CHALLENGES

July 20: NSF, NIST, OSTP, UK announce privacy prize challenges

July 28: NSF Engines Concept Outlines published



Sept. 7: NSF, DOD partner to advance 5G security

Sept. 8: NSF awards five new I-Corps™ Hubs

Activate

Sept. 19: NSF announces Entrepreneurial Fellowships

FY 2023 President's Budget Request

Investments in the Administration's priorities of responding to the pandemic, tackling climate change, spurring economic recovery, innovating for equity, and ensuring national security and economic resilience.

FY 2023 President's Budget Request

Investments in the Administration's priorities of responding to the pandemic, tackling climate change, spurring economic recovery, innovating for equity, and ensuring national security and economic resilience.

THE DIRECTORATE FOR TECHNOLOGY, INNOVATION, AND PARTNERSHIPS (TIP)
$879.87 million

ADVANCED MANUFACTURING
$421.51 million

ADVANCED WIRELESS
$168.56 million

ARTIFICIAL INTELLIGENCE
$734.41 million

BIOTECHNOLOGY
$392.26 million

MICROELECTRONICS AND SEMICONDUCTORS
$145.69 million

QUANTUM INFORMATION SCIENCE
$261.0 million

TIP and advanced cyberinfrastructure

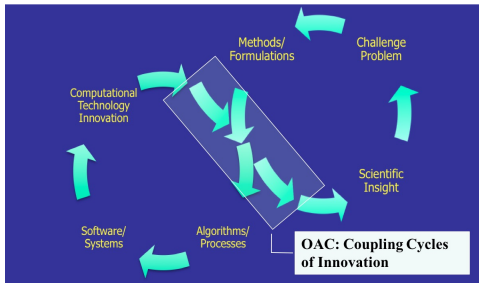
The essential role of advanced CI

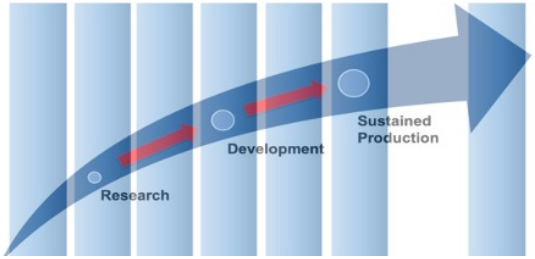
Translational pathways, including testbeds

Workforce pathways

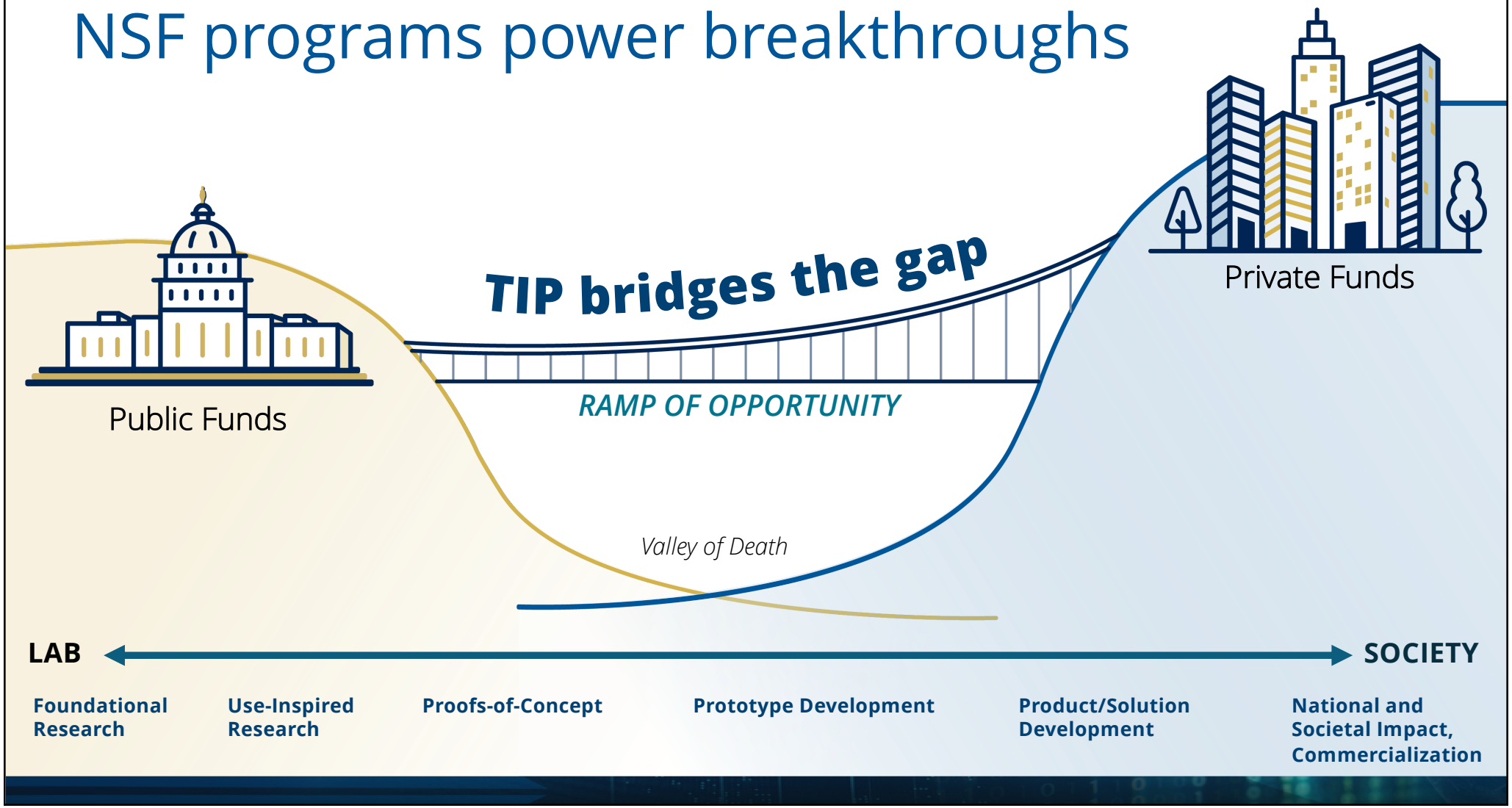
TIP and NSF/OAC: translational impact, innovation

- Translational research and innovation
  - OAC Core Research Program emphasizes translational research
  - Programs and processes for “transition to practice”
    - E.g., CSSI, CICI, SaTC, ….
- Accelerating Translation, Sustainability
  - Regional services to catalyze and facilitate translation,
    - Transition to NSF production CI
  - Explore models for software sustainability
    - Pathways to Enable Open-Source Ecosystems (POSE)
    - Cyberinfrastructure for Sustained Scientific Innovation (CSSI): Transition to Sustainability
- Broadening the translation ecosystem
  - Partnering to support the proof-of-concept engagements by the Minority Serving Cyberinfrastructure Consortium (https://www.ms-cc.org/)





NSF programs power breakthroughs



TIP Technology, Innovation and Partnerships

https://beta.nsf.gov/tip/latest
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