

BIENNIAL
REPORT | 2023



U.S. NATIONAL
SCIENCE FOUNDATION

INNOVATION CORPS (I-CORPS™)

Biennial Report in accordance with Public Law 114-329
American Innovation and Competitiveness Act (AICA) Sec. 601



CORPS
NSF Innovation Corps

LETTER FROM DR. SETHURAMAN 'DR. PANCH' PANCHANATHAN DIRECTOR, NATIONAL SCIENCE FOUNDATION

For over seven decades, the U.S. National Science Foundation (NSF) has powered discovery and innovation across all fields of science, technology, engineering, and mathematics (STEM). These breakthroughs are made possible through a combination of curiosity-driven, discovery-based exploration and use-inspired, solutions-focused innovation — what I call the DNA of NSF.

We are now in an important moment characterized by an urgent need to unleash new talent, ideas, and innovations across our country to address global grand challenges. To keep our Nation at the vanguard of discovery and innovation, we must harness the full potential of U.S. science, technology and engineering.

To meet this challenge, NSF has established its first new directorate in over 30 years. The Directorate for Technology, Innovation and Partnerships (TIP), which Congress authorized as part of the CHIPS and Science Act that the President signed into law in August 2022, is strengthening NSF's research programs and harnessing the geography of innovation across the United States like never before. TIP embodies a strategic mindset that supercharges research outcomes and enhances the lab-to-market cycle so that discoveries can quickly translate into practical applications.

An important part of TIP's approach is NSF's Innovation Corps (I-Corps™) program. For over a decade, this immersive, entrepreneurial training program has helped thousands of NSF-funded researchers develop the skills necessary to identify market opportunities for discoveries that emerge from their work. Having been part of the I-Corps program myself, I know firsthand how impactful this can be. I-Corps training empowers the entrepreneurial spirit and makes it possible to turn laboratory results into new devices, products, and services that can serve the needs of people throughout the Nation.

To strengthen and grow I-Corps, NSF has launched 10 new I-Corps Hubs over the last two years. These Hubs now serve as the operational backbone of the National Innovation Network, expanding the network of universities and collaborators participating and building a diverse and inclusive innovation ecosystem throughout the U.S.

This report highlights these achievements and the overall portrait of continued progress of the I-Corps program. To unlock our Nation's true entrepreneurial capacity and unleash economic and societal benefits for all, we must ensure that innovation is possible anywhere, and that opportunities are available to everyone, everywhere. NSF's I-Corps program is an important part of this effort, and I look forward to building on these successes at speed and scale.



*Sethuraman "Dr. Panch" Panchanathan
Director of the National Science Foundation*

A handwritten signature in blue ink that reads "Panchanathan". The signature is stylized and fluid, with a long horizontal line extending from the end.

*Sethuraman 'Dr. Panch' Panchanathan
Director of the U.S. National Science Foundation*

TABLE OF CONTENTS

2	Director's Message
---	--------------------

3	Table of Contents
---	-------------------

4	Executive Summary
---	-------------------

7	Introduction
---	--------------

9	NSF I-Corps
---	-------------

10	I-Corps at NIH
----	----------------

11	Energy I-Corps
----	----------------

11	Evaluation of I-Corps Impacts
----	-------------------------------

14	Addressing National Needs The Four Focus Areas of I-Corps
----	---

15	Training an Entrepreneurial Workforce
----	---------------------------------------

18	Translating Technologies
----	--------------------------

19	Enabling Economic Impact
----	--------------------------

22	Nurturing an Innovation Ecosystem
----	-----------------------------------

25	Agency Highlights
----	-------------------

37	Summary I-Corps Biennial Report, 2023
----	---

38	Appendix
----	----------

EXECUTIVE SUMMARY

For more than seven decades, the U.S. National Science Foundation (NSF) has been at the forefront of foundational and use-inspired research, innovation, and education that has promoted the progress of science, advanced the national health, prosperity and welfare, and secured the national defense. NSF discoveries and inventions are present throughout society, improving lives, powering the economy, and elevating and protecting the nation's competitiveness on the global stage.

In March 2022, NSF established the [*Directorate for Technology, Innovation and Partnerships \(TIP\)*](#), which Congress authorized as part of the [*CHIPS and Science Act*](#) that the President signed into law in August 2022. TIP's mission is to harness the Nation's vast and diverse talent pool to advance critical and emerging technologies, address pressing societal and economic challenges, and accelerate the translation of research results from lab to market and society. TIP improves United States competitiveness by growing the U.S. economy and training a diverse workforce for future, providing high-wage jobs in science, technology, engineering, and mathematics (STEM). TIP's impact is embodied in its growing set of complementary programs, including the [*NSF Innovation Corps \(I-Corps\)*](#).

As the NSF I-Corps program celebrates its 10th Anniversary, its training and infrastructure represent a critically important investment for NSF and the Nation, as directed by the [*American Innovation and Competitiveness Act \(AICA\), Public Law 114-329, Section 601*](#). When other federal agencies, such as the National Institutes of Health (NIH) and the Department of Energy (DOE), joined NSF in developing I-Corps programs, the [*National Innovation Network \(NIN\)*](#) drew together globally leading U.S. academic and biomedical communities, as well as the National Laboratory infrastructure, to nurture entrepreneurial leadership that thrives in the highly-competitive, high-tech economies of the future.

Responding to the AICA Congressional mandate, I-Corps addresses four urgent national needs:

- Training an Entrepreneurial Workforce;
- Translating Technologies;
- Enabling Economic Impact;
- Nurturing an Innovation Ecosystem.

TRAINING AN ENTREPRENEURIAL WORKFORCE

I-Corps provides a framework to bring together experienced industry mentors, commercial experts, research talent, and promising technologies to formulate ways to address challenges in the Nation's most advanced industries. Since its launch in Fiscal Year (FY) 2012, the NSF I-Corps program has trained over 7,800 participants. I-Corps at NIH (National Institutes of Health), which began in FY 2015, has had 950 individuals participate in I-Corps training, and Energy I-Corps (at the Department of Energy, DOE), which was launched in FY 2016 and focuses on participants from DOE National Laboratories, has had more than 580 individuals participate.

According to [*The Demographics of Innovation in the United States*](#), published by the Information Technology and Innovation Foundation in 2016, women represent just 12% of U.S. innovators, and U.S.-born minorities (including Asian Americans, African Americans, Hispanics, Native Americans, and other ethnicities) represent just 8% of U.S.-born innovators. The participation of women and other underrepresented groups in technology and technology transfer is an important factor leading to economic equity and prosperity across the U.S. As of the end of the FY 2021-2022 reporting period, a cumulative total of nearly 1,590 NSF I-Corps participants were female (20% of NSF's cumulative participant total), with more than 240 female participants in I-Corps at NIH (25% of NIH's cumulative total), and more than 100 female participants in Energy I-Corps (18% of DOE's cumulative total).



While NSF relies on self-reporting of underrepresented groups¹, a total of more than 2,080 (27%) NSF I-Corps participants and more than 290 (31%) I-Corps at NIH participants were reported as members of underrepresented groups since program inception at these agencies. (The number of Energy I-Corps participants that are from underrepresented groups is not currently available.)

To help grow a national diversity and inclusion infrastructure for the NSF I-Corps program, NSF established a cooperative agreement with the [National GEM Consortium](#). GEM's [Inclusion in Innovation Initiative \(GEMi4\)](#) supports academic researchers in launching successful tech startups through the GEMpreneur Workshops, Voices From the Field Panels, and PEP (Preparing for Entrepreneurial Pathways) Talks for current GEM fellows and alumni. GEM received the [2022 Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring \(PAESMEM\)](#). This prestigious recognition honored the exceptional efforts of GEM mentors in encouraging the next generation of innovators and developing a science and engineering workforce that reflects the diverse talent of America.

Due to the social distancing guidelines of the COVID-19 pandemic, the NSF, NIH, and DOE I-Corps programs pivoted to fully virtual operations, allowing I-Corps teams, instructors, and program staff to safely participate in training cohorts. This model allowed the programs to continue uninterrupted in FY 2021-2022. The flexibility of remote participation in I-Corps training also allowed the number of female and underrepresented group participants to remain the same or increase. Notably, many I-Corps teams also benefitted from the ability to interview potential customers virtually from across the country without the need for travel, expanding their access to industrial ecosystems.

TRANSLATING TECHNOLOGIES

As each I-Corps team assesses the commercial potential of a new technology, the number of participating teams serves as a measure of the number of technologies evaluated through the program. Since their respective inception dates, NSF I-Corps has trained 2,546 teams while I-Corps at NIH has trained 317 biomedical teams and Energy I-Corps has trained nearly 188 National Laboratory-based research teams. This represents 3,051 new technologies evaluated using the I-Corps process to determine product-market fit since the start of the program. Further, more than 50% of the participating NSF I-Corps teams have launched startup companies to bring their technologies from the laboratory to the marketplace.

ENABLING ECONOMIC IMPACT

An important measure of impact of I-Corps training is the number of new startup ventures launched and their subsequent success in attracting both public funding and private investment to enable their continued growth. *Since the inception of NSF I-Corps, over 1,380 participating teams have launched startups and these have cumulatively raised \$3.166 billion in subsequent funding (\$1.016 billion in public funding and \$2.150 billion in private investment) - 10.5 times the federal investment in NSF's I-Corps program (\$300 million).*

Since the inception of I-Corps at NIH, over 300 teams have collectively raised over \$634 million in subsequent funding linked to startup businesses (over \$299 million in public funding and \$335 million in private investment).

In addition, since the inception of Energy I-Corps, its teams have raised \$151 million in additional research funding. Importantly, the goal of Energy I-Corps is to accelerate the deployment of energy technologies by granting DOE Laboratory staff access to direct market feedback on their technology offerings. While DOE encourages company formation, the major metrics of Energy I-Corps success are defined as increases in external licenses, enhanced market insight into research, and improved external engagement.

¹ Underrepresented groups are defined as individuals who identify as: 1) women, 2) race as Black or African American, American Indian, Alaska Native, and/or Native Hawaiian or Other Pacific Islander, 3) Hispanic origin, and/or 4) disability status.

NURTURING THE NATIONAL INNOVATION ECOSYSTEM

The NSF National Innovation Network (NIN) historically has been a tightly connected organization of Nodes and Sites that constituted the NSF I-Corps' regional training program. In FY 2021-2022, NSF reorganized the NIN to include ten (10) new I-Corps Hubs, which now serve as the operational backbone of the network. The NSF *I-Corps Hubs* aim to expand the network of universities and collaborators as well as to build and sustain a diverse and inclusive innovation ecosystem throughout the U.S. Each NSF I-Corps Hub comprises a regional alliance of at least eight universities. The current NSF I-Corps Hubs comprise 94 academic institutions in 40 states and the District of Columbia. The NIN is expected to be diverse and inclusive in all aspects – including research disciplines, personnel, institutions, tools, programs, capabilities, and geographic locations.

The NSF I-Corps program consists of an immersive seven-week training in the discovery of industrial needs that helps researchers understand the commercial potential of their technologies. NSF continues to nurture new ways to enhance the entrepreneurial ecosystem by incorporating I-Corps training into other programs focused on translational research and commercial applications, such as the NSF's *Partnerships for Innovation (PFI) program*, the *Industry-University Cooperative Research Centers (IUCRC) program*, and NSF's Small Business Innovation Research /Small Business Technology Transfer (SBIR/STTR) program, also known as *America's Seed Fund powered by NSF*.

“The I-Corps program continued to grow during the period covered by this report — becoming more diverse and inclusive in every dimension, producing extraordinary societal and financial returns on federal investment, demonstrating resiliency and flexibility — even in the face of a global pandemic, and seamlessly integrating into the innovation and entrepreneurial ecosystems.”

The I-Corps program draws together globally leading U.S. academic and biomedical communities, as well as the National Laboratory infrastructure, to nurture entrepreneurial leadership that thrives in the fast-paced, highly-competitive, technology-focused economies of the future.



INTRODUCTION

INTRODUCTION

For more than seven decades, the U.S. National Science Foundation (NSF) has been at the forefront of the research, innovation, and education that has promoted the progress of science, advanced the national health, prosperity, and welfare, and secured the national defense, in part, by powering the economy and elevating the nation’s competitiveness on the global stage. Fundamental scientific discovery, coupled with use-inspired research and translational activities in science, engineering, and education have led NSF to many of the technologies benefiting society – from Doppler radar to bar codes and the modern internet, from web browsers and magnetic resonance imaging to laser eye surgery, DNA analysis, and synthetic biology.

In March 2022, NSF established the [*Directorate for Technology, Innovation and Partnerships \(TIP\)*](#) to advance use-inspired and translational research, giving rise to new industries and new solutions to industrial problems as well as engaging all Americans – regardless of background or location – in the pursuit of new, high-wage jobs in science, technology, engineering, and mathematics (STEM). Congress authorized the TIP directorate as part of the [*CHIPS and Science Act*](#) which the President signed into law in August 2022. TIP’s impact is embodied in its growing suite of programs that are helping to grow the innovation ecosystems and create opportunities for all Americans to engage in the innovation enterprise.

Of note, TIP’s Lab-to-Market platform offers options for researchers to translate technologies into products and services with societal and economic impact and includes [*NSF Innovation Corps \(I-Corps™\)*](#), [*Partnerships for Innovation \(PFI\)*](#), and [*America’s Seed Fund*](#) programs. TIP is also supporting new translation pathways, such as the [*Pathways to Enable Open-Source Ecosystems \(POSE\)*](#) program, which seeks to support open-source ecosystems. Together these programs enable the American research enterprise to accelerate the economic and societal potential of projects born in fundamental science and engineering, and to generate benefits at multiple levels throughout the national innovation ecosystem. TIP brings together teams of researchers, practitioners, and users to shape research directions, to catalyze iterative co-design and co-creation, to develop game-changing technologies and solutions to address the Nation’s societal and economic challenges, and to grow the future workforce.

Startups create disproportionate impact on the economy by creating jobs, generating proprietary knowledge, initiating the commercialization of new technologies, and spurring the development of new industries. NSF I-Corps teaches researchers how to participate in the translation of discoveries from the laboratory to the marketplace. As part of the “lean startup” movement, I-Corps training recognizes the unique needs of academic researchers exploring the translation of their technologies as well as the characteristics and opportunities of startups and small businesses based on customer discovery, hypothesis testing and validation, the ability to pivot based on new knowledge, and the importance of developing a minimal viable product. By teaching entrepreneurial skills to researchers, opportunities abound.

This report is prepared in accordance with the [*American Innovation and Competitiveness Act \(AICA\) Public Law 114-329 Sec. 601*](#), which provides a mandate for the I-Corps program. This report describes the activities of three federal agencies – NSF, the National Institutes of Health (NIH), and the Department of Energy (DOE) – that offer parallel programs focused on their unique entrepreneurial communities. These three organizations report together on their progress in preparing an entrepreneurially-minded workforce to support the Nation. Responding to the AICA Congressional mandate, I-Corps addresses four urgent national needs: 1) Training an Entrepreneurial Workforce, 2) Translating Technologies, 3) Enabling Economic Impact, and 4) Nurturing an Innovation Ecosystem.



In addition, this report explores innovation in the I-Corps program, particularly the:

- Impacts of the COVID-19 pandemic that caused I-Corps training to pivot from in-person to virtual training, which resulted in maintaining or increasing diversity and inclusion of female and underrepresented groups in I-Corps training cohorts;
- Establishment of the *GEM Inclusion and Innovation Initiative (GEMi4)* under a cooperative agreement with The National GEM Consortium to develop national diversity and an inclusion infrastructure for the I-Corps program;
- Evaluation and assessment of I-Corps on the economy as measured by startups formed, subsequent public and private funding of these startups, mergers and acquisitions of these startups, and, in the case of Energy I-Corps program, additional research funding raised;
- Establishment of the *NSF I-Corps Hubs* program, which creates a new operational backbone for the *National Innovation Network (NIN)*, and enables the training, expansion, evaluation and assessment, and research in entrepreneurial research; and
- Leveraging of TIP and NSF programs such as PFI, Industry-University Cooperative Research Centers (IUCRCs), and America’s Seed Fund powered by NSF, to build and strengthen a comprehensive platform for lab-to-market efforts.

NSF I-CORPS

NSF I-Corps currently offers two programs: the National I-Corps Teams Program that focuses on training for researchers at academic institutions, and the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) I-Corps Program that is aimed at NSF SBIR/STTR Phase I companies but additionally includes STTR Phase I companies from National Aeronautics and Space Administration (NASA) and SBIR Phase I companies from Department of Homeland Security (DHS).

NSF National I-Corps training enables the transformation of invention to impact through an immersive seven-week experiential training course led by experts in technology translation in all areas of science and engineering. The standardized curriculum integrates scientific inquiry and customer discovery in an inclusive, data-driven culture driven by rigor, relevance, evidence, and inclusion. By participating in I-Corps training, researchers reduce the time to translate a promising idea from the laboratory to the marketplace. NSF seeks to strengthen a national innovation ecosystem that fosters innovation among scientific faculty and students, promotes regional coordination, linkages, and sharing of promising practices, and encourages networks to address pressing societal needs and economic opportunities for the Nation.

The NSF I-Corps curriculum, which uses an accelerated training process adapted from lean startup methodologies, focuses on the identification of a feasible business model to inform both future research and the pursuit of commercialization opportunities. Participants enter as close-knit teams that collaborate to “get out of the building” and interview potential customers, partners, and other business constituents (typically conducting 100 or more interviews) with a goal of exploring applications potentially addressed by their technological innovations in a feasible business model. The teams participate in NSF I-Corps training as a cohort, wherein peer-to-peer interactions and networking are highly encouraged. This networking enables teams to learn from each other, to build interpersonal skills, to develop relationships leading to further business opportunities, and to keep motivated for success.



The I-Corps training program at all agencies supports a collaborative approach with teams of participants consisting of three roles:

Technical Lead, typically a university faculty member, senior research scientist, or postdoctoral scholar with deep and direct technical expertise in the technology of interest for potential translation;

Entrepreneurial Lead, typically a postdoctoral researcher or graduate student who is interested in launching a startup around the technology solution and who is committed to understanding the potential commercial applications of the technology; and

Industry Mentor, typically an experienced entrepreneur with a background in commercializing technology.

The teaching team for a National NSF I-Corps cohort is drawn primarily from I-Corps Hub and Node regional programs and consists of three core faculty and three adjunct faculty. All instructors participate in a standardized, intensive training program to ensure consistency in the course content and delivery.

As the NSF I-Corps program celebrates its 10th Anniversary, its training and infrastructure represent a critically important investment for NSF and the Nation. In the final Lessons Learned presentation of their I-Corps training, NSF I-Corps participants are challenged to articulate a commercialization plan. Participants craft a cohesive narrative explaining: 1) the “Product-Market Fit,” linking the technology to a commercialization opportunity, with options of “Yes, No, or Not Yet”; 2) the “Path Forward Decision,” regarding the decision to conduct further research or customer discovery, launch a startup, or pursue a different commercialization path; and 3) their next steps, based on their path forward decision. Even a product-market fit decision of “No” is deemed a success as this decision saves years of fruitless effort developing a startup around a technology that has no real market potential. More importantly, participants say the experience changes the way they approach future research, as it encourages them to seek out use-inspired challenges that need to be solved.

I-CORPS AT NIH

In 2015, the NIH initiated an I-Corps training program for NIH-funded companies, I-Corps at NIH, as a means of empowering biomedical entrepreneurs to develop and validate a strategic business model, through customer discovery, to address unmet clinical needs. The I-Corps at NIH teams participate in an eight-week entrepreneurial immersion course based on NSF’s I-Corps curriculum to generate insights into challenges associated with the commercialization of biomedical and life sciences technologies.

The I-Corps at NIH program focuses on NIH SBIR/STTR Phase I awardees. These awardees work on early-stage technologies to establish the technical merit, feasibility, and commercial potential. By design, the I-Corps at NIH program’s team structure incorporates the titles and roles of individuals with decision-making authority within the small business. Participating companies enter the program with three-person teams: C-Level Corporate Officer (e.g., Chief Executive Officer (CEO)), Principal Investigator/Technical Lead, and Industry Expert (e.g., internal or external professional possessing a business development background in the target industry).

ENERGY I-CORPS

In 2016, the DOE established Energy I-Corps to accelerate the deployment of energy technologies by granting DOE National Laboratory staff access to direct market feedback on their technology offerings. The Energy I-Corps program empowers teams with the tools, resources, and relationships necessary to discover potential market pathways for their innovations. Energy I-Corps is administered by the DOE Office of Technology Transitions (OTT).

While the Energy I-Corps program encourages company formation, it defines metrics of success to include outcomes such as external licenses, market insight into research, and improved external engagement. DOE sees value in changing the problem-solving approach of researchers who return to the lab bench better equipped to ask and frame research questions through a customer lens based on their customer outreach. This promotes culture change and a new approach to problem solving that reverberates across the lab system for years.

EVALUATION OF I-CORPS IMPACTS

Responding to the Congressional AICA mandate, four urgent national needs are evaluated:

Training an Entrepreneurial Workforce. This metric is realized as *individuals trained*, including progress toward *broadening participation* objectives. This metric includes expanding the entrepreneurial workforce to include representation of women and individuals from underrepresented groups that is proportionate to the U.S. population through efforts such as GEMi4 and offering the program in a virtual format at the start of the pandemic;

Translating Technologies. This effort is measured by *teams trained*, as each team is linked to a novel core technology in science and engineering, as well as the number of startup companies formed to commercialize the technology. This metric tracks the types of technologies evaluated in the I-Corps program.

Enabling Economic Impact. This assessment considers economic impact as determined by NSF and NIH startup businesses formed by I-Corps teams, subsequent project funding (public and private), mergers or acquisitions (together known as “exits”), and, for Energy I-Corps, measures of additional research funding as a results of enhanced market insights into research, improved external engagements, and increases in external licenses; and




Nurturing an Innovation Ecosystem. This metric includes the *expansion of the NIN* through the establishment of the *new I-Corps Hubs* and the *integration of I-Corps training* throughout a comprehensive NSF laboratory-to-market ecosystem.

Outcomes for all three agencies, as well as an associated glossary/data dictionary, are provided in [Appendix Pg. 38](#).

SUMMARY

Although each agency – NSF, NIH, and DOE – implements I-Corps at a different stage of the entrepreneurial journey from demonstration to validation, they share a common vision of empowering scientists and engineers to inform and accelerate their contact with the marketplace. The I-Corps program’s structured training and commercial evaluation process coupled with the ability to scale has enabled the U.S. to impact economic development with new and innovative products and services, outpacing many global competitors.

I-CORPS™ PROGRAM AT A GLANCE | CUMULATIVE OUTCOMES

	 <p>Extend academic and SBIR/STTR researcher focus beyond the laboratory and accelerate the societal and economic benefits of basic research projects leading to commercialization.</p>	 <p>Accelerate the translation of biomedical research to the marketplace by training NIH-funded SBIR/STTR awardees.</p>	 <p>Increase use-inspired and application focus of energy innovation by National Laboratory staff and researchers.</p>
MISSION			
FISCAL YEAR (FY) STARTED	2012	2015	2016
PILOT LAUNCHED	Fall 2011	Fall 2014	Fall 2015
TEAMS TRAINED¹	2,546	317	188
WOMEN TRAINED	1,589	242	105
UNDER REPRESENTED GROUPS TRAINED²	2,082	296	N/A ³
ENTREPRENEURIAL LEADS TRAINED	3,070	318	224
STARTUP BUSINESSES FORMED	1,380	305	19
SUBSEQUENT FUNDING RAISED⁴	\$3.166 B	\$635 M	\$151 M

FOOTNOTES

- ¹ Numbers reflect total values from the inception of each program until the end of Fiscal Year (FY) 2022.
- ² URG Trained = participants from underrepresented groups trained (e.g., Black or African American, American Indian, Alaska Native, Native Hawaiian or Other Pacific Islander, of Hispanic origin, and/or with a disability), not including women.
- ³ N/A = data not available.
- ⁴ For NSF and NIH, Subsequent Funding Raised excludes financial support from the I-Corps award and only includes funding obtained during and/or after I-Corps participation. For DOE, Subsequent Funding Raised reflects additional research funding that is obtained during or after Energy I-Corps participation. For SBIR/STTR participants, the SBIR/STTR award amounts were excluded from the Subsequent Funding Raised data. A combination of data sources was used to estimate the amount of Subsequent Funding Raised that teams obtained: USASpending data for federal funding, Pitchbook (third party market and private and venture capital data providers), Security and Exchange Commission (SEC) filings, and verified self-reporting data for private funding (through VentureWell). For this report, Pitchbook data were newly incorporated as compared with previous reports to better reflect the actual scope of private funding in the startups. As such, the magnitude of changes observed in the total cumulative funding between the previous and current participation periods is the product of both the growth of these startup businesses and the incorporation of additional financial data into the estimates.





ADDRESSING NATIONAL NEEDS

THE FOUR FOCUS
AREAS OF I-CORPS

TRAINING AN ENTREPRENEURIAL WORKFORCE

Since its launch in FY 2012, NSF I-Corps has trained 7,806 unique individuals. I-Corps at NIH, which began in FY 2015, has trained 950 individuals. Energy I-Corps, launched in FY 2016, has trained 585 individuals. A cumulative total of approximately 9,340 individuals have been trained since the program inception. In the FY 2021-2022 reporting period, over 2,170 individuals participated in NSF I-Corps training while almost 350 participated in I-Corps at NIH and nearly 230 at DOE. This represents an increase of 13% over the previous reporting period (FY 2019-2020) for NSF, and a 79% and 116% increase at NIH and DOE, respectively. The FY 2021-2022 metrics for the number of individuals participating in I-Corps training demonstrate consistent gains over FY 2019-2020, continuing generally steady upward growth in overall I-Corps participation (see Figure 1). For NSF I-Corps, FY 2021-2022 marked the first biennial reporting period that I-Corps teams participated from all 50 States and Puerto Rico, a notable achievement.

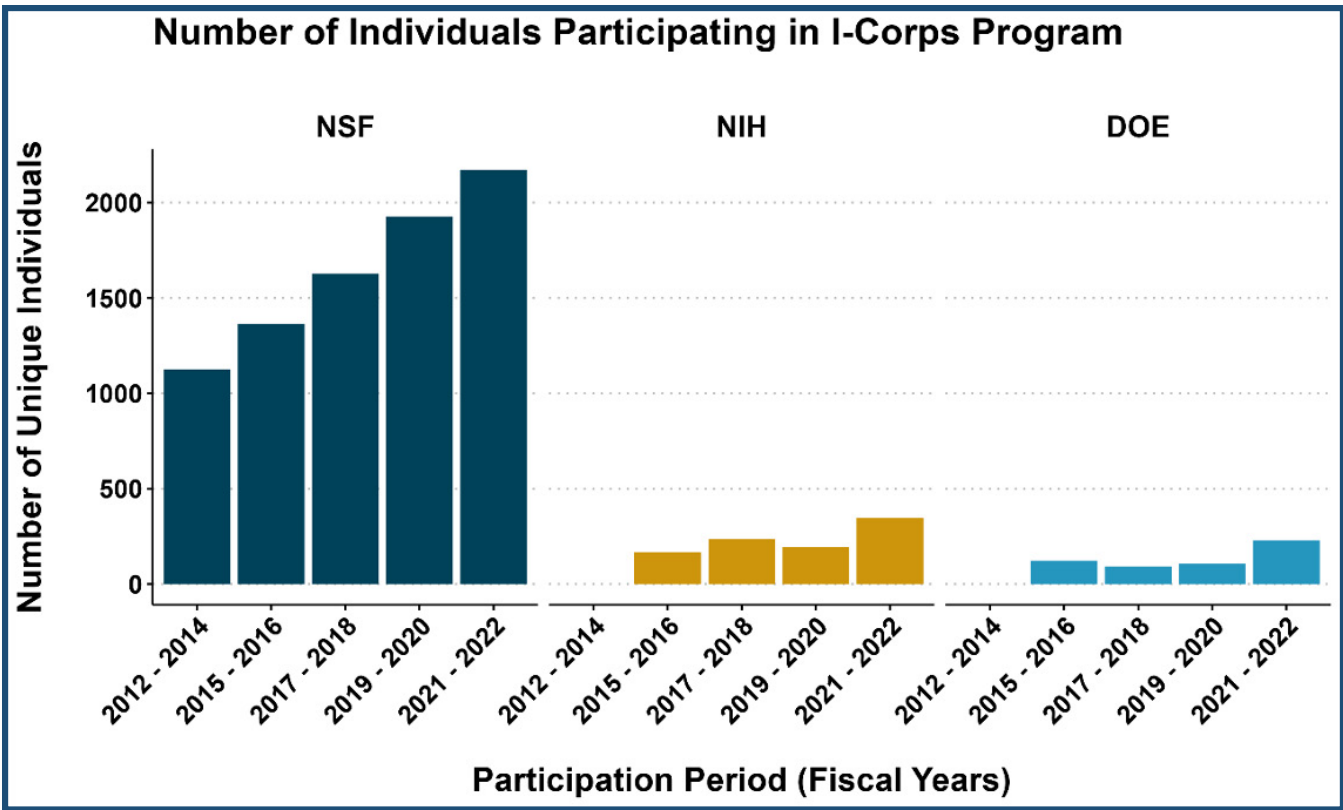


FIGURE 1. Number of individuals participating in I-Corps training by agency and participation period. In FY 2021-2022, over 2,170 individuals participated in NSF I-Corps training while nearly 350 participated in I-Corps at NIH and nearly 230 at DOE. This represents an increase of 13% over the previous reporting period (FY 2019-2020; see Appendix) for NSF, and 79% and 116% increases at NIH and DOE, respectively. The participation period refers to the date of I-Corps training. Individuals are not counted more than once.

WOMEN IN I-CORPS

According to *The Demographics of Innovation in the United States*, published by the Information Technology and Innovation Foundation in 2016, women represent just 12% of U.S. innovators, and U.S.-born minorities (including Asian Americans, African Americans, Hispanics, Native Americans, and other ethnicities) represent just 8% of U.S. born innovators. The lack of diversity in the STEM workforce results in considerable talent that is lost to the innovation ecosystem.

In FY 2021-2022, 516 participants in NSF I-Corps were female, an increase of 25% from the FY 2019-2020 reporting period. Similarly, in FY 2021-2022, 85 participants in I-Corps at NIH were female, and 49 participants in Energy I-Corps were female, increases of 67% and 188% over FY 2019-2022, respectively. Please note that diversity metrics for NSF and NIH are self-reported, while DOE metrics are estimated. In surveys, NSF experienced a 15% non-response rate for gender for the current reporting period.

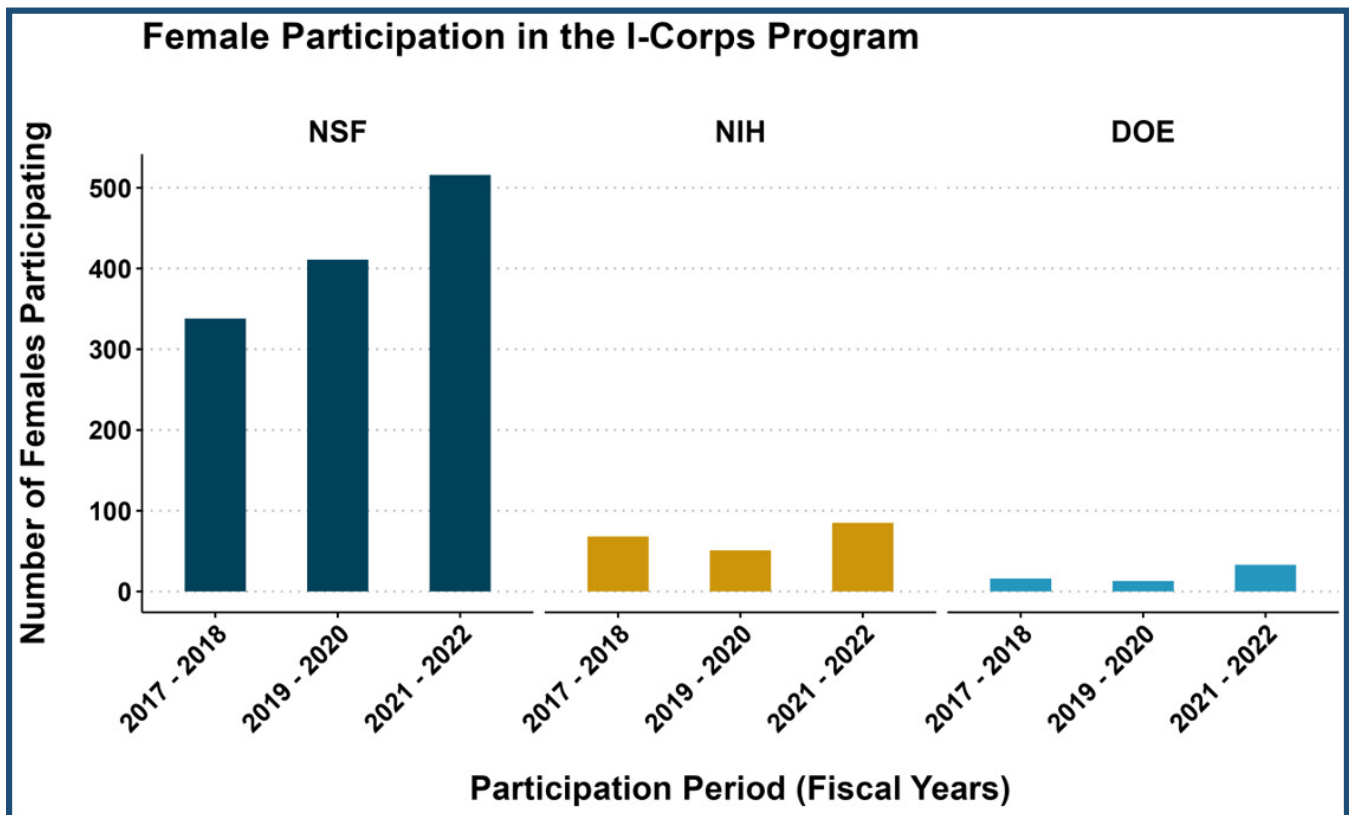


FIGURE 2. *Female participation in I-Corps by agency and participation period. In FY 2021-2022, 516 participants were reported as female in NSF I-Corps training while 85 participants were reported as female in I-Corps at NIH and 49 at DOE. This represents an increase of 25% over the previous reporting period (FY 2019-2020; see Appendix) for NSF, and a 67% and 188% increase at NIH and DOE, respectively.*

UNDERREPRESENTED GROUPS IN I-CORPS

In addition to women, NSF has extended the Congressional AICA mandate to include individuals from other underrepresented groups (e.g., Black or African American, American Indian, Alaska Native, Native Hawaiian or Other Pacific Islander, of Hispanic origin, and/or with a disability) to align with its ongoing mission of creating an inclusive entrepreneurial community that reflects the entire Nation. In FY 2021-2022, the number of individuals trained in NSF I-Corps who were from underrepresented groups was more than 680 (31% of the total number of NSF I-Corps participants in the FY 2021-2022 reporting period, and an increase of 20% from the FY 2019-2020 reporting period). The number of individuals trained in I-Corps at NIH that were from underrepresented groups was 103 (30% of the total number of I-Corps at NIH participants in FY 2021-2022, and an increase of 58% from FY 2019-2020). The number of participants that were members of underrepresented groups at Energy at I-Corps is not currently available.

A cumulative total of more than 2,080 (27%) NSF I-Corps participants and nearly 300 (31%) I-Corps at NIH participants were members of underrepresented groups since program inception at these agencies. The number of Energy I-Corps participants that are from underrepresented groups is currently not available. It should be noted that diversity metrics for NSF and NIH are self-reported.

IMPACTS OF COVID-19

Due to the social distancing guidelines of the COVID-19 pandemic, the NSF, NIH, and DOE I-Corps programs pivoted to fully virtual operation, allowing I-Corps teams, instructors, and program staff to safely participate in training cohorts. The virtual model allowed the programs to continue uninterrupted in FY 2021-2022. The flexibility of remote participation in I-Corps may have enabled the number of participants from groups underrepresented in STEM to increase, as there were no travel requirements for training or customer discovery interviews as compared with the pre-pandemic program that required extensive travel. Going forward, NSF is likely to maintain the remote format for I-Corps training.

THE NATIONAL GEM CONSORTIUM

In the Fall of 2019, NSF entered into a cooperative agreement with [The National GEM Consortium](#) (GEM, formerly Graduate Education for Minorities). Chartered in 1976, GEM is the only privately funded, non-profit graduate educational organization connecting highly qualified graduate students from groups underrepresented in STEM to a national network of more than 150 top-rated universities, government research facilities, and leading multinational corporations.

The [GEM's Inclusion in Innovation Initiative \(GEMi4\)](#) was developed to establish a national diversity and inclusion infrastructure for the NSF I-Corps program. The GEM Inclusion in Innovation Initiative (I4) has four objectives: **1) Inspire** a generation of researchers to pursue entrepreneurial pathways; **2) Integrate** the GEM Network into the I-Corps infrastructure; **3) Increase** the number of I-Corps teams with underrepresented researchers; and **4) Impact** the diversity and inclusion of the entrepreneurial ecosystem. GEMi4 supports academic researchers in launching successful tech startups through the GEMpreneur Workshops, Voices From the Field Panels, and PEP (Preparing for Entrepreneurial Pathways) Talks for current GEM fellows and alumni.

Some of the recent accomplishments of the GEMi4 effort include:

- More than 1,500 GEM Fellows, their advisors, GEM alumni, and GEM university representatives have participated in experiential, customer-based discovery as part of the I-Corps GEMpreneur Workshops and the Voices From the Field Panels; 45% of this group were female;
- Over 390 entrepreneurial coaching sessions have been completed with GEM Fellows in 33 states;
- Greater than 85 GEM Fellows have successfully completed Regional I-Corps training;
- 5 GEMi4-initiated teams have completed NSF National I-Corps training;
- 30 GEM Alumni have been trained as I-Corps Regional instructors and mentors; 2 instructors and 1 mentor have participated in NSF National I-Corps cohorts;
- More than 98 GEM Alumni and Fellows are pursuing Entrepreneurial Pathways focused on launching a startup;
- 11 Tech startups have formed as a result of GEMi4 training and one of these startups has raised over \$3M in seed funding; and
- 5 NSF I-Corps Hubs and Nodes integrate GEMi4 efforts with regard to sharing resources, and collaborating to increase Black, Indigenous, and People of Color recruitment, retention and funding.

In addition, the National GEM Consortium received the [2022 Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring \(PAESMEM\)](#). This prestigious recognition honored the exceptional efforts of GEM mentors “in encouraging the next generation of innovators and developing a science and engineering workforce that reflects the diverse talent of America.”



TRANSLATING TECHNOLOGIES

There has been a steady increase in the number of teams participating annually in the I-Corps program since the program's inception at each agency. In the FY 2021-2022 reporting period, NSF I-Corps trained 638 teams, an increase of 7.5% over FY 2019-2020. Over this same period, I-Corps at NIH trained 116 teams, an increase of 78%, and Energy I-Corps trained 67 teams, an increase of 109%. These data show that the number of NSF teams have grown steadily over each reporting period while NIH and DOE show an increase in the number teams during the FY 2021-2022 reporting period.

As each I-Corps team focuses on the evaluation of the market opportunity of a specific technology under development in a research laboratory, the number of teams is a measure of the number of new technologies evaluated for commercial potential. This means that since the start of the program, NSF I-Corps has explored technologies from 2,546 teams; I-Corps at NIH has explored technologies from 317 teams; and Energy I-Corps has explored technologies from 188 National Laboratory-based research teams. This represents over 3,050 new technologies evaluated using the I-Corps process to determine product-market fit since the start of the program. Further, more than 50% of the participating NSF I-Corps teams have launched startup companies to bring their technologies from the laboratory to the marketplace.

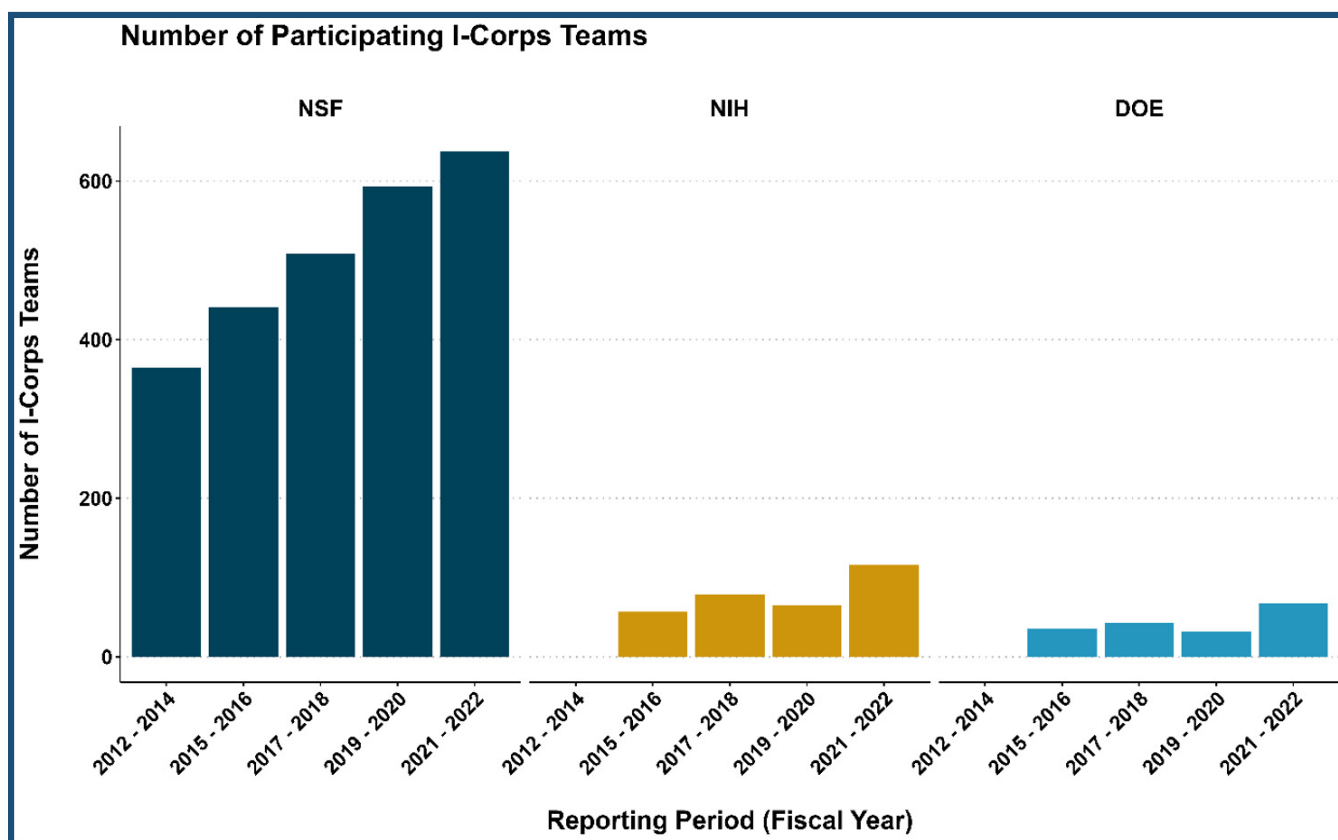


FIGURE 3. *Number of I-Corps teams by agency and reporting period. In the FY 2021-2022 reporting period, over 630 teams participated in NSF I-Corps training while over 110 teams participated in I-Corps at NIH and over 60 teams at DOE. This represents an increase of 8% over the previous reporting period (FY 2019-2020) for NSF, and a 78% and 109% increase at NIH and DOE, respectively.*

In addition, I-Corps projects encompass a wide range of technologies and represent many categories of cutting-edge science and engineering research. NSF does not have a technology topic preference but does encourage applications from researchers with NSF or other research awards in science and engineering.

The largest NSF technology topic areas represented in the current reporting period include: Biomedical Engineering and Life Sciences, Information Technology, Advanced Manufacturing and Materials, and Environmental Technology. Other technology areas evaluated by NSF I-Corps teams in the current reporting period include: Biotechnology, Energy, Robotics, Sensors and Wireless Technologies, Education, Optics and Photonics, and Chemical Technologies, while NIH I-Corps focused on Biomedical and Life Science technologies and DOE focused on energy technologies.

ENABLING ECONOMIC IMPACT

STARTUP FORMATION

An important measure of the impact of I-Corps training is the number of new startup ventures launched or accelerated (see Figure 4) and their subsequent success in attracting both public funding and private investment to enable their growth (see Figures 5 and 6). Figure 4 shows that the total number of startups increased at each federal agency since the prior reporting period: startups associated with NSF I-Corps increased by 33% between the two reporting periods (from 1,036 in the NSF I-Corps Biennial Report 2021 to 1,380 in the current report). The number of startups for I-Corps at NIH increased 52% (from 201 to 305), and the number of startups for Energy I-Corps increased 58% (from 12 to 19) for the same period.

I-Corps training not only has an immediate economic impact but also may continue to be a factor in startup formation well beyond the immediate conclusion of the training program.

For example, in the current reporting period (FY 2021-2022), 298 new startups were associated with I-Corps training from NSF (see Appendix). This number is similar to the number of startups in the previous reporting period (302 new startups in the FY 2019-2020 reporting period; see [NSF I-Corps Biennial Report 2021](#)). Notably, the number of new companies formed by teams participating in NSF I-Corps training in the FY 2019-2020 reporting period increased by 20% (from 302 companies to 361) while the number of companies formed by teams participating in I-Corps training in FY 2017-2018 increased by 2 (from 299 to 301). The conclusion from this unexpected finding is that startups continue to be launched years after their I-Corps training.

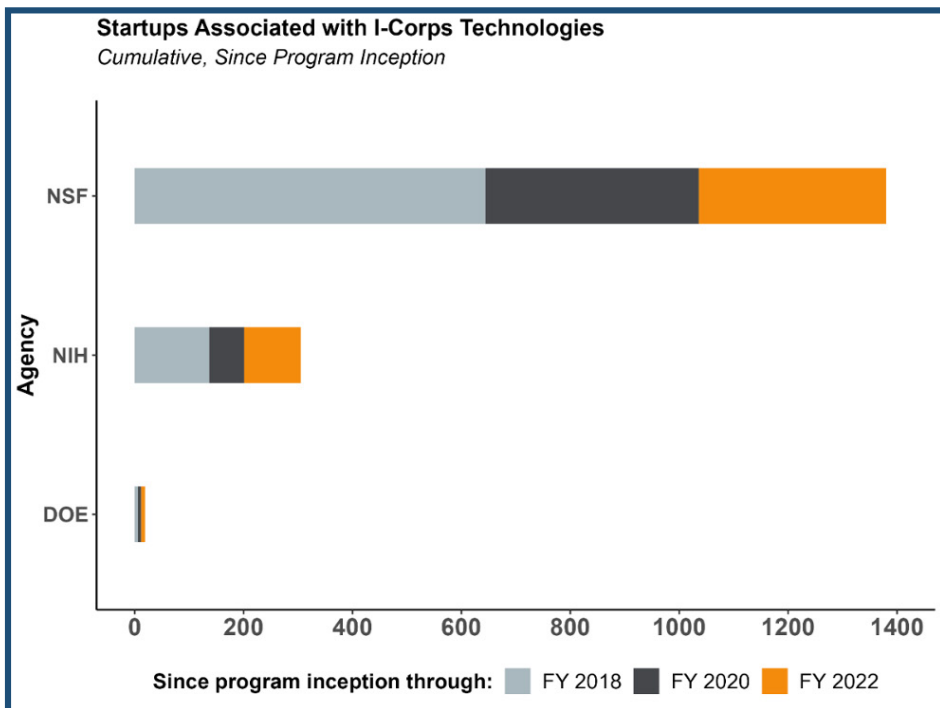


FIGURE 4.

Total number of startups launched or accelerated by I-Corps, by agency. The total number of startup companies is shown to increase during the current reporting period (FY 2021-2022) as compared with the previous (FY 2019-2020) reporting period. The total number startups increased by 33% between the two reporting periods for NSF I-Corps, 52% for I-Corps at NIH, and 58% for Energy I-Corps. The data includes SBIR and STTR companies at NSF and NIH participating in I-Corps training. All NIH participating teams are SBIR and STTR companies, while 118 teams participating in the NSF I-Corps program are SBIR and STTR companies from NSF, NASA, and DHS. I-Corps program inception varies by agency: NSF began in FY 2012, NIH began in FY 2015, and DOE began in FY 2016.

SUBSEQUENT FUNDING

Most startups associated with I-Corps raise subsequent funding from two sources:

- **Public funding** that consists of SBIR/STTR funding, other federal funding (non-SBIR/STTR), and state funding; and
- **Private funding** that consists of venture capital, capital from angel or individual investors, and corporate funding.

As shown in Figure 5, since the inception of NSF I-Corps, over 1,300 of participating teams have launched startups, and these have cumulatively raised \$3.166 billion in subsequent funding (\$1.016 billion in public funding and \$2.150 billion in private investment) — representing a greater than 4-fold increase over the previous reporting period. This figure is 10.5 times the federal funding invested in the NSF I-Corps program to date (approximately \$300 million).

Figure 5 also shows subsequent funding for I-Corps-affiliated startups participating in each reporting period as a percentage of public and private funding. Initial funding of startups associated with NSF I-Corps is 80-90% from public sources (e.g., SBIR/STTR funding, other federal funding (non-SBIR/STTR), and state funding) and 10-20% from private sources (e.g., venture capitalists, capital from angel or individual investors, and corporate investors) within the first two years of I-Corps participation. Private funding becomes dominant 2-4 years after I-Corps program participation. For NSF I-Corps, 65-75% of startup funding is from private sources 2-4 years after I-Corps participation.

In FY 2021-2022, the 298 startups formed from NSF I-Corps teams raised \$25.3 million in public funding and \$6.3 million in private funding for a total of \$31.6 million in subsequent funding (see Appendix). Further, startups established earlier raise significantly more total funding, and often more private funding. For example, startups formed from FY 2019-2020 NSF I-Corps teams raised \$133.3 million in public funding and \$263.7 million in private funding for a total of \$397.0 million in subsequent funding, this represents a greater than 8-fold increase over the previous reporting period. Startups formed from FY 2017-2018 NSF I-Corps teams raised \$265.9 million in public funding and \$671.2 million in private funding for a total of \$937.1 million representing a greater than 4-fold increase over the previous reporting period.

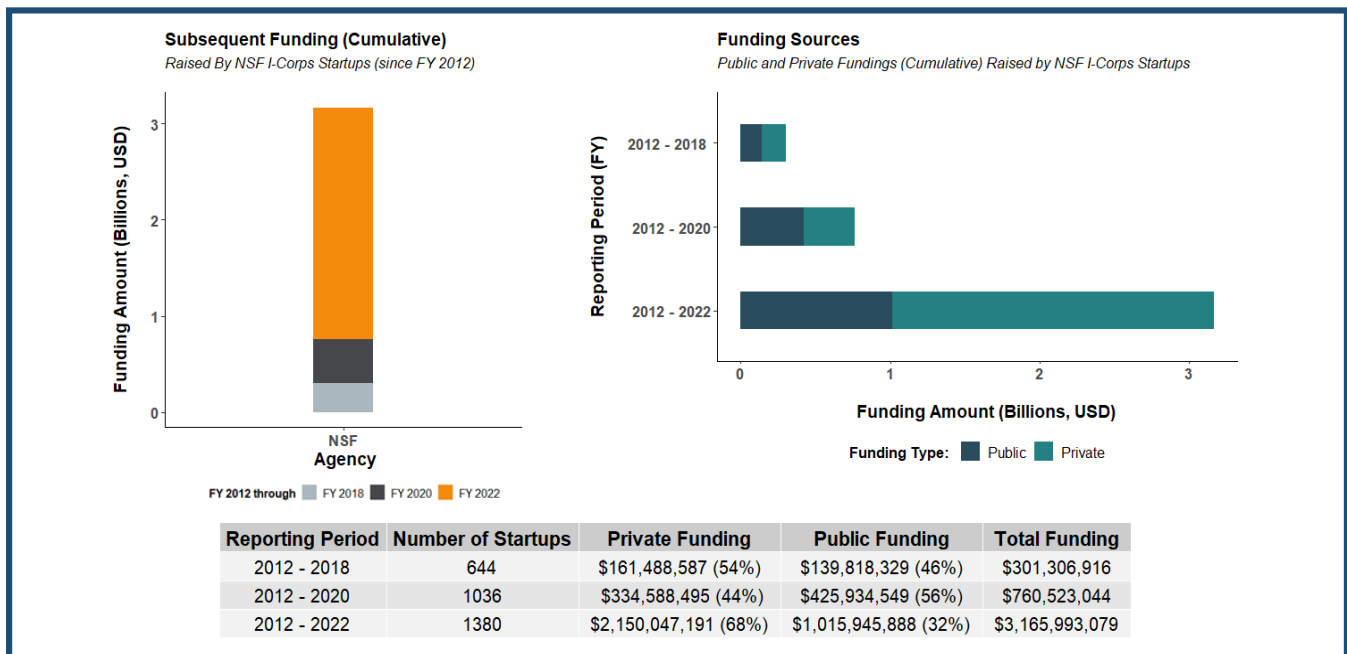


FIGURE 5. Subsequent funding for NSF startups during or after participation in NSF I-Corps training. Funding for prior reporting periods is cumulative; for example, Reporting Period FY 2012-2018 includes all funds raised from 2012 through 2022 for NSF I-Corps teams that were trained from FY 2012-2018. The data demonstrate that the funding for startups continues to increase with time, with private funding significantly outpacing public funding 2-4 years after I-Corps participation.

As shown in Figure 6, since the inception of I-Corps at NIH, 305 companies have collectively raised over \$634 million in subsequent funding linked to startup businesses (over \$299 million in public funding and \$335 million in private investment). Similar to NSF I-Corps startups, in FY 2021-2022, initial funding is largely from public sources (e.g., SBIR/STTR funding, other federal funding (non-SBIR/STTR), and state funding); however, private funding from venture capital, capital from angel or individual investors, and corporate funding becomes dominant 2-4 years after program participation.

In FY 2021-2022, the 109 startups from I-Corps at NIH raised \$34.4 M in public funding and \$3.4 million in private funding for a total of \$37.8 million in total subsequent funding (see Appendix). Further, startups established earlier also raise more total funding. For example, startups formed from FY 2019-2020 NIH I-Corps teams raised \$117.5 million in public funding and \$5.9 million in private funding for a total of \$123.4 million in subsequent funding, which represents a greater than 2-fold increase over the previous reporting period. Startups formed from FY 2017-2018 NIH I-Corps teams raised \$62.7 million in public funding and \$224 million in private funding for a total of \$286.7 million.

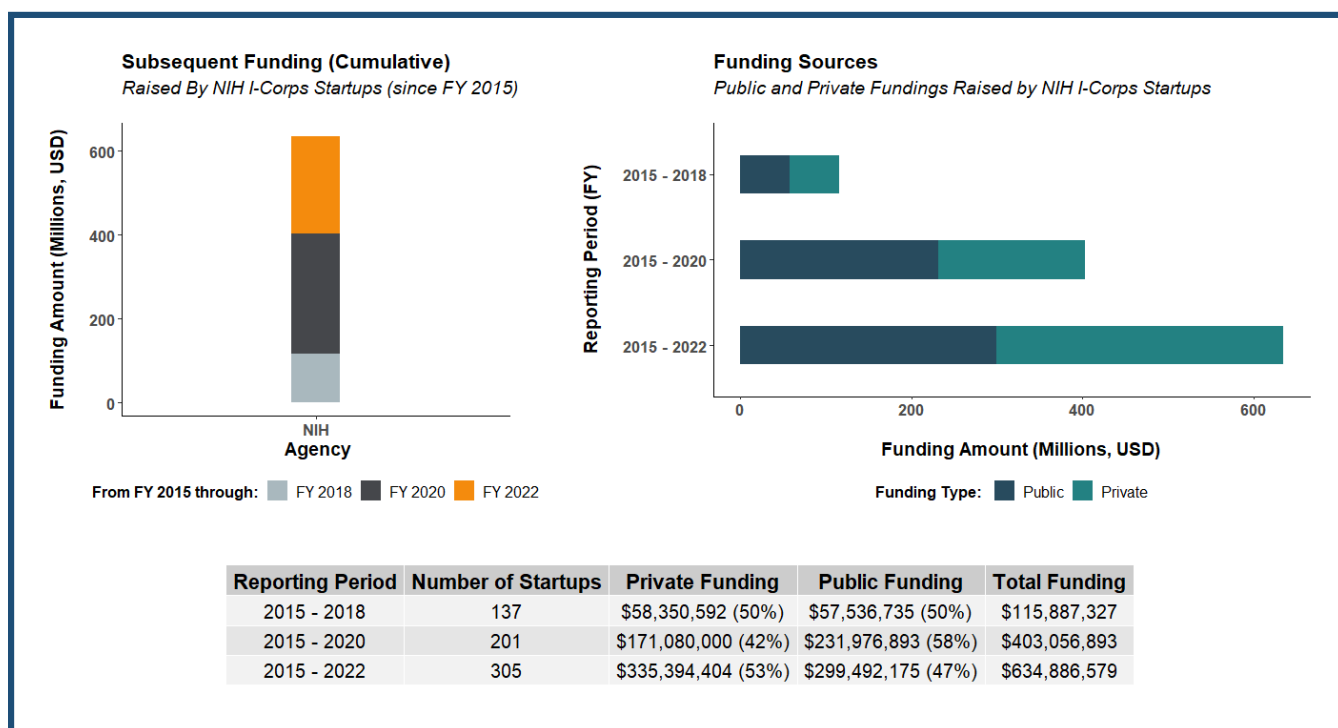


FIGURE 6. *Subsequent funding for NIH startups during or after participation in NIH I-Corps training. Funding for prior reporting periods is cumulative; for example, Reporting Period FY 2012-2018 includes all funds raised from 2012 through 2022 for I-Corps at NSF teams that were trained from FY 2012-2018.*

Unlike NSF and NIH, the goal of Energy I-Corps is to accelerate the deployment of energy technologies by granting DOE Laboratory staff access to direct market feedback on their technology offerings. While DOE encourages company formation, the major metrics of Energy I-Corps participant success are defined as increases in external licenses, enhanced market insight into research, and improved external engagement. Since the inception of Energy I-Corps, teams have raised \$151 million in additional research funding.

NURTURING AN INNOVATION NETWORK

The *National Innovation Network (NIN)* historically had been a tightly connected organization of Nodes and Sites that made up NSF I-Corps' regional training programs. In FY 2021-2022, NSF reorganized the NIN to consist of ten (10) new *I-Corps Hubs*, that now serve as the operational backbone of the NSF regional program and NIN. The NSF I-Corps Hubs expand the network of universities and collaborators as well as build and sustain a diverse and inclusive innovation ecosystem throughout the U.S. (see Figure 7).

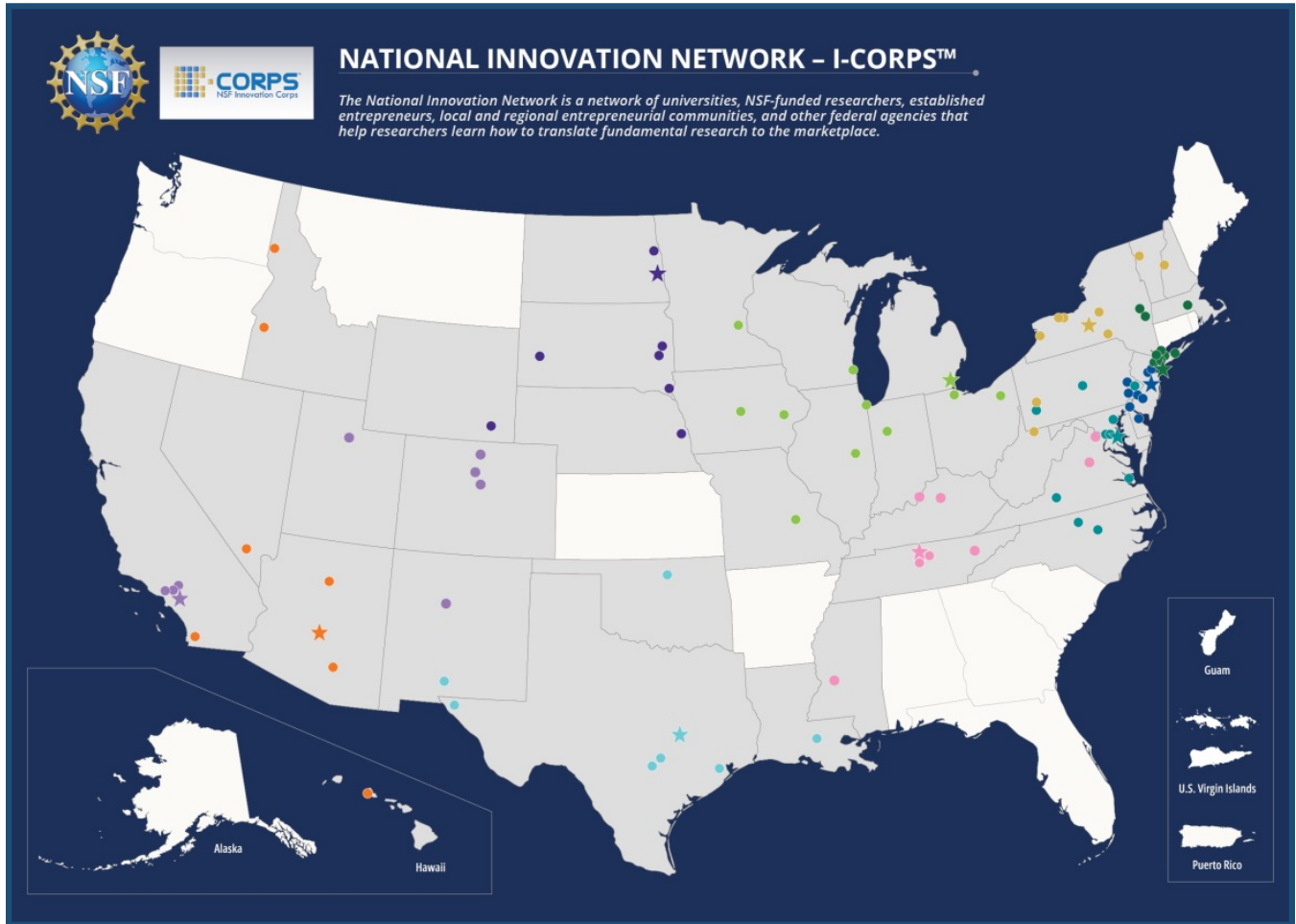


FIGURE 7. *National Innovation Network (NIN) map of NSF I-Corps Hubs. Stars indicate Hub Lead Institutions and dots represent participating Partner Institutions. States and territories without shading do not have an institution that is a Hub member. NSF plans to invest in additional I-Corps Hubs in FY 2023, subject to the availability of funds. A complete list of the I-Corps Hubs and associated institutions may be found on at the [I-Corps website](#).*

Each NSF I-Corps Hub comprises a regional alliance of at least eight universities. *The current NSF I-Corps Hubs represent 94 academic institutions in 40 states and the District of Columbia* (see Figure 7). In order to cover the entire geographic diversity of the U.S., NSF plans to invest in additional I-Corps Hubs, subject to the availability of funds.

The first five NSF I-Corps Hubs began operations in January 2022. An additional five Hubs began operations in January 2023. The former Node and Site funding programs at NSF are now archived, and Nodes and Sites have been encouraged to join or form a Hub. Currently, six former Nodes have formed Hubs and 50 former Sites are lead or partner institutions in new Hubs. As of the end of this reporting period (FY 2021-2022), three Nodes and 59 Sites remained active. Hubs are expected to recommend approximately 25-30 teams to the National I-Corps program annually.

The NSF I-Corps Hubs have four strategic goals within the NIN:

Training | Deliver regional I-Corps training at partner institutions and provide instructors for National I-Corps training.

Expansion | Identify, recruit, and support teams for regional I-Corps training and recommend teams for the National I-Corps program. Grow the Hub by identifying new member institutions.

Evaluation, Assessment, & Research | Collect and analyze data from participants in the regional program to measure regional economic impact, evaluate and improve on the Hub's performance, and conduct entrepreneurial research.

Diversity, Equity & Inclusion | The NIN is expected to be diverse and inclusive in all aspects – including research disciplines, participants, personnel, institutions, tools, programs, abilities, and geographic locations.

The I-Corps program, now housed within the TIP Directorate, provides experiential entrepreneurial education and a commercial evaluation process to further the Nation's innovation ecosystem. I-Corps connects the technological, entrepreneurial, and business communities — addressing skill and knowledge gaps to reduce the time it takes to bring technologies from the lab to the marketplace.

PARTNERSHIPS FOR INNOVATION (PFI)

Other programs in TIP, such as the *PFI program*, provide NSF-funded researchers the opportunity to *demonstrate the translation of technologies to the marketplace*. Specifically, PFI enables researchers to develop and implement a technology roadmap, create a business model, and develop their technology into a prototype or proof of concept. As one of the Nation's leading technology translation programs, PFI seeks to enable the commercialization of new intellectual property derived from NSF-funded research; create new or broader collaborations between NSF-funded researchers and industry (including increased corporate-sponsored research); license NSF-funded research to third parties; create startup companies; and provide entrepreneurship training to further innovation leaders.

Beginning in FY 2019, PFI awards have included funds for NSF I-Corps training for translational research and technology development focused on commercial applications. In the FY 2021-2022 reporting period, 69 PFI teams participated in NSF I-Corps cohorts while conducting their translational research and prototyping activities. Participation in NSF I-Corps enables PFI researchers to gain a better appreciation for use-inspired research and how to translate basic research into future products and services that address national needs and spur university spin off companies.

INDUSTRY-UNIVERSITY COOPERATIVE RESEARCH CENTERS (IUCRC)

Although not within the TIP Directorate, the NSF *IUCRC program* generates breakthrough research by enabling close and sustained engagement between industry innovators, world-class academic teams, and government agencies to enable precompetitive research around topics identified by industry. This engagement educates university researchers about the needs of corporate partners and government agencies as well as the opportunities for collaboration. The direct connection also helps translate high-



impact research from the universities to meet shared industrial needs in companies of all sizes, enhance U.S. global leadership in driving innovative technology development, and identifies, mentors and develops a diverse high-tech, exceptionally skilled workforce.

In FY 2021-2022, 55 IUCRC teams received I-Corps Boot Camp-style training as part of their Planning Grants. The IUCRC program uses the I-Corps entrepreneurial training curriculum taught by highly experienced I-Corps instructors, to educate and equip teams planning new Centers with the knowledge and skills for effective industry and customer engagement. These critical skills help them identify and work with prospective industry partners and discover the areas of strongest research needs and value propositions as part of these year-long planning grants. The outcome is generating a transformative research roadmap and financial commitments from the industry partners most interested in the proposed IUCRC. The teams do not explore translation or commercialization, which makes them different from other I-Corps programs. The focus for an IUCRC is on generating transformative upstream knowledge that will help drive downstream technological innovation led by the Center's industry partners.

NSF SMALL BUSINESS INNOVATION RESEARCH (SBIR) AND SMALL BUSINESS TECHNOLOGY TRANSFER (STTR) PROGRAMS (COLLECTIVELY KNOWN AS AMERICA'S SEED FUND POWERED BY NSF).

I-Corps training accelerates the development of startups by validating the product-market fit of their technology that is funded through the [*SBIR/STTR program*](#). In the FY 2021-2022 reporting period, over 100 NSF SBIR/STTR Phase I companies participated in special NSF I-Corps cohorts, focused on the needs and stage of development of Phase I SBIR and STTR startup companies. The goal for this program is to assist companies in identifying a beachhead market and business model for their technology and help them create a compelling commercialization plan for their Phase II proposal.

In addition, NSF encourages its new SBIR/STTR Phase I awardees to participate in the [*"Beat-the-Odds Boot Camp"*](#), which is an introduction to the I-Corps process. Taught by National I-Corps instructors, the Boot Camp provides an immersive experience that pushes startup companies to develop stronger business models, market strategies, and successful products. The main goal is to provide early-stage companies with the basics in customer discovery and business model validation. The Boot Camp is held in a virtual format four times per year and lasts about two months, requiring about 10-20 hours per week and approximately 30 customer discovery interviews from the participating company. At the end of the program, companies better understand how to verify product market fit and other business model elements. An estimated 300 teams participate in Beat-the-Odds Boot Camp each year, including teams from NASA's Phase I SBIR program.





AGENCY

HIGHLIGHTS

ARABLE LABS

San Francisco, CA
NSF I-Corps Participant 2015
NSF Awards SBIR Phase I/II: 1549035/1660146

Through internet of things (IoT), machine learning, and hardware development, Arable Labs is improving crop forecasts at dramatically more accessible prices, allowing farmers and their buyers to make more informed decisions improving productivity, reducing risk, and increasing sustainability. Arable's technology is helping customers in more than 30 countries protect crops and food supply chains through data on optimized water and fertilizer use.

In November 2022, Arable won *Fast Company* magazine's Next Big Things in Tech Award in the agriculture category. In July 2022, the company raised \$40 million. It was also named 2021 AgTech Breakthrough IoT Solution of the Year, THRIVE's Top 50 Companies for 2020, Plug & Play's Top 10 Ag Tech Companies to Watch in 2019, and the Irrigation Association's Best New Product of 2018.

"I-Corps provided me with the tools to start a business that creates real value by solving customer problems. By tools I mean the tactical tools for investigating pain points but also the organizational tools to build a team ethos centered around the customer and not our technology. I cannot think of any investment our government makes that has such a profound multiplier effect on our economy, by sparking the entrepreneurship that results in real jobs for people making products solving real problems."

Adam Wolf,
Founder & Former CEO, Arable Labs
www.arable.com



The Arable Mark monitors crop growth and weather to inform farm management and breeding.
Photo Credit: Arable Labs Inc.

AXOSIM

New Orleans, LA
NSF I-Corps Participant 2014
NSF I-Corps Award 1439383 and 1622852

AxoSim empowers advancements in human neuroscience through technologies that provide accurate, predictive models of the human nervous system, rapidly delivering clinically actionable human data early in the drug development process.

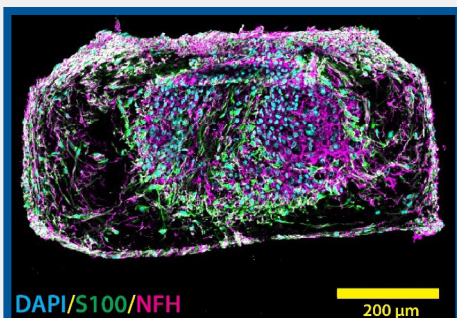
AxoSim's platforms have the potential to reduce the time and cost of new drug research and development for neurodegenerative disorders, in addition to its applications in toxicology. The technology has been shown to achieve research milestones at a fraction of the time and cost of conventional animal testing, allowing AxoSim's biopharma partners to develop more effective and safer drugs with greater speed and efficiency. In June 2021, the company raised \$6.1 million.

AxoSim's CEO, J. Lowry Curley, puts the impact into perspective: "On average, new drugs require \$2.6 B of R&D and 10 years to reach market. Animal testing is the current gold standard, despite the 89% clinical failure rate. AxoSim's patent-pending Nerve-on-a-Chip™ platform predicts human results, addressing a major disconnect between preclinical testing

and clinical trial outcomes. Using living human cells in a 3D environment, AxoSim helps pharmaceutical companies develop safer and more effective drugs, developing cures to some of the most devastating neurodegenerative diseases in the world, including Alzheimer's Parkinson's, pain, multiple sclerosis, and ALS."

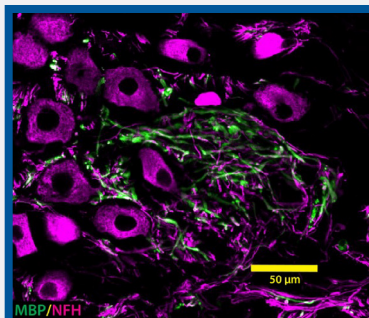
"I truly feel that I-Corps was fundamental to AxoSim's early success. We were two scientists with a crazy idea and promising technology who did not really know how the pharmaceutical industry worked. Being forced out of our comfort zone and really learning what our potential customers needed helped us understand the language and landscape to develop our technology in the right direction. Once we were ready, it also helped us sell better, since we actually understood the problem we were solving, rather than just selling a cool technology."

J. Lowry Curley,
CEO, AxoSim, Inc.
www.axosim.com



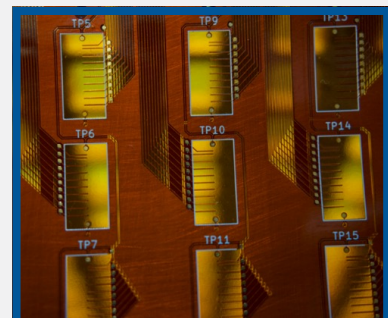
Cross section of AxoSim's 3D NerveSim platform for modeling the peripheral nervous system stained for immunohistochemistry. A co-culture spheroid of human iPSC-derived peripheral sensory neurons (magenta) and Schwann cells (green) creates a dense 3D network of axons and support cells.

Photo credit: AxoSim Inc.



Cross section of AxoSim's 3D NerveSim platform for modeling the peripheral nervous system stained for immunohistochemistry. A co-culture spheroid of primary rat dorsal root ganglion (DRG) cells highlighted neuronal cell bodies (magenta) and myelin basic protein (green).

Photo credit: AxoSim Inc.



AxoSim has developed a proprietary, high throughput electrophysiology platform for in vitro compound testing. Combined with AxoSim's novel tissue culture models, this system can deliver clinically relevant electrophysiology metrics for testing neurotoxicity, neuroprotection, and neuroregeneration.

Photo credit: AxoSim Inc.

BLOOMFIELD ROBOTICS

Bloomfield Robotics, St. Helena, CA

NSF I-Corps Participant 2021 funded by NASA's STTR program that participated in the NSF's All SBIR I-Corps Program

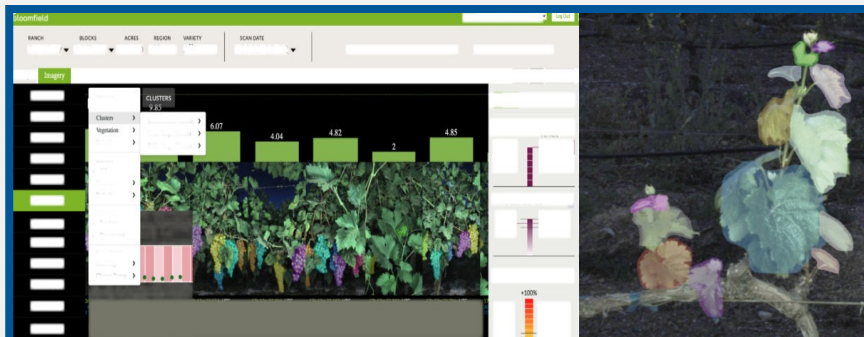
Bloomfield uses computer vision and deep learning to observe, pixel-by-pixel, images of plants. They then analyze the plant phenotype data points and create plant-by-plant health and performance assessments for precise, accurate and efficient crop management.

According to the Bloomfield website:
"Bloomfield's FLASH camera collects high quality images in any agricultural environment from ground-level. Traveling on any vehicle FLASH's stereo camera and active lighting images the entire plant for precise assessments of key plant features throughout the season. Analysis of berries, clusters, shoots, leaves, trunks, buds, cordons or canes results in a health and performance assessment of every feature on every plant at any time."

Bloomfield raised \$1.8 million in December, 2021, and an additional \$6 million in August, 2022.

"I Corps was instrumental in helping our team gain a practical understanding the emerging market opportunity that we ultimately pursued.... One of the I-Corps program's greatest strengths is that it demands the active participation of the researchers and entrepreneurs in the market discovery process. Having founded a number of startups and participated in countless accelerators and incubators, I found the I-Corps approach refreshing and tremendously valuable!"

Mark DeSantis,
CEO, Bloomfield Robotics
www.bloomfield.ai



Bloomfield's computer vision and deep learning technology is trained to "look," pixel-by-pixel, at each image of every plant and then artificial intelligence (AI)-driven assessment digitizes the plants' health and performance enabling precise, accurate, and efficient crop management.

Photo Credit: Bloomfield Robotics



Field photos of Bloomfield Robotics' device in action.

Photo Credit: Bloomfield Robotics

KINTSUGI MINDFUL WELLNESS, INC.

Berkeley, CA

NSF I-Corps Participant 2020

NSF Awards SBIR Phase I/II: 2031310/2036213

Kintsugi is developing voice biomarker software to measure, predict, and scale access to mental healthcare with more effective screening and triage. With just 20 seconds of free form speech, its product, KiVA (Kintsugi Voice Biomarker API), can detect if an individual may require further screening for depression and anxiety.

KiVA integrates seamlessly across complex clinical workflows and provides real-time scoring on voice data in call centers, telehealth platforms, and remote patient monitoring apps. KiVA is language agnostic and trained on the world's largest annotated voice dataset with users from over 250 international cities. By using KiVA, practitioners can enrich patient interactions with deeper screening and evaluation, ultimately improving patient outcomes. Between 2020 and 2022, Kintsugi raised over \$26.5 million.

"The I-Corps experience helped us define our target market and create our commercialization plan. The customer discovery interviews were especially valuable because they forced us to take a step back from our day-to-day product development and focus on the challenges and needs of our end customers. After interviewing accomplished experts, consultants, and key opinion leaders in our space, we systematically reviewed, evaluated, and ranked our opportunities by size and barriers to entry. This systematic approach helped us make data driven decisions on our go-to-market strategy."

Grace Chang,

Founder & CEO, Kintsugi Mindful Wellness, Inc.

www.kintsugihealth.com



*Kintsugi iOS app and customer reviews of the app.
Photo Credit: Kintsugi Mindful Wellness, Inc.*



*A marketing image used in Kintsugi Sales and Marketing literature.
Photo Credit: Kintsugi Mindful Wellness, Inc.*

NATURAL FIBER WELDING

Peoria, IL

NSF I-Corps Participant 2017

NSF Award SBIR Phase I/II: 1747149/1924737

Natural Fiber Welding (NFW) is making plant-based materials that replace petrochemical incumbents. They take natural materials and do the least amount of processing to get them into a new form that allows them to perform – as textiles, as alt-leathers, as molded components, and as foams. While other companies tear down natural materials to build them back up, Natural Fiber Welding takes what is already there and accentuates amazing material properties.

Natural Fiber Welding is a material innovation company providing the global footwear, fashion, accessories, and automotive industries with new material platforms to create low carbon, all natural, petrochemical-free materials. NFW engineers and manufacture all-natural textiles and a zero-plastic complement to leather.

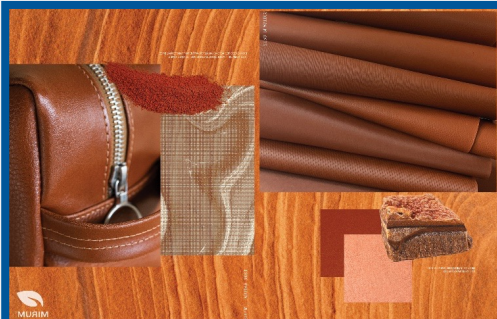
In April 2022, Natural Fiber Welding raised \$85 million. The company is partnering with major brands like Stella McCartney, Allbirds, Pangaia, and Reformation.

“In addition to helping us with the technology scale-up, one of the very valuable aspects of the I-Corps process was conducting the market discovery for the developed technology. It helped us refine our value proposition and understand market positioning.”

Aaron Amstutz,

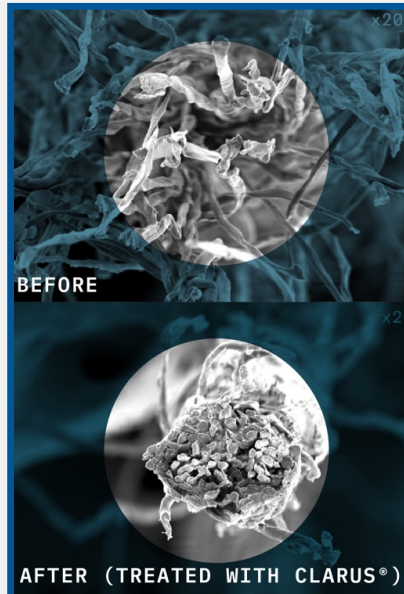
Chief Technology Officer, Natural Fiber Welding

www.naturalfiberwelding.com



MIRUM® is a new, plant-based material that is perfect for footwear, fashion, automotive, and accessories. MIRUM®'s miraculous customizability means it can look like leather or carbon fiber. MIRUM® is a high-performance solution for designers and brands looking to shrink their footprint and expand their creative palettes. At the end of its life, MIRUM® can be recycled into new MIRUM® or ground up and returned to the earth: a climate-friendly, plastic-free option.

Photo Credit: Natural Fiber Welding, Inc.



Natural Fiber Welding's technology imbues 100% natural yarns with previously unachievable performance. Quick-drying, moisture-wicking, warp-knit compatible: CLARUS® makes it possible naturally. The CLARUS® platform works with both recycled and virgin fibers, closing critical gaps in the circular economy. CLARUS® runs on closed-loop green chemistry that enables new efficiencies while delivering unequalled performance. It's a waste-not-want-not kind of breakthrough.

*Photo Credit:
Natural Fiber Welding, Inc.*

OSMOSES

Boston, MA
NSF I-Corps Participant 2021
GEMi4 Team

Today, 15% of global energy use goes into chemical separations – including natural gas purification and the production of oxygen and nitrogen for medical and industrial uses. These separation processes are often based on century-old technologies that also contribute to the world's greenhouse gas emissions. Researchers at Osmoses have developed a new kind of membrane for carrying out these separation processes with roughly 1/10 the energy use and emissions.

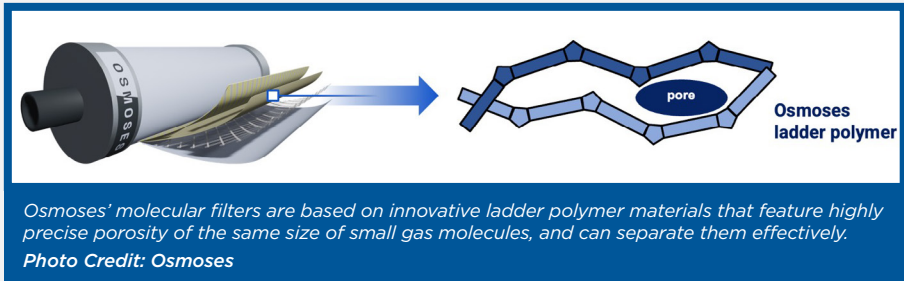
The filters have exceptional size selectivity and can purify hydrogen and natural gas, generate oxygen-rich air, and perform carbon capture at a point source.

Osmoses was started as part of the GEMi4 project. Two of its founders, Francesco M. DeBenedetti and Holden Lai, have been selected as *2021 Activate Fellows*. The company has raised \$3 million in funding after participation in the NSF I-Corps program.

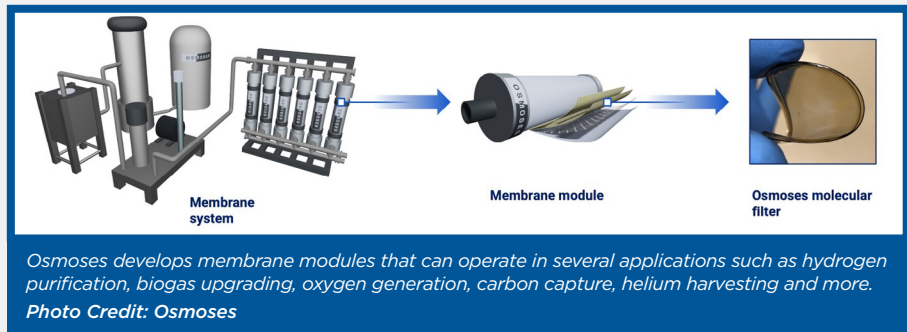
www.osmoses.com



Osmoses Co-Founders:
Katherine Mizrahi Rodriguez,
Holden Lai, Francesco Maria
Benedetti, and Zachary Smith.
Photo Credit:
Tony Luong, *The Engine*



Osmoses' molecular filters are based on innovative ladder polymer materials that feature highly precise porosity of the same size of small gas molecules, and can separate them effectively.
Photo Credit: Osmoses



Osmoses develops membrane modules that can operate in several applications such as hydrogen purification, biogas upgrading, oxygen generation, carbon capture, helium harvesting and more.
Photo Credit: Osmoses

VIA SEPARATIONS

Watertown, MA

NSF I-Corps Participant 2016

NSF Awards SBIR Phase I/II: 1722157/1831203

Via Separations makes a new membrane to enable a new industrial filtration process that could help transition from an energy-intensive thermal separation to a more efficient, mechanical separation. Via Separations is testing its membranes made from nanoscale fragments of graphene oxide on energy-intensive evaporators used in the pulp and paper industry. Via Separations' membranes could better filter water from the wood pulp, last more than one year whereas current filters only last minutes, and potentially save customers millions of dollars per year. The MIT-spin out raised \$38 million in October 2021.

"NSF helped us refine our vision, figure out if our technology could be used for different applications, and helped us figure out if we can manufacture our technology in a scalable fashion - taking it from an academic project to a real-scale commercial project."

Shreya Dave,
CEO, Via Separations
www.viaseparations.com



Via Separations' pilot system installed for the first time at a customer's location.

Photo Credit: Via Separations



Shreya Dave (CEO) of Via Separations.

Photo Credit: Via Separations

ELECTRO-ACTIVE TECHNOLOGIES

Oak Ridge National Laboratory
Department of Energy I-Corps (Cohort 7) 2018
Team 75

Electro-Active integrates biology, electrochemistry, and engineering in multidisciplinary applications. Modular renewable hydrogen generation system using organic waste, adaptable to low- and high-volume customers that can be deployed on-site with large waste generators, waste haulers, and municipalities. Additional coproducts include a residual solids stream for use in composting, animal feed, and regenerative agriculture, as well as a nutrient-rich liquid that can also be utilized in regenerative agriculture or for urban greenspaces.

Through their expertise in these areas, while working with industry, they are bringing the next generation of clean energy and agricultural technologies to market. The company was accepted into the Innovation Crossroads program at Oak Ridge National Lab and raised \$1.6 million in private capital and recently received another DOE grant working with Southern Company on further scale-up and demonstration.

www.electroactive.tech



Alex Lewis and Abhijeet P. Borole (speaking), representing Oak Ridge National Laboratory, present Electro-Active, a modular system that can be placed on-site to convert waste into renewal hydrogen.

Photo Credit: Amy Glickson, NREL

TEREFORM

Department of Energy I-Corps 2021
National Renewable Energy Laboratory
Team 157

Mikhail Konev's company, Tereform, takes waste textiles, such as carpet and clothing otherwise destined for a landfill, and uses a chemical process to break it down into fundamental building blocks. "About a year ago, I went through the Energy I-Corps Cohort 13 program looking to see if the technology I helped develop in the lab had any commercial viability," Konev said. "The initial pitch turned out to not be feasible, but an alternative we pivoted to, everyone was interested in that."

In response to interest in the pivot, Konev resigned from NREL in 2022 to start Tereform. In parallel, Konev applied to NREL's West Gate program within DOE's Office of Energy Efficiency and Renewable Energy (EERE) with core support from the Advanced Manufacturing Office. Typically, it is difficult to use chemical recycling for textiles because of the additives.

Konev's process overcomes that challenge, and for him, West Gate is about validating and scaling up Tereform's process. Since the West Gate program begins with participation in Energy I-Corps Cohort 15 training, even though he has participated before, Konev believes it can still provide crucial lessons.

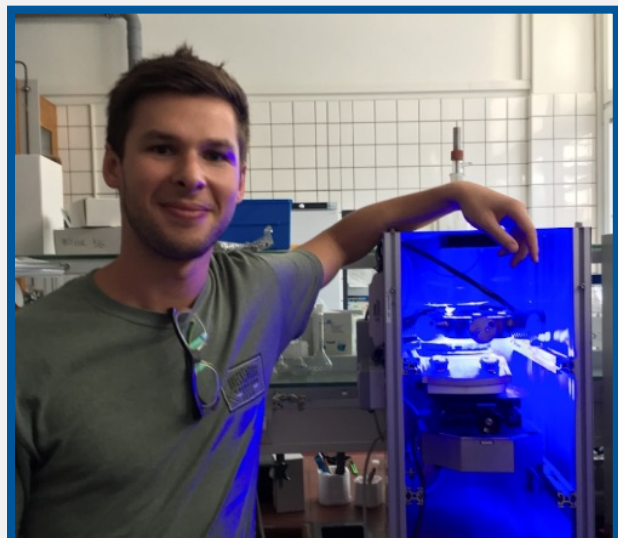
"Aside from validating the technology, the entrepreneurial training is a huge aspect," Konev said. "That's a whole world that I've only scratched the surface with, and I'm super excited about that aspect." Looking ahead, Konev hopes he can continue with other NREL-based programs, such as the Shell GameChanger Accelerator™ Powered by NREL (GCxN), American-Made Challenges, and the Industry Growth Forum

www.tereform.com



This chemical reactor system was created by Pacific Northwest National Laboratory for developing and optimizing processes to make value-added chemical products from basic chemicals derived from renewable feedstocks.

Photo Credit: Pacific Northwest National Laboratory



Mikhail Konev, CTO of Tereform.

Photo Credit: Mikhail Konev

GIGAGEN

San Francisco, CA

NSF SBIR Phase I/II: 1111480/1230150

I-Corps at NIH Participant 2014

GigaGen, an NSF and National Cancer Institute SBIR awardee, participated in the pilot cohort of the I-Corps at NIH Program in October 2014.

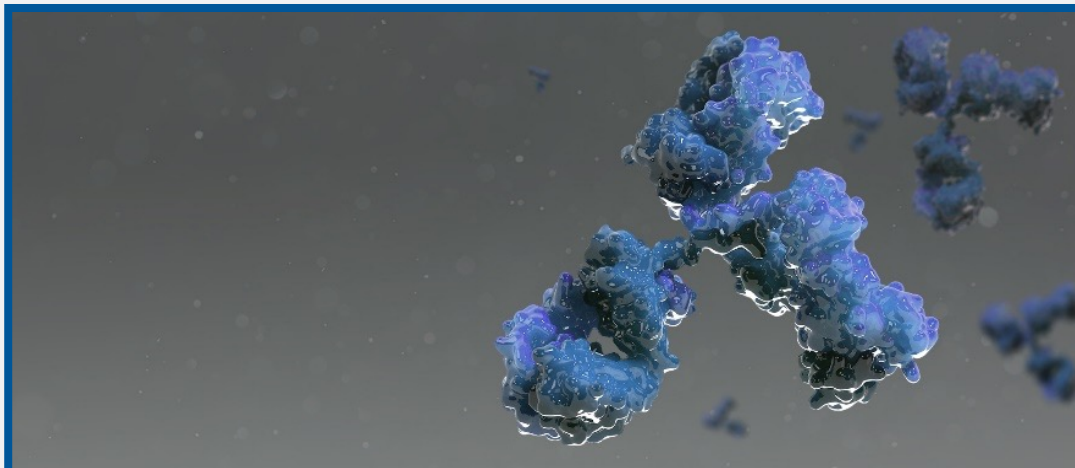
When researchers study tumors after they've been disaggregated, they overlook crucial single-cell biological context. With a passion for discovery, Co-founder and Chief Executive Officer David Johnson invented the Surge technology, which interrogates immune systems, identifying and characterizing every cell at a rapid pace, and, therefore, has the potential to deliver unprecedented information into how the cells of the body fight disease. Through the I-Corps at NIH process, GigaGen executives interviewed business development

executives at a major pharmaceutical company, a meeting that ultimately led to a \$50 million financing and co-development deal.

Johnson credits I-Corps' fast-track approach with saving GigaGen "tens of millions of dollars and several years by homing in on a product that customers actually wanted, versus what we thought they would want."

In March 2021, the company was acquired for \$80 million by Grifols, a world leader in the production of polyclonal antibody drugs.

www.gigagen.com



GigaGen's single-cell antibody discovery and development platforms recreate complete immune repertoires and find exceptional antibodies with unique properties, enabling them to advance novel mono- and polyclonal antibody drugs for a wide range of diseases

Photo Credit: GigaGen

VIEWPOINT MOLECULAR TARGETING

Coralville, Iowa

I-Corps at NIH February 2017

With a Phase I SBIR award from the National Cancer Institute, Viewpoint Molecular Targeting worked to develop radiopharmaceuticals for therapy and diagnosis of cancer. The PI, Michael Shultz, and team began in the program with three different products in mind; however, participation in the I-Corps at NIH program provided them with singularity of focus on therapeutics for metastatic melanoma patients. Viewpoint Molecular Targeting raised \$14 million in January 2021.

The advice Michael Shultz offers to prospective I-Corps applicants: “Do it. Do it because you have the passion, you are ready to accelerate your company from where it is today to potentially a very different place. When you are ready to make that kind of a customer discovery decision, then that’s a great time to do I-Corps.”

www.viewpointmt.com



I-CORPS BIENNIAL REPORT | 2023

S U M M A R Y

The I-Corps program, which celebrated its 10th year anniversary in FY 2021, has continued to grow – becoming more diverse and inclusive in every dimension, producing extraordinary societal and financial returns on federal investment, demonstrating resiliency and flexibility even in the face of a global health pandemic, and seamlessly integrating into the innovation and entrepreneurial ecosystems. *The I-Corps program draws together the globally leading U.S. academic, SBIR/STTR, and biomedical communities, as well as the National Laboratory infrastructure, to nurture* business leadership that thrives in the fast-paced, highly-competitive, highly-varied technology economies of the future.



APPENDIX



Reporting Metrics

	Since Program Inception	FY 2019 -2020	FY 2021 -2022
Number of (unique) individuals trained*	7806	1928	2173
Number of individuals trained that are women **	1589 [20%]	411 [21%]	516 [24%]
Number of individuals trained that are from under-represented groups***	2082 [27%]	568 [30%]	683 [31%]
Statistics			
Number of Entrepreneurial Leads trained†	3070	744	837
Number of Entrepreneurial Leads that are women †	769 [25%]	204 [27%]	261 [31%]
Number of Entrepreneurial Leads that are from under-represented groups †	1005 [33%]	283 [38%]	339 [41%]
Individuals Trained			
Graduate Student	1139 [53%]	251 [49%]	241 [54%]
Post-doctoral Researcher	318 [15%]	56 [11%]	51 [11%]
Undergraduate Student	75 [3.5%]	22 [4%]	18 [4%]
Startup Management	239 [11%]	116 [22%]	68 [15%]
Others	373 [17.5%]	70 [14%]	66 [15%]

* Number of distinct program participants, based on name, affiliation, and biographical sketch submitted with the application and proposal.

** Overall, for individuals that participated in the NSF I-Corps program between FY 2012 and FY 2022, 20% self-reported as female, 66% as male, and 14% offered no response. For individuals that participated between FY 2017 and FY 2018, 21% self-reported as female, 75% as male, and 4% offered no response. FY 2019 and FY 2020, 21% self-reported as female, 67% as male, and 11% offered no response. FY 2021 and FY 2022, 24% self-reported as female, 61% as male, and 15% offered no response.

*** Underrepresented groups are defined as individuals who identify as: 1) women, 2) race as Black or African American, American Indian, Alaska Native, and/or Native Hawaiian or Other Pacific Islander, 3) Hispanic origin, and/or 4) disability status. Overall, for individuals that participated in the NSF I-Corps program between FY 2012 and FY 2022, 26% self-reported to be in one or more underrepresented categories, while 28% of participants provided no response. For individuals that participated between FY 2017 and FY 2018, 27% self-reported to be in one or more underrepresented categories, while 9% respondents provided no response; for individuals that participated between FY 2019 and FY 2020, the percentages are 30% underrepresented and 15% no response; for individuals that participated between FY 2021 and FY 2022, the percentages are 31% underrepresented and 20% no response.

† There are some teams that have more than one entrepreneurial lead.

▲ Overall, for Entrepreneurial Leads (ELs) that participated in the NSF I-Corps program between FY 2012 and FY 2022, 25% self-identified as female, 64% as male, and 11% offered no response. For individuals that participated between FY 2017 and FY 2018, 26% self-identified as female, 71% male, and 3% offered no response. FY 2019 and FY 2020, 27% self-identified as female, 63% male, and 10% offered no response. FY 2021 and FY 2022, 31% self-identified as female, 58% male, and 11% offered no response.

◆ Overall, for Entrepreneurial Leads (ELs) that participated in the NSF I-Corps program between FY 2012 and FY 2022, 33% self-reported to be in one or more of the underrepresented categories, while 26% of participants provided no response. For individuals that participated between FY 2017 and FY 2018, 33% underrepresented and 7% no response; for individuals that participated between FY 2019 and FY 2020, 38% underrepresented and 13% no response; and for individuals that participated between FY 2021 and FY 2022, 41% underrepresented and 15% no response.

‡ Only participants with NSF I-Corps Teams awards were counted (n = 1700, since program inception; n = 391 between FY 2017 and 2018; n = 515 between FY 2019 and 2020, n = 444 between FY 2021 and 2022), i.e., Entrepreneurial Leads from teams funded through the NSF SBIR/STTR and PFI programs, as well as those teams that came through the Program through other funding sources were not included.





Reporting Metrics

	Since Program Inception	FY 2019 – 2020	FY 2021 – 2022
Number of Teams trained ^d	2546	593	638
Number of Teams having one or more female members ^e	1193 (47%)	289 (49%)	366 (57%)
Number of Teams having one or more members from under-represented groups [■]	1465 (57%)	366 (62%)	453 (71%)
Number of Teams with prior NSF Research Lineage	1400	297	150
Number of Teams that came through:			
I-Corps Nodes	547	189	137
I-Corps Sites	480	187	156
I-Corps Hubs	5	0	5
Other federal agencies	44	8	3
Department of Defense (DoD)	28	8	3
Department of Energy (DoE)	9	0	0
Department of Agriculture (USDA)	7	0	0
Federal Laboratories	0	0	0
SBIR/STTR Program*	203	70	118
National Aeronautics and Space Administration (NASA)	20	6	10
Department of Homeland Security (DHS)	18	3	7
National Science Foundation (NSF)	165	61	101
NSF Partnership for Innovation (PFI) Program**	90	21	69
Partners through Memorandum of Understanding (MOU)***	95	22	20
International Partnerships††	13	5	0
Others	0	0	0

Teams Trained

Source of Teams (non-exclusive categories)^d

‡ Number of teams that participated in the NSF I-Corps program: 97 in FY 2012, 135 in FY 2013, 133 in FY 2014, 176 in FY 2015, 265 in FY 2016, 232 in FY 2017, 277 in FY 2018, 267 in FY 2019, 326 in FY 2020, 326 in FY 2021, and 312 in FY 2022.

■ Between FY 2012 and FY 2022, share of teams with completely missing or partially missing data on gender is 30% (n = 769). For teams that participated between FY 2021 and 2022, the shares are: 36% (n = 117) and 47% (n = 147), respectively.

■ Underrepresented groups are defined as individuals who identify as: women, Black or African American, American Indian, Alaska Native, Native Hawaiian or Other Pacific Islander, of Hispanic origin, and/or with a disability. Between FY 2012 and FY 2022, share of teams with completely missing or partially missing information (in either gender, race, ethnicity, and/or disability) is 28%. For teams that participated between FY 2021 and FY 2022, the shares are: 49% (n = 159) and 58% (n = 182), respectively.

* Participating DHS teams were SBIR awardees (4 teams in FY 2016, 4 between FY 2017 and 2018, 3 between FY 2019 and 2020, and 7 between FY 2021 and 2022); Participating NSF teams were STTR awardees (4 teams between FY 2017 and 2018, 6 between FY 2019 and 2020, 10 between FY 2021 and 2022); Participating NSF teams were SBIR/STTR awardees (1 team in FY 2013, 1 in FY 2016, 1 in FY 2017, 60 teams between FY 2019 and FY 2020, and 101 between FY 2021 - 2022).

** To respond to the mandate set by the American Innovation and Competitiveness Act (AICA), Section 601(c)(3), the NSF Partnerships for Innovation (PFI) Program provides funding to support prototype or proof-of-concept development research. Starting in FY 2019, with the solicitation, NSF I9-506, PFI award recipients who have not previously participated in the NSF I-Corps Teams Program must allocate \$50,000 of their budget to participate in the I-Corps Teams program to acquire a better understanding on the commercial aspects of translating an innovation toward a market application (NSF 19-506: <https://www.nsf.gov/pubs/2019/nsf19506/nsf19506.htm>).

*** NSF has executed a total of 9 MOUs with 8 federal agencies. The MOUs are: ARPA-E (Part of DOE), Office of Energy Efficiency and Renewable Energy (Part of DOE), DoD, DHS, National Institute of Food and Agriculture (part of USDA), NASA, National Center for Advancing Translational Sciences (Part of NIH), National Security Agency (NSA), and Small Business Administration (SBA). For the reporting period between FY 2021 - 2022, a total of 20 teams participated in the NSF I-Corps Program via MOU: 10 teams from NASA through their STTR Program, 7 teams from DHS (n = 7) through their SBIR Program, and 3 teams from DoD.

†† NSF also signed a MOU with the Science Foundation of Ireland (SFI), and SFI sent 8 teams to participate in the NSF I-Corps program during the FY2017 - 2018 reporting period, and 5 teams during the FY 2019 - 2020 reporting period. While no teams participated in the NSF I-Corps program during the current reporting period due to the Pandemic, the MOU between the two agencies was renewed in FY 2021. *Training has continued in Ireland.*

◆ Starting in reporting period FY 2021 - 2022, entering pathways (how teams entered into the NSF I-Corps program) were treated as exclusive categories (except MOU). As such, the sum across all sources of teams (except MOU) will add up to the total number of teams trained. MOU is excluded from this calculation, as teams entered into the Program through MOUs have already been accounted for in other mutually-exclusive categories.





Reporting Metrics

	Since Program Inception	FY 2017 -2018	FY 2019 -2020	FY 2021 -2022
Teams	2546	509	593	638
Number of teams linked to startups*	1383 [54%]	294 [58%]	361 [61%]	298 [47%]
Startups	1380	301	361	298
Number of startups formed**				
Subsequent Funding †	\$3,165,993,080	\$937,100,435	\$397,059,414	\$31,629,678
Total (cumulative) funding linked to startups (as of 09/30/2022)**				
Total (cumulative) funding linked to startups (as of 9/30/2020)	\$760,523,044	\$213,344,466	\$47,446,787	Not Applicable
Economic Impact				
Merger & Acquisition	27	5	4	1
Number of startups that merged or were acquired†				
Public Funding	\$1,015,945,888	\$265,916,291	\$133,314,879	\$25,268,609
SBIR/STTR	\$373,198,873	\$126,972,611	\$66,905,669	\$12,968,657
Other federal funding [non-SBIR/STTR]	\$616,307,821	\$129,041,179	\$61,381,421	\$10,915,952
State funding	\$26,439,194	\$9,902,501	\$5,027,789	\$1,384,000
Private Funding	\$2,150,047,191	\$671,184,144	\$263,744,535	\$6,361,069
Venture capital	\$2,017,335,715	\$639,160,401	\$249,452,098	\$5,404,899
Angel or individual investor	\$99,935,008	\$18,411,542	\$10,081,792	\$0
Private industry, corporate funding, or others	\$32,776,468	\$13,612,201	\$4,210,645	\$956,170

*Some teams are linked to more than one start-up business, and some start-up businesses are linked to more than one team. **Note:** Between FY 2021 and 2022, as 118 teams were SBIR/STTR companies, these were already startup businesses prior to program participation.

** The number of startups is cumulative through FY 2022 for each reporting category. Startups include the businesses that participated through the SBIR/STTR Programs.

† Subsequent Funding excludes financial support from the I-Corps award and only includes funding obtained during and/or after I-Corps participation. For SBIR and STTR participants, the SBIR and STTR awards were excluded from the Subsequent Funding data. A combination of data sources were used to estimate the amount of Subsequent Funding that teams obtained: USASpending data for federal funding, Pitchbook (third party market and private and venture capital data provider), SEC filings, and verified self-reporting data (through VentureWell) for private funding. For this report, Pitchbook data was used more as compared with previous reports to better reflect the actual scope of private funding in these startups. As such, the magnitude of changes observed in the total cumulative funding between the previous and current reporting periods is the product of both the growth of these startup businesses and the incorporation of additional financial data into the estimates.

†† Funding is cumulative through the end of the fiscal year for a given reporting period. For example, for reporting period FY 2019-2020, the (cumulative) Subsequent Funding of \$397,059,414 represents all funding obtained by I-Corps teams that formed startups and participated in the program during FY 2019 - 2020 through the end of FY 2022 (9/30/2022). **Note:** The total cumulative funding obtained as of end of FY 2020 (9/30/2020) was included to serve as a reference for the readers and had been reported in the previous I-Corps report.

‡ Out of the 27 startups that merged or were acquired, 16 of them became operating subsidiaries after the merger.



Reporting Metrics

	End of FY 2020	End of FY 2022
Number of active I-Corps Nodes	9	9
Number of universities in active I-Corps Nodes	28	28
National Innovation Network (NIN)[†]		
Number of active I-Corps Sites	92	59
Number of universities in active I-Corps Sites	92	59
Number of active I-Corps Hubs	Not Applicable	10
Number of universities in active I-Corps Hubs	Not Applicable	94

Cohorts

Number of completed cohorts** 90 118

Program Structure

NSF Funding Level [†]		
FY 2019	\$32,824,943	--
FY 2020	\$37,953,776	--
FY 2021	--	\$39,022,125
FY 2022	--	\$39,933,520
Annual Program Funding		
Other federal agencies funding support	\$0	\$0
State funding support	\$0	\$0
Private funding support	\$0	\$0

[†] There were 10 I-Corps Hubs funded between FY 2021 and 2022; 5 Hubs began on January 1, 2022, and the remaining 5 will begin on January 1, 2023. Six (6) former Nodes and 50 former Sites are represented in the Hubs. The Node and Site Programs have been archived and the Hub Program will be the operational model going forward.

** There were 4 cohorts in FY 2012; 6 in FY 2013; 6 in FY 2014; 8 in FY 2015; 14 in FY 2016; 12 in FY 2017; 13 in FY 2018, 13 in FY 2019, 14 in FY 2020, 14 in FY 2021, and 14 in FY 2022 (3 of which are designated for the NSF, NASA and DHS Phase I SBIR/STTR grantees).

‡ Program funding reflects actual obligations.





		Reporting Metrics	
		End of FY 2020	End of FY 2022
National Innovation Network (NIN)*	Number of active I-Corps Nodes		
	Number of universities in active I-Corps Nodes	Not Applicable	Not Applicable
	Number of active I-Corps Sites		
	Number of universities in active I-Corps Sites		
Cohorts	Number of completed cohorts	10	16
Program Structure	NIH Funding Level**		
	FY 2019	\$2,640,000	--
	FY 2020	\$2,640,000	--
	FY 2021	--	\$2,640,000
	FY 2022	--	\$2,640,000
Annual Program Funding	Other federal agencies funding support	\$0	\$0
	State funding support	\$0	\$0
	Private funding support	\$0	\$0

* I-Corps at NIH has no nodes or sites in the NIN.

** Funding set aside for extramural awards to teams was the same for FY21 and FY22



Reporting Metrics

Since Program Inception FY 2019 - 2020 FY 2021 - 2022

	317	65	116
Characteristics			
Number of Teams trained	183 [58 %]	37 [57 %]	65 [56 %]
Number of Teams having one or more female members	206 [65 %]	42 [65 %]	75 [65 %]
Number of Teams having one or more team members from under-represented groups	317	65	116
Number of Teams with prior NIH Research Lineage			
Number of Teams that came through:			
I-Corps Nodes [¶]	15	3	10
I-Corps Sites	8	5	0
Other federal agencies	9	0	0
National Science Foundation	9	0	0
Federal Laboratories	0	0	0
SBIR/STTR Program*	317	65	116
Partners through Memorandum of Understanding (MOU)**	9	0	0
U.S. State Partnerships	0	0	0
International Partnerships	0	0	0
Others	0	0	0
Source of Teams [non-exclusive categories]			
With NSF and National Cancer Institute, the MOU was in spirit, not in writing			
Companies with predicate Phase I STTR grants (STTR grantees must have a 'partnering' non-profit institution such as an university)			
¶ Teams with prior I-Corps at NIH experience.			

** With NSF and National Cancer Institute, the MOU was in spirit, not in writing

* Companies with predicate Phase I STTR grants (STTR grantees must have a 'partnering' non-profit institution such as an university)

¶ Teams with prior I-Corps at NIH experience.

Reporting Metrics

Since Program Inception FY 2019 -2020 FY 2021 -2022

	950	194	347
Number of (unique) individuals trained			
Number of individuals trained that are women	242 [25 %]	51 [26 %]	85 [24 %]
Number of individuals trained that are from under-represented groups	296 [31 %]	65 [34 %]	103 [30 %]
Statistics			
Number of Entrepreneurial Leads trained	318	64	117
Number of Entrepreneurial Leads that are women	84 [26 %]	19 [30 %]	30 [26 %]
Number of Entrepreneurial Leads that are from under-represented groups	106 [33 %]	23 [36 %]	38 [32 %]
Graduate Student	0	0	0
Post-doctoral Researcher	0	0	0
Undergraduate Student	0	0	0
Startup Management	317 [100 %]	64 [100 %]	117 [100 %]
Others	0	0	0

Individuals Trained

† All Entrepreneurial Leads are C-level executives (which are considered as employees of the company) in the I-Corps at NIH program.

Reporting Metrics

	Since Program Inception	FY 2017 -2018	FY 2019 -2020	FY 2021 -2022
Teams	317	79	65	116
Number of Teams				
Number of Teams linked to startups*	304 [96 %]	78 [99 %]	65 [100 %]	109 [94 %]
Startups	305	78	65	109
Number of startups formed**				
Subsequent Funding				
Total (cumulative) funding linked to startups (as of 09/30/2022)	\$634,886,579	\$286,752,376	\$123,411,388	\$37,828,528
Total (cumulative) funding linked to startups (as of 09/30/2020)	\$403,056,893	\$12,842,375	\$48,691,193	Not Applicable
Merger & Acquisition				
Number of start-up businesses that were merged or acquired	9	2	2	1
Economic Impact				
Public Funding	\$299,492,175	\$62,713,835	\$117,523,185	\$34,385,519
SBIR/STTR	\$192,710,770	\$50,137,074	\$36,359,847	\$29,147,646
Other federal funding (non-SBIR/STTR)	\$106,134,013	\$12,576,761	\$80,983,338	\$5,237,873
State funding	\$647,392	\$0	\$180,000	\$0
Private Funding	\$335,394,404	\$224,038,541	\$5,888,203	\$3,443,009
Venture capital	\$269,541,881	\$215,607,543	\$5,688,203	\$180,000
Angel or individual investor	\$12,102,523	\$6,175,998	\$0	\$3,263,009
Private industry, corporate funding, or others	\$53,750,000	\$2,255,000	\$200,000	\$0

* Reflects the number of small-businesses participants in I-Corps at NIH. Some businesses participated twice with different teams.

** Reflects the number of distinct small-businesses participants in I-Corps at NIH plus new start-ups generated. Some businesses participated twice with different teams.

*** Funding numbers were provided by VentureWell. Funding is cumulative through the end of the fiscal year for a given reporting period. **Note:** The total cumulative funding obtained as of end of FY 2020 (9/30/2020) was included to serve as a reference for the readers and had been reported in the previous I-Corps report.

Reporting Metrics

Since Program Inception FY 2019 -2020 FY 2021 -2022

Number of (unique) individuals trained*	585	106	229
Number of individuals trained that are women**	105 [18 %]	17 [16 %]	49 [21%]

Number of individuals trained that are from under-represented groups Not Available

Statistics

Number of Entrepreneurial Leads trained	224	40	89
Number of Entrepreneurial Leads that are women	Not Available	9 [22 %]	20 [22 %]

Number of Entrepreneurial Leads that are from under-represented groups Not Available

Graduate Student	0
Post-doctoral Researcher	20
Undergraduate Student	0
Others***	57

Status of the Entrepreneurial Lead at the time of training Not Available Not Available

* Distinct count of program participants

** Individuals estimated as gender female

*** Others consists of lab staff scientists and post-doc researchers

Reporting Metrics

Since Program Inception FY 2019 - 2020 FY 2021 - 2022

Characteristics	188	32 [†]	67
	Not Available	13 [41 %]	33 [49 %]
	Not Available	Not Available	Not Available
Number of Teams trained	188	32 [†]	67
Number of Teams having one or more female members	Not Available	13 [41 %]	33 [49 %]
Number of Teams having one or more team members from under-represented groups	Not Available	Not Available	Not Available
Number of Teams with prior DOE Research Lineage*	188	32	67
Number of Teams that came through:			
Universities	0	0	0
I-Corps Nodes	0	0	0
I-Corps Sites	0	0	0
Other Federal Agencies	0	0	0
Federal Laboratories	188	32	67
Incubators/Accelerators	0	0	0
SBIR/STTR Program	0	0	0
Partners through Memorandum of Understanding (MOU)	0	0	0
U.S. State Partnerships	0	0	0
International Partnerships	0	0	0
Others	0	0	0

Teams Trained

Source of Teams [non-exclusive categories]

* All teams have received previous direct DoE funding, but not specifically through grants.
 † Due to COVID-19, 15 teams did not get to participate

Reporting Metrics

Since Program Inception FY 2019 -2020 FY 2021 -2022

Teams	Number of Teams	188	32	67
	Number of Teams linked to start-up businesses	20 [11 %]	3 [9 %]	5 [7 %]
Startups	Number of startup businesses formed	19	3	5
Subsequent Funding*	Total funding obtained by startups	\$151,322,063	\$23,065,000	\$27,059,250
Merger & Acquisition	Number of start-up businesses that were merged or got acquired	0	0	0
Economic Impact	Public Funding**	\$132,306,853	\$19,291,000	\$25,154,250
	SBIR/STTR	Not Available	Not Available	Not Available
	Other Federal Funding [non-SBIR/STTR]	\$100,926,739	\$5,620,000	\$20,056,250
	State Funding	\$7,897,714	\$6,256,000	Not Available
	Private Funding	\$16,465,210	\$3,774,000	\$1,905,000
	Venture Capital	Not Available	Not Available	Not Available
	Angel or Individual Investor	Not Available	Not Available	Not Available
	Private Industry, Corporate Funding, or Others	Not Available	Not Available	Not Available

* Follow-on Funding excludes financial support to the I-Corps program, and only considers funding raised during or after I-Corps participation.

** Based on funding obtained through self-reported sources

*** The remaining funding is categorized either as "Others" or "Unknown"

Reporting Metrics

End of FY 2020 End of FY 2022

	Number of active I-Corps Nodes	1	1
National Innovation Network (NIN)*	Number of universities in active I-Corps Nodes	Not Applicable	Not Applicable
	Number of active I-Corps Sites	13	13
	Number of universities in active I-Corps Sites	Not Applicable	Not Applicable
Cohorts	Number of completed cohorts**	10	15
Program Structure	DOE Funding Level		
	FY 2019	\$3,400,000 [†]	--
	FY 2020	\$2,450,000 [▲]	--
	FY 2021	--	\$3,028,803
	FY 2022	--	\$3,155,000
	Annual Program Funding		
	Other federal agencies funding support	\$0	\$0
	State funding support	\$0	\$0
	Private funding support ^Δ	\$75,000	\$0

* The (definitions of) nodes and sites of the Energy I-Corps program are different from those of the NSF I-Corps program. Please see the *Program Structure* section of the Energy I-Corps Annual Report for more details (https://energyicorps.energy.gov/sites/default/files/Nov%202019_BR_Energy%20I-Corps_View%20File.pdf)

** The pilot (first cohort) was launched in October 2015. There would have been 11 cohorts by the end of FY 2020, but Spring 2020 cohort was cancelled due to COVID-19.

[†] The overall budget for FY 2019 was an estimated \$3,400,000; \$1,750,000 from OTT and \$1,650,000 from other DOE program offices

[▲] The overall budget for FY 2020 was an estimated \$2,450,000, which is lower than planned because of COVID-19 postponement/cancellation

^Δ 1 privately-funded team from FY 2017



National Science Foundation
WHERE DISCOVERIES BEGIN