DIRECTORATE FOR TECHNOLOGY, INNOVATION, AND PARTNERSHIPS (TIP) **$864,870,000 +$500,000,000 / 137.0%**

TIP Funding[1]
(Dollars in Millions)

	FY 2020 Actual	FY 2020 CARES Act Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate Amount	Change over FY 2021 Estimate Percent
Innovation Ecosystems (IE)	$98.18	$0.80	$110.00	$335.00	$225.00	204.5%
Partnerships Office (PO)	-	-	-	50.00	50.00	N/A
Technology Frontiers (TF)	-	-	-	150.00	150.00	N/A
Translational Impact (TI)	254.13	2.75	254.87	329.87	75.00	29.4%
Total	**$352.31**	**$3.55**	**$364.87**	**$864.87**	**$500.00**	**137.0%**

[1] FY 2020 and FY 2021 funding is adjusted for comparability to reflect the movement of activities to TIP in FY 2022. See the R&RA Overview for more details.

About TIP

In close collaboration with all of NSF's directorates and offices, as well as with other stakeholders in the Nation's research, innovation, and education enterprise, the Directorate for Technology, Innovation, and Partnerships (TIP) will (i) advance science and engineering research and innovation leading to breakthrough technologies as well as solutions to national and societal challenges, sustaining and enhancing U.S. competitiveness on a global stage; (ii) accelerate the translation of fundamental discoveries from lab to market, advancing the U.S. economy; and (iii) create education pathways for every American to pursue new, high-wage, good-quality jobs, supporting a diverse workforce of researchers, practitioners, and entrepreneurs. Building on NSF's longstanding leadership in scientific and engineering research and education, TIP will effectively serve as a cross-cutting platform that leverages, energizes, and rapidly brings to the market and to society the innovations that result from all of NSF's investments. Further, TIP will open up new possibilities for research and education by catalyzing strategic partnerships linking academia, industry, government, philanthropy, investors, and civil society to cultivate 21st-century local, regional, and national innovation ecosystems, ensuring U.S. leadership in critical technologies as well as national and societal challenges. TIP investments strongly align with Administration priorities, including the Build Back Better and Racial Equity pillars, and with Congressional priorities.

This FY 2022 Request to Congress for TIP aligns with the American Jobs Plan. The American Jobs Plan would provide limited-duration scale-up of TIP activities to accelerate and enhance their overall impact, including pathways for every American to pursue new, high-wage, good-quality jobs, whereas the FY 2022 Request to Congress specifies a path toward long-term sustainment of the Directorate and its investments.

TIP will work with all of NSF's directorates and offices to advance the impacts of NSF-funded research by accelerating the translation of fundamental science and engineering discoveries into innovative new technologies and solutions. TIP will provide an optimized lab-to-market platform, funding the highly successful Partnerships for Innovation (PFI), Small Business Innovation Research (SBIR), and Small Business Technology Transfer (STTR) programs, which are moved from ENG to TIP. By operating in close coordination with one another, these programs will allow NSF-funded researchers to pursue additional prototyping, technology demonstration, and scale-up work, including licensing of NSF-funded research outputs. They will also give rise to the startups and small businesses that have the potential to lead to new markets and economies of scale.

TIP will further cultivate new innovation ecosystems at the scale of individual communities and regions throughout the U.S., advancing use-inspired, solution-oriented research and innovation in a range of technology areas (e.g., artificial intelligence, quantum information science, advanced wireless, advanced manufacturing, semiconductors) as well as in a diverse set of national-challenge areas of priority to the Administration and Congress (e.g., climate change and biotechnology). Coupled with these innovation ecosystems is entrepreneurial education through the NSF Innovation Corps (I-Corps™) program as well as the NSF Entrepreneurial Fellowships; these investments will develop future leaders capable of maturing promising ideas and technologies from lab to market.

Along the way, TIP will serve as a central resource to catalyze and scale public and private partnerships agency-wide. Specifically, TIP will provide expertise and support to build partnerships, along with co-funding to strategically advance high-impact relationships that will deepen and advance NSF's mission across all areas of science, engineering, and education. TIP will aim to expand the reach of NSF partnerships and exponentially increase the return on investments across all of NSF's directorates and offices.

In FY 2022, TIP investments will advance the frontiers of emerging industries as well as other national-priority areas, and they will result in the creation of new, high-wage, good-quality jobs.

Major Investments

TIP will be organizationally structured to house three divisions (IE, TF, and TI) and one office (PO), as detailed by the table shown on the previous page. Across these divisions and office, investment in the following areas is envisioned.

TIP Investments[1]
(Dollars in Millions)

Area of Investment	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate Amount	Change over FY 2021 Estimate Percent
Accelerating Public and Private Partnerships	-	-	$50.00	$50.00	N/A
Convergence Accelerator	60.23	70.00	70.00	-	-
NSF Entrepreneurial Fellows	-	-	20.00	20.00	N/A
Lab-to-Market					
PFI	22.07	22.81	30.00	7.19	31.5%
I-Corps™	37.95	40.00	40.00	-	-
SBIR/STTR, including Operations	232.06	232.06	274.64	42.58	18.3%
Racial Equity			20.00	N/A	N/A

[1] FY 2020 and FY 2021 funding is adjusted for comparability to reflect the movement of activities to TIP in FY 2022.

- Accelerating Public and Private Partnerships: TIP, through the PO, will establish seed funding to incentivize the scale-up of public and private partnerships, providing co-funding to specifically enable strategic high-impact relationships that will deepen and advance NSF's mission across all areas of science, engineering, and education. TIP will also nurture STEM talent by focusing on the engagement of populations long underrepresented in STEM, along with broad organizational changes (e.g., at institutions of higher education) and the inclusion of diverse institution types such as minority-serving institutions.
- Convergence Accelerator (CA): TIP will invest in new research tracks informed by community responses to a Request for Information, current national priorities, and other external stakeholder input. The CA will continue to leverage foundational advances by other NSF directorates and offices, nurture

multi-disciplinary and multi-sector teams, and accelerate solutions-oriented research and piloting in specific areas of national importance such as emerging industries.

- NSF Entrepreneurial Fellows: TIP will invest in NSF Entrepreneurial Fellowships for Ph.D.-trained scientists and engineers to forge connections between academic research and government, industry, and finance; the Fellows will receive training to become leaders capable of maturing promising ideas and technologies from lab to market.
- Lab-to-Market Platform: TIP will establish an optimized lab-to-market approach leveraging existing programs at NSF. Specifically:
  - PFI: Provides researchers funded by NSF from all disciplines of science and engineering the opportunity to explicitly enter into partnerships, especially with industry, to accelerate the transition of discoveries from the laboratory to the marketplace for societal benefits; PFI supports additional prototyping, technology demonstration, and scale-up work, including licensing of NSF-funded research outputs.
  - I-Corps™: Connects NSF-funded science and engineering research with the technological, entrepreneurial, and business communities, linking scientific and engineering discovery with technology development, societal needs, and economic opportunities; I-Corps reduces the time and risk associated with translating promising ideas and technologies from the laboratory to the marketplace through entrepreneurial education including customer discovery.
  - SBIR/STTR: Provides the opportunity for startups and small businesses to undertake cutting-edge, high-quality scientific research and development to determine the scientific and technical feasibility of new concepts or innovations that could be developed into new products, processes, or services for profound societal and/or economic impacts.
- Racial Equity: Across its full portfolio of investments, TIP will include Racial Equity as a foundational design principle. In addition, as one form of translational impact, TIP will partner with other NSF directorates and offices to build upon the Foundation's education and broadening participation research portfolio to advance organizational change.

TIP Funding for Centers Programs

TIP Funding for Centers Programs
(Dollars in Millions)

	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate Amount	Percent
Regional Innovation Accelerators	-	-	200.00	-	N/A
Total	**-**	**-**	**$200.00**	**-**	**N/A**

Regional Innovation Accelerators (RIAs): TIP will build and expand capacities for innovation at the level of individual communities and/or regions by launching Regional Innovation Accelerators that tackle use-inspired, solutions-oriented research and innovation in a range of technology areas (e.g., artificial intelligence, quantum information science, advanced wireless, advanced manufacturing, semiconductors) as well as in a diverse set of national-challenge areas (e.g., climate change and biotechnology) of priority to the Administration and Congress. For detailed information about the RIAs, please see the divisional narratives below as well as the NSF-Wide Investments chapter on Centers Programs.

TIP Funding for NSF-Wide Investments

TIP will advance science and engineering research and innovation leading to breakthrough technologies; paving the way for new, high-wage, good-quality jobs; and sustaining and enhancing U.S. competitiveness

on a global stage for decades to come. TIP funding in NSF-wide investments corresponding to emerging industries are shown in the table below.

TIP Funding for NSF-Wide Investments[1]
(Dollars in Millions)

Area of Investment[2,3]	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request
Advanced Manufacturing	$26.58	$24.63	$54.63
Advanced Wireless Research	0.60	0.55	30.55
Artificial Intelligence	67.66	61.55	121.55
Biotechnology	9.27	9.06	69.06
Climate: Clean Energy Technology	48.47	52.47	52.47
Microelectronics and Semiconductors	17.71	20.23	50.23
Quantum Information Science	15.47	18.42	48.42

[1] FY 2020 and FY 2021 funding is adjusted for comparability to reflect the movement of activities to TIP in FY 2022.

[2] NSF-Wide investments may have funding overlap and thus should not be summed.

[3] This table reflects this directorate's support for selected areas of investment. In other directorate narratives, areas of investment displayed in this table may differ and thus should not be summed across narratives.

Program Monitoring and Evaluation

The Performance and Management chapter provides details regarding the periodic reviews of programs and portfolios by external Committees of Visitors and directorate Advisory Committees. Please see this chapter for additional information.

People Involved in TIP Activities

Number of People Involved in TIP Activities

	FY 2020 Actual Estimate	FY 2020 CARES Act Actual Estimate	FY 2021 Estimate	FY 2022 Estimate
Senior Researchers	2,486	33	2,600	5,800
Other Professionals	1,331	25	1,400	3,000
Postdoctoral Associates	130	-	140	700
Graduate Students	286	4	300	3,600
Undergraduate Students	174	9	180	3,000
Total Number of People	**4,407**	**71**	**4,620**	**16,100**

DIVISION OF INNOVATION ECOSYSTEMS (IE) **$335,000,000**
+$225,000,000 / 204.5%

IE Funding[1]
(Dollars in Millions)

	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate Amount	Percent
Total	**$98.18**	**$110.00**	**$335.00**	**$225.00**	**204.5%**
Research	**98.18**	**110.00**	**325.00**	**215.00**	**195.5%**
Convergence Accelerator	60.23	70.00	70.00	-	-
Centers Funding (Total)	-	-	150.00	150.00	N/A
Regional Innovation Accelerators (RIAs)	-	-	150.00	150.00	N/A
Education	**-**	**-**	**10.00**	**10.00**	**N/A**

[1] FY 2020 and FY 2021 funding is adjusted for comparability to reflect the movement of activities to TIP in FY 2022.

About IE

IE investments will build and strengthen the U.S. innovation ecosystem, engaging a broad, diverse set of individuals and organizations in the Nation's research, innovation, and education enterprise, and accelerating use-inspired, solutions-oriented efforts that will result in breakthrough technologies and enhance U.S. competitiveness and security. IE investments will bring together teams of researchers, practitioners, and users, catalyzing iterative co-design/co-creation, leading to game-changing technologies and solutions, and paving the way for new, high-wage, good-quality jobs.

Among its investments, IE supports efforts to enable NSF to accelerate use-inspired, convergent research in areas aligned with Administration and Congressional priorities. For example, the CA leverages foundational advances by other NSF directorates and offices, nurtures multi-disciplinary and multi-sector teams, and accelerates solutions-oriented research and piloting of new technologies in specific areas of national importance such as emerging industries. Likewise, in collaboration with all NSF directorates and offices, the RIAs will cultivate new innovation ecosystems at the scale of individual communities and/or regions throughout the U.S., advancing use-inspired, solution-oriented research and innovation in a range of technology areas (e.g., artificial intelligence, quantum information science, advanced wireless, advanced manufacturing, semiconductors) as well as in a diverse set of national-challenge spaces of priority to the Administration and Congress (e.g., biotechnology and climate change). The RIAs will bring together multiple disciplines, organizations, and sectors by balancing technical and geographic (i.e., local and regional challenges, capabilities, and perspectives) innovation; incentivizing partnerships between NSF, academia, industry, nonprofits, state and local governments, and venture capital; and serving as hubs for NSF's broader portfolios in their respective areas of focus.

IE also supports entrepreneurial education through the I-Corps™ program, which is moved from ENG to TIP, as well as through NSF Entrepreneurial Fellowships. I-Corps™ connects NSF-funded science and engineering research with the technological, entrepreneurial, and business communities, addressing the skill and knowledge gap associated with the transformation of basic research into deep technology ventures. In particular, I-Corps™ reduces the time and risk associated with translating promising ideas and technologies from the laboratory to the marketplace through entrepreneurial education including customer discovery. The NSF Entrepreneurial Fellowships will embed Ph.D.-trained scientists and engineers in leading research environments that will develop the Fellows into leaders capable of maturing promising ideas and technologies from lab to market.

PARTNERSHIPS OFFICE (PO) **$50,000,000**

PO Funding
(Dollars in Millions)

	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate Amount	Percent
Total	**-**	**-**	**$50.00**	**$50.00**	**N/A**
Research	**-**	**-**	**50.00**	**50.00**	**N/A**

About PO

To further enable NSF investments in research, innovation, and education, the PO will serve as a central resource to catalyze and scale public and private partnerships agency-wide. Specifically, the PO will provide expertise and support to build partnerships, along with co-funding to strategically advance high-impact relationships that will deepen and advance NSF's mission across all areas of science, engineering, and education. The PO will help these partnerships expand the reach of, and exponentially increase the return on, NSF's investments across all of its directorates and offices.

NSF's partnerships unite broad and diverse communities and coalitions in the pursuit of discovery and innovation by leveraging the individual and unique experiences and strengths of government, industry, academia, philanthropy, civil society, and investors to motivate the understanding of research problems and iteratively pilot research-based solutions through co-design. In addition to advancing the Nation's research enterprise, PO-facilitated partnerships will nurture STEM talent by focusing on the engagement of populations long underrepresented in STEM, along with broad organizational changes (e.g., at institutions of higher education) and the inclusion of diverse institution types such as minority-serving institutions. Through these partnerships, the PO will also advance testbeds and other infrastructure critical to furthering the research and education enterprise.

DIVISION OF TECHNOLOGY FRONTIERS (TF) **$150,000,000**

TF Funding
(Dollars in Millions)

	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate Amount	Percent
Total	**-**	**-**	**$150.00**	**$150.00**	**N/A**
Research	**-**	**-**	**140.00**	**140.00**	**N/A**
Centers Funding (Total)	-	-	50.00	50.00	N/A
Regional Innovation Accelerators (RIAs)	-	-	50.00	50.00	N/A
Education	**-**	**-**	**10.00**	**10.00**	**N/A**

About TF

TF will partner with the other divisions and PO of TIP as well as with other NSF directorates and offices to identify and accelerate the translational impacts of NSF-funded research, with a particular focus on the innovative technologies that will address national and societal challenges as well as enhance U.S. competitiveness and security. TF will promote sustainable partnerships spanning government, academia, industry, philanthropy, civil society, and investors to foster game-changing technologies and solutions, along with new, high-wage, good-quality jobs.

Along with the IE division, and in collaboration with all NSF directorates and offices, TF will cultivate new innovation ecosystems at the scale of individual communities and/or regions throughout the U.S. by launching a set of RIAs. The RIAs will advance use-inspired, solutions-oriented research and innovation in a range of technology areas (e.g., artificial intelligence, quantum information science, advanced wireless, advanced manufacturing, semiconductors) as well as in a diverse set of national-challenge areas of priority to the Administration and Congress (e.g., climate change and biotechnology).

TF will also invest in NSF Entrepreneurial Fellowships to embed Ph.D.-trained scientists and engineers in leading research and innovation environments that will develop the Fellows into leaders capable of maturing promising ideas and technologies from lab to market.

DIVISION OF TRANSLATIONAL IMPACT (TI) **$329,870,000**
+$75,000,000 / 29.4%

TI Funding[1]
(Dollars in Millions)

	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate Amount	Change over FY 2021 Estimate Percent
Total	**$254.13**	**$254.87**	**$329.87**	**$75.00**	**29.4%**
Research	**254.13**	**254.87**	**329.87**	**75.00**	**29.4%**
SBIR/STTR, including Operations	232.06	232.06	274.64	42.58	18.3%
SBIR	196.04	199.06	236.39	37.33	18.8%
STTR	31.10	28.00	33.25	5.25	18.8%
SBIR/STTR Operations	4.93	5.00	5.00	-	-

[1] FY 2020 and FY 2021 funding is adjusted for comparability to reflect the movement of activities to TIP in FY 2022.

About TI

TI investments will advance the impacts of NSF-funded research by accelerating the translation of research results to practice. In particular, the division will provide an optimized lab-to-market platform, funding the highly successful PFI, SBIR, and STTR programs, which are moved from ENG to TIP.

Through PFI, TI offers researchers with prior NSF-funded efforts spanning all disciplines of science and engineering the opportunity to explicitly enter into partnerships, especially with industry, to accelerate the translation of discoveries from the laboratory to the marketplace for broad societal and/or economic benefits. In particular, PFI supports additional prototyping, technology demonstration, and scale-up work, including licensing of NSF-funded research outputs.

Meanwhile, the SBIR and STTR programs transform scientific discovery into societal and/or economic benefit by catalyzing private-sector commercialization of deep technological innovations. The SBIR and STTR programs provide the opportunity for startups and small businesses to undertake cutting-edge, high-quality science and engineering research and development to determine the scientific and technical feasibility of new concepts or innovations that could be developed into new products, processes, or services for profound societal and/or economic impacts. SBIR and STTR technology topics draw upon the full breadth of NSF scientific and engineering research disciplines and are aligned with national and societal priorities.

TI will also provide co-funding to existing investments by all of NSF's other directorates and offices, inspiring additional translation activity across the Foundation, leading to significant acceleration of the societal and/or economic impacts of NSF-funded research in a range of locales and sectors throughout the U.S.