DIRECTORATE FOR TECHNOLOGY, INNOVATION & PARTNERSHIPS (TIP) $1,185,630,000

TIP Funding

(Dollars in Millions)

	FY 2022 Actual[1]	FY 2023 Estimate Base	Disaster Relief Supplemental Base	Disaster Relief Supplemental CHIPS and Science	FY 2023 Estimate Total	FY 2024 Request	Change over FY 2023 Base Total[2] Amount	Change over FY 2023 Base Total[2] Percent
Technology Frontiers	-	$129.80	-	-	$129.80	$196.80	$67.00	51.6%
Innovation and Technology Ecosystems	78.22	149.00		200.00	349.00	490.00	341.00	228.9%
Translational Impacts	334.86	171.00	220.00	10.00	401.00	488.64	97.64	25.0%
Strategic Partnerships Office	-	0.20	-	-	0.20	10.19	9.99	4995.0%
Total	**$413.09**	**$450.00**	**$220.00**	**$210.00**	**$880.00**	**$1,185.63**	**$515.63**	**77.0%**

[1] Excludes $230,000 in American Rescue Plan supplemental funding.

[2] Captures both the FY 2023 Omnibus appropriation and the Disaster Relief Supplemental base.

About TIP

TIP advances key technology focus areas to address societal, economic, national, and geostrategic challenges and opportunities; accelerates the translation of research results from the lab to the market and society; and cultivates new education pathways leading to a diverse and skilled future technical workforce comprising researchers, practitioners, technicians, entrepreneurs, and educators. Building on NSF's longstanding leadership in science and engineering research and education, TIP serves as a crosscutting platform that leverages, energizes, and rapidly advances use-inspired research and innovation. Further, TIP opens new possibilities for research, innovation, and education by catalyzing strategic partnerships linking academia; industry, including startups and small businesses; federal, state, local, and tribal governments; nonprofits and philanthropic organizations; civil society; and communities of practice to cultivate 21st-century innovation ecosystems that give rise to future, high-wage, good-quality jobs and enhance the Nation's long-term competitiveness.

TIP collaborates with NSF's other directorates and offices as well as with other federal agencies and the private sector to advance use-inspired, solutions-oriented research and innovation in key technology focus areas (e.g., advanced materials, AI, biotechnology, clean energy technology, future manufacturing, next-generation networks and systems, microelectronics and semiconductors, and QIS), as specified in the CHIPS and Science Act of 2022. Through these investments, TIP addresses a dynamic range of societal, economic, national, and geostrategic challenges (e.g., climate change, equity, bioeconomy, supply-chain resilience), as further specified in the CHIPS and Science Act of 2022. For example, in collaboration with CISE and SBE, TIP will advance democracy-affirming technologies, enabling practical privacy solutions, as well as digital assets research and development. Of particular note, in FY 2024, TIP will continue support for the NSF Regional Innovation Engines (NSF Engines), catalyzing regional-scale innovation ecosystems throughout the U.S., particularly in those parts of the Nation that have not benefited from the technology and innovation booms of the last several decades. NSF Engines will harness the Nation's diverse science and technology research enterprise, regional-level resources, and untapped innovation potential to accelerate advances in critical and emerging technologies, grow our economy, address societal challenges, and advance national security and competitiveness.

TIP also accelerates the translation of fundamental science and engineering discoveries into innovative new technologies and solutions. TIP optimizes the NSF Lab-to-Market Platform, allowing

researchers to pursue additional prototyping, demonstration, and scale-up work, giving rise to the startups and small businesses that are leading to new markets and economies of scale. In addition, TIP is introducing new translational pathways, for example, facilitating the adoption of NSF-funded research results as secure open-source ecosystems, affording the U.S. a competitive advantage in technology development vis-à-vis the closed-box approaches that others may take. As part of these efforts, TIP will support the establishment and operation of testbeds to advance development, operation, integration, deployment, and demonstration of innovative key technology focus areas.

Equity is a fundamental design principle across TIP's portfolio, providing opportunities for everyone to engage in the Nation's R&D enterprise. For example, TIP will work with academia, state, local, and tribal governments, industry, and other educational partners to provide practical experiences to diverse learners at every stage of education, from first-time job seekers to experienced workers.

TIP Investments

(Dollars in Millions)

Area of Interest	FY 2022 Actual	FY 2023 Estimate Base Total[1]	Disaster Relief Supplemental CHIPS and Science	FY 2024 Request	Change over FY 2023 Estimate Base Total[1] Amount	Change over FY 2023 Estimate Base Total[1] Percent
Accelerating Public and Private Partnerships	-	$0.20	-	$10.19	$9.99	4995.0%
Accelerating Research Translation	-	45.00	-	45.00	-	-
Assessment of Science and Technology Investments	4.00	20.00	-	25.00	5.00	25.0%
Convergence Accelerator	64.98	70.00	-	100.00	30.00	42.9%
Experiential Learning for Emerging and Novel Technologies	-	20.00	-	50.00	30.00	150.0%
NSF Entrepreneurial Fellows	2.24	-	10.00	10.00	10.00	N/A
NSF Lab-to-Market Platform:					-	N/A
PFI	30.04	30.00	-	30.00	-	-
I-Corps™	39.93	50.00	-	50.00	-	-
SBIR/STTR, including Operations	235.68	266.54	-	304.18	37.64	14.1%
Pathways to enable Open-Source Ecosystems	9.29	27.80	-	35.00	7.20	25.9%
Testbeds	-	-	-	106.00	106.00	N/A

[1] Captures both the FY 2023 Omnibus appropriation and the Disaster Relief Supplemental base.

- Accelerating Public and Private Partnerships: TIP, through SPO, will provide co-funding to incentivize the scale-up of strategic, high-impact public and private partnerships that will in turn deepen and advance NSF's mission across all areas of science, engineering, and education. TIP-enabled partnerships will also nurture talent by focusing on the engagement of populations long underrepresented in STEM, along with broad organizational changes in higher education and the inclusion of diverse institution types such as minority-serving institutions and community colleges.
- Accelerating Research Translation (ART): In alignment with the CHIPS and Science Act of 2022, TIP will support institutions of higher education that wish to build infrastructure needed to boost their institutional capacity to accelerate the pace and scale of translational research. ART will nurture a network of ambassadors who will champion translational research throughout the Nation.
- Assessments for Science & Technology Investments: TIP will continue to invest in long-term assessments of emerging technologies and industries to examine the alignment of federal science and technology research spending and programs with long-term U.S. competitiveness in these areas. As part of this assessment, TIP will conduct regular reviews evaluating the effectiveness of major federal R&D spending, and whether it is optimized for advancing U.S. competitiveness.
- Convergence Accelerator: TIP will regionalize the Convergence Accelerator, initiating investment

in regional anchors and teams pursuing technology solutions to pressing location-specific challenges including, but not limited to, food and agriculture, disaster response and mitigation, equitable water resources, and transportation. These efforts will leverage foundational advances by other NSF directorates and offices, nurture transdisciplinary and multi-sector teams that include industry, nonprofits, and others, and accelerate use-inspired research and innovation.

- Experiential Learning for Emerging and Novel Technologies (ExLENT): TIP will scale efforts to support inclusive experiential learning opportunities designed to provide cohorts of diverse learners with the crucial skills needed to succeed in key technology focus areas and prepare them to enter the workforce ready to solve the Nation's most pressing societal, economic, national, and geostrategic challenges. ExLENT will specifically promote cross-sector partnerships among companies, governments, and nonprofits, enabling learners at all levels and from all backgrounds, including adults interested in re-skilling and/or upskilling, to pivot into key technology focus areas. A particular focus of ExLENT will be to align the Nation's workforce with regional economies.
- NSF Entrepreneurial Fellows: TIP investment will allow Ph.D.-trained scientists and engineers to forge connections between academic research and government, industry, and finance as they mature promising ideas and technologies from the lab to the market and society.
- NSF Lab-to-Market Platform: TIP will optimize NSF's lab-to-market approach. Specifically:
    - Partnerships for Innovation (PFI): Provides NSF-funded researchers the opportunity to enter into partnerships to accelerate the transition of discoveries from the laboratory to the marketplace. In addition to supporting prototyping, technology demonstration, and scale-up work, including licensing of NSF-funded research outputs, PFI will grow its support for patent expenses for intellectual property reduced to practice.
    - NSF Innovation Corps (I-Corps™): Through a network of Hubs, I-Corps™ connects federally-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. TIP will pilot a FastTrack option to accelerate the translation of deep technologies to the market.
- Importantly, beyond the Lab-to-Market Platform, TIP will introduce new translational pathways to enable the full breadth of socioeconomic impact for NSF-funded fundamental research. For example, in FY 2024, NSF will continue the recently-initiated Pathways to enable Open-Source Ecosystems (POSE) program, growing the number of secure open-source ecosystems resulting from fundamental research results.
- Testbeds: TIP will invest in the establishment and operation of testbeds to advance development, operation, integration, deployment, and demonstration of innovative critical technologies. These will serve as prototyping platforms that will allow experimentation across key technology areas.

Major Investments

TIP Funding for NSF-Wide Investments

(Dollars in Millions)

Area of Investment[1,2]	FY 2022 Actual	FY 2023 Estimate Base Total[3]	Disaster Relief Supplemental CHIPS and Science	FY 2024 Request	Change over FY 2023 Estimate Base Total[3] Amount	Change over FY 2023 Estimate Base Total[3] Percent
Advanced Manufacturing	$54.00	$41.60	$13.04	$73.60	$32.00	76.9%
Advanced Wireless	30.00	23.26	7.29	41.16	17.90	77.0%
Artificial Intelligence	100.00	78.09	24.48	138.19	60.10	77.0%
Biotechnology	30.00	52.58	16.48	93.05	40.47	77.0%
Climate: Clean Energy Technology	49.20	53.07	12.52	70.69	17.62	33.2%
Microelectronics/Semiconductors	15.00	38.25	11.99	67.68	29.43	76.9%
Quantum information Science	25.00	29.25	9.18	51.76	22.51	77.0%

[1] Major investments may have funding overlap and thus should not be summed.

[2] 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.

[3] Captures both the FY 2023 Omnibus appropriation and the Disaster Relief Supplemental base.

To learn more about cross-agency themes and initiatives supported by TIP, such as Advanced Manufacturing, Advanced Wireless, Artificial Intelligence, Biotechnology, Climate: Clean Energy Technology, Microelectronics/Semiconductors, and Quantum Information Science, see individual narratives in the NSF-Wide Investments chapter.

Centers Programs

TIP Funding for Centers Programs

(Dollars in Millions)

	FY 2022 Actual	FY 2023 Estimate Base Total[1]	Disaster Relief Supplemental CHIPS and Science	FY 2024 Request	Change over FY 2023 Estimate Base Total[1] Amount	Change over FY 2023 Estimate Base Total[1] Percent
NSF Regional Innovation Engines (NSF Engines)(ITE)	-	-	$200.00	$300.00	$300.00	N/A

[1] Captures both the FY 2023 Omnibus appropriation and the Disaster Relief Supplemental base.

For detailed information on individual centers programs, please see the Cross Theme Topics section of the NSF-Wide Investments chapter.

People Numbers and Funding Profiles

For info on NSF's People Numbers and Funding Profile tables, please see the Summary Tables chapter.

TIP Funding Mechanisms

NSF's award funding is used primarily for financial assistance to carry out a public purpose through grants and cooperative agreements. Grants can be either standard awards, in which funding for the full duration of the project is awarded in a single fiscal year, or continuing awards, in which funding for a multi-year project is awarded in increments. Cooperative agreements are used when the project requires substantial agency involvement (such as research centers and major facilities). Contracts are generally used for the direct benefit of the federal government (i.e., to acquire products or services), but they may be used to benefit the public in specific circumstances. NSF has had long-standing authority to use "other arrangements," and in FY 2022, NSF received "other transaction authorities" as part of the CHIPS and Science Act. These two mechanisms may support innovative approaches to fund programs managed by the TIP Directorate.

DIVISION OF TECHNOLOGY FRONTIERS (TF)

TF Funding

(Dollars in Millions)

	FY 2022 Actual	FY 2023 Estimate Base	Disaster Relief Supplemental Base	FY 2023 Estimate Total	FY 2024 Request	Change over FY 2023 Base Total[1] Amount	Percent
Total	**-**	**$129.80**	**-**	**$129.80**	**$196.80**	**67.00**	**51.6%**
Research	-	119.80	-	119.80	169.30	49.50	41.3%
Education	-	10.00	-	10.00	27.50	17.50	175.0%

[1] Captures both the FY 2023 Omnibus appropriation and the Disaster Relief Supplemental base.

TF accelerates breakthroughs in the key technology focus areas to sustain and grow U.S. competitiveness and security. These investments spur high-priority innovations in advanced materials, AI, biotechnology, clean energy technology, future manufacturing, next-generation networks and systems, microelectronics and semiconductors, and QIS, among other areas specified in the CHIPS and Science Act of 2022. As part of this investment, TF will advance democracy-affirming technologies, including privacy-preserving technologies, and digital assets research and development, in collaboration with CISE and SBE. TF additionally focuses on nurturing diverse talent by harnessing the innovative spirit that permeates all corners of our country, engaging individuals of all backgrounds, organizational affiliations, and geographic locations, thereby ensuring sustained leadership for generations to come.

To achieve the above outcomes, TF will partner with the other TIP units, other NSF directorates and offices, and other agencies, private industry, philanthropy, state and local governments, civil society, and investors. Specifically, TF pursues innovative partnerships and collaborations across sectors, along with transformative mechanisms such as testbeds to accelerate research activities and scale outputs and impacts.

Finally, TF will lead the assessment of key technology focus areas to examine the alignment of federal science and technology research spending and programs with long-term U.S. competitiveness in these

areas. Relatedly, TF will conduct regular reviews evaluating the implementation of major federal R&D spending, and whether that implementation is optimized for advancing U.S. competitiveness.

DIVISION OF INNOVATION AND TECHNOLOGY ECOSYSTEMS (ITE)

ITE Funding

(Dollars in Millions)

			Disaster Relief Supplemental					
	FY 2022 Actual[1]	FY 2023 Estimate Base	Base	CHIPS and Science	FY 2023 Estimate Total	FY 2024 Request	Change over FY 2023 Base Total[2] Amount	Percent
Total	**$78.22**	**$149.00**	**-**	**$200.00**	**$349.00**	**$490.00**	**$341.00**	**228.9%**
Research	78.12	139.00	-	200.00	339.00	467.50	328.50	236.3%
Education	-	10.00	-	-	10.00	22.50	12.50	125.0%
Infrastructure	0.10	-	-	-	-	-	-	N/A

[1] Does not capture funding provided by the American Rescue Plan supplemental appropriation.

[2] Captures both the FY 2023 Omnibus appropriation and the Disaster Relief Supplemental base.

ITE significantly strengthens the unique U.S. innovation ecosystem, engaging a broad, diverse set of individuals and organizations spanning government, academia, industry, philanthropy, civil society, and investors in the Nation's research, innovation, and education enterprise. ITE specifically brings together researchers, practitioners, and users to catalyze iterative co-design and co-creation, developing breakthrough technologies and addressing societal challenges. In this way, ITE enhances U.S. competitiveness and paves the way for new, high-wage, good-quality jobs.

Among its investments, ITE supports efforts that accelerate use-inspired, convergent research in areas aligned with Administration and Congressional priorities, including those articulated in the CHIPS and Science Act of 2022. For example, building upon a strong portfolio, the Convergence Accelerator will regionalize its approach, investing in cohorts of transdisciplinary, multi-sector teams pursuing technology solutions to location-specific challenges in food and agriculture, disaster response and mitigation, and transportation, to name a few. The NSF Engines will create regional-scale innovation ecosystems throughout the U.S. and usher in a transformational revolution of economic growth by harnessing the Nation's rich science and technology research enterprise and regional-level resources to accelerate key technology focus areas and address societal, economic, national, and geostrategic challenges. The NSF Engines will catalyze new business and economic growth especially in those regions of America that have not fully participated in the technology boom of the past several decades.

ITE also seeks to develop inclusive workforce-training pathways for the innovation-driven jobs of the future. For example, through ExLENT, ITE connects a highly diverse set of aspiring students and professionals interested in key technology focus areas with internship opportunities across the country, providing them with much-needed experience to land high-wage, good-quality jobs.

DIVISION OF TRANSLATIONAL IMPACTS (TI)

TI Funding

(Dollars in Millions)

			Disaster Relief Supplemental					
	FY 2022 Actual[1]	FY 2023 Estimate Base	Base	CHIPS and Science	FY 2023 Estimate Total	FY 2024 Request	Change over FY 2023 Base Total[2] Amount	Percent
Total	**$334.86**	**$171.00**	**$220.00**	**$10.00**	**$401.00**	**$488.64**	**97.64**	**25.0%**
Research	332.62	171.00	220.00	-	391.00	428.64	37.64	9.6%
Education	2.24	-	-	10.00	10.00	60.00	60.00	N/A

[1] Does not capture funding provided by the American Rescue Plan supplemental appropriations.

[2] Captures both the FY 2023 Omnibus appropriation and the Disaster Relief Supplemental base.

TI investments accelerate the translation of scientific excellence and technological innovation from the laboratory to society. By investing federal funds in a portfolio of universities, startups, small businesses, and open-source communities, TI stimulates the creation of novel products, services, and solutions that grow the national economy; catalyzes public-private partnerships that increase the depth and relevance of research activities; and nurtures and grows the US workforce, especially by fostering and encouraging participation by socially- and economically-disadvantaged individuals and groups.

In particular, TI provides an optimized Lab-to-Market Platform comprising the PFI, I-Corps™, and SBIR/STTR programs. TI additionally supports new pathways for translation, impacting government services, policy making, and education. For example, through the relatively new POSE program, TI facilitates the creation and growth of sustainable, high-impact collaborative environments that produce tools and products designed to be publicly accessible, modifiable, and distributable by anyone at no cost. Benefiting communities far beyond the initial applications, the resulting open-source ecosystems are expected to catalyze broad adoption across academia, industry, government, non-profits, and other sectors, and result in a growing, civic-minded community of users and developers.

TI also supports entrepreneurial education through the NSF Entrepreneurial Fellowships authorized in the CHIPS and Science Act of 2022. These fellowships provide Ph.D.-trained scientists and engineers with resources, including lab space, to mature promising ideas and technologies from lab to market. Along the way, the NSF Entrepreneurial Fellows become leaders in technology translation.

Finally, TI fosters cultural change within institutions of higher education, supporting the adoption of use-inspired research, translational research, and entrepreneurial training. For example, in partnership with ITE, TI invests in the ART program, which grows capacity for institutions of higher education to accelerate translational research, all the while supporting the requisite workforce development via mentorship and educational activities.

STRATEGIC PARTNERSHIPS Office (SPO)

SPO

(Dollars in Millions)

	FY 2022 Actual	FY 2023 Estimate Base	Disaster Relief Supplemental Base	FY 2023 Estimate Total	FY 2024 Request	Change over FY 2023 Base Total[1] Amount	Change over FY 2023 Base Total[1] Percent
Total	**-**	**0.20**	**-**	**0.20**	**10.19**	**9.99**	**4995.0%**
Research	-	0.20	-	0.20	10.19	9.99	4995.0%

[1] Captures both the FY 2023 Omnibus appropriation and the Disaster Relief Supplemental base.

SPO serves as an agency-wide resource to catalyze and scale public and private partnerships in order to amplify and further the impact of NSF investments in research, innovation, and education. Specifically, SPO provides 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 science, engineering, and education. SPO assists these partnerships in expanding the reach of, and exponentially increasing the return on, NSF's investments across its directorates and offices.

NSF's partnerships unite broad and diverse communities and coalitions in the pursuit of discovery and innovation by leveraging 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, SPO-facilitated partnerships nurture STEM talent by focusing on the engagement of populations long underrepresented in or underserved by STEM, along with the inclusion of diverse organization types such as minority-serving institutions and community colleges. SPO also advances testbeds and other infrastructure critical to furthering the research and education enterprise, as authorized in the CHIPS and Science Act of 2022.