

**DIRECTORATE FOR BIOLOGICAL SCIENCES (BIO)****\$862,930,000****BIO Funding**

(Dollars in Millions)

	FY 2023	FY 2024 (TBD)	FY 2025 Request	Change over	
	Base Plan <sup>1</sup>			FY 2023 Base Plan Amount	Percent
Division of Biological Infrastructure (DBI)	\$205.47	-	\$230.37	\$24.90	12.1%
Division of Environmental Biology (DEB)	167.35	-	162.87	-4.48	-2.7%
Division of Emerging Frontiers (EF)	132.64	-	140.48	7.84	5.9%
Division of Integrative Organismal Systems (IOS)	194.58	-	187.99	-6.59	-3.4%
Division of Molecular and Cellular Biosciences (MCB)	144.87	-	141.22	-3.65	-2.5%
<b>Total</b>	<b>\$844.91</b>	<b>-</b>	<b>\$862.93</b>	<b>\$18.02</b>	<b>2.1%</b>

<sup>1</sup> For comparability with FY 2025, the FY 2023 levels do not include this organization's share of Mission Support Services that were funded through the R&RA and EDU directorates and offices.

**About BIO**

BIO supports fundamental research and infrastructure that promotes a unified understanding of all forms of life and at all scales, from molecules to populations of organisms and species that underpin the functioning of the Nation's ecosystems, as well as across time and geographic diversity. It also supports the human capital necessary to enable this research. The knowledge gained advances fields from agriculture to climate change mitigation and conservation, biotechnology and biomedicine, and more. In the past decade, biology has been transformed by new technologies and has transformed other areas of science and engineering from computer and information sciences, engineering, and the mathematical and physical sciences. BIO seeks to capitalize on these advances to vastly improve our ability to understand life's deepest mysteries, and to enable new capabilities to modify molecules, cells, organisms and ecosystems for societal benefit and economic prosperity. The key to innovations that will drive the Nation's bioeconomy is through discovery and harnessing of life's evolutionary innovations. BIO's support for foundational and translational research promotes economic prosperity, health, security, and well-being by addressing existing and future global challenges.

BIO's scientific investments align directly with Administration priorities, including biotechnology to promote the bioeconomy, environmental forecasting and mitigating the impacts of global warming on essential ecosystem services, predicting and preventing the emergence of infectious diseases, and increasing equity and diversity across the STEM enterprise. BIO investments across scales, from molecules, to genomes, to cells and organisms, coupled with bioinformatics spur further development of capabilities in synthetic biology and enhance biotechnology beyond the current state-of-the-art. The accelerating power of this advanced biotechnology promises to sustain U.S. economic growth and innovation across multiple sectors including agriculture, biomanufacturing, pharmaceuticals, and other bioproducts. BIO investments in biotechnology also aid development of a circular bioeconomy that reduces carbon emissions and creates new sources of clean energy. BIO investments in ecology, evolution, and biodiversity, including support for the National Ecological Observatory Network (NEON), promote the development of dynamic, eco-forecasting models to predict climate change impacts at local, national, and global scales. BIO investments in life's innovations will similarly focus on understanding the adaptive potential of species and ecosystems to respond to climate change

stressors such as ocean acidification, sea level rise, droughts, flooding, fires, and other extreme events. Together, these investments are responsive to the national need to understand and develop solutions for the climate emergency. BIO will continue to invest in research on infectious disease emergence and transmission, contribute to the goal of preventing future pandemics, and fill knowledge gaps concerning the spread and evolution of biothreats. BIO will build upon the knowledge of how key properties of living systems emerge from complex interactions that will support convergent, use-inspired research in biotechnology to address pressing societal challenges and grow and sustain a vibrant bioeconomy by creating new jobs and industries.

Biological questions often drive convergence research across multiple fields of science and technology and stimulate applications that enhance economic and national security, and societal well-being. Pursuits in the biological sciences to quantify living systems at all scales have propelled the frontiers of research in statistics, mathematical sciences, and computer sciences to consider larger and more complex data sets that benefit from artificial intelligence (AI) and machine learning. Foundational research on microbes and their interactions with plants leverages these advances in data analytics using AI and advanced computing to fuel a revolution in agriculture. Similarly, collaborations between the biological and physical sciences have contributed to advances in biomaterials and other bio-inspired products, biological computing, and semiconductors, which exploit the extraordinary information density in genetic polymers, and neuro-technologies that power advances in neuroscience and cognition. Quantum biology, the application of quantum theory to biological systems, provides new insights into the power of photosynthesis for energy production as well as a fundamental understanding of vision, smell, magnetoreception, and other sensing systems. This convergent research will enable bioinspired designs based on quantum energy production and sensing systems leveraging AI that will enhance American security.

Tackling bold questions in biology increasingly requires an integrated approach that leverages advances from multiple subdisciplines and incorporates cutting-edge methods, tools, and concepts. Such research is critical to inform solutions to societal challenges, including natural resource management, resilience to environmental change, and global food security. In FY 2025, BIO will invest in integrative, convergent, and team science; fundamental and use-inspired research aimed at addressing grand societal challenges; and in emerging industries such as biotechnology through existing core programs and a new effort focused on establishing Biofoundries, special calls like Organismal Response to Climate Change (ORCC) and Biodiversity on a Changing Planet (BoCP), and programs aimed at addressing and overcoming the continuing challenge of integrating across subdisciplines and approaches such as the Biology Integration Institutes (BII). In FY 2025, BIO is also increasing its investment in synthesis centers, centers focused on integration and reuse of existing data to create new knowledge that will fuel advances in both basic and use inspired research across all scales of biological organization. These institute awards, and others across BIO, will result in highly collaborative, team-science endeavors, which also fosters diversity and inclusion in science.

BIO will continue supporting investments in building and broadening the biological sciences workforce through postdoctoral fellowships, Building Research Capacity of New Faculty in Biology (BRC-BIO), postbaccalaureate scholars (Research and Mentoring for Post baccalaureates in Biological Sciences (RaMP), and cultural change to ensure an inclusive environment that contributes to retention of these individuals (Leading Culture Change through Professional Societies of Biology (BIO-LEAPS).

BIO supports 65 percent of federal funding for basic research in life sciences at academic institutions.

**Major Investments**

**BIO Major Investments**

(Dollars in Millions)

Area of Investment <sup>1,2</sup>	FY 2023		FY 2024 (TBD)	FY 2025 Request	Change over	
	Base Plan	FY 2023 Base Plan			FY 2023 Base Plan	Percent
Advanced Manufacturing	\$7.16	-	-	\$7.48	\$0.32	4.5%
Artificial Intelligence	20.00	-	-	20.90	0.90	4.5%
Biotechnology	148.00	-	-	154.66	6.66	4.5%
BaRP: Clean Energy Technology	55.00	-	-	57.48	2.48	4.5%
BaRP: USGCRP	211.71	-	-	242.00	30.29	14.3%
Improving Undergraduate STEM Education	1.50	-	-	1.50	-	-
Quantum Information Science	3.28	-	-	3.43	0.15	4.6%

<sup>1</sup> Major investments may have funding overlap and thus should not be summed.

<sup>2</sup> This table reflects this directorate's support for selected topics. Investment priorities and presentation may differ by organization and so should not be summed across narratives.

To learn more about cross-agency themes and initiatives supported by BIO including, Advanced Manufacturing, Artificial Intelligence, Biotechnology, Climate, Improving Undergraduate STEM Education, and Quantum Information Science, see individual narratives in the NSF-Wide Investments chapter.

- Biotechnology: BIO is an agency lead in this area. Biotechnology comprises the data, tools, research infrastructure, workforce capacity, and innovation that enable the discovery, use, and reprogramming of living organisms, their constituent components, and their biologically related processes.

**Centers Programs**

**BIO Funding for Centers Programs**

(Dollars in Millions)

	Division	FY 2023			Change over	
		Base Plan	FY 2024 (TBD)	FY 2025 Request	FY 2023 Base Plan	Percent
Artificial Intelligence Research Institutes	EF/IOS	\$1.00	-	\$1.00	-	-
Biology Integration Institutes	DBI/EF	35.20	-	45.20	10.00	28.4%
Centers for Analysis & Synthesis	DBI	2.50	-	9.50	7.00	280.0%
STC: Center for Cellular Construction (CCC)	DBI	5.00	-	5.00	-	-
STC: Center for Research on Programmable Plant Systems (CROPPS)	DBI	5.00	-	5.00	-	-
STC: Science and Technology Center for Quantitative Cell Biology (QCB)	DBI	-	-	6.00	6.00	N/A
<b>Total</b>		<b>\$48.70</b>	<b>-</b>	<b>\$71.70</b>	<b>\$23.00</b>	<b>47.2%</b>

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

## Major Facilities

### BIO Funding for Major Facilities

(Dollars in Millions)

	Division	FY 2023	FY 2024	FY 2025	Change over	
		Base Plan	(TBD)	Request	FY 2023 Base Plan Amount	Percent
National Ecological Observatory Network (NEON)	DBI	\$71.71	-	\$82.02	\$10.31	14.4%

For detailed information on individual facilities, please see the Research Infrastructure section of the NSF-Wide Investments chapter.

## BIO Divisions

### BIO Division Funding by Category<sup>1</sup>

(Dollars in Millions)

	FY 2023			Change over	
	Base Plan	FY 2024 (TBD)	FY 2025 Request	FY 2023 Base Plan Amount	Percent
<b>DBI</b>	<b>\$205.47</b>	-	<b>\$230.37</b>	<b>\$24.90</b>	<b>12.1%</b>
Research	57.57	-	72.74	15.17	26.4%
Education	25.50	-	25.75	0.25	1.0%
Infrastructure	122.40	-	131.88	9.48	7.7%
<b>DEB</b>	<b>\$167.35</b>	-	<b>\$162.87</b>	<b>-\$4.48</b>	<b>-2.7%</b>
Research	165.85	-	161.27	-4.58	-2.8%
Education	1.50	-	1.60	0.10	6.7%
Infrastructure	-	-	-	-	N/A
<b>EF</b>	<b>\$132.64</b>	-	<b>\$140.48</b>	<b>\$7.84</b>	<b>5.9%</b>
Research	96.85	-	104.77	7.92	8.2%
Education	34.79	-	34.71	-0.08	-0.2%
Infrastructure	1.00	-	1.00	-	-
<b>IOS</b>	<b>\$194.58</b>	-	<b>\$187.99</b>	<b>-\$6.59</b>	<b>-3.4%</b>
Research	180.78	-	174.36	-6.42	-3.6%
Education	3.80	-	3.63	-0.17	-4.5%
Infrastructure	10.00	-	10.00	-	-
<b>MCB</b>	<b>\$144.87</b>	-	<b>\$141.22</b>	<b>-\$3.65</b>	<b>-2.5%</b>
Research	142.87	-	139.42	-3.45	-2.4%
Education	1.00	-	0.80	-0.20	-20.0%
Infrastructure	1.00	-	1.00	-	-

<sup>1</sup> For comparability with FY 2025, the FY 2023 levels do not include this organization's share of Mission Support Services that were funded through the R&RA and EDU directorates and offices.

**DIVISION OF BIOLOGICAL INFRASTRUCTURE (DBI)** empowers biological discovery by investing in the innovation and capacity-building of cutting-edge research infrastructure for fundamental biological science, which includes human capital, technologies, institutes and centers, and mid- to-large scale infrastructure.

**DIVISION OF ENVIRONMENTAL BIOLOGY (DEB)** supports fundamental research on Earth's biodiversity and the ecological and evolutionary processes that explain the origin and maintenance of genetic variation in living systems, including its history and patterns of speciation and extinction.

**DIVISION OF EMERGING FRONTIERS (EF)** serves as an incubator for innovation and integration within the biological sciences. It supports research that transcends scientific disciplines and advances conceptual foundations across all levels of biological organization. Innovative research and infrastructure activities in BIO typically begin development in EF and then move to other BIO divisions to become part of the disciplinary knowledge base.

**DIVISION OF INTEGRATIVE ORGANISMAL SYSTEMS (IOS)** supports fundamental research and training focused on mechanistic analyses of the functional phenotypic characteristics of diverse organisms, prioritizing integrative research linking biological molecules to complex populations through understanding the processes that build and maintain diverse organisms in the contexts in which they function.

**DIVISION OF MOLECULAR AND CELLULAR BIOSCIENCES (MCB)** supports fundamental interdisciplinary research to uncover the basic principles that describe cellular function at the molecular level, including (a) how information content in cells is maintained and transmitted to the next generation and guides expression of cellular characteristics; (b) how material and energy are absorbed, transformed, and flow through biological system; and (c) how biological molecules assemble into complex structures and compartments with varied functions.

