

# Lifelong STEM Engagement

As part of our community's efforts to make the case for museums, this brief describes the essential role that museums of all sizes and types have in addressing some of the most urgent issues of our day and discusses our collective requests to support robust funding for federal programs that advance education and engagement in science, technology, engineering, and mathematics (STEM).

## Museums as Infrastructure

Museums are essential anchors in their communities, serving as trusted institutions that reflect community values, document culture, and play a unique role in educating, entertaining, and inspiring a diverse array of audiences. In addition, most museums operate facilities regularly open to the public, some among the largest venues in their communities.

There are many examples of museums serving their communities by hosting farmers markets or food distribution events, volunteering as disaster shelters, coordinating blood drives, acting as voting locations, and being a meaningful place where a community gathers. While many of these roles were more visible during the COVID-19 pandemic, they have long been a focus of museums as institutions committed to addressing the needs of their communities.

Given this essential role museums play as community infrastructure, it is imperative that they be considered in the same way as other important infrastructure, such as schools, libraries, parks, and transportation.

In particular, we stress the need to make museums eligible for funding programs relative to infrastructure that are otherwise available to schools, libraries, and other nonprofit organizations. This includes—but is not limited to—funding for enhancing the energy efficiency of facilities, such as those included in the Inflation Reduction Act and Bipartisan Infrastructure Law.<sup>1</sup>

Museums share the need to upgrade their facilities to increase efficiency, reduce operating costs, leverage new technologies, and improve building health. Many museums have a long history of service to their communities, and it is not uncommon for them to occupy historic buildings built many decades ago—that have a need for updated systems.

In addition, museums are in an ideal position to be models for their communities. They are experts on effectively engaging their communities on complex topics—including on issues of science and technology, community wellbeing, and social justice—and in making those topics accessible to a wide range of audiences. As such, museums and other similar institutions are perfectly positioned to complement the improvements to their physical infrastructure with public-facing education and experiences that provide a multiplying impact on government investment.

## Museums as Research Institutions

Although not nearly as visible as public programs and exhibits, many museums contribute significantly to the nation's research enterprise, advancing fundamental and applied knowledge in many disciplines. This includes significant efforts to collect, catalogue, and steward research

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<sup>1</sup> For example, the \$500 million [Renew America's Schools Program](#) at the Department of Energy is limited to local education agencies even though museums share the same needs for energy infrastructure improvements that reduce building operating costs—like new HVAC and ventilation systems, building envelope and lighting projects, and renewable energy technologies.

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collections—and to make those collections available to researchers and the public.<sup>2</sup> In the realm of STEM, museums are among the organizations that hold priceless collections of biological, geological, and cultural specimens and artefacts that they must maintain indefinitely. It's not just about long-time storage, these collections are increasingly called upon to inform not only historical research, but investigation of contemporary issues like climate, biodiversity, and earth science.

In addition, many museums are active participants in learning research, both by employing and engaging researchers and partnering with learning R&D organizations and universities within their communities. Learning research that happens in museums contributes to the body of knowledge of education, including best practices, educator training and professional development, the creation of new standards-based curriculum, and education standards themselves.

In service of the above, many museums employ or host researchers who are active participants in academic research communities, collaborate with academic institutions across the country and around the world, and serve as a leading convener for those research communities.

We encourage opportunities for ongoing support of research collections and ensuring that museums are eligible for research funding alongside other educational institutions and nonprofits.

## Museums as STEM Educators

The nation has repeatedly stressed the importance of STEM education for people of all ages. As the landmark *Call to Action for Science Education* report argued, “Science is an essential tool for solving the greatest problems of our time and understanding the world around us”—and that “scientific thinking and understanding are essential for all people navigating the world, not just for scientists and other STEM professionals.”<sup>3</sup> Moreover, high-quality STEM education prepares people for the jobs of today and tomorrow, fostering economic development and the opportunity to address important national, local, and global priorities.

In this brief, we use the term “lifelong STEM engagement” as it captures the diversity of museums’ STEM activities—it includes early STEM learning; PreK–12 STEM education, both formal and informal; family engagement in STEM; as well as adult learning, workforce preparation, and community dialogue and deliberation on scientific issues.

As organizations that provide a wide variety of out-of-school time STEM learning experiences, museums are an essential part of the nation’s education ecosystem. Museums—including science centers, zoos, aquariums, botanical gardens, and other STEM-rich cultural institutions—must be thought of in the same breath as schools and school systems: they provide hands-on learning and professional development for educators, develop educational materials and curricula, offer field trips and other out-of-school activities that complement in-class learning, and provide afterschool and summer enrichment to welcome school students throughout the year. We urge Congress and Federal agencies to include museums—and other similar organizations that are part of the nation’s education ecosystem—when defining eligibility for funding and other programs available to schools and school systems.

<sup>2</sup> For example, more than 1/3 of science centers and museums in the United States responding to the ASTC Annual Statistics Survey report holding research collections or archives.

<sup>3</sup> National Academies of Sciences, Engineering, and Medicine. (2021). *Call to Action for Science Education: Building Opportunity for the Future*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/26152>.

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Many federal agencies have significant funding programs that museums utilize for STEM education and engagement initiatives.<sup>4</sup> In addition, the President’s Council on Advisors on Science and Technology (PCAST) recently recommended the inclusion of science and technology communication and public engagement as a core component of agency missions and strategies—and called for the establishment of a new office to support Federal agencies in their efforts to develop and build participatory public engagement.<sup>5</sup>

These STEM education and public engagement programs across the government provide an opportunity for the museum community to deepen connections with Federal agencies by working in partnership to build strong foundations for STEM literacy among all Americans; increase diversity, equity, and inclusion in STEM and provide all Americans with lifelong access to high-quality STEM education; and prepare the STEM workforce for the future. There are additional opportunities to expand funding and support for the museum community by growing relationships with Federal agencies who have a need to engage the public in consideration of scientific issues, including significant expansion beyond specific education and outreach-focused programs, offices, and divisions.

## Request

As museums are key community infrastructure, ensuring Americans’ lifelong engagement in STEM and contributing to America’s leadership in scientific research, we urge Congress to provide robust funding for a variety of programs that support lifelong STEM education and public engagement and research around many of the most important and urgent scientific issues.

In particular, we ask Congress to

- fully fund and authorize museums to participate in STEM engagement and informal STEM education programs across Federal science agencies, including the National Science Foundation (NSF), National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), and the National Institutes of Health (NIH), as well as the Departments of Agriculture, Defense, and Energy;
- support the goals of the President’s Council of Advisors on Science and Technology’s letter<sup>6</sup> to the Administration recommending the inclusion of science and technology communication and public engagement as a core component of agency missions and strategies—and establishing a new office to support Federal agencies in their efforts to develop and build participatory public engagement;
- regard museums and other institutions engaged in informal STEM education as vital components of the STEM education ecosystem, including by ensuring that such

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<sup>4</sup> For example, the December 2018 Federal-wide strategy for STEM education cataloged STEM education programs at 15 Federal agencies. (*Charting a Course for Success: American’s Strategy for STEM Education*: [https://www.whitehouse.gov/wp-content/uploads/2023/02/Final\\_2022\\_CoSTEM\\_Progress\\_Report.pdf](https://www.whitehouse.gov/wp-content/uploads/2023/02/Final_2022_CoSTEM_Progress_Report.pdf)).

<sup>5</sup> “Letter to the President: Advancing Public Engagement with the Sciences,” August 2023.

[https://www.whitehouse.gov/wp-content/uploads/2023/08/PCAST\\_Science-Engagement-Letter\\_August2023.pdf](https://www.whitehouse.gov/wp-content/uploads/2023/08/PCAST_Science-Engagement-Letter_August2023.pdf)

<sup>6</sup> President’s Council of Advisors on Science and Technology, “Letter to the President: Advancing Public Engagement with the Sciences,” August 2023. [https://www.whitehouse.gov/wp-content/uploads/2023/08/PCAST\\_Science-Engagement-Letter\\_August2023.pdf](https://www.whitehouse.gov/wp-content/uploads/2023/08/PCAST_Science-Engagement-Letter_August2023.pdf)

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organizations are eligible for relevant Federal funding opportunities and represented at appropriate conversations convened by Federal agencies;

- ensure that opportunities for public engagement are incorporated in agency research programs, especially those with significant public interest, and ensure that museums are eligible to compete for these awards;
- fund the following programs at levels that exceed inflation-adjusted levels from recent years: NSF’s Advancing Informal STEM Learning (AISL) program at \$75 million, NOAA’s Office of Education at \$38 million, NASA’s Office of STEM Engagement at \$150 million and Science Mission Directorate’s Science Engagement and Partnerships Division at \$48 million, and NIH’s Science Education Partnership Award (SEPA) program at \$25 million<sup>7</sup>;
- ensure that museums have the opportunity to compete for funds related to facilities improvement to address areas including public health, sustainability, and energy efficiency, including opportunities available to schools and other educational institutions;
- support the Department of Education in its efforts to support and promote STEM learning through multiple offices, including its interagency partnerships with the Institute of Museum and Library Services (IMLS), National Park Service, NASA, and NOAA; and
- support IMLS in its priority areas of STEM and Making and its partnership with the Department of Education’s 21st Century Community Learning Centers program.

## Talking Points

- Museums already act as a key piece of infrastructure in their communities, from contributing to the education ecosystem to providing essential services that support community well-being.
- Lifelong access to quality STEM education and learning opportunities prepares the workforce for careers of the future and informed civic decision-making; this is becoming even more important as the public is increasingly asked to consider scientific guidance and make personal decisions based upon scientific information.
- Each year, hundreds of millions of people of all ages and backgrounds visit and/or participate in educational programming offered by museums, science centers, public gardens, zoos, aquariums, and other similar cultural institutions.<sup>8</sup>
  - Many of these institutions are among the most visited cultural institutions within their community and region, providing jobs and economic development.

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<sup>7</sup> In FY 2018, the Conference Report stated that SEPA receive not less than \$19.5 million, a number based on the FY 2017 level “plus the proportional share of the general increase provided to NIGMS.” Minimum SEPA funding levels were not included in the FY 2019 and FY 2020 Conference Reports, but if SEPA were to have been similarly granted proportional increases to the NIH budget in those years, FY 2021 funding would be \$22.5 million.

[www.congress.gov/crec/2018/03/22/CREC-2018-03-22-bk3.pdf](http://www.congress.gov/crec/2018/03/22/CREC-2018-03-22-bk3.pdf)

<sup>8</sup> See, for example, the 2019 report, *Encountering Science in America*, from the American Academy of Arts and Science: [www.amacad.org/publication/encountering-science](http://www.amacad.org/publication/encountering-science)

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- Museums spark interest and activate learning through educational exhibitions, thought-provoking collections, public dialogue and deliberations, and hands-on, experiential programming.
- Museums conduct research, collaborate with researchers, and maintain research collections that are vital to America’s scientific leadership on topics from climate change and biodiversity to effective learning and education technology.
- Today, museums partner with and receive funding from a variety of Federal agencies, contributing to agency missions to engage Americans in STEM, seed tomorrow’s workforce, and connect the public with current scientific research.
- Federal funding supports a wide variety of institutions, from rural nature centers to suburban museums to urban zoos and aquariums, and fulfills multiple goals, including:
  - Evidence-based STEM engagement within the institution and out in the community—from programs in PreK–12 schools to partnerships with military installations and Native American reservations.
  - Research on effective STEM learning in informal environments, particularly for populations underrepresented in STEM fields and from underserved communities.
  - Museum-based scientific research that makes major original contributions to the understanding of important issues such as climate, biodiversity, and the history of life, enriches exhibitions and programs and engages students and the public in current research.

## Background on Federal Agencies’ STEM Engagement Work

**NSF:** The Division of Research on Learning in Formal and Informal Settings (DRL) within the Directorate for STEM Education (EDU) is currently an important source of support for museums to research learning in informal education settings and has historically funded the development of innovative exhibitions, programs, and outreach models. Relevant programs within EHR/DRL include [Advancing Informal STEM Learning](#) (AISL), [Innovative Technology Experiences for Students and Teachers](#) (ITEST), [Discovery Research PreK–12](#) (DRK12) and more.

The NSF Directorates for Biological Sciences, Geosciences, and Social, Behavioral & Economic Sciences have all supported museums in the areas of field and collections-based research, collections improvements and digitization, database development, and educational programming, such as those in the [Biological Collections Programmatic Area](#). The new [Directorate for Technology, Innovation, and Partnerships](#), given its focus on use-inspired and translational science, is significantly grounded in the intersection of science and society, including a variety of opportunities for public engagement with science.

We also call attention to cross-organization programs such as the newly announced [Responsible Design, Development, Deployment of Technologies](#) (ReDDDoT) program, which is a partnership between NSF and several philanthropic funders, and the [Research Experiences for Undergraduates](#) (REU) program, which allows museums to involve undergraduate college students in field and laboratory research. Finally, the [broader impacts criterion](#) for all NSF awards requires consideration of the benefits to society, including in areas of education and science engagement.



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**NASA:** The [Teams Engaging Affiliated Museums and Informal Institutions](#) (TEAM II) program<sup>9</sup> and its new Community Anchor Awards within NASA’s [Office of STEM Engagement](#) and the [Science Activation program](#) within the Science Mission Directorate’s Science Engagement and Partnerships Division directly support museums and museum networks. In addition, the [Museum & Informal Education Alliance](#) offers an important community of practice that provides informal educators—including those in museums—with access to NASA resources.

**NOAA:** Two programs within NOAA’s [Office of Education](#)—the [Environmental Literacy Program](#) and [Bay Watershed Education and Training](#) (B-WET) Program—help zoos, aquariums, science centers, and museums bring real world examples of science to students nationwide. Other NOAA offices support community outreach, public engagement, and citizen science initiatives and programs.

**NIH:** The [Science Education Partnership Award](#) (SEPA) program builds relationships between the biomedical research community and educational organizations—including museums—that improve life science literacy. In addition, there is growing awareness of the importance of public engagement as a core aspect of several major initiatives that intersect with societal interests and public concerns, such as the [BRAIN Initiative](#) and the [All of Us Research Program](#).

**Other Federal Agencies:** The Department of Energy, Department of Defense, and U.S. Department of Agriculture are among the other agencies that have STEM workforce development programs and which could benefit from strengthening public engagement in science that could be expanded in collaboration with museums.

## Funding History of Select Informal STEM Programs:

The budgets proposed by the Biden–Harris Administration have generally been supportive of programs of interest to the museum community. Fiscal year 2024 is not included since appropriations bills are still pending. Amounts in the table below<sup>10</sup> are in millions.

Appropriation	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23
<b>NSF</b>	<b>\$7,472</b>	<b>\$7,767</b>	<b>\$8,075</b>	<b>\$8,278</b>	<b>\$8,487</b>	<b>\$8,838</b>	<b>\$9,874</b>
EHR/EDU <sup>11</sup>	\$880	\$902	\$910	\$940	\$968	\$1,149	\$1,371
AISL	\$63	\$63	-	\$63*	\$63*	\$65	\$70
<b>NASA</b>	<b>\$19,653</b>	<b>\$20,736</b>	<b>\$21,500</b>	<b>\$22,629</b>	<b>\$23,271</b>	<b>\$24,041</b>	<b>\$25,384</b>
Office of STEM Engagement	\$100	\$100	\$110	\$120	\$127	\$137	\$144
TEAM II	-	\$10	-	\$5*	-		

<sup>9</sup> TEAM II was formerly known as the Competitive Program for Science Museums, Planetariums, and NASA Visitor Centers (CP4SMPVC).

<sup>10</sup> Primary source of budget numbers: [www.aip.org/fyi/federal-science-budget-tracker](http://www.aip.org/fyi/federal-science-budget-tracker)

<sup>11</sup> The Directorate for Education and Human Resources (EHR) was renamed the Directorate for STEM Education (EDU) in 2022.

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Science Mission Directorate's Science Activation Program	\$37	\$44	\$45*	\$46*	\$46*		
<b>NOAA</b>	<b>\$5,675</b>	<b>\$5,909</b>	<b>\$5,425</b>	<b>\$5,352</b>	<b>\$5,431</b>	<b>\$5,877</b>	<b>\$6,201</b>
Office of Education	\$27	\$28	\$29	\$30	\$33	\$34	\$35
ELGs**	\$5**	\$5**	\$5**	\$5**	\$5**	\$3.1	\$3.2
B-WET	\$7.5	\$7.5	\$7.5	\$7.8	\$7.8	\$8.3	\$8.7
<b>NIH</b>	<b>\$34,084</b>	<b>\$37,084</b>	<b>\$39,084</b>	<b>\$41,684</b>	<b>\$42,934</b>	<b>\$44,959</b>	<b>\$47,459</b>
SEPA***	\$18.5	\$19.5	-	-	-	-	-

\* No less than.

\*\* Environmental Leadership Grants were not called out explicitly in FY 17–21; budget provided for those years is for the Education Program Base, which includes ELGs.

\*\*\* The NIH SEPA program has not been called out explicitly in the Conference Report for the past several years.