Outside Witness Testimony in Support of FY 2025 Funding for the National Science Foundation

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Subcommittee on Commerce, Justice, Science and Related Agencies

The American Institute of Biological Sciences (AIBS) appreciates the opportunity to provide testimony in support of fiscal year (FY) 2025 appropriations for the National Science Foundation (NSF). We encourage Congress to provide NSF with **at least $11.9 billion** in FY 2025.

AIBS is a scientific association dedicated to promoting informed decision-making that advances biological research and education for the benefit of science and society. AIBS works to ensure that the public, legislators, funders, and the community of biologists have access to information that can guide informed decision-making.

Importance of Biological Research

Biological research is in our national interest. It advances our understanding of the living world and provides solutions to important problems. Increasing our knowledge of how genes, cells, tissues, organisms, and ecosystems function is vitally important to efforts to improve the human condition. Food security, medicine and public health, national security, economic growth, and sound environmental management are all informed by biological sciences. Notably, biological research helps to sustain biodiversity and healthy ecosystems that underpin the livelihoods of communities. The knowledge gained from NSF-funded biological research also contributes to the development of new research tools and industries.

Biological research strengthens our economy. Research funding from NSF powers the expansion of the bioeconomy and has given rise to successful companies, such as Genentech, Ekso Bionics, and Ginkgo BioWorks, as well as new industries that provide more robust food crops or disease detection tools and techniques. The translation of biological knowledge into formal and informal education programs fosters the development of the scientifically and technically skilled workforce needed by employers. Data show that employers continue to seek workers with scientific and technical skills. Over the past decade, the U.S. science, technology, engineering,

and mathematics (STEM) workforce grew both in number and in the percentage of the total U.S. workforce – from 22% to 24% between 2011 and 2021. In fact, in 2021, the U.S. STEM workforce comprised 36.8 million people in diverse occupations that require STEM knowledge and expertise, making up 24% of the total U.S. workforce.

Importance of NSF-Funded Biological Research

The cornerstone of NSF excellence is a competitive, merit-based review system that underpins the highest standards of excellence. Through its research programs, NSF invests in the development of new knowledge and tools that solve the most challenging problems facing society.

- **Combating emerging diseases**: NSF-funded research played a crucial role in our response to the COVID-19 pandemic. Fundamental research supported by NSF led to the development of critical diagnostic tools and medical devices to combat the outbreak. NSF supported the discovery of bacteria from thermal pools at Yellowstone National Park that contain thermostable enzymes that allow for the rapid copying of genetic material through a process called Polymerase Chain Reaction (PCR). This process was integral to manufacturing a widely used clinical test for determining whether a patient has been infected with the virus that causes COVID-19.
- **Mobilizing big data**: Access to and analysis of vast amounts of data are driving innovation. NSF enables integration of big data across scientific disciplines, including applications in the biological sciences. Digitization of biodiversity and natural science collections involves multi-disciplinary teams, which have put nearly 140 million specimens and their associated data online for use by researchers, educators, and the public.
- **Enabling synthetic biology:** DNA editing has become more advanced and targeted with techniques such as CRISPR-CAS9, allowing scientists to rewrite genetic code and redesign biological systems. NSF funds research on how these techniques can be used to bio-manufacture new materials, treat diseases, and accelerate growth of the bioeconomy.

Other examples of federally-funded research that have benefited the public are chronicled in the AIBS report, "Biological Innovation: Benefits of Federal Investments in Biology," which is available at https://www.aibs.org/assets/pages/policy/AIBS-Biological-Innovation-Report.pdf.

NSF is the primary federal funding source for biological research at our nation's universities and colleges, providing 65 percent of extramural federal support for non-medical, fundamental biological and environmental research at academic institutions.

Strengthening Biological Research Infrastructure

NSF is also an important supporter of biological research infrastructure, such as field stations, natural history museums, and living stock collections. These place-based research centers enable studies that take place over long periods of time and variable spatial scales to provide insights into our nation's most pressing issues.

Scientific collections are an important component of our nation's research infrastructure. Recent

reports have highlighted the value of mobilizing biodiversity specimens and data in spurring new scientific discoveries that grow our economy, improve our public health and well-being, and increase our national security. In 2019, the Biodiversity Collections Network released their report, "Extending U.S. Biodiversity Collections to Promote Research and Education," outlining a national agenda that leverages digital data in biodiversity collections for new uses and calling for building an Extended Specimen Network.

A 2020 report by the National Academies of Science, Engineering and Medicine (NASEM), "Biological Collections: Ensuring Critical Research and Education for the 21st Century," argued that collections are a critical part of our nation's science and innovation infrastructure and a fundamental resource for understanding the natural world. The NASEM report's recommendations for establishing an action center for biological collections and requiring specimen management plans for research proposals generating new specimens, underscore the importance of biodiversity collections and have been supported by the CHIPS and Science Act.

Both reports articulate a common vision of the future of biological collections and define the need to broaden and deepen collections and associated data to realize the full potential for biodiversity collections to inform 21st century science. This endeavor requires robust investments in our nation's scientific collections, whether they are owned by a federal or state agency or are part of an educational institution, free-standing natural history museum, or another research center.

While many federal agencies have a role in supporting the establishment of an action center for biological collections and the development of the Extended Specimen Network, NSF has a central role to play. The agency has been a leader in this space through the Advancing Digitization of Biodiversity Collections program, and is now supporting critical advancements through the Infrastructure Capacity for Biological Research: Biological Collections program.

Building the STEM Workforce

NSF supports recruitment and training of our next generation of scientists. Support for undergraduate and graduate students is critically important to our research enterprise. Students learn science by doing science, and NSF programs engage students in the research process.

NSF awards reached 1,900 colleges, universities, and other public and private institutions across the country in FY 2023. Initiatives such as the Graduate Research Fellowship and the Faculty Early Career Development program are important parts of our national effort to attract and retain the next generation of researchers. Since 1952, the number of students supported by NSF Graduate Research Fellowships has grown to more than 70,000. In FY 2023, nearly 353,000 people, including researchers, postdoctoral fellows, trainees, teachers and students, were supported directly by NSF.

Investing in NSF is Critical for U.S. Global Leadership in Science

Unfortunately, federal research and development investments are shrinking as a share of the U.S. economy. The U.S. is still the largest performer of research and development globally, but our

share of worldwide scientific activity has declined considerably over the past two decades, while countries in East and Southeast Asia, especially China, have been rapidly increasing their investments in science. According to the National Science Board, the annual rate of increase of China's R&D, is almost double that of the U.S.

To remain at the global forefront of innovation and to fully realize the benefits of NSF-supported research, the government must make bold and sustained investments in NSF. Unpredictability in funding disrupts research programs, creates uncertainty in the research community, and stalls the development of the next great idea.

Enacting robust funding increases for NSF will allow for critical federal investments in scientific and educational research, as well as support for the development of the scientific workforce. These investments will allow NSF to increase the number of new graduate research fellowships it awards to nurture the human capital needed to ensure U.S. leadership in scientific innovation. Such increases will also enable NSF to expand support for important new initiatives, such as the Biology Integration Institutes program, which supports collaborative research on frontier questions about life that span multiple disciplines within and beyond biology.

Conclusion

Providing NSF with at least $11.9 billion in FY 2025 is necessary to undo the harmful effects of the slow growth in research funding in recent years that has hurt America's research productivity. The requested funding will grow and sustain the U.S. bioeconomy and enable NSF to accelerate work on important initiatives at the frontiers of science and engineering. This investment will enable NSF to support research in a number of important priority areas such as biotechnology, artificial intelligence, climate change, and advanced biomanufacturing. Importantly, these increases will advance research on infectious disease emergence and transmission, prevent future pandemics, and fill gaps in our knowledge about the spread and evolution of biological threats.

We are disappointed that NSF received only $9.1 billion in FY 2024, an 8% cut compared to its FY 2023 budget. This is the first time that funding for NSF has decreased in a decade. The reduced allocation in FY 2024 hurts research and undermines the nation's ability to address societal challenges. Further, this cut ignores the CHIPS and Science Act, which demonstrated bipartisan commitment to our nation's scientific and technological enterprise and provided an exciting framework for growing federal investments in research. We urge Congress to follow through on its promise by funding NSF as close as possible to the levels authorized by the law.

Please continue supporting increased investments in our nation's scientific capacity by providing NSF with at least $11.9 billion in FY 2024. This request aligns with the FY 2023 authorization for NSF in the CHIPs and Science Act. Thank you for your thoughtful consideration of this request and for your prior efforts on behalf of science and the National Science Foundation.