

December 4, 2022

The Honorable Joseph R. Biden
President
The White House
1600 Pennsylvania Avenue NW
Washington, D.C. 20500

The Honorable Kamala Harris
Vice President
The White House
1600 Pennsylvania Avenue NW
Washington, D.C. 20500

Dear Mr. President and Madam Vice President:

As we began the holiday season, we thank you for your leadership that has resulted in one of the most significant advances in this nation's science enterprise since the publication of Vannevar Bush's *Science, The Endless Frontier* in 1945. As a result of your actions, Congress enacted landmark legislation that includes the *Infrastructure Investment and Jobs Act*, the *Inflation Reduction Act*, and the *CHIPS and Science Act*. Significant resources were appropriated to address economic competitiveness and a myriad of climate change issues; invest in clean energy technology deployment, semiconductor manufacturing, and efforts to accelerate the deployment of biomedical and health research results; and refurbish research infrastructure at the Department of Energy's National Labs as well as weather- and ocean-related facilities at the National Oceanic and Atmospheric Administration. The *CHIPS and Science Act* authorizes important initiatives to strengthen the fundamental research enterprise, support research infrastructure, broaden the participation of people and regions not well represented in today's science enterprise, expand STEM education, and address research security issues.

As former directors of the National Science Foundation (NSF) and chairs of the National Science Board (NSB) we applaud all that you have done thus far and urge the Administration to fund the NSF in your FY 2024 budget request at the levels authorized in the *CHIPS and Science Act*.

As you know, China and other nations are aggressively investing in research and commercialization as they try to dominate the key technologies of the future. China's spending on research and development grew an average of 12.3% annually between 2016 and 2021, surpassing the U.S. growth rate of 7.8%. Without a significant and sustained increased investment in our fundamental research enterprise, it is only a matter of time before our competitors overtake the United States in certain aspects of technological primacy.

Fundamental research is conducted at America's research universities and in so doing it provides a dual benefit to the nation. It creates the foundation for major advances in health and medicine, national security, communications, food, economics, energy, and other areas. It also educates students to be the scientific leaders, innovators, and entrepreneurs of tomorrow. The national investment in university research has fueled U.S. economic growth and prosperity and made the nation a beacon for the best and brightest from around the world. This leadership, however, is not guaranteed.

In January of this year, the NSB released the latest edition of *Science and Engineering Indicators*. The report concluded that the global concentration of research and development performance continues to shift from the U.S. and Europe to countries in East-Southeast Asia and South Asia. If our nation is to remain a world leader in science and technology, amongst the many issues we must address is to enhance our investments in next-generation research facilities such as advanced computing centers, astronomical and atmospheric observing capabilities, ocean and coastal research facilities, particle accelerators, and mid-scale research infrastructure. Such facilities enable the conduct of cutting-edge research that can contribute to our economic and national security as well as the education and training of our technological workforce.



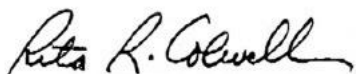
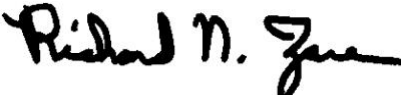
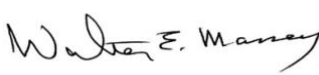
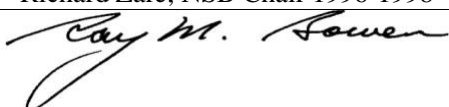

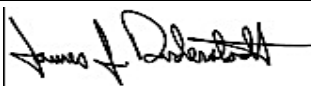

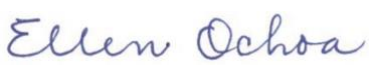
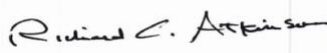
As the NSB concluded in another report on the NSF's role in research infrastructure, there can be no doubt that modern and effective research infrastructure is critical to maintaining U.S. leadership in science and engineering. New tools have opened vast research frontiers and fueled technological innovation in fields such as biotechnology, climate change, data science, artificial intelligence, quantum computing, and

communications. The concept of infrastructure has expanded to include distributed systems of hardware, software, information bases, observing systems, and automated aids for data analysis and interpretation. Among Federal agencies, NSF is a leader in providing the academic community with access to state-of-the-art instrumentation and facilities. This infrastructure is essential to address complex research questions, the answers to which may transform scientific thinking. In an era of rapid discovery and intense competition, it is critical that NSF's infrastructure investments be enhanced so that advancements in fundamental research can continue to contribute to our important national goals.

The *CHIPS and Science Act* contains a comprehensive reauthorization of the NSF. We are hopeful that this Congressional aspiration will be matched with real, transformative investments in science, infrastructure, and innovation. As your Administration develops the FY2024 budget request, we urge you to include robust funding for research, next generation infrastructure and facilities, and STEM education and training at the NSF at levels consistent with the *CHIPS and Science Act*. Investments in discovery science and its underlying infrastructure are of paramount importance to protecting America's national security and ensuring our economic strength and leadership in the industries of the future.

Thank you for the opportunity to provide this information. We stand ready to assist the Administration in whatever way would be most useful.

Sincerely,

Former NSF Directors	Former NSB Chairs
	
France Cordova, NSF Director 2014-2020	Diane Souvaine, NSB Chair 2018-2020
	
Rita Colwell, NSF Director 1998-2004	Richard Zare, NSB Chair 1996-1998
	
Walter Massey, NSF Director 1991-1993	Ray Bowen, NSB Chair 2010-2012
	
Neal Lane, NSF Director 1993-1998	James Duderstadt, NSB Chair 1991-1994
	
Subra Suresh, NSF Director 2010-2013	Ellen Ochoa, NSB Chair 2020-2022
	
Richard Atkinson, NSF Director 1976-1980	

cc: Ms. Shalanda D. Young, Director, Office of Management and Budget
 Mr. Bruce C. Deese, Director, National Economic Council
 Dr. Arati Prabhakar, Director, Office of Science and Technology Policy
 Dr. Sethuraman Panchanathan, Director, National Science Foundation
 Dr. Daniel Reed, Chair, National Science Board