

Testimony of
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Director for Geoscience Policy
for the
Geological Society of America
Regarding the
National Science Foundation
and
National Aeronautics and Space Administration
FY 2022 Appropriation
to the
U.S. House of Representatives
Committee on Appropriations
Subcommittee on Commerce, Justice, Science, and Related Agencies
April 15, 2021

The Geological Society of America (GSA) supports strong and growing investments in geoscience research and education at the National Science Foundation (NSF) and National Aeronautics and Space Administration (NASA). We encourage Congress to appropriate \$10 billion for NSF in FY 2022 and increases to NASA's Science Mission Directorate and its Earth Science and Planetary Science Divisions. Investment in NSF and NASA is necessary to secure America's future economic leadership, both through the discoveries made and the talent developed through their programs. For the United States to remain a global leader, the nation must provide greater investment in its people, particularly women and individuals from other groups traditionally underrepresented in STEM fields. Earth and space science at these two agencies play a vital role in American prosperity and security by playing an integral role in understanding and documenting mineral and energy resources that underpin economic growth; researching and monitoring potential natural hazards that threaten U.S. and international security; and determining and assessing water quality and availability.

The Geological Society of America (GSA) is a scientific society with members from academia, government, and industry in more than 100 countries. Through its meetings, publications, and programs, GSA enhances the professional growth of its members and promotes the geosciences in the service of humankind. GSA encourages cooperative research among earth, life, planetary, and social scientists, fosters public dialogue on geoscience issues, and supports all levels of earth science education.

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National Science Foundation

The Geological Society of America (GSA) appreciates the increase to the National Science Foundation (NSF) budget in FY 2021 and thanks the Committee for recognizing the important role that the agency plays in our country's global competitiveness. We urge Congress to provide NSF at least \$10 billion in fiscal year 2022.

Sustained increases beyond inflation are necessary to regain America's science and technology leadership and to enable the discoveries that lead to future innovations and industries. Data from the [Merit Review Process Fiscal Year 2019 Digest](#) show that NSF receives many more high-quality proposals than it can fund. In FY 2019, NSF was only able to fund 27% of the proposals received. The report noted, "Approximately \$2.8 billion was requested for declined proposals that were rated Very Good or higher in the merit review process – proposals that, if funded, may have produced substantial research and education benefits." The report states that National Science Board members "believe that the long-term health of the research community and promised benefits to the nation demand a funding rate closer to the historical average of 30% or more." Increases in funding will allow NSF to continue to support its core basic research in addition to growing investments in its [Ten Big Ideas](#) and other transformational research. These big ideas are designed to position the U.S. on the cutting edge of global science and engineering leadership and will build upon and complement the basic research occurring in the directorates.

Geoscience research is a critical component of the overall science and technology enterprise and a key contributor to groundbreaking research across disciplines at NSF. NSF's Directorate for Geosciences is the largest federal supporter of basic geoscience research at universities. Increased investments in NSF's geoscience portfolio are necessary to address such issues as natural hazards, energy and minerals, water resources, education, and needed research funding due to the coronavirus pandemic.

- There is a vital need to understand the abundance and distribution of critical mineral resources, as well as the geologic processes that form them, as articulated in the Energy Policy Act of 2020. NSF's Division of Earth Sciences supports research on the structure, composition, and evolution of the Earth and the processes that govern the formation and behavior of the Earth's materials. This research contributes to a better understanding of the natural distribution of mineral and energy resources.
- The quality and quantity of surface water and groundwater have a direct impact on the wellbeing of societies and ecosystems, as evidenced by flooding and drought impacts experienced across the U.S. during the past year. NSF's research addresses major gaps in our understanding of water availability, quality, and dynamics, including the impact of both a changing climate and human activity on the water system.
- The Division of Atmospheric and Geospace Sciences provides critical infrastructure and research funding for understanding our planet, including weather and precipitation variability and atmospheric and space weather hazards. NSF is a key partner in obtaining data necessary to predict severe space weather events, which affect the electric power grid, satellite communications, and navigation systems. The Promoting Research and Observations of Space Weather to Improve the Forecasting of Tomorrow Act

(PROSWIFT Act), which was signed into law in October of 2020, highlights how NSF contributes to understanding these research questions.

- Understanding the oceans is key to a sustainable future. The National Research Council report [*Sea Change: 2015-2025 Decadal Survey of Ocean Sciences*](#) highlights areas of research that are needed to make informed decisions, including: How can risk be better characterized and the ability to forecast geohazards like megaequakes, tsunamis, undersea landslides, and volcanic eruptions be improved? What are the rates, mechanisms, impacts, and geographic variability of sea level change? How different will marine food webs be at mid-century? In the next 100 years? Additional support for NSF would allow researchers to find answers to these essential questions.
- Natural hazards are a major cause of fatalities and economic losses. NOAA found in 2020 alone, there were 13 severe storms, seven tropical cyclones, one drought, and one wildfire that resulted in a cost of \$95 billion and 262 deaths. An improved scientific understanding of hazards will reduce future losses by informing effective planning and mitigation. We urge Congress to support NSF investments in fundamental Earth science research and facilities that underpin innovations in natural hazards monitoring and warning systems. For example, the Coastlines and People (CoPe) initiative aims to understand the impacts of coastal environmental variability and natural hazards on populated coastal regions.

National Aeronautics and Space Administration

GSA requests increases to NASA's Science Mission Directorate (SMD) and its Earth Science and Planetary Science Divisions. Increased funding will be critical to implement the recommendations of the recent National Academy of Sciences' [*Earth Science and Applications from Space \(ESAS\) Decadal Survey*](#) report. The report notes,

“Earth science and applications are a key part of the nation's information infrastructure, warranting a U.S. program of Earth observations from space that is robust, resilient, and appropriately balanced.”

The data and observations from Earth observing missions and research are a tremendously important resource for natural resource exploration and land use planning, as well as assessing water resources, natural disaster impacts, and global agriculture production. GSA supports interagency efforts to ensure the future viability of Landsat satellites as well as funding to increase the capabilities and uses of multi-spacecraft constellations of small scientific satellites.

We appreciate congressional support in FY 2021 for Earth Science Missions, and request that Congress continue their funding in FY 2022. These missions will advance science frontiers and provide critical data for society. For example, NASA's Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) mission will help monitor the duration and impact of harmful algae blooms and The Climate Absolute Radiance and Refractivity Observatory (CLARREO) Pathfinder will enable industry and military decision-makers to more accurately assess natural hazards, such as flooding.

By looking at our planet as an integrated system, NASA's Earth and climate science efforts are among the nation's most effective tools to understand and tackle climate change. Planetary research is directly linked to Earth science research and cuts in either program will hinder the other. To support missions to better understand the workings of the entire solar system, planetary scientists engage in both terrestrial field studies and Earth observation to examine geologic features and processes that are common on other planets, such as impact structures, volcanic constructs, tectonic structures, and glacial and fluvial deposits and landforms. In addition, geochemical planetary research studies include investigations of extraterrestrial materials now on Earth, including lunar samples, meteorites, cosmic dust particles, and, most recently, particles returned from comets and asteroids. We appreciate past congressional support for this area and urge you to continue to increase this important area to support priority areas identified in the [Planetary Science Decadal Survey](#).

Support Needed to Educate Future Innovators

Earth scientists will be essential to meeting the environmental and resource challenges of the twenty-first century, but a shortage is expected in the future workforce. The [Status of the Geoscience Workforce Report 2018](#) found an expected deficit of approximately 118,000 geoscientists by 2026. It also highlighted the diversity of careers supported by geoscience research. For example, the report found that the majority of master's degree graduates found jobs in the oil and gas industry and government, while environmental services, such as environmental consulting and remediation of water and soil, hired the highest percentage of geoscience bachelor's degree graduates. Other industries hiring geoscientists include manufacturing, trade, construction, information technology services, mining, and agriculture. Increased NSF and NASA investments in Earth science education are necessary to meet these workforce needs and develop an informed, science-literate population.

For the United States to remain a global leader, the nation must provide greater investment in its people, including women and individuals from other groups traditionally underrepresented in STEM fields. NSF's Education and Human Resources Directorate researches and improves the way we teach science and provides research and fellowship opportunities for students to encourage them to continue in the sciences. Similarly, NASA's educational programs, led by NASA's Office of STEM Engagement and directorates, have inspired and led many into science careers. GSA fully supports these efforts, as well as additional programs to make the geoscience workforce more diverse, such as NSF INCLUDES- Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science.

Please contact GSA Director for Geoscience Policy Kasey White to learn more about the Geological Society of America – including GSA Position Statements on water resources, planetary research, energy and mineral resources, natural hazards, climate change, and public investment in Earth science research.