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Submitted to:
Senate Committee on Appropriations
Subcommittee on Commerce, Justice, Science, and Related Agencies
Senator Jerry Moran, Chair
Senator Jeanne Shaheen, Ranking Member

Agency addressed:
National Science Foundation

The American Mathematical Society is the home society of approximately 30,000 individuals and over 500 institutional members. The AMS has been serving the mathematical sciences community since 1888. The Society's programs and services for its members and the global mathematical community include professional programs; publications of books and journals; meetings and conferences; support for young scholars programs; and tools for researchers such as MathSciNet. The organization is headquartered in Providence, Rhode Island, with a Government Relations Office in Washington, DC.

The American Mathematical Society (AMS) appreciates the opportunity to submit written testimony in support of fiscal year 2019 appropriations for the National Science Foundation (NSF).

We encourage Congress to provide the NSF with \$8.45 billion in FY 2019.

The NSF is the key funding agency for the mathematical sciences. Most mathematics research is done by Ph.D. mathematicians at universities and colleges. The NSF accounts for approximately 64 percent of federal support for academic research in the mathematical sciences.

The NSF is the only federal agency that supports research and education across all fields of science, engineering, and mathematics and at all educational levels. Research and education programs supported through the NSF are essential for increasing and developing the knowledge base needed for pushing the frontiers of science, mathematics, and engineering disciplines; developing new fields of inquiry; and supporting technological innovation. Support for the scientific training of undergraduate and graduate students is critically important to our research

enterprise. Other NSF investments in education support broadened participation in STEM fields and development of the STEM workforce in demand by American employers.

The entire country benefits from NSF funding and Chairman Moran's state can serve as an example.¹

Kansas, an EPSCoR state,² received \$42 million in NSF funding in FY 2017. There were 138 NSF grants awarded to researchers in Kansas. Funds go toward research – for example, researchers in the Kansas State University Medical Component Design Laboratory used NSF funding to develop supplemental sensors for ingestible-pill technology that monitor the health of livestock, protecting against disease outbreaks. Funds go toward STEM education – for example, The Noyce Teacher-Leaders for Western Kansas project at Fort Hays State University is developing STEM teachers for rural Kansas communities.

The NSF has funded mathematics research and education in Kansas:

- At Wichita State University, Professor Victor Isakov is improving numerical algorithms for measurements used in biomedicine, economics, geophysics, and material science. In particular, the results of his work will dramatically enhance the quality of a cheap, fast, and safe diagnostic imaging method called electrical impedance tomography.³
- Kansas State University is the site of an NSF-funded Research Experience for Undergraduates (REU) program in mathematics. Each summer, students from across the country come to Manhattan where they are trained to become independent researchers while working on problems in the important fields of network security and biomathematics.
- Kansas State Professor Dave Auckly has funding to expand the Navajo Nation Math Circles.⁴ This includes a mathematical visitor program sending mathematicians to schools to work with students and their teachers as well as inclusion of mathematics in public festivals to increase community mathematical awareness.

Society has benefitted from the many products, procedures, and methods that have resulted from NSF supported research in mathematics – research performed over many years and typically not intended for specific applications. These benefits include innovations such as the Google Page Rank algorithm, enhancement of magnetic resonance imaging (MRI), and in cybersecurity. The plethora of applications that have resulted from basic research in the mathematical sciences is described in the National Academies report “The Mathematical

¹ <https://cnsf.us/factsheets2017.cfm>

² EPSCoR enhances research competitiveness of targeted jurisdictions (states, territories, commonwealth) by strengthening STEM capacity and capability. For more information, see <https://www.nsf.gov/od/oia/programs/epscor/>

³ https://nsf.gov/awardsearch/showAward?AWD_ID=1514886&HistoricalAwards=false

⁴ Navajo Nation Math Circles was featured in the documentary “Navajo Math Circles,” which aired nationwide in September 2016 on the Public Broadcasting System.

Sciences in 2025” or in the executive summary “Fueling Innovation and Discovery: The Mathematical Sciences in the 21st Century”.^{5,6}

Strong and sustained investment will allow the NSF to continue to support innovative and transformational scientific research that fuels the American economy, strengthens national security, maintains our global competitiveness, improves public health and the quality of life for Americans, and contributes to the development of the next generation of science, mathematics, and engineering researchers.

Many of our global competitors are increasing financial support for scientific research at the same time that the rate of growth of funding for research in the U.S. is slowing. Because our national investment in basic science research has been declining as a share of the federal budget for decades, we are losing our global edge. To compare, China has grown its R&D spending rapidly since 2000, at an average of 18 percent annually. During the same period, U.S. R&D spending grew by 4 percent [per year].⁷

A strong level of funding together with a predictable pattern of funding will facilitate a robust stream of high-level research and researchers that, in turn, will support the level of technological development needed to remain globally competitive.

Thank you for your consideration of this request, and for your prior efforts on behalf of the NSF.

⁵ <https://www.nap.edu/catalog/15269/the-mathematical-sciences-in-2025>

⁶ <https://www.nap.edu/catalog/13373/fueling-innovation-and-discovery-the-mathematical-sciences-in-the-21st>

⁷ <https://www.nsf.gov/statistics/2018/nsb20181/report>