



## Response to Senator Paul's "The Festivus Report 2021"

The National Science Foundation (NSF) has been the backbone of America's science and engineering research enterprise for over 70 years. In fact, NSF is the only federal agency that supports all fields of fundamental science and engineering research and education. NSF supports cutting-edge research projects — many of which serve as bellwethers for solutions to the myriad complex issues facing society. NSF programs also traditionally integrate research and education, fast tracking innovation excellence via hands-on learning to train our next generation of researchers and innovators.

Each year, NSF competitively awards thousands of grants that collectively advance our nation's scientific capabilities and engage the talents of hundreds of thousands of researchers, postdoctoral fellows, technicians, teachers and students in every field of science and engineering.

NSF is the primary source of federal funding for non-medical basic research, providing approximately 12,000 new awards annually. Through its merit review process, NSF ensures that proposals submitted are reviewed in a fair, competitive and in-depth manner. Competition for funding is intense, with only about one out of five proposals ultimately being approved.

Each proposal submitted to NSF is reviewed by science and engineering experts well-versed in their particular discipline or field of expertise. All proposals submitted to NSF are reviewed according to two merit review criteria: *Intellectual Merit* and *Broader Impacts*. NSF's merit review process is widely considered to be the "gold standard" of scientific review. Perhaps the best evidence of NSF's success is the repeated replication of its merit review model for discovery, education and innovation around the globe.

The results of this process — funding the best and brightest ideas through competitive merit review — have been profound. NSF-supported research has underpinned multitudinous discoveries leading to new inventions — the Internet, web browsers, Doppler radar, Magnetic Resonance Imaging, DNA fingerprinting, and bar codes — to name a few. These diverse examples underscore NSF's significant contributions to our nation's prosperity, health and wellbeing. NSF-funded discoveries have expanded our understanding of the world in which we live, led to life-saving medical advances, enhanced our national security, improved our everyday lives and yielded insights into the creation of the universe.

NSF's task of identifying and funding work at the frontiers of science and engineering requires keeping close track of research around the United States and the world; maintaining constant contact with the research community to advance the horizons of inquiry; and choosing the most promising people to conduct the research.

The following grants cited in "The Festivus Report 2021" illustrate examples of promising NSF-funded research awarded support through the merit review process.

## *Antarctic Dinosaurs: A Giant Screen Film and Educational Outreach*

NSF Award 1811607

Festivus 2021: “Dinosaurs of Antarctica: A \$2.4 Million (waste of a) Big Screen Film”

Giant Screen Films

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Promoting STEM education is a critical component of NSF’s mission to advance knowledge at all levels and enhances national competitiveness. Science fiction media such as Jurassic Park serve an important role to spark interest in science, as shown by the “Jurassic Park generation” of paleontologists. However, knowledge of dinosaurs, their rise and fall, and the worlds they lived in comes from scientific study of the earth and its ecosystems. Scientific knowledge, made accessible to learners across the Nation, can inspire young people to explore and pursue careers in STEM, including polar research.

The Antarctic Dinosaurs project aims to build on the popularity of dinosaurs, and introduce a new generation of learners to the sciences that have revealed Antarctica's history and how it connects with the rest of the globe. Guided by scientific advisors with expertise in biology, geology, paleontology, and education, this project brings the story of what Antarctica was like 200 million years ago, when the continent was a wooded, lush habitat where dinosaurs, amphibians, and proto-mammals thrived.

This project will develop a widely distributed large screen film, with a target audience of middle school students as well as their teachers and families. Early screenings of the film have been sponsored by schools and museums in Florida, Missouri, North Carolina, Pennsylvania, Utah, and Virginia. The project will create not only the film itself (with anticipated millions of viewers), but an associated television series, free educational toolkits for schools and science museums, a museum exhibit, and web-based materials. These materials will connect to middle school science lessons while augmenting what is typically available in the classroom. Decades of investment by NSF in educational media projects have shown that this approach is effective, and this project will be evaluated in terms of its success in promoting STEM learning.

Role models can elevate and inspire children to become something they previously never imagined. To that end, this film features diverse individuals including women and others from groups under-represented in science. In seeing these scientists, children may see themselves as capable of entering these fields and having a fulfilling career. Data from the U. S. Bureau of Labor Statics show a growing need for a STEM educated workforce. This project invests in America's future STEM professionals.

In addition to dinosaurs and scientists, the materials will also feature the U.S. Antarctic Program (USAP). USAP is the largest national program operating in Antarctica and provides a constant U.S. presence on the continent. Through USAP, NSF, along with partners at the U. S. Department of Defense, NASA, and NOAA, supports world-class, cutting-edge research in some of the most remote locations on this planet.

## *Explore the Science of Spring: A Live Media Event*

NSF Award 1811511

Festivus 2021: “Spring has come and gone, and so has \$2.8 million”

WNET

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The National Research Council, in 2009, described educational broadcast media as one of the most powerful educational and science communication means available in modern times. NSF’s Advancing Informal STEM Learning (AISL) program has supported not only award-winning educational television, but also rigorous research and evaluation on how STEM learning can best be accomplished through such media. This is part of decades of investment by NSF in high-quality educational media to promote public understanding of science.

This NSF project led to the production of three episodes of the award-winning NATURE series, broadcast for all Americans to watch on PBS in the spring of 2019. The episodes supported family and adult learning about the science of spring, through multi-media engagement with scientists in locations across the country that most Americans will never experience. The episodes described three important scientific concepts that are essential to understanding spring: birth and rebirth; migration; and connection. The project also provided opportunities for children and adults to participate in the process of scientific discovery by making observations in their community settings. Viewers were able to learn from professional scientists and citizen scientists in such diverse locations as California’s Farallon Islands, Arizona’s Chiricahua Mountains, the Rocky Mountains, the Greater Yellowstone Basin, and Florida’s Everglades. They were able to witness the flight of the bats from a cave in New Mexico and virtually enter a cave with a bear mother and her new cubs. Along with the compelling visuals, viewers heard scientific explanations of the various natural phenomena.

The initial broadcast averaged more than a million viewers per episode, and millions more have subsequently watched the episodes on various digital platforms.

Given the increasing popularity of viewing television while accessing social media on a second screen, the project experimented with engaging a social community of viewers during the live broadcast by having hosts make specific requests to participate on Facebook. The results of a comprehensive evaluation provided evidence for the engaging qualities of the television episodes and the accompanying web pages and social media posts. This project led to enhanced understanding of the scientific process and interest in scientific activities.

The evaluation also showed that this project effectively supported science education for American families. While it encouraged community involvement in scientific discovery, it also supported learning about nature and America’s natural resources in a way that goes far beyond looking in any individual’s backyard. Additionally, the project developed ways to make educational television more interactive and more accessible to Americans using social media.

This project also established partnerships with scientists, educators, and practitioners at Arizona State University, Cornell University, San Francisco State University, the University of Minnesota, and the National Park Service.