

Testimony Submitted on Behalf of the American Physiological Society, Jeff Sands, MD, President

The American Physiological Society (APS) thanks you for your sustained support of science at the NSF and NASA. In this statement we offer our recommendations for FY 2019 funding levels for these two agencies.

- **The APS urges you to fund the FY 2019 NSF budget at a level of at least \$8.45 billion to prevent further erosion of program capacity.**
- **The APS urges you to restore cuts to NASA's life sciences research budgets and to increase funding for the Human Research Program.**

NSF and NASA support scientific research and technology development programs that are critical to the future technological excellence and economic stability of the United States. Federal investment in research is critically important because breakthroughs in basic and translational research are the foundation for new technologies that help patients, fuel our economy, and provide jobs. A strong federal investment in the sciences is also critical to maintaining the United States' position as a science and engineering leader in a global context. The 2018 Science and Engineering Indicators show that other countries including China have continued to increase their investments in research at a rate that outpaces the growth of US investments.¹

NSF Funds Outstanding Research and Education Programs

NSF provides support for 27% of all federally funded basic science and engineering and provides 69% of the support for non-medical biology research. This includes investment in basic biological research across a broad spectrum of subdisciplines, as well as the infrastructure that is needed to support scientists in their work. Time and time again we have seen that the knowledge gained through basic biological research is the foundation for more applied studies that sustain the health of animals, humans and ecosystems. NSF-funded research has led to countless new discoveries that could not have been envisioned when the research began. Nevertheless, these unforeseen applications have had enormous impact on science, health and the world's economy.

The majority of the NSF funding is awarded through competitive, merit-based peer review. Merit review ensures that the best possible projects are supported. Both the scientific reviewers and NSF program staff consider not only the intellectual merit of each research proposal, but also its broader impacts. NSF's criteria for broader impact address the potential for research to benefit society or to achieve specific outcomes. NSF has an exemplary record of accomplishment in terms of funding research that produces results with far-reaching potential. Since its inception in

1950, NSF has supported the work of 231 Nobel Laureates, including the 2017 winners of the Medicine, Chemistry, Physics and Economics prizes.

Biological research is just one part of the NSF portfolio. The APS believes that each of the NSF directorates support research that is critical to NSF's mission "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense..." Collaboration among scientific disciplines is increasingly recognized as the best and most efficient way to advance science. This will only be possible with strong support for all disciplines of research.

In addition to funding innovative research in labs around the country, the NSF education programs foster the next generation of scientists. The APS is proud to have partnered with NSF in programs to provide training opportunities and career development activities to enhance the participation of underrepresented minorities in science. We believe that NSF is uniquely suited to foster science education programs of the highest quality, and we recommend that Congress continue to provide federal funds for science education through the NSF.

The APS joins the Federation of American Societies for Experimental Biology (FASEB) in recommending that the NSF be funded at a level of at least \$8.45 billion in FY 2019. The increase provided to the NSF in FY 2018 is a first step toward restoring the erosion of NSF's purchasing power. Prior to FY 2018 the NSF budget had been flat in real terms for 15 years. The NSF is poised to address major challenges facing our nation and our world in the 21st Century, but it needs adequate resources to continue to carry out its mission.

Support for Life Sciences Research should be increased at NASA

NASA sponsors research across a broad range of the basic and applied life sciences, including gravitational biology, biomedical research and the Human Research Program (HRP). The gravitational biology and biomedical research programs explore fundamental scientific questions through research carried out both on Earth and aboard the International Space Station, which provides an environment for the conduct of experiments in space. NASA's HRP conducts focused research and develops countermeasures with the goal of enabling safe and productive human space exploration. The program funds more than 300 research grants that go to academic researchers in more than 30 states around the country.

During prolonged space flight, the physiological changes that occur due to weightlessness, increased exposure to radiation, confined living quarters, and alterations in eating and sleeping patterns can lead to debilitating conditions and reduced ability to perform tasks. Scientists are actively engaged in research that explores the physiological basis of these problems with the goal of contributing to the identification of therapeutic targets and development of novel countermeasures. One of the most well-known studies of these physiological changes is the

NASA Twin Study which compares identical twin brothers and fellow astronauts Mark and Scott Kelly to see what changes occurred following Scott Kelly's one year mission aboard the International Space Station.² The knowledge gained from this research is not only relevant to humans traveling in space, but is also directly applicable to human health on Earth. For example, some of the muscle and bone changes observed in astronauts after prolonged space flight are similar to those seen in patients confined to bed rest during periods of critical illness as well as during the process of aging.

NASA is the only agency whose mission addresses the biomedical challenges of human space exploration. Over the past several years, the amount of money available for conducting this kind of research at NASA has dwindled. In the past, appropriations legislation specified funding levels for biomedical research and gravitational biology, but ongoing internal reorganizations at NASA have made it difficult to understand how much money is being spent on these programs from year to year. The APS recommends that funding streams for these important fundamental research programs be clearly identified and tracked within the NASA budget. The APS also recommends restoration of cuts to peer-reviewed life sciences research to allow NASA-funded scientists to conduct research that will be critical in not only supporting the success of future long-range manned space exploration but also leading to innovative discoveries that can be applied to Earth-based medicine. As highlighted above, investment in the basic sciences is critical to our nation's technological and economic future. This innovative engine of research fuels our world leadership and our economy. The APS urges you to make every effort to provide these agencies with increased funding for FY 2019.

The APS is a professional society, numbering more than 11,000 members, dedicated to fostering research and education as well as the dissemination of scientific knowledge concerning how the organs and systems of the body function.

¹<https://www.nsf.gov/statistics/2018/nsb20181/report/sections/overview/introduction>

²<https://www.nasa.gov/feature/nasa-twins-study-confirms-preliminary-findings>