

**Testimony for the Record**  
**Submitted to the United States Senate Committee on Appropriations**  
**Hearing on “Driving Innovation Through Federal Investments”**

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**By**  
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Chairwoman Mikulski and Vice Chairman Shelby, on behalf of the more than 7,500 members of American Astronomical Society (AAS)—the preeminent professional society for researchers and educators in the astronomical sciences in North America—I want to thank you for holding today’s hearing to examine how federal investments in scientific research and engineering drive innovation.

The AAS strongly endorses sustained and robust funding for the National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), and the Department of Energy’s (DOE) Office of Science. For FY 2015, we support funding of no less than the FY 2014 appropriation for NASA and the DOE Office of Science. And as a member of the Coalition for National Science Funding (CNSF), we support an FY 2015 budget of at least \$7.5 billion for NSF. These three agencies provide the lion’s share of support for the astronomical sciences and undergird of our nation’s innovation ecosystem in basic science research. We want to thank you for your past leadership and your current commitment to supporting these critical investments in our nation’s continued prosperity.

We stand on the precipice of groundbreaking developments in our understanding of the universe, thanks largely to the federal government’s commitment to investments in basic research in the astronomical sciences.

The highly cost-effective Kepler satellite, a NASA Explorer mission, has found that planets around other stars are ubiquitous; we now yearn to peer into their atmospheres, looking for the signatures of life. The veteran Hubble Space Telescope has recently returned evidence of giant water plumes shooting up from the ice-encrusted seas of Jupiter’s moon Europa; we now strive to send a probe to understand that icy moon and its potential for harboring life. As we zoom in on the incredible beauty and complexity of our own sun, we struggle to understand its inner workings and to predict its activity so as to protect our fleet of telecommunications, weather monitoring, and national security satellites.

We are on this precipice, but we cannot take the next steps forward without sustained and robust funding for basic science research. We cannot enjoy the same monumental progress we have enjoyed for decades while fighting against the strong headwind of budget austerity.

The astronomical discoveries that have captured the public’s imagination for the last 60 years have been enabled by an astronomical ecosystem supported primarily by federal investments—a partnership between federal agencies; researchers at universities, national labs, and private institutions; and our technology industries. Public funding supports the development and construction of cutting-edge space missions and ground-based telescopes and laboratories

developed by universities and industry. It supports the researchers who use these facilities to further humanity's understanding of the cosmos and our place within it. And it supports the educators and science communication experts who directly, and in partnership with the researchers themselves, disseminate our discoveries to the public, the ultimate investors in our scientific enterprise.

Since the inception of the Nobel Prizes, 14 of the 18 astronomy-related Nobel Laureates have been from the United States. But without strong federal support, the US may cede many of the coming major breakthroughs to researchers from other nations—other nations who have seen how much our economy has benefited from our commitment to funding basic science research and want to realize that prosperity for themselves. We echo our colleagues in calling on Congress to close the growing innovation deficit, as we continue to mind our fiscal deficit, in order to continue to be the innovative nation, the nation of pioneers, we have always been. If we do not, other nations will take up that mantle. Researchers in the US have taken notice of these global trends, and more and more are looking for opportunities outside our borders.

As our global society evolves toward a primarily knowledge-based economy, it is crucial that we provide our next generation with high-quality education, especially in the Science, Technology, Engineering and Math (STEM) fields. Astronomy serves as an accessible gateway science, engaging students' curiosity through explorations of some of the most fundamental human questions. A quarter of a million US students choose introductory astronomy courses each year, 10 percent of all college students, and 15 percent of our future K-12 teachers are among them.

Basic research in the astronomical sciences contributes, often in unpredictable ways, to the technological progress that has driven the US economy's exponential growth for more than a century. Investigations into the very origins and evolution of our universe lead to new discoveries and new questions, which themselves drive further discovery. As researchers strive to understand the formation of galaxies, they meet and conquer technological challenges that can find applications far beyond that search, such as the ten new technologies scientists and engineers have developed while working on the James Webb Space Telescope. As astronomers push the boundaries of humanity's understanding of the cosmos, we will raise exciting new questions that will drive future innovation.

A great nation does great things. It seeks to expand human knowledge because, as history has shown—from the Babylonian discovery of how to predict eclipses, to the Iberian application of the compass in the fifteenth and sixteenth centuries, and from the industrial revolution of the nineteenth century in Britain, to the microprocessor a few decades ago—expanded knowledge leads to expanded prosperity. The twentieth century was the American century, in large part because of our public investment in scientific research. The creation of knowledge, the generation of excitement, and the development of perspective is what our study of the universe provides.

I once again thank you for calling this important hearing and for providing an opportunity for the AAS to provide testimony on the importance of federal investments in basic science research, especially in the astronomical sciences. I, and our AAS members, look forward to working with

you to provide robust funding for the astronomical sciences in the FY 2015 appropriations for NASA, NSF, and the DOE Office of Science.