

January 10, 2021

Rep. Matt Cartwright
Chair, House Appropriations Commerce, Justice,
Science Subcommittee
2102 Rayburn House Office Building
Washington, DC 20515-3808

Sen. Jeanne Shaheen
Chair, Senate Appropriations Commerce,
Justice, Science Subcommittee
506 Hart Senate Office Building
Washington, DC 20510

Rep. Robert Aderholt
Ranking Member, House Appropriations
Commerce, Justice, Science Subcommittee
266 Cannon House Office Building
Washington, DC 20515-0104

Sen. Jerry Moran
Ranking Member, Senate Appropriations
Commerce, Justice, Science Subcommittee
521 Dirksen Senate Office Building
Washington, DC 20510

Dear Senators Shaheen and Moran and Representatives Cartwright and Aderholt:

On behalf of the over 8,000 members of the American Astronomical Society (AAS), thank you for your past strong support for the astronomical sciences, including in your FY 2022 marks. As you conference the FY22 House and Senate bills, the AAS respectfully requests that the conference include the House top line levels of \$25 billion for NASA, \$9.6 billion for the National Science Foundation (NSF), and \$940 million for National Institute of Standards and Technology's Scientific and Technical Research and Services (STRS) account.

Robust funding of NASA, NSF, NIST provides the vital programs and cutting-edge research facilities that our community of scientists, engineers, students, and educators depends on. The subcommittees' past investments have led to major milestones in 2021 with the landing and operations of the Perseverance and Ingenuity missions to Mars, the commissioning of the D.K. Inouye Solar Telescope (DKIST) in Hawaii, and the launches of trojan asteroid explorer Lucy, the Double Asteroid Redirection Test (DART), and the Imaging X-ray Polarimetry Explorer (IXPE). We especially look forward to the paradigm-shifting discoveries from the much-anticipated James Webb Space Telescope (JWST), successfully launched on December 25th.

As you may know, our community sets scientific and ranked mission/project priorities every ten years through the "decadal survey" process. These decadal surveys—astrophysics, planetary science, and heliophysics—are commissioned by the agencies and carried out independently by the National Academy of Sciences. The AAS advocates for a balanced federal astronomical sciences portfolio that follows the priorities of the decadal surveys, the decadal midterm reports, and other scientific community consensus inputs like senior-, portfolio-, and standing advisory committee reviews. These guiding inputs combined with robust support from Congress have resulted in U.S. leadership in space science research, keeping us at the vanguard of global competition. The latest Astronomy and Astrophysics Decadal Survey Report, *Pathways to Discovery for Astronomy and Astrophysics in the 2020s*, was released on November 4th, 2021. We encourage you to begin using the report's recommendation in your final deliberations for FY22, since *Pathways to Discovery* will not be able to inform the Administration's requests until the FY23 cycle at the earliest.

National Science Foundation

The AAS joins many other organizations and the Coalition for National Science Funding in asking you to provide an increase for NSF by matching the House mark of \$9.6 billion. Every year, the NSF must deny the equivalent of billions of dollars in support to excellent-rated research and education grant proposals. The most recent NSF-wide solicitation of interest in mid-sized research instrumentation received over \$4 billion in requests for programs in the \$20-70 million range, so the demand exceeds even this requested \$1 billion increase. The U.S. needs to invest in basic research and the necessary facilities to stay competitive in an era of unprecedented global competition.

NSF Infrastructure

Both the previous and the new astrophysics decadal survey identify priorities in constructing ambitious new facilities and maintaining current workhorse facilities. For new facilities, the 2020 survey recommends investment in one or both Extremely Large Telescope (ELT) projects, which would provide observational capabilities unmatched in space or on the ground. The US ELT program currently risks falling well behind our European counterparts, whose 30-meter class projects are fully funded with construction underway. Equally important, however, is the augmentation of the Facility Operation Transition activity pilot which will support research infrastructure modernization across NSF's Division of Astronomical Sciences (AST).

NSF Support for Researchers

The 2020 decadal continues to identify the necessity of the Mid-Scale Innovations Program (MSIP). Thanks to past Congressional support, the program was the first of its kind at NSF and has been funded in the \$15-20 million/yr range. However, MSIP is currently funded bi-annually instead of yearly and is nearly incapable of meeting the needs of the community. We ask that you maintain the separate AST mid-scale innovations program within AST in addition to funding the NSF-wide mid-scale research instrumentation program (MSRI). Below the level of mid-scale programs, over the last decade there has been a growing imbalance between funding for facility operations/maintenance and supporting the work of scientists. Without the individual investigators and students, none of the facilities investments are meaningful. Therefore, the new decadal recommends the NSF increase funding for Astronomy and Astrophysics Research Grants by 30 percent over five years. All these priorities depend on Congressional support and growth in both the astronomy and overall Foundation budgets.

NSF Support for Education

Our national research and development enterprise depends on a strong NSF that can support the diverse scientific workforce and the ambitious, transformative projects they are proposing. This requires robust investment in NSF's education research and workforce programs, including K-12 STEM education, undergraduate and graduate education, and training, broadening participation, and informal education programs. We thank the House and Senate for their recognition of the importance of STEM education and broad participation priorities and request the House mark of \$1.3 billion for NSF Education and Human Resources.

National Aeronautics and Space Administration

At NASA, as in previous years, the AAS requests support for a balanced, ambitious scientific program guided by the decadal surveys, consistent with past Congressional appropriations and authorizations. The Science Mission Directorate (SMD) engages in important, world-leading discovery and applied research that covers everything from the Earth to the edge of the universe. For SMD, we support the House appropriation of \$8 billion in FY22, an increase of \$700 million from FY21.

Astrophysics Division

We ask that you provide the \$1.45 billion House mark to the division's budget in FY22. This request includes funding for the Nancy Grace Roman Space Telescope (Roman)— the 2010 Astrophysics Decadal priority— which has experienced delays due to COVID-19.

The primary recommendation for NASA in the new 2020 Decadal was the initiation of the Great Observatories Mission and Technology Maturation Program. This Program will help prevent large budget overruns by first maturing novel technology ideas, such that engineering and construction costs are fully understood before approving a full mission. The first entrant for the maturation program will be a large Infrared/Optical/Ultraviolet space telescope. The budget request here is a first step towards growing this program and ensuring an ambitious but sustainable future for space-based astronomy.

Heliophysics Division

We ask that you continue to support the top-priorities of the 2013 Solar and Space Physics decadal survey: The DRIVE initiative capitalizes on investments in solar and space physics; development of new technologies enables an increased cadence for Explorer missions; and compelling strategic missions will advance the science of space weather with an eye toward improving forecasting capability. The decadal survey mid-term assessment in 2020 found that, "NASA and NSF have made progress on most of their DRIVE elements, although some of the DRIVE elements were implemented only recently" because of limited funding. To keep the DRIVE program on track and to avoid damaging cuts to critical Heliophysics Research & Analysis programs, it is imperative to appropriate the higher Senate mark for the division in FY22. Continued R&A funding at the requested level is essential for the scientific community to attract and retain the highest-caliber researchers, and to follow through on the path outlined for NASA Heliophysics in the recently enacted PROSWIFT Act.

Planetary Sciences Division

Thanks to Congress' commitment to exploring our solar system, new missions such as Europa Clipper, Psyche, VIPER, NEOSM, and Dragonfly are advancing in development, with launches planned in the coming few years. The recent selection of DAVINCI+ and VERITAS return the U.S. to exploring Venus after a 30-year lull. The next planetary decadal survey is underway and on track for a release in 2023. Steady growth will provide the planetary science community with the funding stability to pursue the next world-leading science mission in the upcoming decadal survey – the return of samples being collected by Mars Perseverance rover, and we recommend the House level of \$3.2 billion for the division in FY22 (a 19% increase over FY21). This also supports new technologies and instrument concepts for future missions to be developed cost effectively through research programs, independent of schedule constrained mission projects.

The division has been fortunate to have been funded to build, launch, and operate a significant number of exciting missions, but the community of scientists that the AAS represents have been struggling to find the funding to fully realize the scientific potential of these missions. We request that you strengthen the research and analysis program to sustain the U.S. workforce of planetary scientists necessary to extract maximum value from this excellent set of solar system missions. This can be accomplished by increasing overall research and analysis support by 30% so that proposal selection rates are about 1 in 3 rather than the current 1 in 5. This has been the top priority of the planetary decadal surveys for two decades.

James Webb Space Telescope

JWST was launched successfully and has deployed flawlessly. Mirror alignment and instrument calibrations will continue for the next 6 months, at which point the science mission can begin. We are deeply appreciative of Congress’ unwavering support over the course of its development. The scientific returns from JWST will be truly amazing and worth the Congress’ steadfast support over many appropriations cycles.

STEM Engagement

We ask that you continue your support for these necessary programs, including Space Grants and the Established Program to Stimulate Competitive Research (EPSCoR). These provide valuable opportunities for the next generation of researchers to launch their careers in science.

National Institute of Standards and Technology

In coordination with many of NIST’s stakeholders, we ask that you strengthen the funding for NIST’s STRS programs in FY22. We recommend funding STRS at a minimum of \$938 million, an increase of 19% above FY21. In addition to providing one-of-a-kind, critical atomic and molecular data for the astronomical sciences, these funds can be used to advance research projects in the areas of advanced computing, advanced materials, and communications.

Summary Table

(\$M)	FY21 Enacted	FY22 PBR	FY22 House	FY22 Senate	AAS Ask	Ask – FY21 (%)
NSF	8,700	10,300	9,600	9,500	9,600	+10%
NASA	23,300	24,800	25,000	25,000	25,000	+07%
Science Mission Dir	7,300	7,900	8,000	7,900	8,000	+10%
Planetary Sciences	2,700	3,200	3,200	3,200	3,200	+19%
Heliophysics	750	800	770	830	830	+10%
Astrophysics	1,400	1,400	1,450	1,400	1,450	+04%
Roman ST	505	502	502	502	502	
JWST	423	175	175	175	175	-58%
STEM Engagement	127	147	147	147	147	+16%
NIST STRS	788	916	938	913	938	+19%

We thank you for the support for the astronomical science represented in both the House and Senate bills. The American Astronomical Society looks forward to working with you in the future to accomplish the priorities laid out here and in the decadal survey.

Sincerely,



Paula Szkody
President, American Astronomical Society