DIVISION OF ASTRONOMICAL SCIENCES (AST) $243,640,000
+$9,090,000 / 3.9%

AST Funding
(Dollars in Millions)

	FY 2012 Actual	FY 2012 Enacted/ Annualized FY 2013 CR	FY 2014 Request	Change Over FY 2012 Enacted Amount	Percent
Total, AST	**$234.72**	**$234.55**	**$243.64**	**$9.09**	**3.9%**
Research	**66.30**	**73.23**	**74.71**	**1.48**	**2.0%**
CAREER	4.30	4.30	4.75	0.45	10.5%
Education	**6.65**	**6.65**	**5.83**	**-0.82**	**-12.3%**
Infrastructure	**161.77**	**154.67**	**163.10**	**8.43**	**5.5%**
Adv. Technology Solar Tel. (ATST)	2.00	2.00	2.00	-	-
Arecibo Observatory	5.63	5.50	4.50	-1.00	-18.2%
Atacama Large Millimeter Array (ALMA)	28.61	28.61	36.41	7.80	27.3%
Gemini Observatory	21.57	22.07	19.59	-2.48	-11.2%
Nat'l Optical Astron. Obs. (NOAO)	26.25	25.50	25.50	-	-
Nat'l Radio Astron. Obs. (NRAO)	43.14	43.14	41.00	-2.14	-5.0%
Nat'l Solar Observatory (NSO)	9.10	9.10	8.00	-1.10	-12.1%
Research Resources	20.98	14.00	19.35	5.35	38.2%
Pre-Construction Planning (total)	4.50	4.75	6.75	2.00	42.1%
Large Synoptic Survey Telescope (LSST)	4.50	4.50	6.50	2.00	44.4%
Giant Segmented Mirror Telescope (GSMT)[1]	-	0.25	0.25	-	-

Totals may not add due to rounding.

[1] Pursuant to solicitation NSF 12-526, published in December 2011, AST has selected the Thirty Meter Telescope (TMS) for the further development and improvement of the partnership model for a GSMT project. It is expected that NSF construction funding would not be available before FY 2020.

AST is the federal steward for ground-based astronomy in the United States. Through awards to individual investigators, small groups, and national facilities, AST funding covers research to understand the origins and characteristics of planets, stars, and galaxies, as well as the structure and origin of the Universe. AST also supports the development of advanced technologies and instrumentation, the planning and design of future astronomical research facilities, and management of the electromagnetic spectrum for scientific use. Working in partnership with private institutions to enhance the Nation's overall astronomical observing capacity and capabilities, AST funds the operations and maintenance of several world-class national and international facilities. These facilities provide access to a wide range of observational resources on a competitive basis and serve thousands of users each year.

In 2010, the National Academy of Sciences released a decadal survey report recommending a comprehensive ground-based astronomy program for the coming decade. In anticipation of funding that is more constrained than assumed in that report, AST carried out a community-based review of its entire portfolio in order to maximize the delivery of the recommended science. The AST Portfolio Review was completed in FY 2012. In light of the more constrained budget outlook, the review recommended re-balancing the AST portfolio by FY 2017. In order to maintain the balance of large facilities, mid-scale projects, and individual investigator grants that is needed to make progress on key decadal survey science goals, the recommendations included divestment of some components of major research facilities, as described in the Facilities chapter. AST is presently engaged in exploring partnership and scope options for the various facilities given lower priority in the Portfolio Review, and no decisions on divestment

have been made. Funding to support NSF-wide efforts on its facilities portfolio are provided through OMA.

Approximately 59 percent of AST's budget is used to support current operations and future development of large multi-user astronomy facilities, while 32 percent supports individual investigator grants and 8 percent supports the development and operation of advanced instrumentation and experiments based on such instrumentation. In general, about 16 percent of the AST budget is available for new research grants, while the remainder funds long-term facilities and continuing awards for grants made in previous years.

FY 2014 Summary

All funding decreases/increases represent change over the FY 2012 Enacted level.

Research

- Changes in NSF-wide investments are accommodated through strategic investments through AST core programs, accompanied by small reductions to programs not receiving proposals in these areas. These NSF-wide investments include:
  - CIF21 (+$1.98 million to a total of $3.68 million): This includes $1.50 million to implement the Theoretical and Computational Astrophysics Networks recommendation of the decadal survey, in collaboration with NASA.
  - EARS (+$9.0 million to a total of $12.0 million): This investment will concentrate on the radio-frequency-interference mitigation, advanced receiver design, propagation studies, and other foundations of radio spectrum access and hardware design, as well as key regulatory and public policy foundations for radio spectrum management.
- Other grants programs, including the Astronomy and Astrophysics Research Grants (AAG), remain approximately constant in the FY 2014 Request. AAG supports foundational research in all areas of astronomy, such as extra-solar planets, near-Earth objects, and cosmology. The stable level of AAG is enabled by reductions to select areas within AST facility infrastructure (see below) and is made to support the AST commitment to maintaining individual research that is critical to advancement of the field.

Education

- Research Experiences for Undergraduates Site and Supplements program (+$230,000 to a total of $2.63 million): This additional funding will support enhanced research experiences for students in their first two years of college, as recommended by the President's Council of Advisors on Science and Technology (PCAST) in their report, *Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics.*
- AST eliminates funding for ADVANCE (-$850,000 to a total of zero) in order to continue support for other activities, including REU (above), Astronomy and Astrophysics Postdoctoral Fellowship (-$200,000 to a total of $2.20 million), and Partnerships in Astronomy and Astrophysics Research and Education (constant at $1.0 million).

Infrastructure

AST oversees an array of infrastructure projects and programs. Reductions in facility support reflect the maintenance of funding balance between facilities and individual research. Future trends for these facilities will consider the recommendations of the AST Portfolio Review. For detailed information on individual AST facilities, please see the Facilities chapter.

- ATST operations: Funding is constant at $2.0 million, to mitigate the cultural impacts of construction in Hawaii as agreed to in the permitting process.

- Arecibo: AST funding decreases (-$1.0 million to a total of $4.50 million); additional funding is provided by GEO ($3.50 million) and NASA ($2.0 million).
- ALMA: Support (+$7.80 million to a total of $36.41 million) is consistent with a planned ramp-up of operations as this observatory comes online and continues early science activities.
- Gemini: Support (-$2.48 million to $19.59 million) is primarily for observatory operations and maintenance, reflecting the international partner agreement, with a decreased contribution to the long-term instrumentation fund.
- NRAO: Funding is reduced (-$2.14 million to a total of $41.0 million) as part of the budget realignment plan to support ALMA operations.
- NSO: Funding (-$1.1 million to $8.0 million) assumes that closure of one or more current facilities is concluded in FY 2014, as planned for a long-term transition to the Advanced Technology Solar Telescope (ATST), currently under construction (see the MREFC chapter for more details).
- Research resources: Funding growth (+$5.35 million to a total of $19.35 million) reflects the initiation of a competed Mid-Scale Innovations Program (MSIP) at $7.0 million, together with a decrease (-$2.0 million to $8.50 million) for the Advanced Technologies and Instrumentation program. A vigorous MSIP was recommended by the 2010 decadal survey, which cited "many highly promising projects for achieving diverse and timely science." MSIP will support a variety of astronomical activities within the $4.0 to $40.0 million range and will emphasize both strong scientific merit and a well-developed plan for student training in instrumentation, facility development, community telescope access, and/or provision of data to the community.
- LSST: Design and development (D&D) funding increases (+$2.0 million to $6.50 million) following the successful NSF Preliminary Design Review and coordinated DOE camera review, for this top-ranked ground-based large-scale project in the decadal survey. Support covers enhanced systems management, continued work on data management issues, and improved project management and quality assurance, which were recommended by the reviews, and other D&D that will reduce risk before a construction start. Funds to support an FY 2014 construction start for LSST are separately requested in the MREFC chapter.
- GSMT: Funding maintained at $250,000 to support the Thirty Meter Telescope (TMT) project to define and develop a model by which the federal government could potentially become a partner in this GSMT candidate after 2020.