



Introduction to the NSF Division of Astronomical Sciences Portfolio Review

The Astro2010 Decadal Survey recommendations were made under the assumption of an NSF Division of Astronomical Sciences (AST) budget that, with inflation, would approximately double to nearly \$500M by 2020. Current expectations are, instead, for a 2020 NSF/AST budget of between \$245M and \$340M.

Even in a highly optimistic scenario, in which the AST budget increased at 7% per year from 2012-2015, AST's purchasing power in 2015 would be no higher than in 2010, because of significant decreases in purchasing power from 2010 to 2012. But annual operating costs already committed for new facilities coming on line this decade increase by approximately \$30M from 2010 to 2015. By mid-decade, even in the highly optimistic scenario, AST would be at least \$50M per year short of what it would need to maintain current grant and facilities programs and to implement *any* new Decadal Survey recommendations.

In a nutshell, foreseeable budgets will be insufficient to meet the aspirations of the astronomical community.

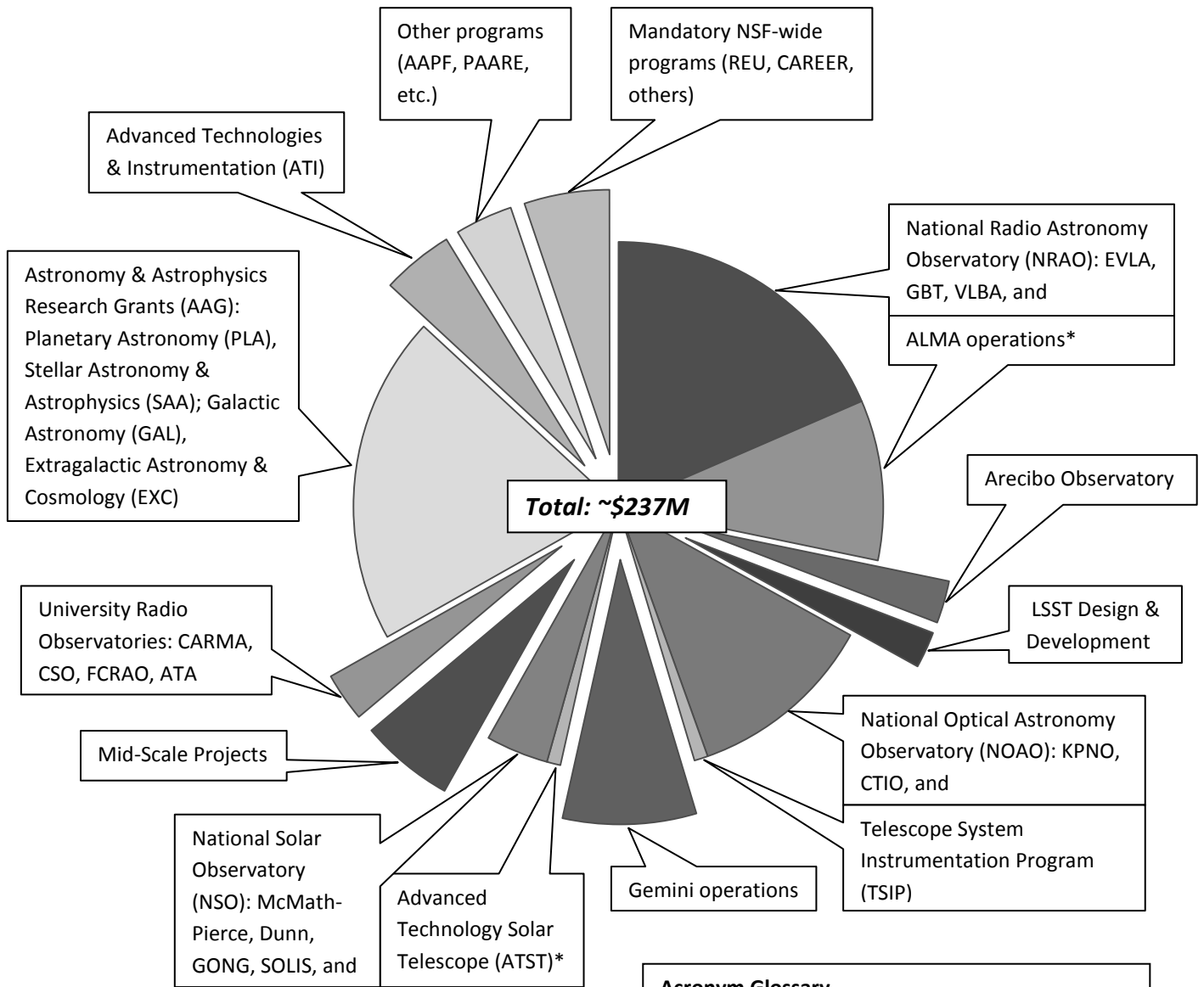
The goal of the Portfolio Review is to recommend to AST how support for existing facilities, programs, and activities should be prioritized and interleaved with new initiatives recommended by Astro2010, within the limitations of realistic future budgets. This review encompasses the entire portfolio of AST-supported facilities, programs, and other activities. Portfolio Review Committee activities began in late September 2011 and a report is expected to be completed by the end of June 2012.

Members of the scientific community are invited and encouraged to provide input to the Portfolio Review process, via Email sent to astportfolio@nsf.gov ; note that this is the *only* channel for direct community input. The window will be open through January 31, 2012.

Useful community input will focus on strategies for delivering key scientific capabilities in highly budget-constrained conditions, directly addressing the Charge to the Committee and its context. For a full explanation, including the Charge and instructions for submitting input, see the Portfolio Review web page at http://www.nsf.gov/mps/ast/ast_portfolio_review.jsp .



A Snapshot of the AST Portfolio in FY 2011



***Facilities Under Construction**
 Construction costs for major facilities come from the NSF Major Research Equipment and Facilities Construction (MREFC) budget. These funds are not charged against the AST Division budget; however, AST is responsible for the NSF share of operating costs. In FY2011, MREFC expenditures were \$13.9M for ALMA and \$5.0M for ATST.

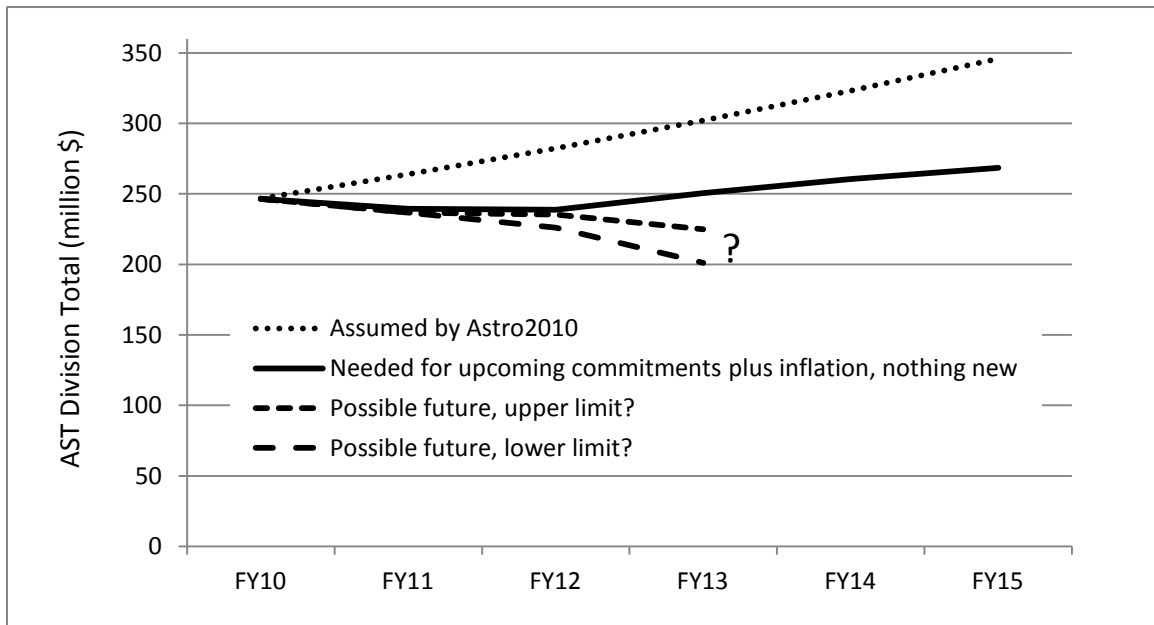
Acronym Glossary

- AAPF: Astronomy & Astrophysics Postdoctoral Fellowships program
- ALMA: Atacama Large Millimeter/submillimeter Array
- ATA: Allen Telescope Array
- CAREER: Faculty Early Career Development program
- CARMA: Combined Array for Research in Millimeter-wave Astronomy
- CSO: Caltech Submillimeter Observatory
- CTIO: Cerro Tololo Interamerican Observatory
- EVLA: Expanded Very Large Array
- FCRAO: Five College Radio Astronomy Observatory
- GBT: Robert C. Byrd Green Bank Telescope
- GONG: Global Oscillation Network Group
- KPNO: Kitt Peak National Observatory
- LSST: Large Synoptic Survey Telescope
- PAARE: Partnerships in Astronomy & Astrophysics Research & Education
- REU: Research Experience for Undergraduates program
- SOLIS: Synoptic Optical Long-term Investigations of the Sun



Why a Portfolio Review is Needed—A Deeper Look

NSF’s Astronomy budgets are declining at a time when the funding levels needed to maintain current activities and meet upcoming commitments are rising. The budgetary assumptions underlying the recommendations of the Astro2010 Decadal Survey no longer appear achievable. In addition, periodic portfolio reviews are important for responsible stewardship of the portfolio.



EXPLANATION OF THE FIGURE

Assumed by Astro2010: The Decadal Survey Committee, in their *New Worlds, New Horizons* (NWNH) report, assumed that “purchasing power would grow at 4% per year for 10 years” (NWNH p. 188). With 3% inflation this is 7% per year in then-year dollars.

Needed for upcoming commitments plus inflation, nothing new: This is what AST would need to allow the budgets of existing facilities and of most existing programs to keep pace with inflation, and to meet commitments for operations of facilities currently under construction. It incorporates real cuts expected for the grants programs in FY12 with declining success rates due to increasing numbers of proposals and funding reductions. Except for already-committed design and development work, no Astro2010 recommendations would be implemented.

Possible futures: FY10 and FY11 indicate actual appropriations. Note that in FY11, the President’s budget request to Congress was for a 7% increase for NSF as a whole, and a 2% increase for AST, compared to FY10; Congress’s appropriation was a 1% decrease for NSF and a 4% decrease for AST. The FY12 appropriation gives NSF a 2.5% increase relative to FY11; based on previous years and the FY12 request, an AST budget between 0.5% and 4.5% below FY11 is assumed. For FY13, the Office of Management and Budget (OMB) has instructed agencies to submit budget requests 5% below FY11



appropriations, and identify additional funding reductions that would bring the total request to a level at least 10% below FY11. An FY13 AST budget between 5% and 15% below the FY11 appropriation is assumed in the figure.

THINGS TO NOTICE

In 2011, the actual AST budget was already \$25 million below the Astro2010 assumption. Based on the Congressional appropriation, the AST budget in 2012 may be roughly \$50 million below the Astro2010 assumptions. Plausible extrapolations place the AST budget, within just 1 or 2 years, \$50 million or more below what is needed for current programs and existing and upcoming facility commitments. This is true even if the AST budget were to resume the Astro2010-projected growth rate in 2014, and will remain true for the second half of the decade.

BUDGET FAQs

Why is there such a big difference between the Astro2010 assumption and reality? Didn't anybody plan for this? The origin of the Astro2010 assumption is explained in Chapter 7 of the *New Worlds, New Horizons* report: specifically, the paragraph starting at the bottom of page 187 under the heading "National Science Foundation (NSF)" and the subsequent paragraph at the top of page 188, and the section starting on page 238 under the heading "NSF Astronomy" and continuing to page 240. These passages are essential reading for anyone interested in the Portfolio Review process.

Why doesn't AST just lobby for more funding from Congress, or argue for a bigger share of the NSF pie? Federal agencies are not permitted to lobby Congress. NSF's budgets are determined through a lengthy process that starts with negotiations between the NSF Director and the White House Office of Science and Technology Policy (OSTP) and Office of Management and Budget (OMB). These negotiations inform the content of the President's Budget Request, which is made public and sent to Congress in February. Ultimately, all agency budgets are determined by Congressional appropriation and an operations plan which is subsequently prepared by the agency and approved by Congress. The process does not include steps in which individual divisions within NSF argue to Congress or OMB for increased shares of the total.

This still doesn't look like that big a problem. Can't we just tighten our belts for a couple of years and ride out the storm? Belt-tightening can't happen at a moment's notice. In each new fiscal year, roughly 80% of the AST budget is, in effect, already committed—either to facility operations (55%) or to continuing annual increments to grants made in previous years (25%). Facility administrative costs have already been cut "to the bone" in response to the 2006 Senior Review, and facility operations can't be precipitously reduced without incurring additional expenses. If we fail to plan for a shortfall that could approach 25% in two years, we may quickly find ourselves unable to fund *any* new grants. This is why we can't regard the present situation as a small perturbation.



Portfolio Review FAQs

How can the community give input to the Portfolio Review committee?

The astportfolio@nsf.gov mailbox is the single channel for community input. Check the Portfolio Review web page, http://www.nsf.gov/mps/ast/ast_portfolio_review.jsp, for instructions.

I just posted a comment to a web forum run by a national facility or some other entity; is the Portfolio Review Committee going to see it?

No forum run by any entity other than NSF is an official input channel to the Portfolio Review. The Committee is under no obligation to read any of these postings, and they are not being monitored by NSF.

I heard that the forum I contributed to is going to provide my comments as input to the Portfolio Review. Isn't this true?

NSF has no way of knowing what any other entity may do with input provided to its forum.

Who is making presentations to the Portfolio Review Committee? Can I be on the list?

AST is responsible for providing information to the Committee. There are no current plans for additional presentations, although it is possible that some organizations may be asked to provide answers to written questions for the Committee. In this event, any in-person presentations, if they were to occur, would be by invitation only.

We've been through tight budgetary times before; is this really any different?

Yes, this is qualitatively different from previous situations, because of the combination of increasing commitments for new facilities, increasing aspirations of the community, and sharp decreases in purchasing power. Even in a highly optimistic scenario in which the AST budget increased at 7% per year starting in 2012, purchasing power in 2015 would be no higher than it was in 2010, because of significant decreases in purchasing power from 2010 to 2012. But commitments for operations of new facilities coming on line this decade will go up by approximately \$30M by FY 2015, leaving AST at least \$50M per year short of what it would need to maintain existing facilities and programs and to implement any Decadal Survey Recommendations. \$50M per year constitutes more than one fifth of the total AST budget. If the real budget appropriations are lower than the "highly optimistic" scenario, the corresponding shortfall will be greater.

Why is the AST budget going down?

The AST budget is declining because of a combination of effects. The Federal appropriations process has resulted in lower-than-hoped-for budgets for many federal agencies, including NSF, in recent years. In addition, current national priorities in basic research focus around areas such as energy, health, near-term economic development, and national security, areas in which astronomy and astrophysics have less direct impact compared with other fields that NSF supports.

Why didn't AST plan for a smaller budget earlier?

AST has been planning for tightening budgets; the 2006 Senior Review was a significant part of this planning. As input to the Astro2010 Decadal Survey, AST provided a budget scenario in which purchasing power would remain flat for the decade. How this scenario was used in Astro2010 is explained in Chapter 7 of the New Worlds, New Horizons report: specifically, the paragraph starting at the bottom of page 187 under the heading "National Science



Foundation (NSF)” and the subsequent paragraph at the top of page 188, as well as the “NSF Astronomy” section starting on page 238 and continuing to page 240. These passages are essential reading for anyone interested in the Portfolio Review process. In the near term, large-scale economic trends are driving the AST budget well below the level of constant purchasing power, but this was not foreseen when the Decadal Survey began in 2008.

Why don't you make a stronger argument to NSF/OMB/Congress that astronomy is important?

AST takes every opportunity to highlight the successes of its funded PIs and facilities. But Federal agencies are not permitted to lobby. NSF budgets are negotiated through a lengthy process involving many agencies and a wide variety of interests, and ultimately determined by Congressional appropriations. The process does not include steps in which divisions within NSF argue or compete outside NSF for increased funding.

Why does the Portfolio Review have to be completed so quickly?

The target date for completion of the Portfolio Review, June 2012, is the latest possible date for which the recommendations can inform the budget request for FY 2014.

My field, specialty, or area of concern is inadequately represented on the Committee. Why?

It's impossible to represent every research specialty or concern on a committee of manageable size. Members of the Portfolio Review Committee were invited to participate because of their broad view of the field, not to advocate on behalf of particular constituencies. Major effort was put into creating a committee with reasonable balance across not only scientific, but also demographic, dimensions. If you feel that an important point of view may not be voiced in the Committee, you are encouraged to express that viewpoint in your own input to the Committee.

What is the budget that the Portfolio Review is working with?

The Committee is working with 2 budget scenarios, in which the AST budget is approximately in the ranges of \$210M to \$240M in FY 2015 and \$245M to \$340M in FY 2020. These figures are in then-year dollars, i.e., not corrected for inflation.

Are certain things going to be protected in the Portfolio Review? What is off the table?

Nothing is “protected,” although there are certain multi-year commitments that have to be met, for example, those that are constrained by international agreements. But the Portfolio Review has a horizon that extends well into the next decade, and therefore nothing is technically off the table.

Is the Portfolio Review going to consider the potentially damaging impact on the field of terminating projects/closing facilities/eliminating programs?

Yes. The Committee is explicitly charged with considering several aspects of the health of the profession and of US astronomy in the international context.

What is the Portfolio Review Committee assuming about future NASA missions and international observatories?

The Committee is considering the AST programs in the expected context of both international and NASA capabilities. However, this context is highly uncertain, so there is no single answer to the question. The Portfolio Review Committee focuses on science capabilities that may be available to US astronomers in a variety of scenarios, and also is considering the importance of US leadership in developing its recommendations.