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NSF 14-022

Dear Colleague Letter: MPS/AST Portfolio Divestment Options

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Dear Colleague:

The National Science Foundation (NSF) has embarked on an exciting program in astronomy that involves construction of several new state-of-the-art telescopes, in order to enable progress on key scientific questions in astronomy. In a constrained budget environment, building and operating these new facilities requires that difficult priority choices be made. Therefore, in 2011/2012, the NSF Directorate for Mathematical and Physical Sciences (MPS) conducted a community-based Portfolio Review of the program of its Division of Astronomical Sciences (MPS/AST). The Portfolio Review Committee report recommended significant adjustments to the MPS/AST research portfolio, including divestment of some major telescope facilities, in order to maintain the most compelling scientific program. In its written response to that report, MPS/AST noted that it would make decisions about divestments near the end of 2013.

This letter provides information to the scientific community about the status of the response to the Portfolio Review Committee's divestment recommendations. For some telescopes, studies of alternatives will be carried out in 2014, while the assessment of options for other telescopes will be deferred until alternatives can be defined more crisply; this letter presents the details and rationale on a telescope-by-telescope basis.

1. PORTFOLIO REVIEW COMMITTEE DIVESTMENT RECOMMENDATIONS

National Science Foundation investments in astronomy follow a careful process of prioritization that is informed by National Academy of Sciences studies. The most recent National Academies decadal survey in astronomy and astrophysics, *New Worlds, New Horizons in Astronomy and Astrophysics*, was published in August 2010. That report made science-based recommendations for new initiatives in large- and medium-scale projects, as well as increased investments in smaller programs. However, the recommended plan was based on an assumption of 4% real growth per year in the budget of MPS/AST, a growth that has not been achieved. Instead, the MPS/AST budget has decreased by an average of 2.0% per year in actual dollars, or approximately 3%-4% per year in spending power, from 2010 through 2013. This is likely an enduring, systemic change relative to the decadal survey assumption. The resulting actions discussed in this letter are therefore important for NSF to pursue, and are independent of the resolution of the Federal budget sequester in Fiscal Year 2014.

Because of the discrepancy between the decadal survey budget assumption and the actual MPS/AST funding levels, MPS/AST undertook a community-based Portfolio Review in 2011 and 2012 (See http://www.nsf.gov/mps/ast/ast_portfolio_review.jsp). This review was carried out under the Federal Advisory Committee Act by a subcommittee of the Advisory Committee of the NSF Directorate for Mathematical and Physical Sciences (<http://www.nsf.gov/mps/advisory.jsp>). The Portfolio Review Committee (hereafter PRC) was charged to preserve the ordering of new priorities from the decadal survey, and to use the explicit science questions listed in the decadal survey to develop portfolio recommendations under current budget scenarios. The PRC report was accepted by the parent Advisory

Committee and formally transmitted to NSF in August 2012. The report recommendations included significant divestment of facilities from the MPS/AST portfolio in order to retain the balance of capabilities needed to deliver the best performance on the key science of the present decade and beyond. The PRC recommended that these divestments take place expeditiously, in order to restore portfolio balance by Fiscal Year 2017. “Divestment” in the PRC context meant removal from the MPS/AST base budget, and the PRC recommendations made no presumptions about what form that removal might take.

MPS/AST presently funds five distinct federal facilities, some with multiple telescopes, for carrying out astronomical research. In alphabetical order, used in the following sections to avoid any possible implication of a priority ordering, these are the Arecibo Observatory (Arecibo), International Gemini Observatory (Gemini), National Optical Astronomy Observatory (NOAO), National Radio Astronomy Observatory (NRAO), and National Solar Observatory (NSO). The PRC made specific divestment recommendations for four of these five facilities, whereas a budget cap (but no divestment) was recommended for Gemini.

Telescopes specifically recommended for expeditious divestment by the PRC were the following:

- NOAO 2.1-meter telescope, located on Kitt Peak, Arizona.
- NOAO Mayall 4-meter telescope (Mayall), located on Kitt Peak, Arizona.
- NOAO share in 3.5-meter WIYN (Wisconsin-Indiana-Yale-NOAO) Telescope, located on Kitt Peak, Arizona.
- NRAO Robert C. Byrd Green Bank Telescope (GBT), located in Green Bank, West Virginia.
- NRAO Very Long Baseline Array (VLBA), with 10 telescope locations including Saint Croix, Hawaii, and eight continental U.S. sites.
- NSO McMath-Pierce Solar Telescope (McMath-Pierce), located on Kitt Peak, Arizona.
- Approximately one half of the NSO Integrated Synoptic Program (NISP), with telescopes located at various sites including Kitt Peak and several other U.S. and international locations.

On a somewhat longer time scale, divestment-related recommendations included the following:

- Reconsider status of Arecibo for the time frame following the expiration of the current cooperative agreement, after Fiscal Year 2016.
- Reconsider the NOAO partnership in the SOAR (Southern Astrophysical Research) telescope at the time of expiration of the SOAR collaboration agreement in 2018.
- Divest the NSO Dunn Solar Telescope (DST), located on Sacramento Peak in New Mexico, in approximately 2017, two years before the Advanced Technology Solar Telescope (ATST) comes on line.

2. PARTNERSHIP PATHS UNDER DEVELOPMENT

This section discusses individual telescopes for which a proposed path forward has not matured. In some cases, we await specific individual milestones; in other cases, the PRC recommendations suggest action up to 2-3 years in the future rather than requiring action in the near term.

2.1 NOAO Mayall 4-meter Telescope

The Department of Energy (DOE) Office of High Energy Physics (HEP) informed NSF earlier in 2013 that the Mayall Telescope is the preferred host for their potential Dark Energy Spectroscopic Instrument (DESI) project. In the solicitation for management of NOAO ([NSF 13-582](#)), NSF stated that it potentially could provide bridge funding for the Mayall beyond the end of Fiscal Year 2015, until the start of a funded DESI survey in 2018. However, DESI was not included in the DOE budget request for Fiscal Year 2014, and DOE has informed NSF that they cannot yet confirm that the DESI survey will begin in Fiscal Year 2018. DESI is one of a number of proposed projects currently under consideration by the Particle Physics Project Prioritization Panel (P5), a subpanel of the High Energy Physics Advisory Panel

(HEPAP¹); delivery of the P5 report is expected in May 2014.

Given the longer gap in Mayall funding that is now possible, NSF and NOAO will embark on a process of finding partners who are interested in conducting scientific investigations with the Mayall. If the P5 report gives a high priority to DESI, and DOE is able to reflect that priority by moving toward a DESI start, this partnership opportunity will emphasize shorter term partnerships that may be up to several years in length. If the P5 report gives a relatively low priority to DESI, longer term partnerships for the Mayall may be feasible. In either case, successful partnerships could include modest NSF funding for open access to observing with the Mayall. Given the importance of receiving the P5 recommendation and then pursuing appropriate partnerships, the NSF plan is to defer any formal consideration of a proposed action for the Mayall until the second half of 2014.

2.2 NOAO Southern Astrophysical Research Telescope (SOAR)

NOAO is a 30% partner in SOAR. Given that the NOAO share is committed until 2018 by the SOAR collaboration agreement, and given that the PRC recommended revisiting the SOAR investment at that time, the reconsideration of the SOAR investment will begin in 2015 or 2016.

2.3 NOAO share in WIYN Observatory

NOAO is a 40% partner in the WIYN Observatory, whose costs are dominated by the 3.5-meter WIYN Telescope. NOAO has stated its intent to withdraw from the WIYN Consortium by early 2015; that consortium is actively seeking additional members. The WIYN Consortium (collectively) is responsible for eventual decommissioning of the telescope. Given the announced NOAO plan, the future viability for WIYN may depend on the accession of additional partners, or somewhat reduced operations may be feasible within the current partnership. For WIYN, NSF can wait until the second half of 2014 to define alternatives, with an expectation that the WIYN Consortium will inform NSF by the end of 2014 whether the continued operation of the 3.5-meter telescope is viable.

2.4 NSO Dunn Solar Telescope (DST)

The PRC recommended divestment for the DST two years prior to the completion of ATST construction and commissioning; that completion is scheduled for 2019, which would imply DST divestment in 2017. No decisions on the DST need to be made at this time, but study and consideration of a proposed action will likely begin in 2015.

2.5 NSO Integrated Synoptic Program (NISP)

NISP consists of two parts: the Global Oscillations Network Group (GONG) and the Synoptic Optical Long-term Investigations of the Sun (SOLIS). GONG is partly funded by the U.S. Air Force, while SOLIS is funded entirely by NSF. NSF is presently reviewing a renewal proposal for operation of the National Solar Observatory, which includes the managing organization's future vision for NISP. The path forward will be determined following the evaluation of the NSO renewal proposal.

2.6 NSO McMath-Pierce Telescope

Federal support for the McMath-Pierce Telescope is provided at a reduced level in 2014 to cover the costs of basic operations. A university consortium has proposed to continue to operate the McMath-Pierce at a modest cost, but not as a national facility. In this consortium scenario, NSF would provide transition funding to the consortium for several years, at a gradually decreasing level. If the consortium is unsuccessful in raising operations funding for the telescope, the future of McMath-Pierce will need to be re-evaluated near the end of 2015.

3. TELESCOPE FACILITIES READY FOR CONSIDERATION OF PROPOSED DIVESTMENT

This section discusses the telescope facilities that are viewed as being ready for formal consideration of divestment and related alternatives. We have reached the end of 2013, and the potential choices for these telescopes are defined well enough to permit consideration of specific options. Therefore, in order to be consistent with the recommendations of the Portfolio Review, NSF is preparing to take the next step in the evaluation process. That next step will be an environmental review undertaken by NSF for each facility pursuant to applicable federal environmental laws. These laws include, but are not limited to, the National Environmental Policy Act (NEPA), the National Historic Preservation Act (NHPA), and the Endangered Species Act (ESA), which require NSF to consider environmental impacts as part of its decision-making process.² The level of environmental review for each facility will be largely dependent upon the range and significance of anticipated impacts associated with the proposed action. NSF expects that for most, if not all, of the environmental reviews for the facilities discussed below, there will be a formal comment period and consultation process in which the public will be invited to participate.

3.1 Arecibo Observatory (Arecibo, Puerto Rico)

Arecibo Observatory is located on 120 acres of federal land in Puerto Rico. MPS/AST contributes less than 50% of the annual funding for Arecibo, and thus the continuation of Arecibo operations depends on the scientific interests of all the current partners. Expiration of the cooperative agreement for managing Arecibo is at the end of Fiscal Year 2016, and a decision concerning the steps beyond 2016 requires discussion and agreement among all the federal partners (MPS/AST, NSF Directorate for Geosciences, and NASA) before the end of 2014. Consideration of the potential environmental impacts associated with the various alternatives for the future of Arecibo must be part of those discussions. Because Arecibo is a facility of historical significance and is located in a tropical area with high biological diversity, the time frame for completing reviews under NEPA, NHPA, and ESA will likely take a year or longer, and thus these reviews should be started as soon as practicable in 2014. Among the alternatives NSF currently intends to evaluate in its environmental review of Arecibo are: (1) deconstruction and site restoration of the facility; (2) mothballing the facility; (3) continued operation of the facility as an education center; and (4) a no-action alternative, continuing operation of Arecibo.

3.2 NOAO 2.1-meter Telescope (Kitt Peak, Arizona)

The 2.1-meter telescope is located on land leased from the Tohono O'odham Nation on Kitt Peak, approximately 50 miles from Tucson, Arizona. At this juncture, NSF is in a position to evaluate four alternatives: (1) deconstruction of the telescope and restoration of the site associated with this telescope; (2) mothballing the telescope; (3) having the telescope operated by an entity other than NOAO; and (4) the no-action alternative of continuing to operate the telescope as a federally funded research facility.

3.3 NRAO Robert C. Byrd Green Bank Telescope (Green Bank, West Virginia)

Substantial discussions involving interested university partners are being carried out regarding the future operations of the Green Bank Telescope (GBT). The considerations at Green Bank include the future of the GBT as well as the other activities at the Green Bank site, which covers approximately 2,700 acres of federal land. Green Bank contains a number of potentially historic telescopes, most of which are no longer operating. The site is protected by the unique 13,000-square-mile National Radio Quiet Zone, which provides enhanced regulatory protection against radio interference. Alternatives to be considered in an environmental review include: (1) deconstruction and restoration of the entire site; (2) mothballing the GBT and any other operating telescopes, without restoring the site; (3) turning the facility into a science and education park, perhaps keeping one relatively small telescope operating for education purposes; (4) operating the facility under a different operations model with reduced scientific scope, in partnership with university and other partners; and (5) the no-action alternative of continuing to operate the GBT with full federal funding.

3.4 NRAO Very Long Baseline Array (10 individual antennas, located across the U.S.)

The VLBA is operated as a single telescope with 10 component antennas that are located in eight different states (Arizona, California, Hawaii, Iowa, New Hampshire, New Mexico, Texas, and Washington) as well as the U.S. Virgin Islands. These antennas are variously located on federal land owned by NSF, federal land owned by other agencies, and land leased from universities and related groups. Discussions with potential partners, inside and outside the federal government, are ongoing. However, given the VLBA location at 10 different sites, each with different potential impacts, it is prudent to begin an environmental review of this complex facility in the very near future in order to be prepared for future decisions. The alternatives to be considered include: (1) deconstruction and site restoration of all 10 antenna locations; (2) mothballing the entire facility; (3) deconstruction and site restoration of a subset of the 10 antennas; (4) mothballing of a subset of the 10 antennas; (5) deconstruction and site restoration of a subset of the 10 sites, and mothballing of the remaining sites; (6) operation of the facility by a new partnership consortium with a more limited science scope; or (7) the no-action alternative of continued federal operations. More discussion within NSF will need to take place to define the subset of the 10 antennas to be analyzed during the environmental review.

4. SUMMARY TABLE

For convenience, Table 4.1 below summarizes the status of the various telescopes recommended for divestment or divestment-related action, and the next steps envisioned by MPS/AST.

Table 4.1 Summary of Next Steps

<i>Telescope</i>	<i>Action</i>	<i>Reference</i>
Arecibo	Begin Environmental Review in early 2014	Section 3.1
NOAO 2.1-meter	Begin Environmental Review in early 2014	Section 3.2
Mayall 4m Telescope	Await DOE decision and intermediate partner discussions	Section 2.1
SOAR	Defer to 2015/2016	Section 2.2
WIYN	Await consortium partnership discussions	Section 2.3
GBT	Begin Environmental Review in early-mid 2014	Section 3.3
VLBA	Begin Environmental Review in early-mid 2014	Section 3.4
Dunn Solar Telescope	Defer to 2015	Section 2.4
NISP	Await evaluation of NSO renewal proposal	Section 2.5

Sincerely,

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¹ HEPAP reports jointly to the DOE and the NSF Division of Physics.

² An environmental review under NEPA, the NHPA, and the ESA will include an analysis of a broad range of environmental impacts, including impacts on such resources as air, water, soils, archaeological, historical and cultural resources, and viewsheds.