Minutes of the Meeting of the
Astronomy and Astrophysics Advisory Committee
10 June 2014
National Science Foundation, Arlington, VA, via Teleconference

Members attending:	Andreas Albrecht (Chair)	Angela Olinto
	William Cochran	Angela Speck
	Priscilla Cushman	Suzanne Staggs
	Craig Hogan	Paula Szkody
	Mordecai-Mark Mac Low (Vice Chair)	
Agency personnel:	James Ulvestad, NSF-AST	Patricia Knezek, NSF-AST
	Maria Womack, NSF-AST	Vladimir Papitashvili, NSF-OPP
	Elizabeth Pentecost, NSF-AST	Randy Phelps, NSF-OIIA
	Nigel Sharp, NSF-AST	Jean Cottam, NSF-PHY
	Joan Schmelz, NSF-AST	James Whitmore, NSF-PHY
	Diana Phan, NSF-AST	Pedro Marronetti, NSF-PHY
	Glen Langston, NSF-AST	Linda Sparke, NASA
	Richard Barvainis, NSF-AST	Hashima Hasan, NASA
	Daniel Evans, NSF-AST	Kathleen Turner, DOE
	Craig Foltz, NSF-AST	
Others:	Joel Parriott, AAS	Lauren Broccoli, Caltech
	Josh Shiode, AAS	M. Lystrup, Ball Aerospace
	Paul Schechter, MIT	Stephen Unwin, JPL
	Alina Kiessling, JPL	Jeffrey Mervis, *Science*
	Alexandra Witze, *Science News*	James Murday, USC
	Dan Shapero	Tali Bar-shalom, OMB

MEETING CONVENED 12:00 PM EDT, 10 June 2014

The Chair called the meeting to order. Introductions were done.

The minutes from the 3-4 February and 28 February meetings were approved by the Committee.

Elizabeth Pentecost, the AAAC Recording Secretary, reviewed the list of identified Conflicts of Interest (COIs) for the AAAC. There were no additional changes to the list.

Kathy Turner gave an update on DOE activities. Many projects started since 2006 are coming to completion. New investments are needed to continue US leadership in well-defined research areas. In the last few years the High Energy Physics budget as enabled new world-leading capabilities in the all three frontiers. This has been accomplished through a ramp-down of existing project operations and research. The impact of this has been workforce reductions at universities and laboratories. Program planning has been very difficult due to an unstable budget environment.

HEP was not able to start new Major Item of Equipment (MIE) projects in 2013, including the LSST camera or Belle-II. However, projects approved in the FY 2014 budget were the LSST camera, Belle-II, Muon g-2 and the project engineering and design and construction funds for the Muon to Electron conversion (m2e) experiment. The FY 2015 budget request ($744M) supports full operation of existing HEP facilities and experiments (LSST camera, Muon g-2, Belle-II, Mu2e), the MIE fabrication starts for ATLAS and CMS detector upgrades, continued design studies for LBNE, DM-G2, and DESI projects,

and an accelerator stewardship subprogram started in FY 2014. The HEP budget for the Cosmic Frontier for FY 2014 is $91.034M. The FY 2015 request is $93.673M.

HEP is actively engaged with the community in developing a new strategic plan through the Snowmass/P5 process. The P5 subpanel used the Snowmass process and other inputs to develop the strategic plan for the field within different funding scenarios. The P5 report was delivered and approved by HEPAP at their May 22-23 meeting. The report represents a consensus vision developed by the particle physics community to identify the most exciting and productive areas of research and how DOE can pursue them. The report recognized the reality of a challenging funding landscape, where choices have to be made and resources stewarded carefully. The plan included a well-balanced portfolio of small, medium, and large-scale projects for the future. DOE/HEP management will respond by developing and aligning the program along the P5 recommendations. This will take some time, with many discussions and presentations with partners and stakeholders such as DOE management, the science community, DOE laboratories, Congress, OMB, and other US and international agencies. HEP will use the P5 criteria to develop the program and determine which projects to invest in. One of the major recommendations of the P5 report was the support for DESI. A successful independent project review will be used to show that DESI is ready to receive funding if it becomes available. Completing LSST was also a major recommendation. HEP will use the recommendation for supporting CMB experiments as part of the core particle physical program. A coordinated HEP/NSF US portfolio for direct detection dark matter is being planned; the report will be used to highlight the importance of an expanded direct detection dark matter program and argue for additional funds.. The Cherenkov Telescope Array (CTA) has a broad science reach with direct importance to particle physics. The P5 report recommended investment in CTA as part of the small projects portfolio if the critical NSF Astronomy funding could be obtained. NSF_AST has said publicly that its budget is unable to accommodate the project as a strategic initiative, only a possibility in a mid-scale program. HEP does not plan to continue support of research or R&D efforts on CTA unless NSF moves forward on the project and requests a partnership with DOE, based on priorities, funding, etc.

Priscilla Cushman asked who in DOE would HEP ask for additional funding for some of these recommended projects. Turner replied that it would go through the various levels of approval within DOE, OMB, and Congress. Adjustments would be made to align projects with the P5 recommendations.

FY 2014 proposals have been processed. 129 proposals were received in all HEP subprograms and 60 proposals were funded, with a success rate of around 48%. About 43% of the proposals that were reviewed were from research groups that received DOE/HEP funding in FY 2013. In FY 2014, the DOE/Office of Science transitioned to full funding of multi-year grants and/or cooperative agreements received from academic institutions with total cost less than $1M (funds for the entire award have to be obligated at time of award). This requires university Early Career grants awarded this year to be fully funded from the FY 2014 budget, which translate to 5% success rate across the Office of Science.

During FY 2015, DOE/HEP will continue the large-scale comparative review of research proposals submitted by US academic institutions. This will be the fourth year of such reviews conducted within the HEP research program; HEP is currently preparing the FY 2015 funding opportunity announcement for the reviews.

James Ulvestad presented an update on AST activities. He started the presentation by discussing the AAAC's recommendations to the NSF. The Principles document will be used in negotiating future agreements; the process was discussed at the NSF Town Hall at the recent AAS meeting. Should the budget situation improve, AST will make more aggressive progress on the decal survey priorities. AST is pursuing divestments in the most expedient manner possible to enable decadal survey progress;

environment studies are expected to start soon. The agencies and the AAAC are working together to clarify and quantify questions related to individual investigator grants and mid-scale programs. NSF has tasked the CAA to conduct an O/IR System Study. The Committee is forming and will be chaired by Debra Elmegreen.

Ulvestad described the budget situation. The NSF FY 2014 appropriation was $7.172B. The budgets for MPS and AST are $1.3B and $239M, respectively. There is also $36.88M for DKIST and $27.5M for LSST. For the FY 2015 PBR, there is a significant ramp up of funding for LSST construction.

Ulvestad provided a status update on NSF's response to the Decadal Survey recommendations. LSST construction is expected to begin in July. The Mid-Scale Innovations Program (MSIP) proposals are under final evaluation. NSF and the community are participating in the TMT Board and science advisory committee via a planning award. The only opportunity at this time for the Cerenkov Telescope Array and CCAT is through the MSIP program. TCAN was the only one of the "small" recommendations AST was able to do (with NASA), and there were no funds available for other recommended increases.

A Dear Colleague Letter (DCL) for the Portfolio Review (PR) was released December 2013 and outlined the next steps for every telescope that was the subject of a divestment-related recommendation in the PR report. NSF will begin environmental review of alternatives for a number of telescopes, while consideration of some others await specific external milestones. NSF is aggressively pursuing partnerships with other entities and federal agencies. AST and its facility management organizations are aggressively exploring partnerships for facilities recommended for divestment. NSF is working with OSTP and the community to establish recommended guidelines that can facilitate partnership discussions; these guidelines also may be useful in applying the AAAC principles appropriately to future facilities.

NSF is actively working with DOE and NOAO on a strategy that would enable the Mayall 4m telescope to be made available for DESI. AST expects to issue another MSIP solicitation in either FY15-16 or FY16-17. CTA would be eligible to propose. NSF looks forward to discussions with DOE on future CMB research endeavors.

Many questions are being asked about various grants programs statistics, their impact on soft-money positions, money spent on students, multiple proposal submissions, etc. Gathering data is important for assessing possible future approaches related to community health and demographics. The AAAC recommended clarification and quantification of some of these issues, which is also of great interest to the AAS. In the grants programs, there were 758 projects received in 2013 (with a 15.4% success rate). The number of proposals received in FY 2014 decreased by ~3.5% and the AAG budget will likely decrease by a similar amount. Changes are needed to achieve the best review and reduce the workload. Under consideration (but not finalized), are reducing the frequency of AAG calls and restricting the number of proposals per investigator/institution. AST is also considering encouraging investigators to restrict themselves to 1 AAG proposal in FY 2015; the Division is looking at all options.

Jean Cottam of the NSF Physics Division presented an overview of AAAC-related programs in Physics Division. There are quite a few programs in the Physics Division that overlap and involve research of interest to the AAAC. The Physics Division works with both the DOE/HEP and the DOE Office of Nuclear Physics and within NSF works with AST and the Division of Polar Programs. Particle Astrophysics lies at the intersection of particle physics, astronomy and cosmology. The experimental Particle Astrophysics (PA) program supports university research in many areas of particle astrophysics, including the study of ultra-high energy particles from cosmic sources, experiments or R&D projects for underground facilities, and non-accelerator-based experiments studying the properties of neutrinos. Currently supported activities include: ultra-high energy cosmic-ray, gamma-ray and neutrino studies; the

study of solar, underground and reactor neutrino physics; neutrino mass measurements; searches for the direct and indirect detection of Dark Matter; searches for neutrino-less double beta decay; and studies of Cosmology and Dark Energy. The Theoretical Particle Astrophysics and Cosmology program supports proposals that primarily are involved with theoretical particle astrophysics and big-bang cosmology as well as more speculative string theory inspired cosmologies. The cosmology and astrophysics research supported by the program is usually associated with people with training in particle theory and encompasses dark matter, dark energy, high energy cosmic rays as well as exotic cosmologies arising from Brane-world and String Theory scenarios.

Programs supported in the Division include direct dark matter detection (SuperCDMS, Xenon, Lux); indirect dark matter detection (Veritas, Hawc, IceCube); cosmic ray gamma-ray and ultra-high energy neutrino observatories (IceCube, Veritas, Pierre Auger); dark energy (LSST); cosmic microwave background (South Pole Telescope, Act-Pol); neutrino properties (Daya Bay); and, solar neutrinos (Borexino, Halo). The theory program supports dark matter direct detection research, indirect detection, galactic structure, inflation, and CMB research.

The Gravitational Physics program supports research at the frontiers of science aimed towards answering questions about the nature of space and time, the gravitational attraction at atomically small and cosmological large distances and the use of gravitational waves to explore the universe. The Experimental Gravitational Physics program supports research that includes tests on the inverse distance square law of gravitational attraction, Lorentz invariance and Equivalence Principle as well as the direct detection of gravitational waves. This program oversees the management of the construction, commissioning, and operation of the Laser Interferometer Gravity Wave Observatory (LIGO), and provides support for LIGO users and other experimental investigations in gravitational physics and related areas. The Theoretical Gravitational Physics program supports research on classical and quantum gravity theory, including gravitational wave source simulations and other phenomena associated with strong field gravity and the interface between gravitation and quantum mechanics. The effort also includes a considerable number of interdisciplinary grants.

NSF and DOE are closely coordinating the review, selection and funding of the next generation of dark matter experiments and subsequent support for the experiments. The resulting program will be joint NSF/DOE portfolio of investments in the next generation of Dark Matter experiments. Selections will be announced shortly.

The Physics Division has started a mid-scale instrumentation fund. This is not a separate program to which investigators can apply directly. PIs request funding for specialized equipment as part of a regular proposal to a disciplinary program in the Division. The Program Officer can then request funds be provided through the Mid-Scale Instrumentation Fund. Resources from the Mid-Scale Instrumentation Fund can be used for off-the-shelf purchases or for construction of specialized equipment. Mid-Scale Instrumentation Fund resources are non-renewable and are intended to be one-time investments in the research project.

The Physics Division budget for FY 2014 is $266.3M. This budget includes funding for individual investigator grants, education and infrastructure, and facilities.

The P5 process and report are very important to the planning process in the Physics Division. The report recommendations represent critical input to the ongoing strategy for NSF investments, both for the short and long term. The P5 process and report are very important for articulating clear science drivers and for identifying experimental and theoretical opportunities. The Division will carefully consider the recommendations as part of its short term decision process and long term strategy.

Priscilla Cushman asked whether there is a policy at this time with respect to CTA. Cottam replied that the recommendation in the P5 report included DOE, NSF-Physics, and NSF-AST. All three to talk together about what the possibilities are; AST has indicated that the only option for CTA is through their mid-scale program. NSF-Physics would have to look at how they would be involved in such a project. NSF-Physics will engage with all participating partners in any of the programs recommended in the P5 report. Cottam noted that NSF-Physics wants to make sure that they are aligned with those offices in their planning process.

Mordecai-Mark MacLow commented that he was especially appreciative of NSF-Physics participating in the AAAC meeting and encourages their periodic updates in the future.

Linda Sparke (on behalf of Paul Hertz) presented an update on NASA activities. This remains a time of scientific opportunity for NASA Astrophysics. There has been significant progress on the four large programs recommended in the 2010 Decadal Survey. Pre-formulation and focused technology development for Widefield Infrared Survey Telescope/Astrophysics Focused Telescope Assets (FIRST/AFTA) is underway to enable a new start no earlier than FY 2017. The Division has been able to augment its Explorer program with additional funding. Strategic astrophysics investments are being made that include the LISA Pathfinder, plus partnering with the European Space Agency's (ESA's) L3 gravitational wave laboratory. There are investments being made in technology development for a space-based gravitational wave observatory and discussions with ESA on NASA participation in their L2 mission, an x-ray observatory. Focused technology development for a coronagraph on WFIRST is being done. There are three balloon-borne investigations of the cosmic microwave background underway and there was a small increase in the small research programs.

The JWST program remains on track for an October 2018 launch and on budget. All of the science instruments are installed into the ISIM for cryo-vacuum testing in June. The first two of five flight sunshields are being manufactured and the five engineering sunshields are being used for deployment testing. The spacecraft bus is under construction. Good progress continues on the telescope flight backplane testing and backplane pathfinder.

The FY 2014 appropriation supports pre-formulation of WFIRST/AFTA, including technology development for detectors and coronagraph. The FY 2015 budget request supports an Agency/Administration decision for formulation to begin no earlier than FY 2017, should funding be available. A recent NRC study on WFIRST/AFTA offers a positive view of WFIRST/AFTA with concerns about technology and cost risks. A new ROSES element was announced in April; proposals are due in July which will bridge the basic theory behind WFIRST/AFTA science and the observational modeling needed for the project.

SOFIA achieved full operational capability in February; it also began its Cycle 2 science observations. Six first-generation instruments have been commissioned. SOFIA formally entered operational phase in May. The second generation instruments are under development. However, SOFIA's high operating costs cannot be accommodated within the reduced FY 2015 Astrophysics budget request. The Administration's FY 2015 budget request proposes to place SOFIA into storage by FY 2015, so NASA and the DLR (German Aerospace Center) are analyzing several scenarios to establish SOFIA's path forward within the range of possible outcomes from the US budget process. The US appropriations process continues within the House and Senate.

Several other missions are moving forward. The Neutron Star Interior Composition Explorer (NICER) was confirmed in February. NASA delivered the Astro-H soft x-ray spectrometer to the Japan Space Agency in March. The Transiting Exoplanet Survey Satellite (TESS) is on track for confirmation in Fall

2014. An Explorer Announcement of Opportunity is planned for Fall 2014. NASA is supporting ESA's L2 x-ray observatory mission concept studies during 2014. The Astrophysics Division is consolidating its limited FY 2014 EPO activities at the Program level.

The number of proposals has doubled over the past ten years. The Astrophysics Research Program received twice as many proposals (~ 800) as in 2006 (~400). Funding for the Astrophysics ROSES program has risen 25% since 2006, but it has not doubled; the success rate has fallen. Total funding per successful proposal has been steady at $500k-$600K; this is an average over theory investigations, flight payloads, etc.

The Astrophysics Division conducted its Senior Review of operating missions. Both Hubble and Chandra were extended (they were reviewed separately from the other missions). Swift, NuSTAR, XMM-Newton, Fermi, and Kepler extensions were approved; NuSTAR received a new Guest Observer program and XMM-Newton's GO program was augmented. The Spitzer mission was not extended (insufficient funding; an appeal being considered). Suzaku (JAXA mission) extension was approved and an augmentation for Planck (ESA mission) was also approved. The MaxWISE data analysis proposal (data from the WISE mission; Planetary Division using the data for near asteroid tracking) was not approved.

The President's Budget Request for FY 2015 is $607M for Astrophysics and $645M for JWST; the House appropriations bill includes $680M for Astrophysics and $645M for JWST. Both the House and Senate have bills for more funding than the PBR. The House bill restores the $5M reduction in Hubble operations, rejects SOFIA termination and recommends $70M for support of fixed costs and a base level of science observations, and recommends $30M for EPO activities across the Science Mission Directorate. The Senate appropriations bill includes $708M for Astrophysics plus $42M for SMD education, and $645M for JWST. The bill also recommends $87M for SOFIA, and restores $23M for Hubble and recommends $56M for WFIRST. The Senate bill must be reconciled with the House version.

Activities planned for FY 2015 include experiments on the International Space Station, launch of the LISA Pathfinder, the completion of the WFIRST-AFTA science definition team report, a Senior Review of the Astrophysics Archives, an NRC mid-decade review, four balloon campaigns, and five sounding rocket launches.

The Committee spent considerable time discussing the next steps in providing demographic information to the committee by the agencies. Priscilla Cushman provided an outline of activities that would need to take place for the demographic studies. AAAC, AAS, and the Agencies plan to be involved in this activity. The need for such studies is based on the fact that the proposal numbers are increasing but success rates are declining among the agencies. Having a set of demographics to analyze and interpret would be beneficial in providing the agencies some alternative ways to mitigate the problem.

Joel Parriott commented that the AAS (Committee on Astronomy and Public Policy) has looked at the issue of declining success rates and the reasons behind it. He indicated that from an earlier AAAC meeting, Paul Hertz and Jim Ulvestad were willing to provide data they had but did not want anyone in the community or the AAAC taking that information without a well-defined purpose on what it would be used for. The AAS would help the agencies formulate the policy questions that needed to be answered and then go back to the agencies to see if they had the information. If policy needs to change it is better that any outcomes are through official channels. Any advice to the agencies would need to be done under FACA rules.

Andreas Albrecht commented that there is a perception that something is wrong and needs to be fixed, hence the agencies are making choices about what needs to be done. The community is confused about

what is happening at the agencies. There should be a sense of buy-in from the community and the AAAC can enable this and the agencies can make choices that make sense.

Cushman noted that this should be a data-driven model available for any decisions that are made by the individual agencies. Ulvestad commented that he saw no problem in the AAAC letting the agencies know what data are important for them to gather. Cushman would like to move more quickly than a statement in the next report. Parriott would also like to move quickly on this activity as well; the need is there now. Paula Szkody commented that if the AAAC had the data now, it would help the agencies in making their decisions. Ulvestad suggested that a small group of committee members be charged with assembling a set of questions that could be discussed with the AAS (who might have opinions on what are the important questions), come back to the AAAC at their November meeting with a proposal for the AAAC to discuss, and if the AAAC likes the proposal then the agencies can start working on it instead of waiting for the March report. Parriott suggested two persons from the AAS (Todd Hoeksema and James Loewenthal) and two AAAC members who could work on this. Cushman and Albrecht noted that Jim Buckley was interested in working on this activity. Parriott suggested reaching out to some of the other committees such as the Space Studies Board to make sure there was not any duplication of effort. Cushman agreed it would be good to report on any findings to the AAAC at the November meeting, and she will make contact with the AAS persons.

Maria Womack indicated that the next meetings are November 17-18, 2014 and January 28-29, 2015 at NSF.

The Committee selected February 27 as the meeting date to finalize the annual report submission; this will be a teleconference.

There are five AAAC members rotating off the committee, Andreas Albrecht, Stefi Baum, Richard Matzner, Geoff Marcy, and Mordecai-Mark MacLow. On behalf of the agencies, Ulvestad thanked the outgoing members for their service. The three agencies plus the Office of Science Technology Policy (OSTP) nominate their persons after discussion among themselves (making sure there is a good representation across disciplines); they send their nominees to NSF and the NSF Director makes the appointments. Ulvestad suggested that names for possible members be sent to him, Paul Hertz, and Kathy Turner by June 20.

MEETING ADJOURNED AT 3:35 PM EDT, 10 JUNE 2014