Minutes of the Meeting of the
Astronomy and Astrophysics Advisory Committee
1 June 2015 Teleconference
National Science Foundation, Arlington, VA

Members attending:	James Buckley	Angela Olinto (Vice-Chair)
	William Cochran	Angela Speck
	Priscilla Cushman (Chair)	Suzanne Staggs
	Craig Hogan	Paula Szkody
Agency personnel:	James Ulvestad, NSF-AST	Paul Hertz, NASA
	Patricia Knezek, NSF-AST	Dan Evans, NASA
	Elizabeth Pentecost, NSF-AST	Hashima Hasan, NASA
	Richard Barvainis, NSF-AST	Tom Greene, NASA
	Vernon Pankonin, NSF-AST	Jennifer Troxell, NASA
	James Neff, NSF-AST	Kathleen Turner, DOE
	Sara Dwyer, MPS OAD	Anwar Bhatti, DOE
	Randy Phelps, NSF-OIIA	Eric Linder, DOE
	Jean Cottam, NSF-PHY	Meredith Drosback, OSTP
	James Whitmore, NSF-PHY	
Others:	Monti DiBiasi, SWRI	Ben Kallen, Lewis-Burke
	Steve Unwin, JPL	Nick Saab, Lewis-Burke
	Roeland Van der Marel, STScI	Miriam Quintal, Lewis-Burke
	Nick Siegler, U Arizona	Marcia Rieke, U Arizona
	Dan Leone, Space News	Karin Hilser, USRA
	David Lang, NRC	Amaya Mori Morton, STScI
	Debra Elmegreen, Vassar College	Tricia Crumley, UTexas
	Paul Schechter, MIT	Daniel Peters

MEETING CONVENED 12:00 PM, 1 June 2015

The Chair called the meeting to order.

Priscilla Cushman, AAAC Chair, provided a brief summary of the 2015 Annual Report. There has been a general appreciation that the AAAC is dealing with the proposal pressure issue. The initial plan was to draft a set of questions for the AAS to use in preparing a survey to be developed and administered by the AIP. However, after reading Ted Von Hippel's paper entitled, *To Apply or Not to Apply: A Survey Analysis of Grant Writing Costs and Benefits* and talking with him, the plan has changed. He has joined the study group and the decision now is that a new survey is needed with a larger sample and different questions. Using Von Hippel's data, a short paper will be written augmented by a subset of the statistics being collected from the agencies. A much longer paper will be developed with more agency data and will include a new survey (spring 2016) for possible input into the mid-decadal process.

Paula Szkody asked how and where the short paper will be distributed. Cushman replied that the short paper will not be published; used internally by the Committee. The final report, however, will be published.

There is continued interest in the *Principles of Access*. Andreas Albrecht, past AAAC Chair, is on an international panel to discuss principles of access and has been able to use the document in these discussions; the *Principles* are a starting point for international discussions. The European Commission is

drafting their own document about access which will also be a part of the IAU discussions at the General Assembly meeting in August.

Kathy Turner provided an update on DOE activities. She reiterated that the Office of High Energy Physics (HEP) is implementing the strategy detailed in the May 2014 report of the Particle Physics Project Prioritization Panel (P5). The highest priority projects are the Large Hadron Collider (LHC) detector upgrades in the near-term and the Long Baseline Neutrino Facility (LBNF) in the mid-term. For the Cosmic Frontier, it is advancing the understanding of dark matter and dark energy. Construction and Major Items of Equipment (MIEs) support reflects the P5 priorities. Among them are LBNF, LHC, Muon g-2, LSST, DESI, SuperCDMS-SNOLab, and Mu2e.

The enacted FY 2015 budget for HEP is $766M. The Major Item of Equipment (MIE) projects (LZ, SuperCDMS-SNOLab, and DESI) were all approved as new project starts in FY 2015.

The FY 2016 President's Budget Request (PBR) for HEP ($788M) is up relative to FY2015, $44M over the FY 2015 request and $22M over the FY2015 enacted budget. If the request is passed, it would be slightly above the P5 scenario B which was flat for 3 years starting with the FY 2014 request and then increasing 3% per year.

The HEP Cosmic Frontier Research Thrusts continue to be dark energy, dark matter, cosmic-ray and gamma-ray research, and the Cosmic Microwave Background (CMB). Building DESI is a major step forward in dark energy science and the completion of LSST is essential to DOE's study of dark energy. DOE's investment in a dark matter direct detection program is significantly above that called for in a 2012 joint agency announcement of opportunity. DOE plans to seek a globally complementary program and increased international partnerships in third-generation dark matter direct detection experiments. The multidisciplinary nature of CMB science warrants continued multiagency support.

The community is starting to investigate other dark energy experiments/projects to complement the LSST era. HEP will start discussions with the community to coordinate R&D efforts for both dark energy and dark matter research, planning for future projects and how best to extract precision measurements in the coming year. The US community is planning participation in a European-led next generation gamma ray observatory. HEP, however, is not continuing support of research, planning, and R&D efforts on the Cherenkov Telescope Array (CTA). There is community planning for a CMB Stage IV experiment and HEP has started meeting with their laboratories to oversee coordination of efforts within the HEP program and plan for technical, and science studies.

James Buckley asked whether there are any trends in the balance between university program funds and the national labs; an issue maybe to be presented at a future meeting. Kathy Turner indicated that she can try and pull that information and present it as funding over a period of time.

Paul Hertz provided an update on NASA activities and included several science highlights in his presentation. The FY 2015 appropriation ($685M-Astrophysics and $645M-JWST) and FY 2016 PBR ($689M-Astrophysics, $620M-JWST) provides funding for NASA astrophysics to continue its programs, missions, and projects as planned. The total funding for Astrophysics including JWST is flat at ~$1.3B through FY 2020. The budget supports pre-formulation studies for WFIRST, the commitment of an October 2018 launch date for JWST, restores SOFIA to the budget with a reduction in FY15 and full funding beyond, and provides funding for SMD's education program. The operating missions continue to generate important and compelling science results, and new missions are under development for the future. An update to the Astrophysics Implementation Plan was released in December 2014 and progress is being made against recommendations of the 2010 Decadal Survey. A NRC Mid-Decade Review (with

NSF and DOE) will begin in mid-2015. NASA is identifying concept studies for the 2020 Decadal Survey.

In May, the House Appropriations Committee marked up the NASA FY16 budget request and sent it forward to the full House for consideration. The budget request follows the decadal survey, fully funds JWST, includes a coronagraph on WFIRST, takes SOFIA out of the Senior Review process until it meets the criteria for such a review, and reallocates education funds back to the divisions.

NASA just finished celebrating the Hubble's 25th anniversary and had a huge impact worldwide. There were many activities associated with the celebration including a symposium at STScI, the unveiling of the 25th anniversary image, an awards ceremony at the Air & Space Museum, and a family day and open house at the Udvar-Hazy Museum; there were about 25 Hubble astronauts attending and interacting with the public.

Hertz provided an update on JWST. All of the instruments were re-integrated into the Integrated Science Instrument Module (ISIM) after the planned cryo-vacuum rework was completed. The first pathfinder telescope cryo testing at JSC is underway. The flight backplane assembly was completed and the 1st flight sunshield layer was delivered. The 3rd and final cryo-vacuum test of the ISIM is scheduled for as well as delivery of the spacecraft bus for testing.

The final Science Definition Team (SDT) report for WFIRST/AFTA was delivered on January 31, 2015. NASA is working on plans that will support a decision for formulation to begin in FY 2017 should funding become available.

Funding for the research program has risen 25% since 2006, but it has not doubled, so 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 is preparing for the 2020 Decadal Survey. There are plans to study 3-4 mission concepts as candidate prioritized large missions. The initial short list includes a FAR IR Surveyor, a Habitable-Exoplanet imaging mission, an UV/Optical/IR Surveyor, and an X-ray Surveyor. There is community input and several workshops are planned to provide input into the process. Astrophysics is awaiting input from the various project advisory groups.

James Ulvestad provided an update on NSF activities. There have been several personnel changes in the Division. Since January six program officers have left AST, three rotators and three permanent staff. Personnel shortages are occurring during the midst of three major facility management competitions. Vacancies are being filled more slowly and this has made it more difficult to meet the Division's goal of acting on 75% of proposals within six months of the deadline. The Division is currently recruiting for seven positions including rotators and permanent staff.

LSST construction is in progress. There was a "first stone" ceremony in April. This was attended by the NSF Director, the President of Chile, and the US Ambassador to Chile. There has been tremendous progress on DKIST since site access was approved by the Hawai'i Department of Land and Natural Resources in late 2012. The project is on track for beginning operations in 2019. ALMA construction was officially completed in March. There were over 1600 proposals received for the Cycle 3 science call.

The approved budget plan for FY 2015 was the same as the FY 2015 budget estimates given in the FY 2016 request, and presented to the AAAC in January. LSST and DKIST construction are fully funded at the request levels of $79.64 million and $25.12 million, respectively. The AST increase relative to FY 2014 was 2.4% to $244.16M, compared to 2.7% overall for the NSF Research and Related Activities

(R&RA) account. Highlights for AST in FY 2015 are (1) the first year of DKIST operations ramp, increase in ALMA operations; (2) AST expects to hold AAG steady, or increase $1-2M from FY 2014; and (3) MSIP is being held relatively steady (down $1M from FY 2014, as planned).

The 2016 PBR for NSF is for an overall increase of 5.2%, with a 4.3% increase over FY 2015 in R&RA. MPS (+2.2%) and AST (+1.0%) do less well than other parts of NSF. LSST and DKIST construction continue to be funded fully, at $99.67 million and $20.00 million, respectively. The overall budget request is well above the discretionary spending levels set by the Budget Control Act ("sequestration"). For FY 2016, The House Appropriations Committee passed a bill that provides an increase of 0.7% in the NSF budget from FY 2015 compared to the President's request for a 5.2% increase. The Senate Appropriations Subcommittee overseeing NASA and NSF was provided a funding level 0.14% over the FY 2015 level. The overall House and Senate funding levels for non-defense discretionary spending are 7% lower than the PBR, and thus consistent with the Budget Control Act.

The Division is working to follow the recommendations of the 2010 Decadal Survey and the recommendations outlined in the AAAC annual report. AST funded two CMB polarization proposals in the first MSIP round; AST and DOE are talking but AST prefers to wait the results of the mid-decade review before making further decisions regarding CMB planning. AST is pursuing partnerships and plans to use the *Principles for Access* as a guide in discussions. AST continues vigorous activities toward divestment of facilities recommended by the Portfolio Review. Several success stories include the NN-EXPLORE project on the WIYN telescope, and DESI planned for the Mayall telescope.

Debra Elmegreen, Chair of the OIR System Study Committee, gave a presentation on the study recommendations. The committee was asked to recommend and prioritize adjustments to the US ground based OIR system in the era of LSST. The Committee considered the needs and strategies for several interrelated components of the system, existing and planned instrumentation, technology development, and data management. The Committee based its decisions on science drivers and considered community input (White papers, presentations).

There were 7 major recommendations from the report: (R1) the NSF should direct NOAO to administer a new telescope time exchange with participating observatories of the US OIR System. This would enable more decadal goals to be met by broadening the suite of capabilities available to US astronomers and fostering complementarity; (R2) the NSF should direct NOAO to administer an ongoing community-wide planning process to identify the critical OIR system capabilities needed in the near term to realize the decadal science priorities. NSF would then solicit, review, and select proposals to meet those capabilities within available funding; (R3) the NSF should support the development of a wide-field, highly multiplexed spectroscopic capability on a medium or large aperture telescope in the Southern hemisphere to enable a wide variety of science, including follow-up spectroscopy of LSST targets; (R4) the NSF should help to support the development of event brokers, which should use standard formats and protocols, to maximize LSST transient survey follow up work, work with its partners in Gemini to ensure that Gemini-South is well positioned for faint object spectroscopy early in the era of LSST, ensure that a fraction of the US OIR System observing time be allocated for rapid, faint transient observations, and direct its managing organizations to enhance coordination among the federal components of medium to large aperture telescopes in the Southern Hemisphere, to optimize LSST follow-up; (R5) the NSF should plan for an investment in one or both GSMTs in order to capitalize on these observatories' scientific capabilities for the broader astronomical community in the LSST era; (R6) the NSF should continue to invest in the development of critical instrument technologies, including adaptive/active optics and precision radial velocity measurements; and, (R7) the NSF should support a coordinated suite of schools, workshops, and training networks run by experts to train the future generation of astronomers and maintain instrumentation, software, and data analysis expertise.

The OIR Committee concluded that the NOAO could play a potentially beneficial role as a facilitator of discussions between the US OIR System and other countries' observatories in order to pursue possible international telescope time exchanges. Other countries have indicated their willingness to coordinate and collaborate. In some situations it could be easier for them to negotiate with a federal rather than a private entity.

James Ulvestad provided comments to the OIR study report presented by Debra Elmegreen. He thanked the Committee for its thoughtful work and guidance. Specific responses to the recommendations will be dependent on future budgets. Recommendations for a strong central community coordination role for NOAO are an appropriate role, and are under discussion with NOAO (R1-2). Augmentations to the NOAO budget and scope may be needed. A community working group is needed to define the highest priority science case and instrument requirements for a wide-field highly multiplexed spectroscopic capability (R3). AST is funding several projects along the lines outlined in Recommendation 4; the Zwicky Transient Facility through MSIP, and an INSPIRE grant to NOAO and the University of Arizona. The next generation instrument for Gemini (Gen 4#3) may meet the recommendation for faint object spectroscopy early in the era of LSST operations (R4b). AST is in discussions with NOAO and the Gemini partners in ensuring that OIR system time can be allocated for faint transient observations prioritized by LSST (R4). Follow-up studies should mean coordination for a range of studies not just transient sources. AST planning for an investment in one or both GSMTs would involve a significant amount of money, if it is desirable to invest in a GSMT first-light instrument, AST cannot afford to wait four years from now. This is a big issue and is being discussed in AST; there is no obvious solution (R5). A balance between MSIP and ATI is under active discussion (R6). Doing projects is the best way to maintain instrumentation expertise (R7).

Jim is interested in what the AAAC thinks about the study and its recommendations and how the Committee can inform the Division.

Paula Szkody noted that Ulvestad indicated it might be a huge problem for NOAO to coordinate the various observatories. Did he think NOAO might see this as less of a problem because of their experience with doing some of the coordination with TSIP? Ulvestad commented that TSIP was bilateral, people would propose for funding and if they got funded they had some amount of time available; one to one is simple, one to many is very different, and many to many is even more complicated. The Study Committee is suggesting that NOAO should coordinate a fairly large exchange system where a lot of telescopes put in what they are willing to offer and then that is prioritized through some system process, and then we barter out to a large number of constituents. For example, there may be offers from 10 telescopes, and how that will be prioritized for the community is a major issue; it is very different from having one instrument and ranking it against other instruments to find out which one is the best. Szkody noted it is a complicated problem but it is time to get started on trying to make it happen. Ulvestad commented that AST is discussing this with NOAO. Vernon Pankonin indicated that the first step would be some kind of "market research" that NOAO would have to carry out to see what the exchange might involve and the need for it.

Craig Hogan noted that there are some great ideas resulting from the study. One in particular, is the DESI/DECam swop (2023 timeframe). Is there a way to get this moving? Ulvestad commented that DESI needs to be funded and built first, but the community and NSF need to be thinking about it now and developing a plan for it over the next few years. James Buckley agreed that it needs to be done and advocates for a bigger MSIP program. Ulvestad commented that AST did request $5M more for MSIP in the FY16 PBR to tackle this issue, but when the funding envelope is flat, there is only so much AST can do. Buckley reiterated that the AAAC should continue to emphasize the importance of MSIP in their discussions and reports.

Marcia Rieke provided an update on the Mid-decade survey. The mid-decade review is mandated by law for NASA. It was recommended in *New Worlds, New Horizons*, and the AAAC annual reports, and was discussed at earlier CAA meetings. NSF, NASA, and DOE approached the NRC last Fall and was sent a draft charge by the agencies. The NRC wrote a proposal and sent it to the 3 agencies and funding was provided by the agencies to start the study. The committee's review would look at the most significant discoveries, technical advances, and relevant programmatic changes in astronomy and astrophysics over the years since the publication of the decadal survey, and assess how well the Agencies' program address the strategies, goals, and priorities outlined in the 2010 decadal survey and other relevant NRC reports, assess the progress toward realizing these strategies, goals, and priorities, and recommend any actions that could be taken to maximize the science return of the Agencies' programs. The review would not revisit or alter the recommendations of the 2010 decadal survey. The CAA has heard presentations from NASA, NSF, and DOE about their expectations for the mid-decadal review. The Chair-nominee has been identified and nominated; general membership search is underway. Some current CAA members will be members of the Mid-Decadal committee. There will be three meetings including a symposium. The NRC is aiming for a May 1, 2016 report release so that the recommendations can aid the agencies in their preparations for the FY 2018 budget.

Priscilla Cushman asked if there was any information the AAAC could provide that would be useful in evaluating how well the agencies are doing. Rieke replied that, for example in the case of how well NSF is doing, it might be useful to understand how much of the proposal pressure is being driven by a PI or group who are submitting multiple proposals to feel confident that they will be funded versus large numbers or different people proposing; the basic demographic information might be interesting to look at in terms on what advice to give NSF on the Astronomy and Astrophysics Grant (AAG) program. The AAAC providing a document in early Fall before the first in-person meeting of the committee would have the most effect.

The Committee selected the next set of meeting dates, January 28-29, 2016 (on-site) and February 25, 2016 (teleconference).

James Ulvestad commented on the process for appointing new members. There are 13 members and several members rotate out each year. The Agencies coordinate their nominee selections to make sure that all areas of science expertise (e.g., exoplanets, CMB, LSST/large data set science, relativity/gravitational wave) are covered as well as geographic, gender and ethnic diversity. Ulvestad asked the AAAC if they had any suggestions to let him know soon.

MEETING ADJOURNED AT 4:00 PM, 1 June 2015