Minutes of the Meeting of the
Astronomy and Astrophysics Advisory Committee
12-13 November 2015
National Science Foundation, Arlington, VA

Members attending:	James Buckley	Angela Olinto (Chair)
	Craig Hogan	William Smith
	David Hogg (Telecon)	Angela Speck
	Klaus Honscheid	Suzanne Staggs
	Buell Jannuzi (Telecon)	Jean Turner
	Rachel Mandelbaum	Martin White
Agency personnel:	James Ulvestad, NSF-AST	Gabe Perez-Giz, NSF-AAAS Fellow
	Chris Davis, NSF-AST	Randy Phelps, NSF-OIA
	Elizabeth Pentecost, NSF-AST	Brad Keister, NSF-PHY
	Diana Phan, NSF-AST	Vyacheslav Lukin, NSF-PHY
	Glen Langston, NSF-AST	Andrea Razzaghi, NASA
	Philip Puxley, NSF-AST	Daniel Evans, NASA
	Vernon Pankonin, NSF-AST	Rita Sambruna, NASA
	Harshal Gupta, NSF-AST	Michael Garcia, NASA
	Richard Barvainis, NSF-AST	James Siegrist, DOE
	Greg Mack, NSF-AST	Kathleen Turner, DOE
	James Neff, NSF-AST	Eric Linder, DOE
	Vern Pankonin, NSF-AST	Michael Cook, DOE
	Jessica Rosenberg, NSF-OD	
Others:	Joel Parriott, AAS	Karen Byrum, Argonne Nat'l Lab
	Ben Kallen, Lewis Burke	Marc Postman, STScI
	Miriam Quintal, Lewis-Burke	Mike Boylan-Kolchin, UMD
	Reba Bandyopadhyay, AAAS	Joseph Pesce, CTS Int'l
	Amaya Moro Martin, STSci	James Murday, USC
	Keivan Stassun, Vanderbilt/Fisk	Katie Daud, NAS
	Priscilla Cushman, U. of Minnesota	

MEETING CONVENED 9:00 AM, 12 November 2015

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

The minutes from the 1 June 2015 meeting 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.

The Committee scheduled the May/June 2016 meeting of the AAAC for June 6. This meeting will be a teleconference. The Fall 2016 meeting will be scheduled at the January meeting.

James Ulvestad presented an update on AST activities. Firstly, he provided a brief introduction about the AAAC, i.e., purpose of the Committee, membership, past actions such as task forces, etc. for the benefit of the new members of the Committee.

Ulvestad provided some science highlights. Construction of ALMA was officially completed in March 2015, with a total construction costs of $1.4B. ALMA is providing exciting results. ALMA has imaged the "Antennae" galaxies, which contains an intense source of millimeter radiation. The massive, dense, star-free cloud may be the first known example of a globular star cluster about to be born. The Gemini Planet Imager (GPI) has directly imaged and characterized the most solar system-like gas giant planet yet observed beyond our own sun's system. The Daniel K. Inouye Solar Telescope (DKIST) is being constructed on Maui with a total construction budget of $344M; it is scheduled for completion in 2019. The South Pole Telescope and BICEP3/Keck Array are two telescopes being operated in Antarctica to study the cosmic microwave background (CMB).

AST is in the Directorate for Mathematical and Physical Sciences, which has a ~$1.3B budget. AST is the lead organization for federally funded, ground based astronomy and astrophysics. Annual budgets this decade have ranged from $232M to $246M. Related research is supported in the Physics Division and the Directorate for Geosciences. AST has a staff of about 20 astronomers and 7 administrative support staff. Most of the scientists are permanent federal employees while a few are rotators. Roughly 60% of the AST budget is spent on operations of major national facilities, while the remaining 40% is spent on mid-scale projects and small individual investigator grants.

The President's Budget Request (PBR) for NSF in FY2016 is $7.7B, a 5.2% increase. Congressional action on discretionary budget levels relieves sequester caps for FY2016 and FY2017. The PBR for AST in FY2016 is $246.5M, a $2.4M increase over FY2015 and essentially equal to the AST budget in FY2010. There is also $120M in the Major Research and Equipment Facilities Construction (MREFC) line for DKIST and LSST. Appropriation bills are still needed.

NSF/AST and the NASA Astrophysics Division are discussing coordination issues for the research grants program. What information can and should be shared to facilitate reviews and reduce duplication of effort? Both agencies are discussing possible boundaries that will need to be set to implement any coordination activities.

With regards to the Decadal Survey, AST has successfully started the two highest priority large scale ground-based projects from *New Worlds, New Horizons*, LSST and the Mid-Scale Innovations Program (MSIP). Budget realities have prevented realization of most of the other recommendations that require additional funding. AST's response to *NWNH* was provided in a Dear Colleague letter released in March 2015. It includes the status of all major, actionable recommendations.

The Portfolio Review report recommended significant facility divestment to enable support of *NWNH* priorities. Process toward divestment has been slower than anticipated. NSF (through a contractor) is currently concluding engineering studies and baseline environmental surveys for a number of telescopes and observatories recommended for divestment. Results of these studies will inform more detailed assessments. Most divestments are not clean 100% divestments, but are evolutionary changes to new partnership arrangements. To date, most capabilities have remained available for science in some form.

NSF and DOE interagency activities include LSST, the Dark Energy Survey, the Dark Energy Spectroscopic Instrument, and collaborations with the Physics Division on the Large Hadron Collider, dark matter, Veritas, and HAWC. NSF and NASA interagency activities include the Exoplanet Observational Research Program (NN-EXPLORE), the Theoretical and Computational Astrophysics Network (TCAN), and the Planetary Radar on the Arecibo telescope.

James Buckley commented that the old projections for the shrinking budget wedge discussed in previous meetings looked bleaker than what AST has actually achieved; the 2015 budget for the individual research grants looks better and AST seems to be holding "its ground" better; Ulvestad agreed with

Buckley. Looking at the 2015 to 2016 budget request, the NOAO line is decreasing significantly because AST has pulled the 2.1 m telescope out of operation, there is a ramp down of Kitt Peak's other telescopes as general user facilities, and a ramp up of funding for the 4 m and the DESI instrument which will have significant funding from DOE in running the survey. AST has started to ramp down some of the older solar telescopes. What has not really been achieved is savings in radio astronomy, one reason being AST has been running management competitions along with divestment and they are intertwined in various ways. There are partner discussions concerning the Green Bank telescope and VLBA.

Ulvestad gave a joint presentation on the issue of sexual harassment at the request of the AAAC. The Committee asked for a presentation on the Agencies' policies and practices. All of the Agencies have policies and practices in place to deal with the issue of sexual harassment in the workplace. In general, federal funding awards are made to institutions, not to individuals. Specific harassment policies beyond the mandated terms and conditions of the awards, and enforcement of those policies for their employees, are the responsibility of the institutions receiving the awards. At federal centers, institutes, and observatories, adherence to sexual harassment laws and policies is the responsibility of the managing organization or the local center management. All three agencies have offices and departments that handle complaints.

Andrea Razzaghi presented the NASA update, including some programmatic and science highlights. NASA's Kepler satellite has found a dead star vaporizing a mini planet. Astronomers have detected the first planetary object transiting a white dwarf using data from the Kepler mission; slowly the object will disintegrate, leaving a dusting of metals on the surface of the star.

The FY2016 budget request provides funding for NASA astrophysics to continue its programs, missions, and projects as planned. The total funding is flat at ~$1.3B through FY2020. JWST is fully funded and remains on plan for an October 2018 launch. The budget funds pre-formulation and technology work leading toward WFIRST; the rate of progress depends on the FY2016 appropriation level. 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. The NRC mid-decade review is underway and a report is expected in May 2016. NASA is initiating large mission concept studies as input to the 2020 Decadal Survey.

Razzaghi provided an update on several flight missions. The LISA Pathfinder, an ESA mission with NASA collaboration, was shipped to the Guiana Space Port in French Guiana in October. Launch is scheduled for December 2. An extended mission is being discussed. The U.S. is providing instrument contributions to the JAXA Astro-H mission. All of the U.S. hardware has been integrated onto the spacecraft. Launch is expected in January 2016. The Astro-H mission will study the physics of cosmic sources via high resolution x-ray spectroscopy. CREAM (Cosmic Ray Energetics and Mass) is a suborbital class research project for flight operations on the International Space Station. Partners include the U.S. (various institutions) and South Korea. NICER (Neutron Star Interior Composition Explorer) will perform high-time-resolution and spectroscopic observations of neutron stars in the 2-12 keV energy range to study the physics of ultra-dense matter in the core of neutron stars. The project has now started final payload integration. TESS (Transiting Exoplanet Survey Satellite) is an all-sky photometric exoplanet mapping mission. A delta CDR is planned for December 2015 and a tentative launch readiness date is planned for June 2018.

Manufacturing is coming to an end for JWST. Two of the five sunshield layers are finished and three others are in fabrication. Many activities are in integration and testing. Commissioning planning is moving forward. FY2016 plans call for assembling the telescope, completing the ISIM testing and integration with the telescope, completing the sunshield membrane manufacturing, and the beginning of integration of the spacecraft bus components. Launch is still planned for October 2018.

Euclid, a visible and near-infrared telescope to explore cosmic evolution, is an ESA mission with NASA participation. It is currently in the implementation phase. There are ~50 U.S. scientists who are members of the Euclid Science Team that will analyze the data and make maps of the sky. NASA is involved in the development of the detectors and sensors. The Euclid Mission PDR was held in October and a NASA baseline review will be in January 2016.

Over the past two years, increased funding for WFIRST has enabled significant progress in technology maturation as well as additional fidelity in the design reference mission. WFIRST, with a 2.4m telescope and coronagraph, provides an exciting science program superior to that recommended by *NWNH,* and also advances exoplanet imaging technology. There is broad community support and significant international interest in WFIRST.

NASA Astrophysics is addressing all of the recommendations in the 2010 Decadal Survey and substantial progress is being made. JWST remains on schedule and within budget for a launch in October 2018. Pre-formulation for WFIRST using the Astrophysics Focused Telescope Assets (AFTA) is well underway. Explorer AOs are being issued every 2-3 years. Highly leveraged partnerships with ESA are advancing the science of LISA and IXO. Investments in technology, suborbital investigations, core research, and other Decadal Survey priorities are yielding science in this decade and preparing for the next decade. The Mid-term Review is underway. NASA is preparing for the next decadal survey by studying 3-4 mission concepts as candidate prioritized large missions. The Science and Technology Definition teams will be selected soon and NASA has plans for major community input on selecting the concepts for study.

James Buckley commented that it looked like NASA Astrophysics was moving toward large missions for the next decadal survey and he asked where NASA was thinking about smaller missions such as small probes. Razzaghi replied that discussions are ongoing in this area but are preliminary at this time; NASA is currently concentrating on the large mission concepts.

Craig Hogan asked about planning for the follow-on to the LISA mission; Europe is taking the lead on the mission and NASA is participating. He asked how NASA is going to participate going forward with gravitational waves in space. Razzaghi replied that NASA follows the recommendations of the decadal survey and are prioritizing their work that way. Michael Garcia indicated that NASA was in the process of forming a study team for this effort which will feed into the decadal survey recommendations.

William Smith commented that it would be good to hear what NASA's role might be during the operations phase of LSST, especially in relation to Near-Earth Objects (NEOs). Ulvestad indicated that NSF has been in discussions with NASA's Planetary Division on the issue of using LSST for detecting NEOs. There is a joint study between JPL and the LSST project regarding what capabilities LSST has for NEOs and how these might be optimized. For example, the study will establish the best cadence of observing for NEO detections. Right now the discussion is between LSST and NASA, but DOE has a huge stake in LSST so NSF has also been talking with HEP to make sure that some report does not come out and NSF and NASA change the cadence of LSST so that the dark energy experiments are delayed. There are ongoing discussions but the agencies probably need to wait until the joint JPL-LSST study comes out. Smith suggested scheduling a presentation from the JPL study group; Ulvestad agreed that it was a good idea.

Klaus Honscheid asked if there was an effort by the three agencies in coordinating the scientific infrastructure to maximize the benefits of LSST, WFIRST, and Euclid. Ulvestad replied that currently there is a three-agency group that is having discussions about the requirements of joint data analysis and the impact that might have on LSST, WFIRST, and Euclid. Kathy Turner indicated that the discussions are in the early stages; it is important to have the three agencies get together to look at any issues they

need to keep on top of. In the near term, the agencies are forming internal groups to look at what science and data needs are from other experiments and what kind of infrastructure they already have that could be used to lay out a baseline. Honscheid suggested that the agencies give a few slides on the overlap of these three missions and the role of the agencies in that overlap. Rachel Mandelbaum commented that she would like to see a little more on this topic since she is interested in the synergies among the three projects.

Kathy Turner gave an update on DOE activities. The U.S. High Energy Physics (HEP) program is following the strategic plan laid out by the High Energy Physics Advisory Panel (HEPAP)/P5 (Particle Physics Project Prioritization Panel) studies in developing and executing its program. HEP will use the P5 criteria to develop the program and determine which projects to invest in and at what level. The P5 report strategy has informed the HEP request in the FY2016 DOE budget. The Cosmic Frontier had high priority projects ready to go in the near term (DESI and DM-2) in response to P5 and have moved these to the development phase.

The FY 2015 HEP budget was approved at $766M. The Office of Science approved budget was $5,068M. The PBR for HEP for FY2016 is $788M, an increase of ~3%. The FY 2016 President's Budget Request is $115.9M for the Cosmic Frontier.

Through ground-based telescopes, space missions, and deep underground detectors, research at the cosmic frontier aims to explore dark energy and dark matter. Program thrusts include the study of the nature of dark energy, direct detection searches for dark matter particles, cosmic-ray and gamma-ray studies, CMB. Related efforts funded by other programs in HEP include computational cosmology, related theory, and detector development. Currently the Dark Energy program consists of the Dark Energy Survey (DES), LSST (camera), and DESI.

For dark matter detection, DOE and NSF announced in July 2014 a selection of DM-G2 experiments to move forward to the fabrication phase, ADMX-G2, LZ, SuperCDMS-SNOLab. DOE also funds experiments measuring properties of high energy cosmic rays and gamma rays. HEP efforts on CMB is taking place at the labs.

Since the P5 report, HEP laboratories are redirecting their programs to align with the P5 priorities. A Cosmic Visions group in Dark Matter, Dark Energy and CMB are planning to coordinate the HEP community to support R&D efforts. Community groups will collect and coordinate HEP community status and HEP funded efforts for research and development, planning, studies, and options for future datasets, experiments, and projects.

HEP supports teams and collaborations of scientists with the necessary expertise and responsibilities to take experiments through all phases, from R&D, fabrication, operations, and data analysis. Science planning is expected throughout all phases to end up with coordinated data analysis by a collaboration. Funding for theory, simulations, and computational efforts are in direct support of the experiments.

Craig Hogan asked if there has been any coordination between HEPAP and the next decadal survey. Turner replied that she does not think there has been any coordination and will bring this to the attention of the HEPAP Chair. The AAAC will have some input into the next decadal survey. HEP proactively works with the community in the planning process.

Bradley Keister provided an update on activities in the MPS Physics Division. The experimental Particle Physics Program supports university research that uses astrophysical sources and particle physics techniques to study fundamental physics, research that locates experiments in low background

environments, and research that utilizes the facilities of IceCube at the South Pole. Astrophysical sources of gamma-rays, cosmic-rays, and neutrinos; studies of solar, underground, and reactor neutrinos; neutrino mass measurements; searches for the direct detection of Dark Matter; and the study of ultra-high energy neutrinos and the properties of neutrinos with IceCube. 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. Understanding the quarks-to-cosmos connection has been a recent focus of the program as well as a better understanding of the implications of the fluctuation spectra of the cosmic microwave background. 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, and high energy cosmic rays, as well as exotic cosmologies arising from Brane-world and String Theory scenarios. Projects include SuperCDMS, ADMX-HF, Veritas, HAWC, IceCube, LSST, South Pole Telescope, Act-Pol, Daya Bay, and Borexino. The Theory Program includes dark matter detection experiments, studies of photons and positrons from dwarf galaxies, effects of cosmic variances on astrophysical indirect dark matter signals, dark matter galactic structure studies, non-Gaussian perturbations in inflation, and effects on CMB and large scale structure.

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. This includes tasks that range from instrument science, data analysis and detector characterization to source population calculations and the connection between the gravitational waves and the electromagnetic and neutrino signatures of astrophysical events. 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. This includes formulating new approaches for theoretical, computational, and experimental research that explore the fundamental laws of physics and the behavior of physical systems and, in some cases, interpreting the results of experiments. The effort also includes a considerable number of interdisciplinary grants.

The President's Budget Request for FY2016 for the Physics Division is $277.37M, a 2.38% increase from FY2015. The budget includes funding for Research, Education, and Facilities.

One of the most critical needs of research projects funded through the Physics Division is cutting-edge instrumentation that enables investigators to remain competitive in a rapidly-changing environment. The Physics Division has established a Mid-scale Instrumentation Fund. This is not a separate program to which investigators can apply directly. Rather, PIs request funding for specialized equipment as part of a regular proposal. The Program Officer then requests that funds be provided through the fund. The resources from the fund can be used for off-the-shelf purchases or for construction of specialized equipment. The funds are non-renewable and are intended to be one-time investments in the research project.

The Physics Division has partnerships with DOE (LHC and Dark Matter, NSCL-FRIB) and NIH through the Physics of Living Systems program.

James Ulvestad gave an update on the NSF OIR Systems Report that was delivered in April. The study was recommended by the AAAC in 2013. The Committee was chaired by Debra Elmegreen (Vassar College) under the auspices of the NRC Committee on Astronomy and Astrophysics. NSF's initial response to the report was provided in a Dear Colleague Letter issued in August 2015. The goals of the

OIR Study were two-fold: position the observational, instrumentation, data management, and support capabilities in U.S. OIR astronomy to best address the science frontiers and science goals as identified in *NWNH* in the era of LSST, and achieve the best science return from NSF investment in night-time OIR astronomy, including, but not limited to, the role of the OIR system in delivering LSST-related science. There were 7 major recommendations that NSF is in the processing of responding to. Discussions are underway with NOAO for their involvement in leading a community-wide planning process and facilitating a System organizing committee (R2). NSF wrote a letter to NOAO and LSST in August asking them to work jointly to develop specific requirements for wide-field spectroscopy capabilities. The Kavli Institute is supporting a workshop in February 2016 to move toward development of specific instrument requirements (R3). Active discussions between NOAO and LSST are underway regarding collaboration on an LSST operations proposal (R4). The Gemini Board and the Observatory are presently developing a strategic vision that will incorporate the changed landscape of OIR telescopes in the post-2020 time frame. Plans for an investment in one or both of the Giant Segmented Mirror Telescopes might include instrument proposals to MSIP (R6). The balance between the Mid-scale Innovations Program and other AST instrumentation programs is under active discussion (R6). Coordinated efforts in training the next generation instrumentalists and data analysts/scientists is being evaluated (R7).

Bill Smith asked whether AST had a vision of how MSIP evolves given that it appears several times in the OIR study report recommendations. Ulvestad replied that its evolution is budget dependent; if the division budget is reduced substantially in a given year, then the mid-scale program would be most at risk. After the first round of MSIP proposals, there were some complaints about the lack of "open access" (different from the TSIP model) proposals. In the 2015 solicitation, wording was added stating that AST would consider the possibility of having a separate review path for open access proposals because it is very hard to evaluate a project that is delivering a specific piece of science against one making a telescope available to the community for a wide variety of science when one does not know in advance what that science will be. AST is in the review process for the second round of MSIP; the MSIP program ground rules require the proposers to deliver something of community value, which could be data sets, telescope time, or student training.

Angela Olinto (for Jackie Hewitt, Chair Mid-Decade Review) gave an update on the activities of the *NWNH* Mid-Decade Assessment. The Committee was asked by the Agencies to: (1) describe the most significant scientific discoveries, technical advances, and relevant programmatic changes in astronomy and astrophysics over the years since the publication of the decadal survey; (2) assess how well the Agencies' programs address the strategies, goals, and priorities outlined in the 2010 decadal survey and other relevant NRC reports; (3) assess the progress toward realizing these strategies, goals, and priorities; and, (4) in the context of strategic advice provided for the Agencies' programs by Federal Advisory Committees, and in the context of mid-decade contingencies described in the decadal survey, recommend any actions that could be taken to maximize the science return of the Agencies' programs. The review would not revisit or alter the scientific priorities or mission recommendations provided in the decadal survey and related NRC reports but might provide guidance on implementation of the recommended science and activities portfolio and on other potential activities in preparation for the next decadal survey. The Committee met for the first time in October and plan two other meetings. The report is expected to be delivered to the NRC for review in March 2016 with a release in May. The Committee meetings have time set aside for public comment. There will be a splinter session at the January AAS meeting. The Committee is not asking for white papers or contributed talks. The current reality is very different from what *NWNH* assumed. Budgets available for *NWNH* activities are much lower than projected. There are many unresolved issues, some requiring detailed study. The Committee will have to select scope carefully, and recommend further study on some topics.

In the first meeting of the committee, the Mid-Decadal received a preliminary report on the proposal pressure issue and had the Principles document; all of the AAAC recommendations have been input to the

mid-decadal process. The Chair's suggestion is to at some point invite the mid-decade review panel to present its conclusions to the Committee.

The Committee briefly discussed the plans for the next day including feedback on the 2015 annual report, the draft report on proposal pressure, preparations for the 2016 annual report, and the election of a vice chair for the Committee.

MEETING ADJOURNED AT 4:30 PM, 12 NOVEMBER 2015
MEETING RECONVENED AT 9:00 AM, 13 NOVEMBER 2015

Jim Ulvestad indicated there had been some progress on the recommendations from the 2015 AAAC report. One of the recommendations was for the Agencies to start thinking about Stage 4 CMB experiments and how the agencies can work together on a strategy for them; the agencies are in discussions on what the next steps should be, i.e., technology development of hardware. DOE is looking at an opening for a Stage 4 CMB experiment in the 2019 timeframe. There needs to be some comment from the mid-decadal review on this issue. It might be that another CMB task force needs to be instituted to review and advise the AAAC and the Agencies on this issue. It is important to think about the timing of the task force because the mid-decadal report will not be released after the AAAC's next report, but it may be useful to mention it in the next report as a possibility. Right now there is no clear path to get from the Stage 3 experiments to the Stage 4 concept; what results are the agencies looking for to chart a path forward?

Klaus Honscheid noted that the CMB community is anxious to move forward with a Stage 4 set of experiments and he encourages the Agencies to think about this in a coherent way even though it is not the right time to select a mission. Ulvestad suggested that having some language in the annual report indicating the AAAC's views on the issue would be useful as a starting point for future discussions.

Bill Smith and the Chair suggested that Jim Ulvestad provide an update on the budget and divestment of facilities at the January meeting.

Priscilla Cushman, past AAAC Chair, provided an update on the AAAC Proposal Pressures Study Group activities. The purpose of the activity was to gather relevant proposal and demographic data from the Agencies and the community in order to understand how the funding environment over the last 10 years has affected researchers and projects. The group would then compare funding models across agencies and determine appropriate metrics for evaluating success. This would allow the group to provide data-driven projections of the impact of such trends in the future, as well as that of any proposed solutions. The group consisted of several AAAC members, AAS Committee on Astronomy and Public Policy members, NASA Advisory Council Astrophysics Subcommittee members, and several others. Many areas of scientific research are experiencing declining selection rates. The working group gathered relevant demographic data to understand how the funding environment over the last 10 years has affected researchers and projects, and then compared funding models across agencies to determine appropriate metrics for evaluating success. An interim report will help inform the mid-decadal committee on what has been learned so far, in time for their deliberations, provide the AAAC with a document that can be used in the drafting of the 2016 annual report, and inform the community in order to gather comments and advice.

Over the last decade proposal success rates in the fundamental sciences have dropped significantly. Astronomy and related fields funded by NASA and NSF are no exception. Data across agencies show that this is *not* principally the result of a decline in proposal merit (the proportion of proposals receiving high rankings is largely unchanged), nor of a shift in proposer demographics (seniority, gender, and

institutional affiliation have all remained unchanged), nor of an increase (beyond inflation) in the average requested funding per proposal, nor of an increase in the number of proposals per investigator in any one year. Rather, the statistics are consistent with a scenario in which agency budgets for competed research are flat or decreasing in inflation-adjusted dollars, the overall population of investigators has grown, and a larger proportion of these investigators are resubmitting meritorious but unfunded proposals, likely in response to the decreased success rates. The data clearly indicate that the number of proposals submitted to NASA and NSF for individual investigator and mid-scale grants in astronomy and astrophysics, planetary sciences, and heliophysics is increasing faster than the available funding, causing a corresponding drop in success rate. The data show that the PIs submitting these proposals have remained a stable demographic entity in terms of race, gender, number of years since PhD, type of institution, and number of proposals submitted per opportunity.

An average funding rate of ~6% in astronomy would represent an unsustainably low rate for the health of the field, and would fall far short of US aspirations for leadership, with a vibrant program that attracts the brightest young researchers. Yet, this is close to the effective funding rate for new investigators or investigators who have recently transitioned into unfunded status, even for an average success rate of 20%, and the current average is already below this in NSF/AST and in NASA Heliophysics. Such a low success rate costs the field an immense amount of scientifically productive time and pushes investigators away from grant-supported research. The nation's investment in missions and state-of-the-art facilities is founded on the belief that these facilities will lead to scientists producing great science with them. The agencies should strive for a funding success rate that prevents proposal writing costs from overtaking scientific productivity, and that encourages new researchers to pursue original, potentially transformative ideas.

The working group would like to continue to work with the AAAC to produce the best data for the 2016 annual report. In parallel, the group is committed to a new survey with higher statistical samples. They would continue to refine and analyze the data from the Agencies, addressing very specific questions. There is a lot more data and information not in the draft report that could be included. The working group would need several AAAC members added to their group with a designated point person. The working group felt that a conclusive study could be completed by March 2016 and that a finite set of focused questions is needed which would lead to a useful study by the end of 2016.

The Chair suggested that the AAAC take the information in the draft report and write some conclusions in the 2016 annual report separate from the working group report. This will be important for the next decadal survey and for the next steps being taken by the AAS and the APS (e.g., a focused survey to the community). Martin White, Bill Smith, Jim Buckley, the Chair, and Dan Evans (representing the Agencies) volunteered to interface with this issue within the Committee to study and digest what the working group has already written, make sure that the AAAC focuses on the relevant issues, and produces something that is final from the AAAC that does not interfere with the charge for the AAAC.

The Committee spent time discussing the annual report that is due on March 15, 2016. The Chair made writing assignments for the different sections of the report. There will be further discussion of the annual report at the January meeting.

The Committee discussed the election of a Vice Chair and selected Bill Smith for 2015-16 without the expectation that he would move into the Chair position in 2016-17. The Chair proposed that the selection of a new Chair for 2016-17 be postponed until the June meeting when a new Chair would be elected. The Committee agreed with this suggestion.

MEETING ADJOURNED AT 12:00 PM, 13 NOVEMBER 2015