Minutes of the Meeting of the
Astronomy and Astrophysics Advisory Committee
30 November – 1 December 2012
National Science Foundation, Arlington, VA

Members attending:	Andreas Albrecht (Vice Chair, telecon)	Martha Haynes (Chair)
	Stefi Baum	Mordecai-Mark Mac Low
	William Cochran	Geoffrey Marcy
	Priscilla Cushman	Richard Matzner
	Debra Elmegreen	Paula Szkody
	Joshua Frieman	Paul Vanden Bout
Agency personnel:	James Ulvestad, NSF-AST	Joan Centrella, NASA
	Thomas Statler, NSF-AST	Hashima Hasan, NASA
	Elizabeth Pentecost, NSF-AST	Leonard Dudzinski, NASA
	Nigel Sharp, NSF-AST	Andrea Razzaghi, NASA
	Jeff Pier, NSF-AST	Eric Smith, NASA
	Maria Womack, NSF-AST	Neil Gehrels, NASA
	Ed Ajhar, NSF-AST	Gary Blackwood, NASA/JPL
	Vladimir Papitashvili, NSF-OPP	James Siegrist, DOE
	Randy Phelps, NSF-OIA	Kathleen Turner, DOE
	Jean Cottam, NSF-PHY	Michael Salamon, DOE
	James Whitmore, NSF-PHY	Rebecca Onuschak, DOE
	Paul Hertz, NASA	
Others:	Kaitlin Chell, Caltech	David Spergel, Princeton Univ.
	Lewis Groswald, NRC	Yudhijit Bhattacharjee, Science
	Neill Reid, STScI	Dennis Ebbits, Ball Aerospace
	Miriam Quintal, Lewis-Burke	David Lang, NAS/BPA
	Bethany Johns, AAS	Mangala Sharma, AAAS/DOS

MEETING CONVENED 9:00 AM EST, 30 NOVEMBER 2012

The Chair called the meeting to order.

The minutes from the 11 May 2012 meeting and the 25 September 2012 teleconference were approved by the Committee.

Elizabeth Pentecost, the AAAC Recording Secretary, reviewed the list of identified Conflicts of Interest (COIs) for the AAAC. The list will be distributed again before the February 12-13, 2013 meeting.

Kathy Turner gave an update on DOE activities. The High Energy Physics program's mission is to understand how the universe works at its most fundamental level. To enable discoveries, HEP supports theoretical and experimental research in both elementary particle physics and fundamental accelerator science and technology. Progress in achieving the mission goals requires advancements at the Energy, Intensity, and Cosmic Frontiers. The DOE Office of Science is a science mission agency. The budget for High Energy Astrophysics is up slightly from FY2012, ~$127.5M. However, the lack of new facilities for science threatens the future of the program.

DOE needs to fully exploit the current research efforts but it also needs to develop new facilities and experiments to maintain a healthy and leadership program. Research funding will decrease ~2% a year for the next several years to increase the fraction of the HEP budget for new projects. It is important that there is a balanced program with staged implementation and science. DOE receives program guidance from external FACA panels such as HEPAP and the AAAC. The American Physical Society Division of Particles and Fields (DPF) has started a community-led science planning process to help develop science plans for all of the Frontiers in the next year. There will be a "Snowmass" study meeting next summer.

Currently the Dark Energy program consists of BOSS, DES, and the supernova surveys. There is some science effort on WFIRST and Euclid but no plan for participation in the projects. LSST is the priority for the next HEP dark energy project to be developed. NSF is the lead agency responsible for the telescope and data management; DOE is responsible for the camera. There is good coordination among the two agencies.

The science case for an HEP dark energy program was developed by a task force at HEP's request. The task force's report identified key missing components and opportunities for expanding the program that would include advanced wide-field spectroscopic capabilities. A balanced, staged program of dark matter experiments with multiple technologies in the near term is being coordinated with the NSF's Physics Division. DOE HEP is also involved in high energy cosmic-ray and gamma-ray experiments such as Pierre Auger, VERITAS, Fermi, and HAWC.

The Cosmic Frontier experimental program budget is up slightly in the FY2013 request. The High Energy Physics community is conducting a long term planning exercise which includes workshops over the next year.

Vanden Bout made a comment about a list of projects that are interagency and that focus on the main aspect of the charge to the committee. He asked whether the list had been generated. Haynes replied that the committee informally generated a list but it was not formally written down in any document. She suggested that the Committee make a list of projects that would be made available to the committee and periodically updated.

Baum asked about the funding that is given through the DOE labs that fund the broader research community. She noticed that the DOE Office of Science did not award graduate fellowships this year. How does DOE address the balance of funding for the DOE labs with the research grants or fellowships? Turner replied that she was not aware of the fellowships. In each of the programs there is a balance between the universities and lab research programs and it is not the same balance in each of the Frontiers; the funding going to the universities goes through the review process.

Frieman commented that there are projects where all of the agencies come together and that is the relationship in ground-based surveys such as LSST which involve investment by NSF and DOE and space-based missions such as Euclid which now has NASA participation. There have been issues of data rights and participation which should be of interest to the Committee and the three agencies. He asked whether there have been discussions about these issues. Turner replied that there have been some starting discussions. Haynes commented that it is an important issue, and to get the science done, both ground-based and space-based photometric an spectroscopic data will need to be taken. How all that will shake out is of great interest to the committee. A particular issue is that Euclid is a European-led mission and WFIRST is a US-led mission. The US community is eager to see that the system works; it's important for science and leadership in areas of science.

Paul Hertz commented that the agencies would be interested in hearing the committee state what they think are the required metrics for a successful partnership; providing such advice is a good role for the committee. The committee should not be telling the agencies how to do it but helping them understand the definition of success.

Cushman asked how the relative funding profile is decided for dark energy and dark matter. Is there overall guidance in each of the areas or is it a bottom-up process? Turner replied that a lot is bottoms up but there is a concerted effort to take the research funding and start nudging it upwards. The size we have now is based on the requests. The dark energy projects tend to be larger and the dark energy community at the universities is smaller than the dark matter equivalents. There have not been large dark matter experiments at the labs now but there may be in the future.

Szkody asked what the current selection rate is given that the number of grants will be decreasing. Turner replied that it is not just the grants, it's the research funding at both the labs and the universities. The sum is going down 2% for the whole high energy physics program.

Nigel Sharp and Kathy Turner provided an update on the Large Synoptic Survey Telescope (LSST) project. There have been extensive reviews of the project. NSF and DOE signed a MOU in July outlining the responsibilities of both agencies. NSF and DOE were instructed to align their annual funding profiles and this was done after a succession of additional reviews recommended by the MREFC Panel. NSF went before the National Science Board in July to ask them to authorize the NSF Director to include LSST in a future budget request. Total construction project cost is estimated to be $665M over 7 years, 3 months, including $160M for the DOE camera, and followed by 10 years of operations. This action was approved by the NSB. It will not be known until February 2014 whether or not LSST was put into the President's FY14 budget request.

The final optical polishing has commenced on the M1/M3 mirror. Final acceptance testing is scheduled for late 2013. This work was enabled by private funds. A vendor has been selected for the secondary mirror optical fabrication. All environmental permits have been approved and there has been a program to protect threatened species in the area around the site. LSST's data policies are still in development.

There is a current estimate of ~$37M for annual operating costs (~$19M-NSF and ~$9M-DOE), with the remaining $9M covered by international partners. The camera is a DOE deliverable; the DOE is delivering a certain scope and not a certain budget. Coordination is going well and both agencies are working well together.

Baum commented about partnerships and redistribution rights and asked what Sharp meant by redistribution rights. Sharp replied that redistribution rights meant that "if you get access to the data it will be for science research and does not give you the right to ship it to someone else…we are still working on this." Baum hinted that it should not be made too complicated. Baum went on to ask whether there is a special proprietary access for people who are private partners who are members of the LSST Board. Sharp replied that the LSST Consortium has rights and some of those members are non-US. Once the data are taken then the members have equal access.

Vanden Bout commented that the policy of open skies, however it turns out, will be a compromise. It might be an opportunity for the other facilities to jettison the "open skies" policy. Ulvestad commented that in his opinion, "open skies" is very much eroding. It comes from the

fact that there are funding constraints and the partners want something that is guaranteed for their money. Gemini is not open skies; the VLBA has some dedicated amount of time allocated to o the Navy for which they pay, and the time when the Dark Energy Survey is being done from the Blanco telescope is no longer open skies although the process that was taken to get to the 100 nights a year was very much a merit review process. The Portfolio Review report made some comments on open skies but they support it on a reciprocated basis. What replaces it is unknown.

Szkody commented that the LSST is unique because the short term access is very different from the long term access. People using satellite data can usually wait two years or so to access that data but with LSST, there will be immediate follow-up and this needs to be addressed.

Leonard Dudzinski (NASA) and Rebecca Onushak (DOE) provided a status of the Plutonium-238 (^{238}Pu) for solar system exploration issue. Dudzinski is the program executive responsible for ensuring a supply of ^{238}Pu for NASA missions and Onuschak is the DOE federal program director for ^{238}Pu production. It has been over 50 years since the first radioisotope mission. The goal of the program is ensure the availability of power for the exploration of the solar systems in environments where conventional solar or chemical power generation is impractical or impossible. The targeted mission sets are in the NASA Flagship, New Frontiers, Mars, and Discovery programs. As reported by the National Research Council, ^{238}Pu is essential for space exploration. The NASA Authorization Act of 2010 authorized NASA to fund DOE efforts in ^{238}Pu production under a reimbursable agreement. DOE has begun a multi-phase ^{238}Pu supply project. Phase I efforts are to be completed by December 2012 with technology demonstration efforts achieved by the end of 2013. DOE's goal is to achieve 1.5kg/yr production capability by 2018. The Oak Ridge National Laboratory (ORNL) has begun technology demonstrations to develop a capability to make ^{238}Pu. It is anticipated that production can be restarted without building new facilities. The first step in the effort is to review past NEPA activities to ensure the current approach remains the best approach and to demonstrate key technologies that may need to be re-established and/or adjusted for the current approach. Shipment of the first ^{238}Pu sample material to the Los Alamos National Laboratory (LANL) is planned for Fall 2014 with a ramp-up to full production in Fall 2016. DOE and NASA are moving forward with a realistic, low-risk plan to address this critical supply issue.

Cushman asked if there were any roadblocks that could derail the project. Dudzinski replied that it could certainly be derailed by a lack of funding by Congress or a lack of an agreement by NASA to fund it entirely by itself and without any shared funding from DOE or other agencies. It could also be derailed by other agencies that might need the plutonium themselves. NASA is funding for a capacity that they feel they really need, but another agency might come along and need the material, therefore, NASA might have to increase production which would require more funding. The risk is that if other users need a significant percentage of what NASA is acquiring for its needs, then it will require stepping up the production capabilities. Onushak noted that DOE is planning for this. DOE has historically worked with both NASA and national security users. There are other inventories set aside in case there are other users; that is why they are studying whether there is a growth potential in the production rate.

MacLow asked what was the current status of the Advanced Stirling Radioisotope Generators (ASRGs). Dudzinski replied that the ASRGs are currently on track to have two flight units delivered to the Idaho National Laboratory by October 2016. They are continuing with development they committed to even though they were not selected for the Discovery mission and they are trying to maintain a development pace even though they do not have a mission. The units could be fueled and flown as early as spring 2017. MacLow further asked how much plutonium does an ASRG require? An ASRG requires .88kg per unit of ^{238}Pu, which is pure

plutonium not plutonium oxide. The ASRGs were not a factor in the review of the two proposals that were evaluated for selection for a Discovery mission. NASA is planning for scalability and robustness as missions evolve.

James Ulvestad presented an update on AST activities. He first provided a short primer on the AST budget. He showed a pie chart dividing the budget into facilities, grants program, ATI, mid-scale, etc. Roughly 55-60% of the budget is for the major facilities and 40-45% into the grants programs, mid-scale, etc. There are 2 major facilities that AST is committed to funding based on previous decadal surveys that are important to the community, ALMA and ATST. Each of those is slated to grow $15-20M over the next decade. The budget has shrunk over the past two years and will probably continue to shrink. The Portfolio Review (PR) recommended that AST keep the same balance as it has now, with the overall budget shrinking in purchasing power, but that means that the budget for individual program categories will have to shrink.

Ulvestad provided some programmatic updates for on the Atacama Large Millimeter-submillimeter Array (ALMA) project. There are 64 antennas in Chile with 57 accepted; the last North American antenna was accepted in September. The first science observations started on September 30; 112 projects were selected from over 900 proposals. There were 1133 proposals submitted for Cycle 1 with 196 projects being selected. The inauguration is scheduled for March 2013. The Dark Energy Survey (DES) is progressing. First light images from the Dark Energy Camera (DECam) were taken in September. The Advanced Technology Solar Telescope (ATST) is still awaiting resolution of the appeal of the construction permit. A FY2014 start for LSST is still possible. ATST had its Conservation District Use Permit reaffirmed by the Hawai'i Board on Land and Natural Resources and an injunction was denied by the courts; excavation has started. There are on-going discussions with DOE regarding their Mid-scale Dark-Energy Spectroscopic Instrument (MS-DESI).

There are various budget constraints on the Decadal Survey recommendations. The National Science Board (NSB) approved the NSF Director to include funding for LSST construction in a future budget request. Assuming an FY2014 start, the survey could start in late CY 2021. The ability to issue a solicitation for a midscale program will depend on a FY 2013 budget authorization and appropriation and FY2014 budget request. Success rates for the research grants and ATI grants are expected to go lower in FY2013.

The Division is moving toward making an award in response to the GSMT solicitation. AST will participate in the TMT Collaborative Board. At the recent Gemini Board meeting, all of the parties except Australia expressed their wishes to remain in the partnership post 2015; Australia could not commit funding past 2015 but wished to purchase time on an annual basis. A new international agreement is under development.

The Portfolio Review (PR) report was released in August. There were generally positive statements from the community. An AST response document was issued in late August. The Division cannot publish a detailed implementation plan because of the many stakeholders and the nature of the budget preparation process; discussions within NSF will lead to future Presidential budget requests, which are subject to action by Congress. AST is proceeding to gather additional information about divestment options and opportunities for the facilities. NSF must decide on the nature of any divestments by the end of CY2013 in order to realize significant savings by FY2017.

Competition planning and activities are underway for management and operation of NRAO/ALMA, NOAO, and Gemini, all to be completed in 2015. Solicitations in spring and summer 2013 are expected.

Vanden Bout commented that the flip side of not having enough money is that too many people are asking for money. The decadal survey talked about it briefly; it's the unmentionable problem. He also made a comment that in his opinion, the National Science Board has a policy that cannot work except in a rapidly expanding budget scene; anything built in the MREFC line has to be operated out of the division budget; if that is done in a static budget scene, it cannot work. Looking to the future, the facilities worth building are of such a size that the operations budget will exceed anything that will be cobbled up by closing everything already operated. What you can sell is new construction projects. Ulvestad replied that since coming to NSF, he has been advocating that the MREFC line include some component of funding for divestment and/or operations. He doesn't know that anyone can convince the higher levels of government to do something about it. A reminder is that over the past thirty years, AST has funded around 100-120 research grants a year but the number of proposals has gone from 250 to 750, with a success rate of 40% down to 15%. He mentioned that at a recent Department Chairs meeting, some astronomy departments indicated that they are now admitting a smaller number of graduate students than they have been admitting over the past 15-20 years because budgets are shrinking and they don't see what their future career paths will be. Elmegreen commented that departments are recognizing that students want to go on in their astronomy training but do not want faculty positions so a PhD is not needed. Some departments are starting to develop professional Masters program to satisfy those people.

Haynes asked that in tomorrow's session, Ulvestad explain in more detail what he meant by "Divestment." In particular, she noted that there is some confusion in the community over the time scale for the implementation of the Portfolio Review. There is interest by the Committee on how the Portfolio Review interacts with interagency collaborations and how mechanisms are in place to have that all work out in a logical way. A second question concerns the impact of schedule slip on ATST; what is being done to deal with that slippage, how does Geosciences folds into ATST and are other agencies interested in ATST? A third question deals with the OIR system. What is the OIR system of the future? Does AST have a plan? The Agencies want to do science and how the OIR system is parsed out has a huge impact on our ability in this country to do science.

Vladimir Papatashvili provided a report on the astronomy and astrophysics program in the Antarctic. There are several ongoing programs, namely, IceCube, the South Pole Telescope, BiCEP, HEAT at Ridge A, and the long duration balloons. IceCube is a partnership between OPP and MPS-PHY with international partners. Operations and scientific research are fully underway. The South Pole Telescope (SPT) has discovered over 500 massive galaxy clusters in the distant early universe and has now switched to CMB polarization measurements searching for gravitational waves and understanding gravitational lensing. BiCEP-2 is finishing a three-round observing year. HEAT is a THz robotic telescope at the Dome A summit site; winter observations are ongoing. This is a collaboration between the US and Australia. Support for HEAT is through FY2014. NASA and NSF have partnered since 1990 on the long duration balloon program. There have been forty-seven flights with many pioneering astrophysics and space physics payloads. The agreement between NSF and NASA runs through March 2014.

Paul Hertz presented an update on NASA activities. He first began by providing some science highlights. NuSTAR was launched in June. The post-launch assessment review for NuSTAR was completed in July. There were some early problems with the instrument calibration,

however, the early pointing and alignment issues have now been resolved. NuSTAR is working with other missions such as Chandra, XMM-Newton, Swift, Suzaku, and INTEGRAL for coordinated observations. The first paper has been submitted to *Nature*. NASA accepted the proposal to upgrade the High-resolution Airborne Wideband Camera on SOFIA. Thirty-seven science investigations were selected for SOFIA Cycle-1. During the downtime for SOFIA, the cockpit avionics were upgraded, the telescope mirrors were water washed, a mirror coating facility was installed at Dryden, the observatory systems were upgraded, and ground-based verification and validation (V&V) was conducted on the upgraded observatory. In-flight V&V tests are scheduled for December. The first science flight is scheduled for the second week in January 2013. An upgraded focal plane imager delivered by the Germans will be installed in early 2013. Planning is being done for required heavy maintenance of both the aircraft platform and telescope assembly in 2014 as well as planning for SOFIA's transition to full operations. Proposals were received in August for the NASA-selected members of the Euclid science team consortium and the Euclid consortium board; selection of members is in process. A MOU between NASA and ESA is in the concurrence cycle and is expected to be signed in December. A termination letter was sent in September to NASA/GSFC for the GEMS project. A closeout plan is being reviewed and processed. Closeout should be completed in December. A re-packaged balloon-borne cosmic-ray instrument, CREAM, will be launched by Space-X in 2014 for deployment on the International Space Station.

The FY2013 budget request does not support an Announcement of Opportunity (AO) for both Explorer missions and missions of opportunity in late 2012. The first priority is to complete Explorers in development. The second priority is to downselect and fund the development of one mission and one mission of opportunity from the projects currently in the Phase A studies. The third priority is to issue new AOs leading to the development of additional missions. The Decadal Survey recommended that NASA support the selection of Midex and SMEX missions, and missions of opportunity. The Astrophysics Division is planning a series of AOs for these missions.

NASA is conducting a seven month study to assess the use of National Reconnaissance Office (NRO) 2.4m telescopes to implement a strategic mission to accomplish the WFIRST science described in the NWNH decadal survey. NASA-GSFC is leading the study. A science definition team has been formed to support the study activities. A report is due in April 2013.

The Astrophysics Division's implementation plan uses the science and prioritized activities of the Decadal Survey to guide their strategy and inform choices on new missions, near term mission concept studies and technology development activities. The FY2013 President's budget request for NASA Astrophysics includes an Explorer program that can support four mission selections and four missions of opportunity sections over the decade, continued development and operations of SOFIA, a new program for mid-level technology development, an augmented competitive astrophysics research program and new research opportunities such as theory and computation networks, laboratory astrophysics, and technology fellowships. An Implementation Plan white paper describing the Astrophysics Division strategy in response to the Decadal Survey recommendations, consistent with current budget guidance, is under development.

Marcy commented that he was not clear on how the Committee is suited to ask questions about WFIRST because he does not see much interagency activity. His concern is that there is a wide variety of dark energy experiments funded both in space and on the ground, and it is hard for him to understand that the value of WFIRST will be blindingly clear. There will be science definition choices that will be made in light of the data soon to come that will render the decisions about WFIRST in a different way once the data are in. To what extent do Hertz and other senior

management reflect back on the process and ask themselves what did NASA do that systematically failed and puts them in an awful position with WFIRST because there are other dark energy experiments whose results essentially force a delay of WFIRST itself? Hertz replied that he understands Marcy's frustration. He has heard said many times that WFIRST is not a dark energy mission; it is only one of three science objectives. The Committee should ask Gehrels to what extent does the dark energy part drive - the design - as opposed to the micro-lensing objective or the wide-field survey objectives because it is a multi-purpose observatory as laid out by the Decadal Survey.

Baum asked whether there were some aspect of these missions that Hertz could see that would benefit from more interagency collaboration or participation? Hertz replied that generally speaking, it works well if there are clear leaders and clear partners, and if interagency cooperation does not naturally happen like it has for LSST, DES or Fermi, then we should not force it upon the projects. At the moment, NASA is not explicitly building anything with DOE or NSF.

Neil Gehrels presented an update on WFIRST and the Astrophysics Focused Telescope Assets (AFTA) study. WFIRST was the highest ranked large space mission in the 2010 U.S. Decadal Survey. The Science Definition Team (SDT) for WFIRST delivered its final report to NASA. A second Science Definition Team is looking at the potential use of one of two 2.4m telescopes for WFIRST science. The SDT will determine the science requirements and key mission parameters and will work with the project office to develop a design reference mission using one of the 2.4m telescope assets. They will also be studying the inclusion of a coronagraph instrument as an option. This would be a five-year mission with a launch on a Falcone9 or Atlas V launch vehicle. The report from the SDT is due in April 2013.

Marcy asked how the Committee could help in strengthening the case so that Gehrels could go up the chain in NASA and get funding for the telescope. Spergel replied that an endorsement by the Committee would be helpful. Support will be needed from OMB, OSTP, and the Hill to get the funding.

Matzner asked how this fits together with WFIRST. Is it a truly different experiment? Gehrels replied that it really is WFIRST. It is a different telescope; it is not that much different from the telescope that they were looking at before, but it is bigger. The focal plane is key to this mission. This is essentially WFIRST with a bigger and better telescope; it is a different configuration. It is a different way of doing the exact same mission. It is also in response to the fact that these two telescopes are available.

Frieman asked whether the project has been costed yet. Gehrels replied that a project cost has not been done yet but they did do a costing for the earlier design reference missions. . It will be interesting to see what the number turns out to be when they have that information in January.

Eric Smith provided an update on the James Webb Space Telescope (JWST). The replanned JWST program supports a 2018 launch date. There have been financial and schedule controls put in place. The replan was approved in September 2011. The project made significant progress in FY12, achieving milestones within cost and schedule, especially with hardware. Total required for FY2012-2016 is $3,083M ($3.529M prior to FY12; total life-cycle budget: $8,835M). The program office has developed fiscal year 2013 high-level milestones for external reporting. Instruments are in the integration and test (I&T) phase or final instrument level testing. The project is performing within cost and schedule and has accelerated some hardware elements. The project is now entering its long and challenging I&T activities, e.g., integrated science instrument module (ISIM), thermal vacuum chamber testing of the telescope and instruments.

Frieman asked what is the percentage of reserve remaining in the cost to complete? Smith replied that in any given year, they wanted to make sure that 30% is built into future years.

Haynes asked what Smith sees as the time schedule for the next big milestones over the next year and what are the biggest risks for those. Smith replied that the biggest risks are associated with the ISM cryo-vacuum testing. Some of the other instruments have to make it through their tests. How the spacecraft comes up to their CDR will also be critical next year.

The remaining few minutes of this session centered around topics for discussion in tomorrow's morning session. The Committee will hear from David Spergel and the CAA. There will be considerable time to discuss community access for facilities. The Committee should think about some of the issues discussed in today's session, especially the questions, "What we mean by open skies?, and What do we mean by open access?; also issues of access to medium (i.e., 4-meter) and large telescopes (i.e., TSIP) on the ground.

MEETING ADJOURNED AT 5:00 PM EST, 30 NOVEMBER 2012
MEETING RECONVENED AT 9:00 AM EST, 1 DECEMBER 2012

David Spergel, chair of the National Academy of Sciences Committee on Astronomy and Astrophysics (CAA), provided an update on the committee's activities since its re-activation. The purpose of the CAA is to support scientific progress in astronomy and astrophysics and assist the federal government in integrating and planning programs in these fields. The CAA's scope also includes appropriate cross-disciplinary areas. The CAA provides an independent, authoritative forum for identifying and discussing issues in astronomy and astrophysics between the research community, the federal government, and the interested public. The CAA will also monitor the progress in implementation of the recommendations of the New Worlds New Horizons (NWNH) decadal survey. Discussions are ongoing with NSF as to how the CAA can work with AST. Possible activities include a review of the NSF Implementation Plan for the AST Portfolio Review.

Elmegreen asked Spergel how the CAA sees its role in regard to the Decadal Survey versus the AAAC's role. Spergel replied that the AAAC is in the position to address many things that the CAA cannot. The CAA issues reports when asked. There are some clear areas of interagency interaction. With LSST, Euclid, and other projects, combining the data from various data sets will be critical; the agencies have not really looked at this. There really is no stated role for the CAA to address this issue; the AAAC could play a useful role in this area.

Ulvestad commented that the issue of combining data from various missions and telescopes is often characterized as dark energy, but in fact these surveys have a much broader scope. The NSF community is interested in LSST, WFIRST, and DECAM not just from a dark energy perspective but for a variety of science. The Committee should keep this in mind. Haynes noted that the Committee should raise some of these issues in their report.

Ulvestad further commented (in the context of discussions with CAA about reviewing the Implementation Plan) that the landscape has changed recently in that AST is not in the position to make an implementation plan public even when the FY2014 budget request comes out because there will be potential unfortunate consequences to making statements about what AST plans to do, especially if the FY2014 budget comes out when the FY2013 budget is still under consideration by Congress; this makes it awkward to be able to publish a straightforward

description of what AST wants to do. Spergel noted that the CAA is eager to be helpful in any way they can; it is hopeful that it can respond more quickly than most NRC committees.

Paula Szkody led the discussion on community access to facilities. She raised the issue in light of the NSF Portfolio Review recommendation intending to restrict access to essentially over 700 nights of public time at NOAO, all in the northern hemisphere. It impacts the whole community as well as the different Agencies because of the connections to ground support of HST objects, and impact on BigBOSS for the Mayall for non-DOE projects. Access to the U.S. facilities for the US community members and access to facilities on an international level are separate issues. She fears that astronomy is moving in the same direction as the rest of the country, moving toward success for only a small percentage of scientists. Her concern is that access to the facilities is now dependent on location; if you are at a school that has access you are fine, whereas if you are at a smaller institution you are not fine. This affects not only the ability to do work connected with NASA and DOE but also affects your ability to get a NSF grant. Seven hundred plus nights lost is a very large number because there are so many observers in the US; they cannot do all of their research on the big telescopes. There should be availability to all wavelengths in order to do the science. A suggestion might be to have some kind of TSIP program tied to the grants.

Frieman noted that it needs to be carefully phrased. It sounds as if this is a problem with the trend. The Committee should get more data on what the trend is and what it is projected to be because this has been a long standing problem and the AAAC should be very clear about it.

Cushman asked that if one were to follow the Portfolio Review recommendations and then reassign from the telescopes that are private, and everybody who wants it anytime they want it, would there still be a problem? Is it the access problem or the number of observing nights? Haynes replied that there will always be an oversubscription rate, but the problem is making many nights unavailable for the science. Frieman commented that one has to be careful in talking about the number of nights; you have to ask what are you getting for those nights. For example, for DECAM on the Blanco telescope, DOE is getting 105 nights a year for the next five years to do the survey, around 30% of the telescope time. However, for the other 70% of the time, the community gets to use the $50M instrument that is 10 times as powerful as any imager on other U.S. open-access facilities. That is the trade that NOAO made. As instruments get more expensive, organizations such as NOAO enter into partnerships such as this.

Elmegreen noted that one also needs to talk about the training of future scientists. It does go back to the haves and the have not's. She is worried about the future.

Szkody commented it looks like surveys will be done in the future and there will a need to have follow-up on smaller telescopes, but if we restrict the access now, we restrict what can be done for the follow-up when LSST comes on line. For example, Sloan was a fantastic survey but a lot of the results came because of the follow-up work, and we need to set up a balanced program so that access needs are met for everyone. Cochran commented that the finances as well as access is needed.

Haynes asked Ulvestad to explain what divestment really means. Ulvestad stated that the Portfolio Review defined divestment as the removal of a telescope from the AST budget. It encompasses many options that include divesting to another operator possibly with another mission, developing a funding partnership with a mixed mission (i.e., MS-DESI), mothballing the facilities, and closing the facilities. The issue of open skies also needs to be revisited. For example, Ulvestad commented that "if University X, where X is a major state university or a

private university, has their own big (i.e., 4-m, 5-m, 8-m or 10-m) telescope, they right now have complete open access to NOAO telescopes and do not have to give anything back; that's the open skies policy. If you said to the university, your faculty are going to get 20 nights on the Mayall and we are not going to let you have those 20 nights unless you put 4 nights of your 6, 8, or 10-m telescope back into the system, that would be a very big change from open skies. But in the absence of a TSIP-like program that may be something to think about. That would be huge change in the way our national observatories operate."

Ulvestad noted that the Portfolio Review committee did not come up with some ratio of facilities to grants to mid-scale but they looked at the science questions of the decadal survey and said here is how we can best address them. It turned out that their ratio came out to be the same as it is now. They could have said not to divest anything at the cost of doing one of the new recommendations of the decadal survey. In any mid-scale program that AST plans to run, any solicitation will have return value to the community as a major element of the merit review criteria. Whether that is access to open nights or access to a data set is not yet determined.

On a different topic, Matzner noted that it looked like one of the riskiest items on the JWST was the solar shield. NASA has a vast commitment in the International Space Station (ISS), so is it possible to take an experiment up to the ISS to demonstrate the unfolding and the performance of the material in that environment because that is an essential part of the telescope? Hertz replied that it was a good question, but he could not give a complete answer because he did not know. He did, however, comment that one should ask whether that test would actually reduce any of the risks. For the solar shields, which are a new technology, the development plan has a lot of integration and test to mitigate and reduce that risk. Another question would be how much testing on orbit would reduce the risk in addition to all of the ground based testing that will be done before launch? Matzner noted that what you cannot do on the ground is zero-g and vacuum. Hertz replied that was correct but NASA has had a lot of experience doing tests where gravity is taken into account the right way; there has been a lot of testing of deployables in zero-gravity and there has been a lot of successful deployables. To do such a test given that it is not currently planned would take years so that would be a year's delay in the whole program which would be extremely expensive so you would have to do the trade as to whether that reduction in the unplanned test would be worth the additional cost. He would be happy to get an answer from the JWST team.

Ulvestad made a presentation at the request of the AAAC Chair on what an OIR system of the future would look like. The Portfolio Review committee implied that LSST should be at the heart of the OIR system. It is clear in their recommendations that Gemini-South was more important than Gemini-North for such things as LSST follow-up, and there was specific PR language about the future of SOAR to be considered based on its instrumentation for LSST follow-up observations. Ulvestad hypothesized that the OIR system should center on >4-m telescopes with 4-m telescopes being primarily for support capabilities or survey capabilities. This leads to many questions such as if those are the priorities, what does the OIR system look like in 2021 as a whole and how do you make a transition to that system while still continuing to deliver science capabilities along the way? Whatever the OIR system was over the past years, it was driven by TSIP; how do you motivate private telescopes to participate? In an era where the GMT and TMT are running, there will be a desire to keep the Magellans and the Kecks running as well. How do Gemini and NOAO change over the next decade? The community is doing a lot of self-organizing to find the best methods for doing LSST science. NSF and DOE are discussing how DOE mission goals might be achieved using telescopes in the NSF part of the OIR system. AST thinks it needs a community-led assessment of what it really wants the system to look like post-2020 in order to deliver DOE mission science and NSF investigator science. One of the

difficulties is whether one can leverage the private telescopes through a mid-scale or TSIP-like program and have the budget to do it; AST is arguing for such a budget but saying that there is a plan might be premature. A TSIP-like program will be invaluable in providing access to the community. How do we leverage the strategy that we have elected, that is the LSST, in a manner that fits into the global strategy that includes entities in the U.S. but not the federal government, how does all of that fit? Should we be generous and give our data away; the community would not be happy about this. Access to the data is our leverage. NSF needs to be able to engage the entire community in LSST science. We need a system of algorithms, ways to search the data; it will not happen by accident but is something that NSF is interested in.

The Committee decided they would write a White Paper on issues such as open skies and open access in order to better understand the issues. It's an opportunity to get their own thoughts together before they ask the Agencies to answer any questions the Committee might have regarding those issues.

The Committee spent some time discussing the contents of the annual report that is due on March 15. Writing assignments were made. Issues such as community access, open skies, the issue of data, the OIR system, challenges and opportunities, will be incorporated into the report.

MEETING ADJOURNED AT 12:15 PM EST, 1 DECEMBER 2012