Minutes of the Meeting of the
Astronomy and Astrophysics Advisory Committee

14-15 October 2008
National Science Foundation, Arlington, VA

Members attending:	Wendy Freedman (Chair)	Daniel Lester
	Bruce Balick	Douglas Richstone
	Kim Griest	Keivan Stassun
	Jacqueline Hewitt	Christopher Stubbs
	Rocky Kolb	Alycia Weinberger
	David Koo	
Agency personnel:	Craig Foltz, NSF-AST	Scott Borg, NSF-OPP
	Eileen Friel, NSF-AST	Jim Reidy, NSF-PHYS
	Dana Lehr, NSF-AST	Jim Whitmore, NSF-PHYS
	Donald Terndrup, NSF-AST	Kathleen Turner, DOE-HEP
	Jeffrey Pier, NSF-AST	Jon Morse, NASA-HQ
	Elizabeth Pentecost. NSF-AST	Michael Salamon, NASA-HQ
	Randy Phelps, NSF-OIA	W. Vernon Jones, NASA-HQ
	Vernon Pankonin, NSF-AST	Zlatan Tsvetanov, NASA-HQ
	Morris Aizenman, NSF-MPS	Ed Weiler, NASA-HQ
	Jack Lightbody, NSF-MPS	
Invited participants:	John Henry Scott, OSTP	Roger Blandford, Stanford
	Michael Moloney, NRC	
	Other participants:	Jay Frogel, AURA
	Michael Ledford, Lewis-Burke	James Murday, USC
	Ron Allen, STScI	Neil Gehrels, NASA-GSFC
	David Lang, NRC	Nicholas White, NASA-GSFC
	Randall Correll, Ball Aerospace	Allison Trepod, SRI
	Jon Malay, Lockheed Martin	Michael Devirian, NASA-JPL
	Sam Cowin, Lewis-Burke	M. Hamser, STScI
	Joan Centrella, NASA-GSFC	Shri Kulkarni, Caltech

MEETING CONVENED AT 9:00 AM EDT, 14 OCTOBER 2008

The Chair called the meeting to order. NSF Division of Astronomical Sciences (AST) Acting Division Director, Craig Foltz, made introductory comments and welcomed everyone to the meeting. Introductions were made around the room.

The Chair reviewed the Charge for the Astronomy and Astrophysics Advisory Committee (AAAC) and indicated that it would not change by statute because of the Decadal Survey. There would be short term issues that the AAAC would deal with during the period of the decadal survey. Further discussion of the role of the AAAC would be later in the agenda. The annual

report to Congress and the agencies would be shorter this year. Most of the report would be written during the last day of the February meeting.

Eileen Friel, the AST Conflicts of Interest (COI) Official, reviewed the list of identified COIs for the AAAC and updated the list for each member. The list will be updated and distributed at the start of each meeting.

Dana Lehr provided a brief overview of the National Science Foundation and the agency's support of ground-based astronomy (see presentation for more detail). AST and NSF as a whole are different from the other agencies in construct and mission. NSF supports basic research and education primarily through grants and cooperative agreements. The National Science Board (NSB), establishes overall policies and authorizes large awards, e.g. for support of the national observatories. They are very involved in the awards that are made to the national facilities. NSF's special responsibilities are wide-range and include Polar Programs (U.S. Arctic and Antarctic programs), science resource statistics, and international. The Mathematical and Physical Sciences (MPS) Directorate is the largest NSF Directorate with a budget of over $1B. Nearly half of the NSF large facilities are supported by MPS and about 40% of university federal funding in the physical sciences coming from MPS.

There has been an increase in the number of proposals submitted. The success rate went up until 2004. FY2002-2003 saw an increased funding investment in the grants program but the funding has not been able to keep up with the proposal pressure since then.

Kathy Turner provided a brief overview of the Department of Energy (DOE) (see presentation for more details). The Office of Science consisted of three offices, Field Operations, Science Operations, and Resource Management with a budget of around $4B. There are five science offices under Science Operations. The Office of High Energy Physics (HEP) headed by Dennis Kovar, includes two major divisions, Research and Technology and Facilities. Kathy manages the Non-Accelerator Physics research program, which provides funding for research and development and operations funding for research to do projects. Kathy is the program manager for the Dark Energy Survey (DES) and Joint Dark Energy Mission (JDEM) projects.

There was almost a 10% cut in funding in FY2008 for the Office of Science relative to the President's request, with almost a 12% cut for HEP. The FY08 appropriation was $689M with a supplement of $32M later in the year. FY2009 has faired better for the Office of Science and HEP with a requested 16.8% increase over the 2009 base.

The Office of Science was the single largest supporter of basic research in the physical sciences the U.S., providing more than 40% of total funding. Grants to universities and other institutions are provided by the DOE. The HEP provided over 90% of federal support with the remainder primarily coming from NSF.

Michael Salamon provided a brief overview of the National Aeronautics and Space Administration (NASA) activities (see presentation for details). The Science Mission Directorate is comprised of four divisions, Earth, Heliophysics, Planets, and Astrophysics. Jon Morse is head of the Astrophysics Division. The Astrophysics Division is comprised of 5 programs, Exoplanet exploration, Cosmic origins, Physics of the Cosmos, Astrophysics explorers, and Astrophysics research. Projects such as Beyond Einstein are no longer a program; they are a mission suite residing in the Physics of the Cosmos Program. There was a $200M reduction in the budget from FY2008 to FY2009.

There are three advisory bodies to NASA. These are the NASA Advisory Council (NAC), the AAAC, and the National Research Council (NRC).

Detailed reports from the agencies on their programs are to be presented later in the agenda.

MEETING ADJOURNED AT 10:20 AM AND – RECONVENED AT 10:40 AM

Turner provided a DOE program report (see presentation for details). The High Energy Physics Advisory Panel (HEPAP) was the main advisory body to the HEP.

Funding trends from FY1996 through FY2008 indicated an approximate 23% decline in funding for high energy physics over the last 10 years. Reductions in FY2008 funding resulted in a lessening of scientific productivity and workforce, momentum for new programs, and U.S. credibility as an interagency/international collaborator. This required the HEP to produce a new, realistic strategic plan that would deal with an increased cost and delay of the International Linear Collider, movement of the energy frontier to Europe, closure of the B-factory at the Stanford Linear Accelerator Center (SLAC), and a new role for Fermi Lab in the future.

The HEPAP submitted their report to DOE in June 2008 after having been charged by both DOE and NSF to identify and evaluate the scientific opportunities and options that could be pursued at different funding levels. In the non-accelerator program, dark energy and dark matter are the highest priorities.

Craig Foltz, AST Acting Division Director, provided an NSF-AST report (see presentation for details). The Continuing Resolution (CR) will be in affect until at least March 2009. The NSF budget office has allocated 90% of FY2008 levels for funding. This has had a significant impact on funding for the national facilities. Planning for even the possibility of a year-long CR would result in reductions in force, furloughs, facility shut-downs, etc. Additional cuts applied mid-year cannot be accommodated by additional layoffs due to severance packages, nor can they be substantially offset by facility closure. The observatories and managing organizations have begun planning for layoffs, early retirements, retrenchments to be carried out early in FY2009.

Jackie Hewitt asked how the budget is set. Foltz replied that the budget planning processes is from Division to Directorate to the Foundation. Decisions about budget allocations are made at the Directorate level. Rocky Kolb asked at what level planning was there planning exercises going on at the Foundation. Foltz replied at all levels.

ADJOURNED AT 12:15 PM – RECONVENED AT 1:15 PM

Scott Borg, Director of the Division of Antarctic Sciences in the Office of Polar Programs, provided an overview of astronomy projects at the South Pole (see presentation for details). There are several astronomy and astrophysics being done at the South Pole: IceCube, the 10-m South Pole telescope, the Background Imaging of Cosmic Extragalactic Polarization (BICEP), and Plato at Dome A. IceCube made excellent progress in 2007/2008; 40 digital optical modules (DOMs) are now in place; science and operations have begun. The 10m South Pole Telescope (SPT) completed its second year of operations. In 2007-2008 BICEP produced cosmic microwave background (CMB) polarization maps of unprecedented sensitivity.

The Antarctic balloon program was going well. There were 2 launches per year beginning in 2003. There were a total of 34 payloads funded by NASA and six co-funded by NSF. The

current Memorandum of Agreement (MOA) between NSF and NASA will expire on March 31, 2009 and discussions are underway toward a third MOA.

There are several astrophysics challenges facing the Antarctic program including flat budgets, significant logistical support costs, M&O funding for long term support, data transmission challenges, and environmental challenges.

Joe Dehmer's discussion of the Division of Physics activities was postponed due to illness.

Jon Morse provided a NASA Science Mission Directorate (SMD) report (see presentation for more details). NASA's objective was to fund executable programs, both large and small, as well as a successful suborbital and balloon program. The budget for the astrophysics program had a shortfall of ~$200M from FY2008 to FY2009. Travel funding for FY2009 was affected by the budget changes; there was language in the legislation that restricted travel funding for NASA employees.

The Hubble Servicing Mission 4 (HSM-4) was scheduled to take place in October 2008 but has been postponed until 2009. Activities are underway to switch the Hubble Observatory over to Side B, in order to allow science observing to resume. This will cause a launch slip until sometime in mid 2009. Other projects and programs like the Stratospheric Observatory for Infrared Astronomy (SOFIA), the Joint Dark Energy Mission (JDEM), Kepler and Herschel are all underway in various stages of development and readiness.

Morse briefly discussed the NASA postdoctoral fellowship program. NASA has funded around 30 fellowships a year (15-17 Hubble and Spitzer, 8 Chandra and GLAST, and 5 Sagan); the steady state is on the order of 100 fellows. As missions come up there will be opportunities for new funding for these programs.

There are plans for NASA to participate in the International Year of Astronomy (IYA) activities. There will be talks at the American Geophysical Union (AGU) meeting in December 2008, the American Astronomical Society (AAS) meeting in January 2009; an IYA student ambassador program; an exhibition planned at the United Nations Educational, Scientific, and Cultural Organization (UNESCO), and other activities throughout 2009.

The Chair asked Morse what had been helpful to NASA from the AAAC. Morse replied the reports generated by the committee and the task force reports that helped NASA in its planning and support for future missions. Ground-based observatories have supported space-based missions and vice versa. Also, there should be more explicit and active coordination between the agencies in coordinating these ground-based and space-based activities.

ADJOURNED AT 3:15PM – RECONVENED AT 3:25 PM

Morse and Turner presented a briefing on JDEM (see presentation for details). NASA, DOE, and the Office of Science Technology Policy (OSTP) have been meeting regularly to lay out a plan for a dark energy mission. The JDEM Project Office has been established at Goddard Space Flight Center (GSFC) and will have overall management responsibility for the mission. DOE set up a project office at Lawrence Berkeley National Laboratory that will work within the framework of NASA's project office and will assist with the reference mission design.

JDEM will remain a medium class mission; NASA does not have the resources if its costs escalate; partners would help defray costs. DOE and NASA will participate in the construction

and operations of JDEM. Both agencies will size the content of the project to the resources and manage their own budgets. The two agencies are working on a Memorandum of Understanding (MOU).

A JDEM Science Working Group (SWG) was convened by DOE in June 2008. The Chair of the SWG was Rocky Kolb.

The JDEM Science Coordination Group (SCG) (Neil Gehrels, Chair) was established to determine the top-level science and observational preliminary observational requirements and instrumentation capabilities for a JDEM mission and to evaluate science performance of an initial reference mission. A first meeting of the group was scheduled for October 15-16 and the results are to be delivered to the agencies by mid December.

A letter to the community was to be released in October containing information about the Announcement of Opportunity (AO) selection. Phase A was expected to start in January 2009 with a selection of investigations in summer 2009.

The Chair welcomed Edward Weiler, Associate Administrator for the Science Mission Directorate at NASA Headquarters, via teleconference. Weiler was asked how the AAAC could work with NASA during the decadal survey period. Weiler replied that it could be in a more tactical way. There might be items that were fast breaking and needed a short turn around time so there might be what he called "items du jour."- issues that could cross agencies such as near-earth objects, search for extra solar planets.

The Chair commented that there were a series of task forces that provided coordination between ground and space based science and that put science questions first. Freedman asked how do these things get coordinated. Weiler replied that they get done down in the trenches, they seldom get done at the top. The best collaborations bubble up from the bottom, such as JDEM. Weiler said that he relies on his Division Directors for routine business on a daily basis and gets involved when there are problems. He also said he has a good relationship with the NASA Administrator's office.

Kolb commented that the scientific community has been left in the "dark" about what NASA does. Weiler replied that the NASA subcommittees are a good source of communication to the community. NASA will keep the scientific community informed of its activities in the future.

The Chair commented that Weiler had been away from meeting with the science community for awhile. Were there any things he might like to change? Weiler replied that when he left NASA it was a different environment, the space science budget was doubling, Physics of the Universe and Beyond Einstein were in full swing. Now, there are not a lot of opportunities for small- and medium-class missions. NASA does not have a mid-scale launcher, however, the agency has agreed to use of Minotaur rocket on its mission to the Moon; this would fill the gap until a bigger rocket is developed.

The Chair commented that there a lot of things that happen without community input; the community feels disenfranchised. Weiler replied that he would like to have an executable program. Success is measured by science that is launched—fewer missions that are doable rather than many missions that are not successful. He does not want to see a mission that was started and then not able to find funding for it.

The Chair thanked Weiler for his participation and willingness to talk with the AAAC.

Rocky Kolb provided a presentation on the activities of the JDEM Figure of Merit Science Working Group (FoMSWG) (see presentation for details). The group was constituted in June with the purpose of continuing the work of the DETF in developing a quantitative measure of the power of any experiment to advance our knowledge about the nature of dark energy. The measure will be in the form of a "Figure of Merit (FoM). The group met in July and August with numerous teleconferences in between. The FoMSWG adopted a Fisher Information Matrix approach toward assessing advances in dark energy science. As a result of the study, the group concluded that a figure of merit should not be sole criterion, it was crucial to have common fiducial models and priors, the Fisher matrix was the tool of choice, and one FoM gave a complete picture. The FoMSWG will provide a letter to DOE and NASA with their findings.

MEETING ADJOURNED AT 5:55 PM EDT, 14 OCTOBER 2008

MEETING RECONVENED AT 9:00 AM EDT, 15 OCTOBER 2008

The Chair called the meeting to order. There were introductions around the room because of new participants and attendees.

The Chair continued the discussion of the role of the AAAC during the period of the decadal survey.

Lester commented on the impact of the CR, the importance of the Explorer program, the travel cap for NASA.

Hewitt commented she had a concern that NASA had not competed the JDEM instruments. Richstone also commented that with a ~$800M project, it would push other projects back and there it was not clear that a decade from now you would plan another mission like this. John Henry Scott from OSTP replied that NASA and DOE took the Beyond Einstein Program Assessment Committee (BEPAC) recommendations seriously. JDEM was a strategic mission and the solicitation was written by advocates of the program. OSTP met 20 times to make JDEM work.

Balick commented that it was a hopeful sign that collaboration was underway and there was a strategy by which projects made their way to be reviewed by the decadal survey. Collaboration among the agencies was essential in this process. A critical review of the decadal process and helpful advice to Roger Blandford would be beneficial. Lester mentioned that the NRC did a study on lessons learned from decadal survey and it might be helpful to have a copy of the report.

Koo commented that it was important to assess critically and constructively the agencies and their projects; look at the long term health of the programs. Stassun also commented on the issue of diversity and broadening participation. There needs to be an effort to ensure the health and vitality of the future workforce, train the next generation of instrument builders and prepare and train the next generation of astronomers dealing with large amounts of data. All of these issues are critical as the decadal survey lays out its recommendations to the community.

Weinberger expressed a sense of "paralysis" and that the AAAC could play a special role during the next year educating people on the priorities and pushing ahead on the agenda from the last decadal survey.

The next session was with OSTP's John Henry Scott. Scott commented that the value of the advisory committees was in the reports and documentation that feed into the policy decisions. Arguments for and reasoning behind the work and the decisions are important. Laying out a carefully articulated argument that supports the conclusion allows the community to get behind the reports.

OSTP leads multiple entities that provide advice to the Executive Office of the President (EOP), among them the President's Council of Advisors on Science and Technology (PCAST) and the National Science and Technology Council (NTSC). PCAST provides advice from the private sector and academic community on technology, scientific research priorities, and math and science education. The NTSC is charged with setting clear national goals for Federal Science and technology investments in a broad array of areas and with coordinating science and technology policy in the Executive Branch. One of the interesting new areas it was considering was the "science of science policy," an attempt to apply scientific principles and methods to the analysis of policy issues.

It is sometimes difficult to deal with different agency cultures. Many times it is how the agencies are shepherding large facilities and projects through their own process. There also needs to be an independent assessment of how things work or don't work, are they good or bad, lessons learned.

Scott noted that it was important to ensure that the process was sound and reflected the views of the science community; the more you know about the process, the better off everyone is.

The Chair thanked Scott for his participation.

ADJOURNED AT 10:25 AM – RECONVENED AT 10:40 AM

The Committee received a copy of a letter dated September 23, 2008 from the Space Interferometry Mission (SIM) Science Team. The science team chair, Shri Kulkarni, asked to address the committee in support of the SIM project. Kulkarni explained that the science team had re-scoped the mission to address the metrics that were desired by the EXoPlanet Task Force (EXoPTF) in their report. SIM had spent approximately $500M on interferometry technology and it was important to keep the technology science team going. Kulkarni indicated that there were strategic issues about SIM that will need to be addressed by the decadal survey.

The committee understood the situation and needed to make sure they heard from NASA on the issue. This brought up an issue about how the AAAC dealt with task force reports and how agencies responded to those reports.

The next session was with Roger Blandford, the chair of the decadal survey committee. The Chair welcomed Blandford and thanked him for providing an update on the decadal survey activities. Blandford turned the discussion over to Michael Moloney of the NRC. Moloney noted that the NRC will be engaging the community in the decadal survey process and will have much contact with the AAAC during the next 2 years. Right now, Blandford was the only appointed committee member. NRC had received over 300 names of suggested committee members and were now putting a slate of committee members together. As soon as the committee was appointed, then the panels would be established.

Blandford noted that the survey will be dealing with issues interfacing with physics, planetary astronomy, astronomy, and polar astronomy. Questions of how to deal with space solar astronomy, gravitation, cosmic ray physics, neutrinos, dark matter, etc., were still being

discussed. With regards to the selection of panel members, he will listen to the views of the AAAC. The nature of the output and recommendations will provide useful opinions to the community and the AAAC. Scope, Membership, and Nature of the output, are the major current uncertainties in the process.

Lester asked Blandford whether the Alpha Magnetic Spectrometer (AMS) project is on the table for comments and prioritization? Blandford replied that if the decadal survey were to include cosmic ray physics in its prioritization, it would include AMS as well unless it were deemed to have been given a formal start already. He preferred to limit the scope of what is prioritized. However the science discussion will need to be more inclusive.

Richstone suggested that the report would need to be adaptive to changes in budgets considering cost, schedule, and risk. Blandford responded that this was in his statement of task.

Stassun again commented on the issue of workforce development and the need to make sure that the report addressed this issue completely. There needed to be attention paid to what skills and expertise was needed when going ahead with missions and future facilities.

Blandford noted that the composition of the Committee would have geographical diversity, with a strong premium on scientific breath.

Balick asked Blandford how information would be disseminated in the community. Blandford replied through AAS exploders, professional society meetings, town hall meetings. All of this would be done early in the process. He suggested that short term issues could be addressed by the AAAC.

The Chair thanked Blandford and Moloney for their participation and update and extended an invitation to Blandford to attend the AAAC February 2009 meeting.

The Chair was to ask Blandford to be a reader of the AAAC report.

ADJOURNED AT 12:00 PM – RECONVENED AT 1:15 PM

The Committee discussed the annual report and plans for the next meeting.

Stassun noted that there was a level of complexity inherent in all of the interagency activities that adds significant amounts of time for these activities to come to fruition. Assessing to what extent these activities were done, what was the timescale that have added costs (not necessarily but time) to get these activities accomplished might be useful in planning for the future.

Weinberger asked the NSF representatives if progress had been made convening an internal working group to look at the issue of awarding financial support with observing time at ground-based observatories. Foltz replied that AST had been trying to increase the grants program but it was a matter of managing expectations and looking at the issues carefully.

Salamon and Turner noted that the JDEM concepts were developed as proof of principle. The science and operational requirements for the mission will be developed as Level I requirements by the Science Coordination Group, with input from the Science Working Group (Kolb's group). These will be used to produce a final reference mission. The mission and top level designs were developed by the JDEM project office at GSFC. The final reference mission will be described in the AO (what the scientists can propose against). The success of the mission will be the

responsibility of the project office and the success of the science investigation the responsibility of the science team. Turner noted that one could not do projects in a pre-phase A or early stages and then put a hold on them waiting for the decadal survey—the money would be taken away.

The Chair planned to follow up on the SIM issue with Jon Morse.

The Committee scheduled their next meeting for 18-19 February 2009.

MEETING ADJOURNED AT 3:00 PM EDT, 15 OCTOBER 2008