

<p><b>Minutes of the Meeting of the Astronomy and Astrophysics Advisory Committee 12-13 February 2013 National Science Foundation, Arlington, VA</b></p>
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<b>Members attending:</b>	Andreas Albrecht (Vice Chair, telecon) Stefi Baum (telecon) William Cochran Priscilla Cushman Debra Elmegreen Joshua Frieman	Martha Haynes (Chair) Mordecai-Mark Mac Low Geoffrey Marcy (telecon) Richard Matzner Paula Szkody Paul Vanden Bout
<b>Agency personnel:</b>	James Ulvestad, NSF-AST Thomas Statler, NSF-AST Elizabeth Pentecost, NSF-AST Nigel Sharp, NSF-AST Craig Foltz, NSF-AST Maria Womack, NSF-AST Ed Ajhar, NSF-AST Ilana Harrus, NSF-AST Dan Evans, NSF-AST Fleming Crim, NSF-MPS-OAD	Philip Schwartz, NSF-LFO Vladimir Papitashvili, NSF-OPP Randy Phelps, NSF-OIIA James Whitmore, NSF-PHY Paul Hertz, NASA Hashima Hasan, NASA Linda Sparke, NASA Eric Smith, NASA Kathleen Turner, DOE Gerald Blazey, OSTP
<b>Others:</b>	Steve Unwin, JPL Steve Roming, SWRI Bethany Johns, AAS Chris Carter, UC James Murday, USC Dan Leone, Space News Curtis Levinson, DHS	Monty Di Biasi, SWRI Jim Lancaster, NAS Don Shapiro, NAS Dionne Makila, AURA Jon Malay, Lockheed Martin Lenore Koenig, UMD

**MEETING CONVENED 9:00 AM EST, 12 FEBRUARY 2013**

The Chair called the meeting to order.

The minutes from the 30 November-1 December 2012 meeting 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 May meeting.

Paul Hertz presented an update on NASA activities. He reported that this is a time of opportunity for NASA Astrophysics. The total budget is at a high level and there are large and small space-based observatories spanning the entire electromagnetic spectrum. Sub-orbital class investigations are being conducted on sound rockets, balloons, and the International Space Station. NASA Astrophysics is preparing for the strategic mission that will be developed following JWST. But the budgetary future is uncertain.

The 2013 President's budget request for NASA Astrophysics is \$649M. The final funding levels are pending an FY13 appropriation by Congress and the concurrence of Congress on NASA's initial FY13 operating plan.

Astro2010 recommended that NASA, NSF, and DOE jointly provide awards to Theoretical and Computational Networks that address major theoretical questions raised in Astro2010 that are ripe for a breakthrough. The Theoretical and Computational Astrophysics Networks (TCAN) is a joint program with NSF. A solicitation has been released and proposals are due February 14.

JWST is on schedule for an October 2018 launch. Two of the four instruments have been delivered and the other two are in cryo-vac testing and should be delivered in the summer. Three primary mirror segments and the secondary mirror have been delivered. All aft optics systems testing have been completed, three of the five engineering template sunshields are complete, one is nearly complete, and one is being assembled. There have some modifications to the Johnson Space Center (JSC) test chamber. The avionics check for SOFIA was completed in January. An installation of an upgrade focal plane imager has begun. Instrument commissioning and the remaining observatory verification and validation are scheduled for February-May 2013. Cycle 1 science is scheduled for May-October 2013. Deployment to the Southern Hemisphere is scheduled for early summer. The Antarctic campaign has been very successful. Flight time for one of the experiments lasted 55 days.

The WFIRST Science Definition Team delivered its final report in August 2012. The First Design Reference Mission (DRM1) is a proof of concept that a mission can be constructed that is compliant with the Astro2010 recommendation. The Second Design Reference Mission (DRM2) will be complementary to Euclid, LSST and JWST. The SDT showed that DRM1 was fully responsive to the objectives of Astro2010 and that DRM2 offered a low-cost near-IR survey opportunity but because of its 3-year life was not in full compliance with the decadal survey recommendation. The Astrophysics Focused Telescope Assets (AFTA) study explored the use of the existing 2.4m telescopes to accomplish the WFIRST science. Preliminary findings show that there is a science increase over WFIRST DRM1 and DRM2. The report from the SDT is due in April 2013.

Haynes asked that as NASA goes forward with the original WFIRST and the optional path of making use of the two 2.4m telescopes, how will NASA go forward with a decision and on what timescale. Hertz replied that there are a number of steps that can be taken. When the Administrator gave permission to do the study, the purpose was to see whether NASA should retain these telescope assets and whether they would be of any use to NASA, whether they could be stored and studied or whether NASA should decide they were of no interest. The telescopes would have to offer an advantage for not using them; they might offer science, less cost, and quicker development time. The studies that are being done now will answer those questions. If this version of WFIRST offers more science and less cost, it would be the way to go; if it offers more science but twice the cost, it is obviously not the way to go. NASA will have the report given to the CAA for discussion.

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 guiding principles used by the Division in implementing its strategy include such items as enabling the science and priorities given by the Decadal Survey with new activities as well as through ongoing missions, including large missions, medium missions, and Explorers, and investing in the Astrophysics Research Program for developing the science cases and technologies of new missions and for maximizing the scientific return from operating missions. But the budget reality is that there is inadequate available budget to implement the Astro2010 Decadal Survey recommendations. Although total funding for astrophysics was higher than the Decadal Survey assumed, the increased cost of JWST left insufficient funding over the decade to address the Decadal Survey recommendations

for new projects and activities. Due to budget constraints, no new astrophysics missions other than Explorers can enter formulation before FY17, when JWST approaches launch. The goal is to be prepared to start new strategic Astrophysics missions to follow JWST as soon as funding becomes available while continuing to advance the science during the interim.

The FY2013 President's budget request for NASA Astrophysics includes an Explorer program that can support four mission selections and four missions of opportunity selections to be considered 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, was discussed with the Committee on Astronomy and Astrophysics (CAA) and the NAC Astrophysics Subcommittee (APS) before it was finalized in December. The Astrophysics Implementation Plan is available for download at <http://science.nasa.gov/astrophysics/documents/>.

In 2013, the Astrophysics Division will develop a roadmap that will articulate NASA's astrophysics vision for the next 30 years. The roadmap will be developed by a task force of the NAC Astrophysics subcommittee. It will include community input, including town halls. The plan is for the roadmap to be released in mid-December 2013 and presented at the January 2014 AAS meeting.

Marcy thanked Hertz for a well thought-out set of plans leading up to the mid-decade review.

Kathy Turner gave an update on DOE activities. Progress in achieving the mission goals requires advancements at the Energy, Intensity, and Cosmic Frontiers. The budget for High Energy Astrophysics is up slightly from FY2012, ~\$127.5M. DOE is still under a continuing resolution so the final budget is not known. There is no timeline for release of the President's FY14 budget request. 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. Overall research funding will decrease ~2% a year for the next several years to increase the fraction of the HEP budget for new projects.

DOE receives program guidance from external FACA panels such as HEPAP and the AAAC. HEPAP provides the primary advice on high energy and particle physics programs to DOE and NSF. The AAAC reports to NASA, NSF and DOE on areas of overlap. The American Physical Society Division of Particles and Fields (DPF) is holding 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. Following the Snowmass process, the agencies expect to charge HEPAP to establish a new program and project prioritization subpanel to recommend a new strategic plan for the program in various scenarios. The DOE Office of Science Director has issued a charge to the advisory committees to get their advice on the scientific impact and technical maturity of planned and proposed facilities, in order to develop a coherent plan for future facilities over the next 10 years. There is a new HEPAP subpanel to respond to the request and its report will be presented at HEPAP's March meeting. Only facilities with large projected DOE program contributions (>\$100m) to fabrication over the 10 year period will be considered. Some of the projects to be consider include Mu2E, LBNE, ILC in Japan, high luminosity LHC upgrade, LSST, and Gen 3 dark matter experiments.

Funding for the experiment program in the Cosmic Frontier has an increase of ~\$20M from 2012 to 2013. This program includes research funding at both the universities and the laboratories, future R&D, small project fabrication, major instrument and equipment such as LSST and HAWC, and dark matter Gen 2 research and development.

Currently the Dark Energy program consists of BOSS, DES, and the supernova surveys. There is some science effort on WFIRST and Euclid but no project plans. NSF is the lead agency for LSST and is responsible for the telescope and data management; DOE is responsible for the camera. There is good coordination among the two agencies; the DOE/NSF Joint Oversight Group meets biweekly.

The high-energy physics community dark energy science plan identified a wide-field spectroscopic survey [(mid-scale Dark Energy Spectroscopic Instrument (MS-DESI))] that would enable using the Baryon Acoustic Oscillations and Redshift Space Distortions methods, as an important next step in going forward to a Stage IV dark energy program. DOE and NSF are having regular talks about possible opportunities, constraints and models for the experiment and use of a telescope facility. HEP is preparing a Charge letter to request that the MS-DESI project office conduct a science alternatives analysis in the near-term to support HEP's decision-making process in selecting a preferred telescope facility. To support DOE's plan to hold a CD-1 review in late FY 2013, it is expected that DOE will need to make this selection in spring 2013. This would then feed in to the discussions with NSF.

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.

Buckley noted the role of the Decadal Survey and the Cosmic Frontier, the Snowmass process and the role of HEPAP. He asked whether it was possible to come up with an implementation plan like the one NASA has developed and how the Astro2010 recommendations could be acted upon. Turner replied that DOE is looking at that as primarily supporting what NASA and NSF are using; they are looking at results to find out the science goals and scientific importance of the experiments and what opportunities there are for DOE to participate. Astro2010 made recommendations, the highest priorities were WFIRST and LSST and there were words in the report that said if there was not a budget to support both, then LSST would be the one DOE contributed to because they are providing the camera and the project is moving forward.

James Ulvestad presented an update on AST activities. He provided some programmatic updates on the Atacama Large Millimeter-submillimeter Array (ALMA) project. There are 66 antennas in Chile with 58 accepted; the last North American antenna was accepted in September. The first science observations started on September 30 and 85% of those observations have been completed. There were 1133 proposals submitted for Cycle 1 with 196 high-priority projects selected. The inauguration is scheduled for March 2013. Ground-breaking for the Advanced Technology Solar Telescope (ATST) was in November. Because of delays, ATST is being re-baselined.

There have been some leadership changes at NSF since the November 2012 AAAC meeting. The Director, Dr. Subra Suresh, will be leaving NSF to become the President of Carnegie-Mellon University. Dr. Fleming (from the University of Wisconsin) took over in January as the Assistant Director of the Mathematical and Physical Sciences Directorate; Dr. Celeste Rohlifing returned to the Deputy Assistant Director position. There has been substantial turnover in the Division staff,

due to the end of the rotator terms and retirements. Dr. Patricia Knezak will be the new Deputy Division Director; she starts in March; Dr. Dana Lehr has been the Acting Division Director for over a year. Vernon Pankonin has taken over the NOAO program management from Jeff Pier, who retired in January. The Division has hired three new rotators, Glen Langston, Ilana Harrus, and Dan Evans.

NSF has instituted changes to its grants proposal guide that includes new implementation of the merit-review criteria (includes significant modifications to Fastlane). The Joint Theoretical and Computational Astrophysics Networks (TCAN) solicitation was released and proposals are due February 14. The Major Research Instrumentation (MRI) deadline is February 21. All project reporting transfers from Fastlane to Research.gov in March 2013. The number of proposals in the Astronomy and Astrophysics Grants (AAG) program has increased substantially over the past 20 years. The total dollars requested in FY2013 is \$283M compared to the total AST FY2013 budget request of \$244.6M. There has been no information about the resolution of the FY2013 budget or about the FY2014 budget. Agencies have been given direction on planning for sequestration. There has been language inserted in the Senate Appropriations Committee report that would affect the Division's budget significantly if enacted. The Committee recommends the full budget request of ~\$244.6M for astronomical sciences, but ~\$161.9M would be used for infrastructure. This could result in fewer grants and lower the funding rate; it could also eliminate the possibility of a budget wedge for the mid-scale program. The House Committee report does not contain similar language; an outcome depends on a conference committee report if a FY2013 appropriations is passed.

Ulvestad reported that LSST is still in the NSF queue and is awaiting a future budget request for construction. NSF and DOE are having active discussions regarding the possibility of hosting MS-DESI on an NSF telescope and is very supportive of the timescale leading to a DOE CD-1 review in late FY2013. The Dark Energy Camera is in commissioning stage and the survey will start in late CY2013. Several programs are joint with NASA including funding for the planetary radar at Arecibo, the Virtual Astronomical Observatory, and NSF infrastructure support for NASA's long duration balloon program.

Congress and the agencies are paying close attention to major budget issues, and not so much to specific issues that are of interest to the AAAC. Ulvestad commented that the annual report should be crisp and focused. A long report with discussion of many key science areas and issues is unlikely to be read carefully. The Committee should avoid lengthy descriptions of science highlights and should focus the report on achievable recommendations and choices. What should be upfront in the report is whether the agency collaborations are working well and are the agencies addressing the issues effectively with an example or two. These are the critical areas to the agencies.

Elmegreen asked about the role of the CAA in regards to the Portfolio review implementation plan and the OIR system discussions. Ulvestad replied that there was a discussion with the Academy in January about what role the CAA could play in the implementation plan and AST agreed to look at some options; AST is a bit behind but are hoping to get some set of proposed guidelines to the Academy in the next few weeks. It is AST's intention to find an activity that the CAA can take on. AST is looking at what the OIR system would look like during the era of LSST; it is similar to a study that the Academy did on the OIR system in relation to Gemini.

Marcy asked whether the Senate language about infrastructure delays divestment of the facilities discussed in the Portfolio Review; there may be some damaging effects. Ulvestad stated that NSF has not made any decisions about divestment. For facilities that were lower on the priority

list, AST is exploring options for other operators, reduced costs, etc. He did note that there are recommendations of the decadal survey that AST may not be able to do because of external influences.

Szkody asked whether there was a different way NSF could handle proposals given the low success rate; NSF proposals are much longer than NASA ones, for example. Is there any flexibility in making it a simpler process and combining it with the way other agencies do it? Ulvestad replied that there is little flexibility since there is a NSF-wide proposal guide which sets policy for the entire Foundation, what the merit review criteria are, what has to be put in Fastlane. For an individual solicitation items can be put in that are different. There are divisions in NSF that have been doing a trial run with a pre-proposal process; there are fewer full proposals to be reviewed but there are also fewer funding cycles. Hertz commented that NASA tried the pre-proposal process in the Heliospheric Division and it did not really work successfully.

The Committee had a discussion with Gerald Blazey of OSTP. He commented that there still is a small possibility that the FY13 appropriations will be finalized and passed in the next few weeks. Community support was really important in establishing the budget for FY13 and FY14 budgets. R&D did quite well in the FY13 budget and that was in large part due to community support. The FY14 budget will be submitted in the next few weeks. The America COMPETES Act is up for reauthorization. Discussions are under way with Congressional staff. Sequestration is postponed until March 1; 5% cuts in domestic spending and 8% in defense. It is late in the year and so the impact will be greater. There will be impacts on science and technology spending and some of those impacts can be found on the OSTP web site. The science and engineering communities have done a good job of getting the message out that sequestration would be difficult.

Blazey noted that the assessment and coordination between the agencies is very important, specifically the large shared missions. The large projects get a lot of attention. How do the projects with some of the same science objectives in common support one another, i.e., Euclid, LSST, etc.? How are the agencies looking forward with respect to the coordination of these programs? Are there issues that stick out more than others, for example data handling? These are the questions that OSTP are interested in having the Committee answer. Coordination and the large projects are what OSTP is interested in. With regards to the report, focusing on the important issues is key; keep it short and to the point.

Vanden Bout asked whether the data handling issues are connected to the policy of open access, open skies. Blazey stated that the issue should be addressed from the scientific point of view first; the policy is still being developed. Each agency is developing its own policy but there will be a need to codify it at some future time.

Haynes noted that in astronomy, there is the concept of open skies that means something different to everyone; access to taking data and access to data already taken. As we are involved in bigger projects or are dealing with international issues, it will become more complicated. Blazey commented that every agency has different needs and the committee explaining that will be useful; that is one reason why the policy has not been finalized. Haynes further asked, "Do we need to separate the open access to telescopes from the open access to data?" It is different for astronomy in the sense people might have access to a telescope and may not be required to make it open access. For example, with ALMA, the U.S. time is open access but the other partners' time is not. Blazey indicated that approaching them both would be useful. Coordination among the agencies on data management, i.e., personnel, infrastructure, etc., will be important.

Haynes asked what criteria should one use when entering into an international partnership? The way science is approached in other countries is not the same as in the US. Blazey commented that they need to be advantageous to the agencies that enter into them and they need to be consistent with that agency's priorities and not adjust the priorities to accommodate these other opportunities; that has to be the guiding rule. Marcy noted that international cooperation has implications for State Department and Defense department issues; such science collaborations promote peaceful coexistence internationally. The Administration and the State Department are interested in science diplomacy and it is encouraged at all levels.

Haynes commented that astronomy is a pure basic research science which does not have any immediate impact and we know that many of the objectives for science in recent years are related to more applied sciences. We worry about budgets in the future especially if the emphasis is only on the applied science at the expense of basic research. Can OSTP give a perspective on this? Blazey commented this is well understood within OSTP that the hard sciences, observational and physical sciences, chemistry that are curiosity-driven need an element of protection because of the attention towards applied science and the larger issues that are being dealt with energy and climate. There are three prongs to the S&T policy, climate, energy, and innovation. The focus needs to be on the aspects of innovation and this is where astronomy has a good story. Protecting the hard sciences to support innovation is important.

The Committee elected Andy Albrecht the next Chair of the AAAC. There were discussions about the Vice Chair but there was no selection. This will be discussed again at the March 1 telecon.

The Committee met with Fleming Crim, the new Assistant Director for the Mathematical and Physical Sciences Directorate. He thanked the group for the service to the Foundation; the committee's advice is appreciated.

Frieman asked how AST fits in the rest of MPS. Crim replied that AST supports a majority of facilities and has investigator programs, Physics has facilities and grants, Materials has facilities has grants, Chemistry has some centers as does Mathematical Sciences. It is a challenge. There will internally always be the tension between facilities and grants and it is something the Directorate is talking about all the time. The management issues are quite different if one is managing facilities versus managing individual grants. Mid-scale programs are being discussed at the Foundation.

Vanden Bout notes that at one time NSF had a facilities division. He asked whether this had been discussed in recent times. Crim replied that he was not familiar with the earlier experiment but that NSF does have a large facilities office that helps coordinate projects at the MREFC stage. Having a facilities division might get disconnected from the intellectual focus of the facility. He would like to have those who care about the facility be engaged in that conversation. In MPS there are persons who bring special expertise and knowledge; having a separate division would not be very useful.

The Committee spent the remaining 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 12:00 PM EST, 13 FEBRUARY 2013**