

**Minutes of the Meeting of the
Astronomy and Astrophysics Advisory Committee
11 May 2012 (Teleconference)
National Science Foundation, Arlington, VA**

Members attending:	Stefi Baum Sarah Church (Chair) Debra Elmegreen Martha Haynes (Vice-Chair) Gregory Laughlin Mordecai-Mark Mac Low	Richard Matzner Paul Vanden Bout John Wefel Brian Winer Charles Woodward
Agency personnel:	James Ulvestad, NSF-AST Thomas Statler, NSF-AST Elizabeth Pentecost, NSF-AST Nigel Sharp, NSF-AST Philip Puxley, NSF-AST Richard Barvainis, NSF-AST Ed Ajhar, NSF-AST Vladimir Papitashvili, NSF-OPP Scott Borg, NSF-OPP Paul Hertz, NASA	Rita Sambruna, NASA Hashima Hasan, NASA Wilt Sanders, NASA Chris Davis, NASA Ilana Harrus, NASA Lia LaPiana Jaya Bajpayee, NASA Michael Werner, NASA Kathleen Turner, DOE Joydip Kundu, OMB
Others:	Randall Correll, Ball Aerospace Paul Schechter, MIT David Lang, NRC Danielle Dean, American Univ. Miriam Quintal, Lewis-Burke Bethany Johns, AAS	Cathy Peddie Charles Gemmie Jackie Townsend Mansoor Ahmed Stephen Unwin Ruth Carter

MEETING CONVENED 11:00 AM EDT, 11 MAY 2012

The Chair called the meeting to order.

The minutes from the 10-11 February 2012 and 4 March 2012 meetings were approved by the Committee.

Elizabeth Pentecost, the AAAC Recording Secretary, reviewed the list of identified Conflicts of Interest (COIs) for the AAAC. Martha Haynes provided an update to her list of conflicts (2 were deleted). The list will be distributed again before the November 30-December 1, 2012 meeting.

James Ulvestad presented an update on the FY12 NSF/AST budget. He first provided some programmatic updates on the ALMA project. There are sixty-one antennas in Chile with 39 accepted. The first science observations started on September 30; 112 projects were selected from over 900 proposals. The first science paper has been published. Final North American deliverables (antennas and receivers) are on course for completion in September 2012. The inauguration is scheduled for March 2013. The Dark Energy Survey (DES) is progressing. The DECam (built by DOE-Fermilab) has been delivered to the Blanco telescope in Chile and is being integrated into the telescope. Data management and CTIO operations will be provided by NSF and NOAO. The Jansky VLA was re-dedicated in March. New Directors are expected at NRAO

(Tony Beasley) and Gemini (Markus Kissler-Patig) soon. ATST is still awaiting resolution of the appeal of the construction permit. A FY14 start for LSST is still possible.

Chick Woodward asked if there were any issues with ITAR for ALMA in light of the problems at other agencies. Phil Puxley replied there were no issues with ITAR for ALMA construction.

For the FY12 budget, the research grants program has been cut from \$49M to \$43M, NOAO was cut from \$27.5M to \$26M, Gemini increased by \$1.5M, the ALMA operations ramp was reduced, and the Universities Radio Observatories (URO) program was cut significantly. There are no funds for TSIP.

For the FY13 budget, there will be significant reductions to NRAO, Gemini, and NSO. NOAO will stay at a lower level of funding. AST will try to maintain the research grants program at the FY12 level. All of this depends on the final appropriation and possible sequestration. The FY13 Senate appropriations language calls for restoration of facilities funding which would mean a dramatic reduction in the grants program if the language persists in the final appropriation.

Scott Borg provided a report on the astronomy and astrophysics program in the Antarctic. There are several ongoing programs in the Antarctic, namely, IceCube, the South Pole Telescope, and BiCEP, HEAT at Ridge A, and the long duration balloons. IceCube is a partnership between OPP and MPS-PHY with international partners. The Observatory is complete and maintenance and operations are underway. There is support for IceCube through FY14 and there will be major review of the project in a year. The initial 5 year SZE survey for the South Pole Telescope (SPT) is complete with many new and exciting discoveries of the structure of the early Universe. There is support for SPT through FY13 with a proposal for new work expected. Current support for BiCEP is through FY13 with a renewal proposal in review. 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 FY14. 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 FY14. There is interest to continue the collaboration in the future.

At the request of OMB, the NRC conducted a review of the US Antarctic program. Part 1 of the review consisted of a review of the science drivers behind the program. A report was issued in December 2011 (http://www.nap.edu/catalog.php?record_id=13169). A Blue Ribbon panel (Part 2) reviewed the infrastructure of the program addressing the science drivers. A report is anticipated in July 2012. The review includes consideration of international and interagency partnerships.

Challenges facing the US Antarctic program include stagnant budgets and increasing costs, the need for better integration/partnerships and priority setting with other national investments in astronomy, and future investments in current projects such as SPT and IceCube.

Tom Statler provided an update on the AST Portfolio Review. This is a two-phase process: (1) recommendations of the critical capabilities needed over the period from 2015 to 2025 that would enable progress on the science program articulated in the decadal surveys, and (2) recommendations of the balance of investments in new and in existing, but evolved, facilities, grants programs, and in other activities that would deliver the needed capabilities within the constraints of each of the provided budgetary scenarios. The Committee has weekly full-committee telecons and separate working group telecons. The community was briefed at the AAS Town Hall. Their first face-to-face meeting was in October 2011 with a second meeting in

after the AAS meeting, at which point Phase I was completed. Community input was accepted until the end of January and is being assessed by the Committee. A third meeting of the Committee was held April 12-14, at which time Phase 2 was completed. A first draft of the report has been written and will be delivered to AST for comments in July. Formal acceptance of the report by the MPS Advisory Committee (MPS AC) will take place in late summer with an implementation plan being developed in the Fall. The Portfolio Review web site is http://www.nsf.gov/mps/ast/ast_portfolio_review.jsp.

Paul Hertz provided an update on NASA's FY2013 budget request. The Science Mission Directorate (SMD) still continues to provide the most productive Earth and space science program for the available resources, guided by national priorities, and informed by the NRC decadal survey recommendations. SMD will continue to responsibly manage the national investment in robotic space missions and closely manage JWST to the new cost and schedule baseline. There are plans to conduct a new Mars program with other NASA organizations. There are plans to adequately budget for launch services acquired by SMD by NASA's launch services program in order to have them available for medium class missions and to encourage cost constraining measures for intermediate/large class missions.

The FY2013 President's budget request for NASA Astrophysics is \$633M which does not include SMD budgets that are book kept in the Astrophysics budget line. The Senior Review took place in March (see section for more details). In response to Astro2010 recommendations, the budget for research awards in the Astrophysics Division increased by 10% in FY2012. Suborbital program (payloads, balloons) growth is being deferred. The AAAC is studying the NASA-NSF theory and computation networks program.

The second generation instrument selection was announced for SOFIA. Two proposals were judged to have the best science value and feasible development plans: (1) the High-resolution Airborne Wideband Camera Polarization (HAWC-Pol), an upgrade to the HAWC instrument to include the capability to make polarimetric observations at far-infrared wavelengths (measure the magnetic field in the interstellar medium, star forming regions and the center of the Milky Way), and (2) HAWC++, a more sensitive large format detector array to the HAWC-Pol investigation, increasing its observing efficiency and providing a broader range of targets. The next call for proposals is set for 2014. Launch for NuSTAR from the Kwajalein Atoll is set for June 13 pending resolution of issues with the Pegasus launch vehicle. All flight mirrors for GEMS have been fabricated and flight spare foils are now being fabricated. Fabrication of the long lead flight polarimeter has begun. The engineering model calorimeter for Astro-H has been integrated into the JAXA engineering model dewar. The calorimeter is scheduled to begin cryogenic functional testing in August. The flight model work is proceeding as planned. JWST is on track for a launch in 2018.

The FY13 budget request does not support an announcement of opportunity for both missions and missions of opportunity in late CY12. The first priority in the Explorer program is to complete the Explorers in development (NuSTAR, Astro-H, GEMS). The second priority is to downselect and fund the development of one mission and one mission of opportunity from the projects currently conducting Phase A studies. The third priority is to issue new announcements of opportunity leading to the development of new missions. The Astrophysics Division is planning a series of AOs, subject to budget, for 2013 and 2014.

The Science Definition Team (SDT) for WFIRST delivered its interim report in July 2011. Updated guidance was given to the SDT in December 2011 and a second design reference mission is being studied. This DRM mission will not duplicate the capabilities of Euclid, LSST,

and JWST. The final report is due in June 2012. Even though Astro2010 recommended WFIRST as the highest priority space mission, the President's FY2013 NASA budget does not include any new large missions nor does it fund a start on WFIRST or technology development. In the meantime, NASA is proceeding with planning through the SDT and the design reference missions. NASA is planning to partner with ESA on Euclid. The Astrophysics Division is in the process of working out the details of the planned collaboration with ESA on the Euclid project; an MOU is now in process with the State Department. The Euclid project was assigned to JPL who is working with the instrument developers in Europe and the program office at NASA-GSFC on the technical details of the project. A solicitation for NASA appointed science team members is in preparation for release in May 2012.

Jaya Bajpayee provided an update of the 2012 Senior Review process for NASA's astrophysics programs. The review for 2012 did not provide an overall rank order of the missions. The review panel ranked missions in 5 metric areas: discovery space, long term impact, publications, synergy, and criticality. The Senior Review also considered missions among the classes such as Great Observatories, Discovery, Explorer, and Foreign. All the missions invited to the Senior Review had either completed their prime mission or will have completed their prime mission before the next senior review. Mission operations for Fermi, Kepler, and Swift were extended through FY16. Chandra was fully funded as budgeted through FY16, Hubble was fully funded as budgeted, operations for Spitzer were extended through FY14, US support for Planck was extended for an additional year because of the Low Frequency instrument, US science support for Suzaku and XMM-Newton were extended through March 2015.

Jim Ulvestad and Paul Hertz indicated that the CAA has been reconstituted. Both NASA and NSF will fund the committee through the National Academy of Sciences. NSF is looking to have the CAA take the lead in a mid-decade review of the survey.

Kathy Turner gave an update on DOE activities. The budget for High Energy Astrophysics will be down in FY13 substantially compared to FY11. The FY12 & FY13 budgets include SBIR/STTR of approximately \$20M, which has already been removed from the FY10 and FY11 actuals, therefore the real FY12 and FY13 amounts are a reduction of approximately \$5M and \$19M relative to FY 2011. The FY 2012 appropriation is reduced by \$840,000 for the High Energy Physics share of the DOE-wide \$73,300,000 rescission for contractor pay freeze savings. The FY 2013 budget request reflects the FY 2013 impact of the contractor pay freeze.

Support for the International Linear Collider research and development efforts ended. The five-year R&D plan was successfully completed and there is no project on the near horizon. Construction for the Long Baseline Neutrino Experiment was not included in the FY13 budget request. The Office of Science Director William Brinkman notified Fermilab in March that DOE would not be supporting LBNE in its current design due to cost. Brinkman asked that Fermilab investigate an alternative, staged approach with science results at each stage. Fermilab is leading the study and a report is anticipated in July. In the President's FY13 budget request, the Homestake mine dewatering effort is maintained to support early science; a Senate markup has recommended increased support. The lack of new facilities for science threatens the future of the program. There are opportunities at the Cosmic Frontier for such projects as LSST and dark matter detection.

The Cosmic Frontier budget is up slightly in the FY13 request. DECam funding ended in FY11 and funding for LSST is increased in FY13 when fabrication of the camera is supposed to start. The High Energy Physics community is conducting a long term planning exercise which includes workshops over the next year.

Currently the Dark Energy program consists of BOSS, DES, and the supernova surveys. There is some low level planning, e.g. on WFIRST SDT, and Euclid but no plan for participation in the projects. LSST is the priority for the next HEP dark energy project to be developed. Future possibilities are BigBOSS, SN surveys, BOSS-upgrade, etc. For the Dark Energy Survey, DOE is responsible for the camera which has been delivered to Chile. The start of 5-year operations is expected in November 2012. Current projects in the cosmic-ray and gamma-ray program include Auger, VERITAS, AMS, and Fermi. The NASA Senior Review just extended support for Fermi through FY16 with a FY14 revisit. Future possibilities are the Cerenkov Telescope Array (CTA), the number 4 recommendation in Astro2010. There are Joint Oversight Groups (JOGs) for DES, VERITAS, and LSST.

The Chair asked Turner how does the output from the community workshops translate into future opportunities; does HEP expect to receive proposals for funding these opportunities? Turner replied that the process is to lay out the science program and justification and have the community come up with options, project, directions to go forward; get the community to think about different facility experiments, then there will be a HEPAP chartered panel to prioritize projects within budgets.

Nigel Sharp, Kathy Turner, and Fred Borcharding provided an update on the Large Synoptic Survey Telescope (LSST) project. There is a realignment of NSF and DOE schedules and budgets for LSST. It is the intention of NSF to have an MREFC start in Q4 of FY14. The FY13 request includes funding to continue the project in FY13. There was a good report from the NSF MREFC panel, but approval was made conditional on some additional reviews and signing of the MOU by NSF and DOE. There will be additional reviews over the next few weeks.

There was a question about the costing for LSST cited in Astro 2010 and whether the same process will apply to these additional reviews. Sharp replied that the process should be pretty consistent. If there are issues found in the costing, we will not move forward. There must be a solid not-to-exceed cost. Reviewers have been told to follow their instincts and pursue anything that seems off. Should anything happen in construction where a specification is not quite met it is important that you can quickly calculate the impact on the rest of the project.

A "Statement of Intent" preparatory to the MOU was signed in April by Bill Brinkman and Cora Marrett, and sent to OMB and OSTP the same day. The idea is to make certain that OMB concurs with both agencies' budget requests. The LSST data policy is still in development. The project still has to find $\sim 1/4$ of the operations budget from someplace other than NSF and DOE. The project has looked for other partners but it is not yet clear what other partners would get in return for their contributions; the project will probably not be allowed to give out unrestricted data rights. NSF-AST and DOE-HEP reserves the right to approve all agreements.

Chick Woodward asked whether the open skies policy applies to LSST. Sharp replied that No, there will be an annual-ish release so it will be like SDSS. Other issues concern access to processing or other types of products. Applying for access to time doesn't really apply. Woodward commented that the issue is processing to level 1 data that become scientifically interesting and remarked that SDSS sat on their data for a long time. Sharp replied that the federal investment was not the majority in SDSS, but with LSST, the agencies have $3/4$ of the ops cost. The project must be able to get the remaining $1/4$ and it is not really possible to reduce the operations cost. Woodward further asked whether the agencies anticipate an increase in proposals to work on LSST data. Sharp replied that it is not so much as planning on an increase

but a shift of activities in the same way that we saw more people requesting support for analyzing SDSS data rather than making new observations.

Mordecai Mac Low and Greg Laughlin gave an update on Theory and Computation Networks, first discussed at the March meeting. *New Worlds, New Horizons* made a recommendation that NSF, NASA, and the DOE cooperate to fund networks in theoretical and computational astrophysics. Mac Low and Laughlin were requested by the AAAC at their meeting of 13-14 October 2011 to consult with the community to recommend the desirable parameters of such a program. DOE was uninterested in participating, as they already provide substantial resources (through their INCITE program) in support of large computational astrophysics collaborations. It was further suggested that a likely level of support for this program was on the order of \$2M per year.

A major question was “What scale should the TCN be?” Initially, the idea of holding a workshop to enable effective consultation with the community was discussed. However, after due consideration, it was decided that the time and expense could not be justified, and instead individual consultations in person and by electronic means, combined with a group telecon that included designated Federal officials Tom Statler and Linda Sparke, were substituted. Several NASA models were discussed. Many European models were simply not feasible because of limited funds. But, a medium scale model is very interesting and more appropriate for 3 year projects, probably not for 5 year projects.

Community input emphasizes that participation in research networks is particularly valuable for graduate students, as it introduces them quickly to a broad range of ideas and a larger group of potential collaborators. Another major issue identified is the relatively limited amount of support for the development of computational methods and tools, in comparison to the support available for applying them. This is true at both junior and senior levels. Support for both groups should be encouraged, but not required, as the design of each program will inevitably lead to different needs.

This program is intended to focus on the areas of greatest potential for progress, such as those identified by the Decadal Survey. However, the agencies should not limit themselves just to those subjects identified as high priority questions by the Science Review Panels, as that will not give the necessary balance of focus and flexibility. The initial period maybe confined to the decadal survey priorities, but over time, it may open up to other ideas, perhaps at a lower priority. This should be discussed more.

In order to maximize the return from this program, the effectiveness of implementation of proposed networks will need to be explicitly evaluated. This means an extension beyond the usual criteria for evaluation used by the NSF of scientific merit and broader impact; and by NASA of scientific merit and programmatic relevance. How will collaborations work? It should be clear in the budget how all of this will work and how it will be successful. There must be a strong case that it will have a broad impact on the field in general, not just to the proposing group. There should not be a scientific topic restriction on proposed topics. Others agree. All agreed on this point.

The AAAC agreed that the topics should not be limited to just the NWNH priorities. However, NWNH did not anticipate the lower budget that is now materializing. Statler commented that the Portfolio Review will be considering all of this as far as how to manage this part of the grants program. The Portfolio Review will make some sort of a recommendation; expect some solicitation in FY13 but schedule and budget amount remain TBD.

A question was asked as to whether there will be a recommendation regarding the balance of grants, i.e., the fraction of individual grants going to TCN. Statler replied that AST tracks that information but he did not have the numbers for the Committee.

Another question asked was “What should the relative investment in TCN be given the overall AST budget reduction?” Statler replied that this is all in the context of CIF21, etc., within the foundation. This TCN will be seen as an exemplar of how to create programs that are strictly computational in nature but still fulfill the science needs. This would also be a way to demonstrate how we might match up with Grand Challenges and other foundation directions. Thank you for the report and important comments that it is generating. This is helpful as it is new and complementary to what is already going on. Linda Sparke commented that the NASA computation program is not coming from the main science program. NASA does not have an overarching program that this fits under. So, NASA can go with NSF's schedule and work together in planning this. NASA knows how to do this, and it should happen!

The Chair noted that these are hard times for all of the agencies. The AAAC will need to wait for the Portfolio Review. The AAS will need to stay on alert. Right now the Senate Committee language preserves facility funding at the possible expense of grants. Debbie Elmegreen (AAS President) has been corresponding with Bethany Johns, who will go directly to the Hill to talk with people working on the language; a message will be sent to members depending on how things go. The Chair noted that it might be tricky to get the Committee to buy in to the Portfolio Review recommendations. The balance between grants and facilities is quite a problem and will remain one for the foreseeable future. This will most probably make a yearly presence in the annual report.

On a different subject, the Chair noted that there is a close connection between funding of OPP projects and AST projects. The subtext here is that OPP is getting pinched too so e.g. how does the South Pole Telescope fit in with the astronomy program. Nigel Sharp noted that the issue is really whether the AAAC can assess the cost effectiveness of the science done in the Antarctic compared to what can be done elsewhere. Does the science justify the additional complexity? Astronomy from space is more expensive too. It certainly makes sense to use the South Pole Station, which exists partly because of geopolitical concerns, to accomplish first class science. Mac Low asked whether we should be doing there only the stuff that only can be done from the South Pole, e.g., IceCube, high altitude balloons, SPT? What role does the AAAC want to play in this? The Committee has talked about this kind of thing in previous reports, but the Committee is not sure they want to set policy. This may be a topic for the Fall meeting agenda.

The Fall meeting is scheduled for November 30 and December 1.

Stefi Baum suggested that at some future meeting the Committee should have a discussion of astronomy EPO and cuts in the EPO budget.

MEETING ADJOURNED AT 4:00 PM EDT, 11 MAY 2012