Minutes of the Meeting of the
Astronomy and Astrophysics Advisory Committee
10-11 February 2012
National Science Foundation, Arlington, VA

Members attending:	Andreas Albrecht	Mordecai-Mark Mac Low
	Stefi Baum	Richard Matzner
	Sarah Church (Chair)	Paul Vanden Bout
	Debra Elmegreen	John Wefel
	Joshua Frieman	Brian Winer
	Martha Haynes (Vice-Chair)	Charles Woodward
	Gregory Laughlin	
Agency personnel:	James Ulvestad, NSF-AST	William Lightsey, NASA
	Thomas Statler, NSF-AST	Tina Swindell, NASA
	Elizabeth Pentecost, NSF-AST	Hashima Hasan, NASA
	Ed Ajhar, NSF-AST	Linda Sparke, NASA
	Nigel Sharp, NSF-AST	Jaya Baypayee, NASA
	Dana Lehr, NSF-AST	Eric Smith, NASA
	Maria Womack, NSF-AST	Kathleen Turner, DOE
	Jeffrey Pier, NSF-AST	Glen Crawford, DOE
	Christer Watson, AAAS Fellow-AST	James Seigrist, DOE
	Randy Phelps, NSF-OIA	Lali Chatterjee, DOE
	Bill Miller, NSF-LFO	Fred Borcherding, DOE
	Kristin Ludwig, NSF-LFO	Tammy Dickinson, OSTP
	Phillip Schwartz, NSF-LFO	Gerald Blazey, OSTP
	Paul Hertz, NASA	Joel Parriott, OMB
	Rita Sambruna, NASA	Arti Garg, OMB
	Chris Davis, NASA	
Others:	Randall Correll, Ball Aerospace	Naomi Webber, Lewis-Burke
	Paul Schechter, MIT	Michael Devirian, JPL
	Renuka Nagaraj, Washington College of Law	Bethany Johns, AAS
	Danielle Dean, American Univ.	Mangala Sharma, STSci
	David Lang, BPA/NASA	Ethan Schreier, AUI
	Robert Hanisch, STSci	James Murday, USC
	Margot Walker, British Embassy	Jean Rene Roy, STSci

MEETING CONVENED 8:45 AM EST, 10 FEBRUARY 2012

The Chair called the meeting to order.

The minutes from the 13-14 October 2011 meeting 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 May 11, 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 fifty-four antennas in Chile with 35 accepted. The first science observations started on September 30; 112 projects were selected from over 900 proposals. Data were taken for more than 30 projects. The first science paper has been placed on the preprint server. Final North American deliverables (antennas and receivers) are on course for

completion in September 2012. The inauguration is scheduled for March 2013. Gemini is making good progress on getting new instruments on the telescopes, specifically the multi-conjugate adaptive optics (GeMS), the Gemini Planet Imager (GPI), and Flamingos-2. The US share in Gemini will grow from about 50% to 63% in 2013 after the UK withdrawal. The EVLA has been re-named the Karl G. Jansky VLA. It will be completed on time and on budget at the end of 2012. Early science for EVLA generated ~34 papers in ApJ. The Dark Energy Survey (DES) at CTIO will begin in late 2012. The camera (developed by DOE) is being integrated into the Blanco telescope. ATST is still awaiting permission to break ground on Haleakala and discussions continue with the Geosciences Directorate about a home for ATST/NSO.

Haynes commented that the two issues for Gemini are the future of the international Gemini observatory and how it folds into the US national program in ground based astronomy. Ulvestad noted that the Portfolio Review will probably comment on these issues and that will have an effect on how the new international agreement is structured.

Ulvestad provided some historical trends for the past 20 years as an introduction to discussing the budget profile. Several major facilities came on line from 1993 -2000, the VLBA, GBT, and Gemini. At that time facility operations costs were ~65% of the AST budget in 2000-2002. While the AST budget doubled in the 2000-2010 decade, no new facilities became operational after 2002 other grants programs expanded significantly. Design and development (D&D) budgets were started for LSST, GSMT, and SKA. The NSF astronomy community now is supported at a very healthy level. Facility operations costs were ~53% of the AST budget in 2008 and major facility infrastructure renewal was supported through ARRA in 2009. This decade, new major facilities will come on line, ALMA, EVLA, and ATST. However, the budget is stagnant and decreasing. Facility operations costs are ~56% of the budget and are headed upward. There is little to no room for starting the Astro2010 recommendations.

Each of the AST FY11 and FY12 appropriations were $15M below the President's request ($251.8M vs. $236.6M in FY11 and $249.1M vs. $234.5M in FY12). The bottom line is that the expectations and the aspirations of the community cannot be met. All possible scenarios have 2015 AST purchasing power less than that of 2010. The Division is committed to operating costs for facilities coming on line increasing by ~$30M from 2010 to 2015. The existing programs and commitments cannot be covered let alone respond to Astro2010 recommendations. After accounting for inflation, the estimated shortfall will be 15-20% of the total AST budget of ~$230M by 2015, without considering any of the recommendations. The Portfolio Review committee is working with these constraints and a report is expected in the summer. The Division has been planning for some of these shortfalls since 2010 by forward funding some of the facilities operating costs, reducing out-year commitments, and program cuts. The division managed to protect the AAG and ATI programs in FY11 but they will be cut in FY12. Also, there will be no new mid-scale projects started in FY12.

AST is addressing the Astro2010 recommendations in a variety of ways. LSST is being presented to the MREFC panel as part of the process of seeking permission for a possible FY14 start. If started in FY14, the planned date for the beginning of operations is October 2021, but there is little room for FY14 starts in the MREFC line. There is no funding for a mid-scale plan. A solicitation for GSMT partner planning has been released, but there is no construction funding until at least 2020. The Division has provided D&D funding for CCAT but there is no construction wedge available at this time. However, Gemini has a Congressionally-mandated increase of $2M for FY2012.

The health of the profession is important to the community, but to what extent? Is it fair that in a flat-budget scenario, we are graduating far more PhDs than there are careers in research astronomy? Most grant funding is from NASA so NSF cannot help in this regard. What is the appropriate NSF response in the facility/mid-scale/grants balance? Should we support older facilities just to produce students? What is the responsibility of the university community in faculty incentives and promotion policies,

and in the signals being sent to students? Can university observatories be healthy without long-term federal commitments? Given a highly constrained budget, what do we want US ground-based (and space-based) astronomy to look like in the 2020-2025 timeframe, and how do we get there? These are all very important questions and issues that need further discussion as the community sees reductions in future budgets.

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 January, at which point Phase I was completed. Community input was accepted until the end of January and is being assessed by the Committee. New working groups are engaged in Phase 2 of the process. A third meeting of the Committee is scheduled for April with a report delivery in June/July. The report will be delivered to the MPS Advisory Committee (MPS AC) later in the 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.

Woodward asked whether the report will be released in a roll-out fashion. Statler replied that it will be released after it is accepted by the MPS AC. Ulvestad noted too that once the report is accepted by the MPS AC, it becomes a public document; it's now a matter of how to make people aware of the report. A plan will be developed on how the community will be aware of the report. It is a set of recommendations only, not an implementation plan. The reason to get it out in the June/July timeframe is to affect the FY 2014 budget.

Eric Smith provided an update on the James Webb Space Telescope (JWST). JWST is the scientific and technological successor to HST and Spitzer. The replanned JWST program supports a 2018 launch date. The replan was approved in September 2011. The project made significant progress in FY11, 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). NASA provided a report to Congress detailing projected cost and schedule for completing the program (at 80% cost confidence level). The program office must develop fiscal year 2012 high-level milestones for external reporting.
Mac Low asked how long the operations period is assumed to be. Smith replied that operations would be for five years with two years of data analysis following the operations. The mission would be reviewed in a Senior Review process at the end of the prime missions and if accepted, it could be extended.

Nigel Sharp provided an update on the Large Synoptic Survey Telescope (LSST) project. The project has been endorsed by the NSF directorate, advisory committees at NSF, along with several external and community reports. Private funding of $39M has mostly been spent on the mirror, site preparation and detector development. NSF completed the Preliminary Design Review (PDR) in September. The review panel considered that the LSST project has met the requirements of the PDR. The DOE held CD-1 review of the camera in November; the project met all of the CD-1 prerequisites and in some areas significantly exceeded them. Both review panels made recommendations. NSF and DOE should align their funding profiles and conduct an independent review of the interfaces between the camera and the other observatory systems. Many of the recommendations endorsed steps that the project has already planned to take. The NSF total project cost is $457M over 7 years. The extended duration is to synchronize with the DOE camera funding. The DOE total is $160M which is now properly synchronized with the NSF request. There are no site risks. Preliminary site preparation

with private funds found no geotechnical concerns. Environmental permitting in Chile is completed with site impact mitigation well in hand. The biggest risks are budgetary. On the advice of NSF, the AURA LSST Project Office was created to take over project management with the LSST Corporation retaining technical charge of the project. This increases the management fee but adds considerable confidence that the project will be completed. Revisions of the work breakdown schedule add a year and $27.7M to NSF's total cost for the telescope. The increase is not due to change in the scope or project error. Full science operations now start in October 2021. NASA is interested in LSST but they have not made any commitments to the project. Some foreign partners are willing to sign letters of intent to contribute to operations. NSF and DOE are working well together. They have set up a Joint Oversight Group (JOG) that meets regularly; the JOG also has regular meetings with the project management team. The NSF is the lead agency but there are defined contributions from NSF and DOE.

Mac Low asked what would happen to the camera if the MREFC funding did not come until FY 2017. Sharp replied that if the process gets delayed a year then we can hold things, but if there several years delay, rethink it. The project is well organized. The MOU has been re-done along the lines of scope. The scope for DOE is the camera and that is separate from the issue of the telescope; they are not on the critical path for each other. The agencies require a lot of time to synchronize their project efforts.

Haynes note that we need to better understand the coordinated campaign of observations, both fundamental and follow-up and we need to work together. Sambruna commented that the WFIRST SDT is looking at questions of coordination among the projects like LSST, Euclid and WFIRST.

Nigel Sharp and Hashima Hasan provided a status update on the Virtual Astronomical Observatory (VAO). The intent of the VAO is to move beyond the very successful NVO (international standards, software, data mining support, user interfaces, etc.) to create a real astronomical observatory. The VAO continues to have excellent relations with international efforts, i.e., the International Virtual Observatory Alliance (IVOA). VAO, LLC was created by AURA and AUI but there was a significant delay in making the NSF award, which was made in May 2010. This did not affect the NASA funding which was passed through their existing centers. The Virtual Astronomical Observatory is the second phase of a project recommended by the 2001 Decadal Survey .....The first phase, the National Virtual Observatory, was supported by NSF and NASA to develop international standards, software, user interfaces, and general middleware, which it has successfully accomplished. The intent is to provide an observatory, one more amongst the suite of observatories available to the community, from which working astronomers can obtain data with which to address their scientific questions, and from which educators can draw real data for teaching and outreach. The important guiding principle is that the VAO should build on, but not be a continuation of, the existing NVO project.

There was a review of the project's program execution plan in April 2011. The panel commended the work on standards and protocols and noted strong penetration, that is, the use of those standards and protocols by other projects. However, the panel noted that the application development had been slow and applications lacked a consistent and intuitive user interface. The core functionality and the maintenance of standards and updated middleware should now be the primary function of the VAO. The VAO should now concentrate on adopting, integrating, and disseminating tools, not on developing them. EPO is not a priority and could be discontinued. There is still no clear transition from NVO to user-oriented VAO. The project should regroup and/or reduce the scope to fit within ~55% of the original budget ($2M +$1M from NSF+NASA, not $4M+$1.5M). The result has been for the two agencies to redirect guidance to emphasize the goals from the cooperative agreement. The intent is to continue discussion between the project and the agencies, involving further community review, to find the best way forward.

Joel Parriott and Arti Garg from the Office of Management & Budget attended the meeting. Both are OMB examiners for NSF and DOE's Office of Science, respectively. Wefel asked them o keep going,

there needs to be some priorities, how does OMB do that and what guidance do they get. Garg replied that science priorities are set by things such as the decadal studies; other communities have decadal surveys but they are not as organized as the astronomy community. Parriott commented that there are multiple sources of interest such as the National Economic Council, Domestic Policy Council in the White House, the national security staff and all of these things are taken into account; it's a thoughtful deliberative process. How much does it cost? Strong sources for these priorities come from the heads of the agencies. For example, the NSF director may have his own priorities but he is also immediately responsible for carrying out the President's priorities.

Haynes asked several questions of Parriott and Garg. Is interagency cooperation viewed as value added?; Do you have advice on how that might work, should one agency be a lead agency?; and , How does this fold into international collaboration? Garg commented that interagency collaborations can be difficult because of the different authorizing and appropriations committees. Also, for example, Garg works with the Department of Energy which will have different priorities than NSF or NASA would; if there is a lead agency, it makes it easier. International cooperative has another layer of complication, because in addition to just the budget, you have the different countries science priorities and other diplomatic considerations. Haynes further asked, is it viewed as an advantage or disadvantage to add an international component and because of the added complexity, is it a disadvantage? Parriott commented that in his view, if there is actual scientific expertise and you really need those partners, you make a stronger case to do international partnerships.

Church noted that in an era of tightening budgets and that NSF is going through a portfolio review, this is a prime environment for there being a slew of earmarks. Is there any advice OMB can provide? Parriott asked what Church's definition of earmark was. Church responded by saying that if for example, the Portfolio Review recommends a certain course and then the NSF budget comes in with a certain stipulation, it makes the agencies lives complicated and the community must bear the responsibility for that. Parriott responded by stating that there are two coequal branches of government involved in this particular situation; Congress is free to do what Congress decides to do; clearly there is the Administration's long standing view on earmarks, they are not good if they are outside the peer review process in particular and they do make it difficult for agencies to do their work. If the agency is proposing something that varies dramatically from what the community wants, OMB will ask difficult questions of the agencies and Congress will likely do the same.

Haynes asked Parriot and Garg for their opinion on the Astro2010 decadal survey report. How is it viewed in OMB and is there any feedback to the community about the report or the process? Garg responded by stating that when reports come out the agencies take it under advisement. In Astro2010 there was an attempt to look at project costs and technical risks and that from a budget standpoint it has a bearing on long term project costs and it was useful that Astro2010 did that. Woodward asked given project cost and technical risk, should future reports be more aggressive in that area since this was only an experiment this go round? Garg responded that personally it is helpful. Parriott responded by saying that the community last decade was told to think "big" by certain agency officials and the community used that guidance in crafting their recommendations, but then things outside Astronomy or NASA's control changed the budget picture; similarly, this decade the budget profiles the community assumed that NSF AST would be on a 7% annual growth trajectory and as soon as report comes out, the Budget Control Act (with 2% annual growth) is enacted. Even though this President is supportive of R&D there are still limits within the Budget Control Act and Congress may have different views of priorities within those limits.

Wefel asked if the AAAC could do anything to help OMB? Garg responded that from her perspective getting back to the question of whether these would still be your priorities under different budget scenarios and being critical about whether the science or technology has evolved would be useful. Parriott responded that it would be useful if the community sees that there is some kind of breakdown in a partnership among the agencies or something else going wrong with a particular project, they let

OMB know about it because agencies may hesitate to let them know about it thinking they can fix the problem before OMB finds out about it. When you hold the agencies, OMB, and Congress to account for things that are within our control that go wrong on projects, those are the useful things we can hear about.

Albrecht noted that he knows Parriott and Garg cannot talk about specifics about the FY13 budget but can they talk about general trends in terms of Administration priorities for the next five years. Parriott stated that there is the Budget Control Act that has a 2% growth factor and other technical things, there is an election that could change things dramatically and with this Administration, there is a President who loves R&D&D; he sees the whole picture and even in tight budgets last year, R&D agencies like NSF did well. Garg responded by saying that there is broad guidance within the agencies for areas such as clean energy, the environment, and advanced manufacturing. Parriott, in turn, gave an example of "Big Data" as a priority area for the astronomy community to plug into. Sambruna asked what is "Big Data"? Garg responded by stating that this community has done a lot of work in data curation, scientific data and the exploitation of it, slicing it in a lot of different ways; there may be cross over into other areas of science.

Tammy Dickinson and Gerald Blazey from the Office of Science Technology Policy in the Executive Office of the President attended the meeting. They cover two areas of interest to the AAAC. Dickinson covers the space and NASA space and NSF geosciences portfolio related activities and Blazey the large facilities. OSTP was established in 1976 by Congress with a broad mandate to advice the President and others in the Executive Office on national and international science policy; work with private and state and local government. OSTP is involved in key issues such as science and technology innovation, economic advancement, STEM education, increasing efficiencies in government, and access to data. Key administration-wide initiatives include energy, earth observations, climate change, regulatory reform, cyber-security. Many of the agencies and councils work together on policy issues. Dickinson sits in the Energy and Environment group but her portfolio covers energy, environment, NASA space activities and some classified portfolio in national security. Blazey sits in the Science division. They provide policy for science and technology across the R&D portfolio and provide S&T input into policy decisions. OSTP oversees two major activities: the National Science and Technology Council which comprises deputy secretaries and under secretaries of various cabinet-level departments; the work done by series of committees and subcommittees; a lot of the interagency coordination is done here. The other activity is the President's Council of Advisors on Science and Technology which is OSTP's federal advisory committee; it meets quarterly. They meet frequently with the President and he has asked them to meet more frequently and to track what the agencies are doing; the President gets a lot of advice from this group. The focus within the Science Division is life sciences and biotech, physical sciences, engineering, large instruments and large facilities, social and behavioral sciences, prizes and awards to stimulate activity in the private sector, and STEM education. Dickinson and Blazey help to monitor the different agencies to develop programs, reconcile priorities with budget.

Woodward asked what the sense was within OSTP about the general R&D health in the country supported by investment. Blazey replied that OSTP pays a lot of attention to the general health and one thing is concern is the balance between facilities and research. Understand you need the facilities but you need the people to do the research as well. This Administration is doing as much as possible to support R&D activities given the economic climate. Woodward further asked about leveraging federal and private investments to achieve science goals; how is that incorporated in the strategic thinking that goes on in looking at new initiatives. Dickinson replied that public-private partnerships have been a major emphasis of OSTP in the last three years. There are initiatives to bring public dollars in with private dollars; if there are others areas in which the OSTP should be doing other things, they would like to hear about it.

Albrecht asked about "big data" and how it works. Dickinson commented that "big data" activities are cross-cutting. Much of the push has come from the climate community and the health community. They are trying to look at how other communities play in that arena. Blazey commented that there are some working groups that are trying to come up with some interagency guidelines for handling of data and how to move forward with large data sets; there are some groups focused on what it means to have "big data" in their communities.

Elmegreen asked about the JWST issue. Dickinson replied that how to deal with the JWST issue was a discussion between NASA, OMB, OSTP and to some extent Congress over many months; it was a back and forth negotiation and the Committee will see the final answer next week. Tough decisions had to be made and in the end NASA decided this was a high priority for the agency. Elmegreen further asked regardless of JWST, does OSTP weigh in on how SMD gets subdivided between astrophysics and planetary sciences? Dickinson replied that it is a back and forth between OSTP, OMB, and NASA.

Vanden Bout asked whether OSTP is involved in discussions on government policy on the publication of scientific results. Blazey replied that it is involved quite extensively. There is a working group looking at how public should the results be and how open should the access to the data be. OSTP is aware of ITAR issues but it is not front and center right now.

Said that in his opinion, the priority exercises are essential because people rotate in and out and they help introduce themselves to the field and to find out what the community finds interesting. What is most interesting, though, is the prioritization of the science; that will last through various cycles of the budget and the economy. OSTP having some reference when considering the issues is very useful.

Woodward asked what is the general thinking about life cycles and facilities in how they engage in scientific activity when multiple agencies are looking around to see what the landscape might be? Blazey replied that this is one of the important issues that needs to be addressed on the national and international scale. Agencies like to build facilities and then they have to operate them. OSTP will be working with the agencies on this issue.

2011 Physics Nobel Laureate Saul Perlmutter presented a seminar, "Nurturing and Sustaining Nobel Science" during the lunch break.

Kathy Turner provided an update on DOE programs and budgets. The High Energy Physics (HEP) 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. It is a balanced program of projects in all three frontiers. HEP's priority is significant contributions to facilities/experiments and supporting collaboration with necessary expertise, resources to from design to data analysis, including science studies/planning. Their goal is to make significant advances in science.

The FY12 appropriation of $790.8M included $20M of SBIR/STTR grants, which has been removed from the FY10 and FY11 actuals. The real FY12 request is a reduction of approximately $5M from FY11 and $12M from FY10. HEP's strategy is to work to increase that back to 20%. With flat funding, HEP has to end programs to start new ones.

DOE is only doing one major dark energy experiment, LSST. The Tevatron was shutdown at the end of FY11 after 30 years of operations. DOE has made significant contributions to the accelerator and detectors (ATLAS and CMS) for the Large Hadron Collider (LHC) at CERN. LHC will shutdown in 2013 for "Phase 1" improvements including extensive maintenance for the detectors and planned upgrades to the detectors that support high data rates and radiation levels. Neutrino experiments

continue at Fermilab and Minnesota. HEP is developing an Intensity Frontier implementation plan based on community input from a workshop held in December 2011. DOE is reviewing options for underground science and will provide a detailed project plan and updated cost estimates by April before Congress will consider construction approval. The FY12 budget includes $15M to keep the Homestake Mine viable while decisions are made; NSF had covered the costs until the continuing resolution was lifted.

Partnerships between agencies and other offices within agencies can provide necessary or additional resources and provide opportunities for increased science. While all government agencies follow the same rules, there are differences in the details. HEP's emphasis is on collaboration leading the science from the start which is different than other communities. Many Cosmic Frontier experiments have a much broader science programs than what is of interest to the HEP program, so DOE makes a contribution at an appropriate level. DOE funds collaborations of scientists with associated technical personnel and other expertise to make big advances in its prescribed science areas. Science planning is expected all along the process with an end product of coordinated data analysis by collaboration. Science thrusts for the Cosmic Frontier are dark energy, dark matter, high energy cosmic and gamma rays, CMB. HEP receives official advice from the High Energy Physics Advisory Panel (HEPAP) and the AAAC. DOE also gets input from the National Academy. The Astro2010 recommendations for DOE are part of a coordinated ground/space-based dark energy program that includes LSST and WFIRST. LSST was recommended as the priority because the DOE role is critical. The Cosmic Frontier budget for FY12 is ~$68.35M. The LSST and the High Altitude Water Cherenkov (HAWC) telescope have become major instrument and equipment (MIE) projects in FY12. DOE is working with NSF-PHY on current efforts and in coordinating future plans as they are with AST. DOE is funding several joint dark energy programs with AST that include BOSS on SDSS-III and DES (Dark Energy Survey-camera).

HEP has bi-annual (or tri-annual) reviews of their projects because they do not have time nor manpower to have a separate review of each experiment. For larger projects (e.g. DES), prior to the operating phase, HEP plans an individual panel review of the project operations plan and readiness; after this they move into the standard joint review process. For all experiments, HEP will continue to have monthly or quarterly reports and discussions with agencies and joint oversight groups as appropriate.

Woodward asked if there are any salient science results from the Alpha Magnetic Spectrometer (AMS) instrument on the International Space Station. Turner replied that she was not aware of any results yet. Woodward also asked how the DOE interacted with Euclid. Turner replied that there is a 900-member science collaboration. They asked for science expertise; for example, LBL worked on sensors that might be utilized on Euclid. Sambruna noted that there are two science teams, one a 12-13 member science team who are the major science advisors and the larger science collaboration that takes care of more detailed science issues. Turner commented that she envisions the science collaboration analyzing the data, setting up the tools, etc. There are US people including some from DOE that have joined the collaboration.

Paul Schechter provided an update on WFIRST. A panel was convened by the NRC to assess NASA's proposed participation in the European-led dark energy mission Euclid. The proposal from NASA is to contribute hardware for a max of $30M in exchange for a US scientist be a member of the Euclid Science Team and her/his team to be members of the Euclid Science Consortium, with full data access rights. The *NRC Committee on the Assessment of a Plan for US participation in Euclid* heard presentations about Euclid, WFIRST, and the Decadal, and determined that "both Euclid and WFIRST should make important contributions to the understanding of cosmic acceleration. While Euclid should advance our understanding of dark energy, WFIRST has the more robust and powerful approach. WFIRST should make significant advances in dark energy research beyond Euclid's own contribution." In addition, the Committee found that critical elements of the WFIRST mission are

outside the scope of the Euclid core mission. WFIRST will enable a broader range of astronomical science from gravitational microlensing to search for Earth-sized exoplanets, to surveys of supernovae and the galactic plane.

NASA charged the WFIRST SDT with producing two design reference missions, one (DRM-1) continuing the work performed in 2010 (which produced the Interim Design Reference Mission report), and one to look for a WFIRST mission that does not duplicate capabilities that are already present in Euclid, LSST, and JWST (DRM-2). Options for reducing the cost of a stand-alone WFIRST mission in DRM-1 included eliminating the spectroscopy channel, and dropping the Baryon Acoustic Oscillation technique. In DRM-1, the SDT is looking at possible extension of the wavelength cutoff to 2.5micron and the use of an Imaging Field Unit for supernovae studies.

Schechter made the case that funds are needed in the short-term to go ahead with the development of the Hawaii-4RG detectors. WFIRST will be doing weak lensing in the infrared not the optical. Weak lensing is the riskiest program for WFIRST.

Woodward drew attention to the impact of the other science drivers for WFIRST, like exoplanets, and asked whether that would make a significant improvement in that part of the science. Schechter replied that we're looking at nonconflicted capabilities. What is being discussed is the size of the pixels for the imaging; fatter pixels sacrifices weak lensing which is undesirable.

Woodward asked whether the WFIRST team has thought about what it means to have leadership in the US with regards to the science programs now that there is a strong recommendation for US involvement in Euclid. Schechter replied that WFIRST will be leading in exoplanet microlensing, supernovae studies, and IR surveys (which includes a GO program); as far as weak lensing and BAO, WFIRST will be complimentary to Euclid.

The Agencies were asked to start thinking about nominating new members for the Committee. Sarah Church, Gregory Laughlin, John Wefel, and Chick Woodward rotate off the Committee in June and new members need to be selected and appointed well in advance of the Fall meeting.

MEETING ADJOURNED AT 5:00 PM EST, 10 FEBRUARY 2012
MEETING RECONVENED AT 8:30 AM EST, 11 FEBRUARY 2012

Paul Hertz, Acting Director for the Astrophysics Division, provided an update on the NASA astrophysics budget and programs. He reported that John Grunsfeld was named Associate Administrator for the Science Mission Directorate, with Ed Weiler's departure. Hertz has been named Acting Director of the Astrophysics Division and Michael Moore has been named Acting Deputy Director of the Division. A search is on for both positions.

Hertz gave a brief overview of some of the significant accomplishments in the Division. The Japanese government has approved the Astro-H budget for the new fiscal year. The engineering model calorimeter spectrometer has completed all pre-ship activities and is now packed and ready to be shipped to Japan. The March 14 launch readiness date for NuSTAR was approved by SMD. The observatory was shipped to Vandenberg AFB in late January (the spacecraft and booster are integrated at Vandenberg), and will be shipped along with the Pegasus launch vehicle to Kwajalein Island in early March, with a launch on March 14. SOFIA has completed 45 early science and telescope characterization flights. Major observatory upgrades have started. Thirteen teams of Airborne Astronomy Ambassadors (26 educators from 14 states) were selected for Cycle 1 science flights in 2012-2013. Proposals have been received for the second generation instruments on SOFIA. Approximately 130 Cycle 1 guest investigator proposals were received. The GEMS project has been given permission to continue to Confirmation Review in April 2012. The instrument and mission PDRs are planned for February 2012.

Mac Low asked when SOFIA will come into full operations. Hertz replied that SOFIA will go through two milestones. The first milestone is full operational capability that will involve commissioning a suite of 4 instruments and meeting level 1 requirements put on Observatory except for the 960 flight hours/year because that requires ramping up staffing, etc. The second milestone will be when we maintain routine operations. Full operational capability as promised to Congress is no later than end of 2014. Normal operations are three years later than that. It is expected to attain that earlier.

The Stratospheric Terahertz Observatory (STO) Astrophysics payload was launched from McMurdo, Antarctica on January 14, 2012. STO will provide 3-dimensional maps of the structure, dynamics, and thermodynamics of our galaxy's interstellar medium and stellar rate. STO made one complete revolution around the continent in ~13 days.

There are changes to the 2012 Senior Review schedule. The invitation list has been expanded to cover all astrophysics missions in or entering extended operations. EPO will be part of the 2012 review. Kepler and Fermi will participate in the 2012 Senior Review. Hubble was invited to participate in this year's review. A report is expected by the end of March. This report will be used to inform the operations plan for 2013 and the budget plans for 2014 and beyond.

Woodward asked whether the EPO review was for the individual missions or for the SMD EPO program as a whole. Hertz replied the review will be for the individual missions. SMD requires that each mission spend at a minimum 1% of their budget on EPO activities. The review will provide feedback on how the EPO programs are influencing the science, etc.

Concepts studies for x-ray and gravitational wave experiments are being completed with presentations to the Committee on Astronomy and Astrophysics (CAA) once it forms. Concept studies are being considered for Exoplanet and UV/optical science. Requests for information were released to ask for concepts that would enable the technology for missions to address high priority science for large missions. For the x-ray concept studies, 29 requests for information (RFI) responses were received in October 2011 outlining 16 mission concepts and 13 enabling technology projects. Three notional missions were selected by the Community Science Team for further study, Calorimeter mission, Gratings mission, and a Wide field imaging mission. For the gravitational wave mission concept study, there were 17 RFI responses outlining 12 mission concepts, 3 instrument concept, and 2 technology projects. The community science team recommended a LISA-like concept, a geocentric ultra low-cost concept, and a non-drag-free concept.

In October 2011 the European Science Programme Committee (SPC) met and approved two missions, Euclid and Solar Orbiter. In June 2012, the SPC will consider of the missions (cost-at-completion and payload formal agreement). At this point, Euclid enters into an implementation phase. For its L-class missions, ESA in April 2011 made the decision to limit international participation for launches in the early 2020s. It approved technical studies for three missions to replace LISA, IXO and EJSM-Laplace in which NASA had a key role. ESA is to make a recommendation in April 2011 for one of these missions to enter Phase A/B1. A launch date for the L1 mission is ~2022. The National Research Council organized an ad hoc study to assess if a proposed NASA plan for a US Hardware contribution to ESA's Euclid mission, in exchange for US membership on the Euclid Science Team and science data access, was a viable part of an overall strategy to pursue dark energy, exoplanet detection, and infrared survey science goals articulated in the Astro2010 decadal survey report. The report informed NASA that there were benefits to US participation in Euclid, that NASA should make a hardware contribution of ~$20M to the Euclid mission to enable US participation while continuing a strong US commitment to WFIRST, and that NASA should negotiate for participation on the Euclid Science Team and inclusion of a team of US scientists in the Euclid consortium with full data access.

Woodward asked whether the Burrows-Kennel report was influential in modifying NASA's thinking about participation in Euclid. Hertz replied that the Burrows-Kennel report was influential in NASA's decision not to move forward with the larger partnership that was being contemplated over a year ago.

The WFIRST Science Definition team has provided a report outlining an interim design reference mission. They were given further guidance for a second design reference mission. The second DRM will not duplicate the capabilities of Euclid, LSST, and JWST in advancing the science objectives of WFIRST. The SDT met in February 2012 and will meet again in early March. A final report is due in June. Hertz noted that how fast WFIRST is done is mostly determined by how long it will take to open up a wedge for funding. There will be no significant funding until after JWST launches in 2018. If it costs $1.6M it won't launch until 5 years after JWST; if it is $1.2M it might be 4 years after JWST.

Frieman asked about WFIRST in the context that NASA will get the new report in June which will have an alternate design reference mission. What happens next for WFIRST? Hertz replied that within the FY12 budget, there will be technology investments that can be leveraged against a fast start when a budget wedge opens up.

Woodward asked Hertz to comment on SMD's R&A activities (pressure on those programs). The ROSES call last year was challenged by budget. Hertz replied that this it is a SMD question, however, in Astrophysics, the budget grew about 10% in response to the decadal survey. There is a lot of change in the budget from year to year and we cannot do the programs that were envisioned two years. When a budget cut is done, we first honor all of the commitments; this reduces new selections. If the budget is changing and you hold R&A still, the budget becomes out of balance.

Jaya Bajpayee provided an overview of the 2012 Senior Review for NASA's astrophysics programs. The Senior Review assists NASA in maximizing scientific productivity from its operating missions in the extended phase. NASA uses the findings from the Senior Review to prioritize the operating missions and projects, define an implementation approach for achieving strategic astrophysics objectives, provide programmatic direction to the missions and projects for fiscal years 2013 and 2014, and issue initial funding guidance for fiscal years 2015 and 2016. The Senior Review is held every two years and evaluates proposals for continued funding for mission operations in the extended phase. It is the highest level of peer review in the Astrophysics Division. Missions in the upcoming 2012 review include the Great Observatories, Explorers and foreign-led missions in which the US is a partner.

All the missions invited to the Senior Review have either completed prime mission or will complete their prime mission before the next senior review.

Albrecht asked how the NASA Senior Review coordinates its feedback with international partners. Bajpayee replied that NASA evaluates the US involvement in the mission; Planck has recently run out of coolant and ESA recommended a one-year extension for a warm mission.

Church had two questions. How will the success of the NASA Tech Fellows program be measured? How will it work? Hertz replied that the first solicitation was released and proposals were received but NASA plans to hold off on selections until they see the new budget. Under the FY12 budget, NASA plans to select a larger number of fellows for a 1 year period and then they will be reviewed at the end of the year, with funding for an additional three years, possibly involving a suborbital payload development; 1-6 fellows with a downselect of 2-3 fellows (run out of President's FY12 budget). It is so far in the future that NASA has not written down what the success criteria will be; they may look to committees like AAAC to help determine the metrics.

Mordecai-Mark Mac Low and Gregory Laughlin led a discussion of the Theory and Computation Networks program. Astro2010 recommended a new competed program with coordinated interagency support to enable the large-scale theoretical and computational investigations identified as science priorities by Astro2010. NASA and NSF have discussed the possible creation of such a joint program. NSF and NASA asked the AAAC to help define the scope of such a program. DOE felt their efforts in this area were being covered under their own theory and computation program so they decided not to participate in a joint program. Mac Low and Laughlin consulted with the scientific community.

Haynes asked why Mac Low did not contact members of the Astro2010 committee in light of the fact that the decadal survey discussed the TCN extensively in the report. Mac Low replied that his initial report is only a draft and that he could still solicit input before a solicitation is released; the draft report is only a framework. Several committee members suggested leaving out the community responses so far and asking for additional community input. The report should be simply factual with questions being asked of the community.

Sparke commented that the report needed to include how theory and computation activities support NASA astrophysics space missions. Statler commented that the report should make a set of recommendations for the properties of the TCN program, but it should not be a transcript of a large number of community comments.

One of the recommendations of the report is to support a single program at the $2M level; in the context of the US community, having a smaller center is a more useful thing to do. The centers should have substantial budget for interaction among the center internally and outside the center; students and post docs being involved in the programs. This would be a major contribution to workforce development. Leveraging existing investments to expand out the scope of these programs should be viewed very positively and called out as much as possible; participation from industry should be encouraged. Partial support of tenure-track faculty positions should be encouraged. The program should not focus on specific fields of study but left to emerge on their own. Interdisciplinary collaborations should be encouraged.

Statler commented that more specificity or clarity needs to be given on several of the recommendations. Haynes suggested that Mac Low go back and read the decadal survey report again that describes the TCN and work that into the recommendation report. It needs to be strategic associated with the science goals and not something that is already being done. How to best balance theory vs. computation because they are not the same? How to balance education and workplace development vs. the science?; they are not in competition with each other. It involves real thought and planning that ultimately meets the needs of both agencies. What should the program strive to create in the long run?

Action items for Mac Low and Laughlin are to get further input from the community, talk with the Agencies, clarify the recommendations, etc. Church suggested that time be set aside at the next teleconference to discuss this issue further.

The Committee elected Martha Haynes as the new Chair and Andreas Albrecht as the new Vice-Chair.

The Committee decided on the Fall 2012 meeting date, November 30-December 1. The Committee will select the 2013 meeting dates at the May 11 teleconference meeting

The Committee spent the remaining time discussing the annual report.

MEETING ADJOURNED AT 12:00 PM EST, 11 FEBRUARY 2012