

**Minutes of the Meeting of the
Astronomy and Astrophysics Advisory Committee**

**11-12 February 2008
National Science Foundation, Arlington, VA**

Members attending:

Garth Illingworth (Chair)
Bruce Balick
Scott Dodelson
Wendy Freedman
Katherine Freese
Rocky Kolb

Daniel Lester
E. Sterl Phinney
Marcia Rieke
Keivan Stassun
Christopher Stubbs
Alycia Weinberger

Agency personnel:

G. Wayne Van Citters, NSF-AST
Eileen Friel, NSF-AST
Dana Lehr, NSF-AST
Nigel Sharp, NSF-AST
Philip Puxley, NSF-AST
Linda Sparke, NSF-AST
Craig Foltz, NSF-AST
Tony Chan, NSF-MPS
Kathie Olsen, NSF-OD
Denise Caldwell, NSF-PHY
Jim Whitman, NSF-PHY
Randy Phelps, NSF-OIA

Kathleen Turner, DOE-HEP
Dennis Kovar, DOE-HEP
Jon Morse, NASA-HQ
Zlatan Tsvetanov, NASA-HQ
Stephen Ridgway, NASA-HQ
W. Vernon Jones, NASA-HQ
Michael Griffin, NASA-HQ
Hashima Hasan, NASA-HQ

Invited participants:

Michael Griffin, NASA-HQ
Kate Beers, OSTP
John Henry Scott, OSTP
Jonathan Lunine, U. Arizona

Amy Kaminski, OMB
Michael Holland, OMB
Sara Seager, MIT

Other participants:

Jay Frogel, AURA
Sara Heap, NASA-GSFC
Jennifer Wiseman, NASA-GSFC
Randall Correll, Ball Aerospace
Dennis Ebbets, Ball Aerospace
Michael Devirian, NASA-JPL

Michael Ledford, Lewis-Burke
Roeland Vandermarl, STScI
David Lang, NRC

MEETING CONVENED AT 8:45 AM EST, 11 FEBRUARY 2008

The Chair called the meeting to order. There were introductions made around the room. The Chair reviewed agenda items and associated issues and distributed a chart showing historical trends in R&D funding for FY1998-2009 for National Institutes of Health (NIH), National Science Foundation (NSF), Department of Defense (DOD) Science & Technology, United States Department of Agriculture (USDA), Department of Energy (DOE) Office of Science and National Aeronautics and Space Administration (NASA). The big issue was the budget implications of the FY08 Omnibus appropriation with major impacts in FY08, along with

consideration of the President's FY09 budget request. These issues were on the minds of the agencies and during the lunch break, there was a discussion of the impact of the FY08 budget on the agencies' programs.

The Chair discussed briefly the upcoming Decadal Survey. The last Survey was very ambitious, but most of its recommended programs were undercosted. There is considerable uncertainty regarding how inclusive and comprehensive that next Decadal Survey can be, given the budget challenges for the astrophysics program at each of the agencies. There will be an opportunity to discuss this with the Office of Management and Budget (OMB) and the Office of Science and Technology Policy (OSTP) during the next day's session.

Christopher Stubbs asked how the proposal(s) for the Decadal survey were funded. Van Citters replied that the proposal was being evaluated.

The last Task Force to be undertaken before the Decadal Survey was the Exoplanets Task Force, (ExoPTF) chaired by Jonathan Lunine, University of Arizona. Lunine was scheduled to discuss the committee's report after lunch. The Committee worked very hard and provided approaches that maximized the resources of the programs. The report had a comprehensive set of recommendations over a 15-year period which would play into the next Decadal Survey.

There was a brief discussion of the role of the Astronomy and Astrophysics Advisory Committee (AAAC) during the next Decadal Survey process. The role would be more tactical than strategic in nature.

NSF Division of Astronomical Sciences (AST) Director Wayne Van Citters thanked NASA for their contributions to this meeting of travel support for the AAAC members. He reported the news that the NSF-NASA Virtual Astronomical Observatory Memorandum of Understanding (MOU) had been signed and the solicitation released. He also reported on the excellent interactions of NASA and DOE with both NASA and DOE in joint consideration of the decadal survey proposal review and structure process; this also included discussions with OSTP and OMB. There had been more regular and fruitful discussions between AST and NASA's Astrophysics Division and DOE High Energy Physics.

Van Citters reported that the 2008 Committee of Visitors (COV) met last week and would report to the Mathematical and Physical Sciences Advisory Committee (MPS AC) in April. He noted that the overall success rate for FY07 was 24% for the Astronomy and Astrophysics Research Grants (AAG) program. The National Science Board (NSB) at its February 2008 meeting declared that the Advanced Technology Solar Telescope (ATST) was ready for inclusion in a future budget; there would be a new line in the FY09 Major Research Equipment and Facility Construction (MREFC) account for ATST Design & Development (D&D) at \$2.5M. As a result of the Science and Technology Facilities Council (STFC) program priorities and their Comprehensive Spending Review, it was likely that the United Kingdom would decrease its share in Gemini, eventually to zero. The partnership was currently considering options; community input was welcomed as opportunities are explored.

Lester asked how the UK priorities for ground-based astronomy had changed. Van Citters replied that it was more complicated than that but discussions with STFC were ongoing. Kolb asked "what would be helpful to receive as community input." Van Citters replied that AST was looking at that at the moment. The National Optical Astronomy Observatory (NOAO), the U.S. gateway to Gemini, started these discussions at the American Astronomical Society (AAS) meeting; they planned to create a Renewing Small Telescopes for Astronomical Research

(ReSTAR)-like committee to look at community access to Optical/Infrared apertures 6m and up. It's a complicated issue, and we must first find out what the boundary conditions are and define the process by working with the Gemini partners.

The Chair noted the need for the US community and the NSF to develop a plan for Gemini and its relationship to NOAO that was leading towards a more coherent and integrated "US National O/OR Observatory." The development of a consensus view on the US side would enable us to initiate discussions and negotiations with our international partners so as to maximize the effectiveness of Gemini for them and NOAO/Gemini for us.

Van Citters provided a status update on the implementation of the AST Senior Review recommendations. He reported positive progress for the Very Long Baseline Array (VLBA) and the National Astronomy and Ionosphere Center (NAIC) in seeking partnerships to supplement AST support. Latest news from the Global Oscillation Network Group (GONG++) also indicated that some possibilities may be opening up. He noted that the Giant Segmented Mirror Telescope (GSMT) National Science Working Group (expanded from the previous SWG) had met several times since the AAAC last met. NOAO had begun infrastructure improvements at Kitt Peak and Cerro Tololo. Van Citters reported that AST had recently signed a contract with an external firm to conduct detailed cost reviews of each of its facilities necessary to understand where cost reductions could be made; a report was expected at the end of 2008. AST had also contracted with another firm to look at costs and legal issues associated with the Senior Review recommendations, including environmental, deconstruction, divestiture, and termination; the first report was delivered to AST and was under review.

Van Citters noted his concerns regarding the short timescale of community attention and understanding about the Senior Review recommendations, and the increasing political pressure and interference with a science community-based process and plan. He asked the Committee for help in spreading accurate news.

Van Citters discussed the planning and priority-setting process for astronomy and astrophysics and noted the increasing interagency coordination and more proactive international interactions. He noted that OMB and OSTP were a part of the process. Balick asked, was the scope of the AAAC's charge to include international opportunities in the future? Van Citters replied that it was an interesting question given that AST is deeply involved in discussions, e.g. for the Square Kilometer Array (SKA), that investigate the international context so the U.S. is not ruled out as a participant because of the developing structure of the project. The European Southern Observatory (ESO), for instance, was one of the funding agencies for the Extremely Large Telescope (ELT) but there are non-ESO members, Japan, Canada, and Australia who meet informally to discuss funding prospects. The U.S. was involved in these discussions as well. The Chair suggested that the Committee offer advice cognizant of the international aspects.

Van Citters identified challenges of developing mid-scale projects and infrastructure to respond to projects and activities between the Advanced Technologies and Instrumentation (ATI)/Major Research Instrumentation (MRI) and MREFC scales (~\$10M). This need was felt NSF-wide, so AST hopes to prepare for and lead the agency response. Van Citters identified current projects under the mid-scale rubric [Sloan Digital Sky Survey (SDSS-II), QUIET, POLARBEAR, Atacama Cosmology Telescope (ACT), Dark Energy Survey (DES)], including D&D or technology development programs (TDP) for future large projects such as GSMT, SKA, and the Large Synoptic Survey Telescope (LSST). He reported that an internal AST working group was looking at a plan for the future for all AST instrumentation-related programs. He also noted that the NSF Division of Atmospheric Sciences (ATM) had put out a mid-scale solicitation which

AST would monitor for lessons learned. AST would need to gauge the demand and scope out questions such as the timescale for operations support, targeted vs. general solicitation, and how the budget should be set.

Van Citters noted that the NSF operations plan that had gone up to the Hill did not recognize the committee language asking AST to fund facilities at the Request level. This plan had not yet been approved by the appropriations committee. He showed the Committee the FY09 Budget Request for the Mathematical and Physical Sciences (MPS) Directorate and noted that AST was up 14.8% (relative to FY08 estimate ops plan), which was the lowest among MPS Divisions and less than overall MPS and NSF R&RA increases. He highlighted the FY09 budget lines for facilities, University Radio Observatories (UROs), Telescope System Instrumentation Program (TSIP), and Adaptive Optics Development Program (AODP).

Van Citters showed a chart of the MREFC account, which included the Atacama Large Millimeter Array (ALMA) construction costs and a \$2.5M Design & Development (D&D) line for ATST. The latter represented a new line for ATST, but it was not a construction start; D&D had not been done through MREFC before. The Chair welcomed this change, since it was consistent with recommendations that had been made in previous AAAC Annual reports; Van Citters cautioned that there was a potential impact on the AST base budget. The next steps for ATST include Section 106 consultations and consultations with the Federal Aviation Administration (FAA) and National Park Service.

Van Citters provided a waterfall chart of AST budget components and compared them with various models for AST budget projections. Stassun asked Van Citters to identify the components of the Senior Review (SR) recommendations that would result in funds for reinvestment. Van Citters itemized several items (Arecibo, GONG, VLBA) and noted that the anticipated wedge would not be fully available until FY12.

Van Citters summarized what had stayed the same: the excitement of the science and its future; the stochastic nature of the budget process; the fact there is no good socket in the NSF planning process for the plug we have made; AST is not a big American Competitiveness Initiative (ACI) player; a lack of clarity in the MREFC process.

Stubbs asked Van Citters how often all three agencies meet as a group. Van Citters replied that the agencies met a few times a year in addition to the AAAC meetings, usually in response to a particular issue.

MEETING ADJOURNED AT 10:15 AM AND – RECONVENED AT 10:30 AM

Dennis Kovar reviewed the mission of DOE-High Energy Physics (HEP) as well as the three strong conclusions and one major recommendation from EPP2010. He noted that the FY08 Omnibus Bill funding resulted in significant loss of HEP scientific productivity and workforce and U.S. credibility as an interagency/international partner. HEP was planning to address the EPP 2010 priorities: (1) exploration of the terascale at the Large Hadron Collider (LHC); (2) investment in R&D for an international linear collider; and (3) expansion of the program in astrophysics and internationalization of a staged program in neutrino physics.

Kovar identified current U.S. HEP accelerator experiments and described LHC's effort at CERN.

Kovar reviewed the FY08 appropriations for DOE Office of Science (SC) and HEP in particular. He noted that FY08 funding for HEP was an 8.4% (\$63M) reduction from FY07. DOE SC was

up 2.5% overall (after accounting for earmarks). The budget language specified: no funding for NuMI Off-Axis ν_e Appearance (NOvA); International Linear Collider (ILC) Research & Development and Superconducting Radio Frequency (SRF) infrastructure funding is capped at ~1/4 requested (a large fraction of these reductions supported people). Fermilab and Stanford Linear Accelerator Center (SLAC) (because of ILC/SRF funding) were impacted most severely. He also noted that the magnitude of the reduction and the timing (occurring about one quarter of the way through the FY) limited options.

Kovar reviewed the DOE HEP Budget Request for FY09. He noted that the HEP budget was \$805.0M, a 17% increase from the FY08 appropriation. This would put the HEP program back on the track set by the American Competitiveness Initiative (ACI) that doubles the physical sciences funding over 10 years. The Chair asked whether the B-Factory effort would come back on line if the DOE gets its FY09 appropriation. Kovar said No.

Kovar identified: “A central challenge for the U.S. and international HEP community is defining and executing a robust and balanced scientific program that includes a collider at the energy frontier.” The ILC is a complex, multi-billion dollar investment. The overall strategy for accelerator technology R&D has both near- and long-term components to provide options for the U.S. program over the next decade. Kovar stated, “We’re at a pivotal point, I believe, in the U.S. not only for HEP, but for DOE SC program and the physical sciences.” Kovar noted that there was support for R&D, but there was a debate about how much should go for short-term, mid-term and long-term basic research. He noted an expectation that Congress would not pass a funding bill until the current President leaves office and that implied a Continuing Resolution (CR) for at least 6 months. DOE and NSF had asked the High Energy Physics Advisory Panel (HEPAP) for prioritized scientific recommendations that are consistent with the current budgetary guidelines. HEPAP had been engaged to develop (using P5) a 10-year plan consistent with four budget scenarios—with preliminary comments were anticipated by March 15, 2008 and a final report by May 2008. The scientific community’s role was critically important. The science community through HEPAP and P5 was developing the science-driven plan; the FY09 budget request maintains future options for HEP; this HEPAP/P5 plan will be used to articulate the case for the FY 2010 budget request.

Kovar showed a detailed FY09 HEP budget request compared to FY07 actuals and the FY08 appropriation. There was a 17% increase in non-accelerator programs.

Kovar identified current Major Infrastructure and Equipment (MIE) projects. He reviewed current dark matter search experiments and noted that HEP was currently evaluating technologies for the future as recommended by the Dark Matter Scientific Assessment Group (DMSAG). He identified dark energy experiments in each Dark Energy Task Force (DETF) category, including operating and R&D and described the status of: DES, Gamma-ray Large Area Space Telescope (GLAST) (launch scheduled for 16 May 2008), and the Pierre Auger Observatory. Kovar identified proposals for next-generation tools that are starting to come in or are expected soon. An important part of the DOE/HEP P5 process and evaluation would be asking how various proposals and directions impact the HEP mission to “understand how our universe works at its most fundamental level.”

Freese asked the question, “Will projects compete with each other?” Kovar replied that all projects would compete with everything HEP funds. The Chair asked, are there links to NSF Physics for project selection? Kovar answered yes, through the HEPAP P5 process.

The Chair asked, “Would recommendations from DMSAG be included in these future prospects?” Kovar said yes.

Balick asked “If the funding profile is as expected for FY08-09, where is the silver lining? Is there one?” Kovar replied that it was a bad budget. He identified losses as a result of the FY08 appropriation: a reduction in staff at major labs, ~500 people laid off, rolling furloughs at Fermilab, a loss of 7 months of data at B-Factory (SLAC). Kovar discussed challenges and opportunities in HEP science support. DOE was going to have to make a case for a number of scientific disciplines.

Freese asked “What can we as a Committee do in this regard?” Kovar replied that HEP was not part of ACI in terms of its addressing energy or global climate change. HEP needed to make the case that the investments in long-term basic research are very important and pay dividends to the nation. Other countries in the world are making these investments now when we are not; we’re going to be left behind. We have benefited from scientific talent and investments here from other countries to the U.S.; starting with the LHC now, the flow is going to be in the other direction. Exactly how to quantify the impact of that is somewhat difficult.

Freese asked “Is the science that NOvA is planning to do different from what you expect to get out of Daya Bay?” Kovar replied Yes. Both look at θ_{13} but they provide different data that are important for unraveling the problem.

The Chair asked about the impact of the FY08 appropriation. There was a sense that the impact was exacerbated by specific language directing the operations plan. Kovar replied yes. The Chair said one needs to be able to maximize the opportunities within the constraints, so the congressional language was not at all helpful.

NASA Astrophysics Division Director Jon Morse noted that his message would be similar to the one the AAAC just heard. The FY08 appropriation was pretty good by comparison with DOE, and the FY09 request was consistent with NASA’s expectations, but the outyears were different from previous projections.

Morse started at the top level with the Science Mission Directorate (SMD) with some slides taken from a budget rollout presentation from Alan Stern. He noted changes in agency overhead accounting; it was, as a result, difficult to account for changes. (Current bookkeeping looked at direct cost full-cost accounting. Overhead carried elsewhere.). The SMD budget was \$4.5B/year. Morse identified SMD Astrophysics missions over the next 12 months—a very busy schedule. GLAST was scheduled for May 2008; Hubble Space Telescope (HST) Service Mission 4 was scheduled for August (soft); Herschel and Planck had slipped from October (probably late 2008). Morse noted that environmental testing for GLAST had gone very well; the Naval Research Laboratory (NRL) had really stepped up to help. Some technical issues must still be addressed. He reported a new threat with a design/workmanship problem on another satellite that had the same telemetry hardware; assessing if big issue.

Morse reviewed SMD management objectives: get more science done within our budget; help ensure that U.S. Space Exploration Policy succeeds; promote U.S. leadership across all of SMD’s science disciplines; improve SMD’s actual and perceived impact on, and relevance to, the public; and create a better workplace.

Morse identified selected major accomplishments in 2007. He discussed the Stratospheric Observatory for Infrared Astronomy (SOFIA) schedule (“success-oriented” vs. “risk-adjusted”

and expected open-door testing soon). The James Webb Space Telescope (JWST) had completed its technology non-advocate review (TNAR) in 2007 and was now preparing for its Preliminary Design Review (PDR) to proceed into the development phase in spring 2008. NASA had completed instrument deliveries to European partners for Herschel and Planck. SMD had solicited proposals for large- and medium-class Astrophysics Strategic Mission Concept Studies to help provide technical input to the upcoming Astronomy & Astrophysics (A&A) decadal survey and received 42 proposals. SMD would support as much as they could afford to cast a wide net. Morse identified five new starts in SMD in 2007 including the NUClear Spectroscopic Telescope ARray (NuSTAR) Small Explorer in Astrophysics and several Missions of Opportunity (small investments to fly experiments on other spacecraft developed for a different use, often international).

Morse identified SMD's cross-cutting FY09 budget objectives: accelerate the Earth Science Decadal Survey mission queue; increase space science R&A/MO&DA to get better value from our flight missions; increase space science suborbital research programs to foster PI on-ramps, technology demonstration, and accomplish more science; increase the number of planned missions in all four of SMD's science theme areas; support the National Research Council (NRC) Decadal Survey priorities; initiate an SMD lunar robotic science program. Stassun asked whether an announcement would go out or would it be more focused? Morse replied that it could go either way depending on the partnerships or it could be left wide open.

Morse identified major changes in the FY09 Budget Request and showed a detailed chart for the NASA and SMD Budget Request for FY09-13. He noted that the budget request supported seven new starts in SMD—more than in the past four budgets combined and at least one per SMD science area. One is for Astrophysics, Joint Dark Energy Mission (JDEM). (Also two for Earth Science, one for Heliophysics, and three for Planetary). He showed a “sand chart” for SMD with run-outs by science area for FY07-13; the Astrophysics line appeared squeezed, but Morse noted that the SMall EXploer (SMEX) lines currently lived in Heliophysics. (SMEX budget could be transferred over when a SMEX mission is identified for Astrophysics; if and when, will depend on the selection.)

Morse showed a chart that compared flight programs (launch schedule) as of January 2007 and January 2008 (per calendar year) and New Starts (per fiscal year).

Morse showed a detailed FY09 Budget Request for the Astrophysics Program. He noted that Astrophysics would restructure to broad science themes (Physics of the Cosmos, Exoplanet Exploration, Cosmic Origins, Astrophysics Explorer, Astrophysics Research) that would each include a future missions line. Lester asked what the reason was for breaking the areas out the way it was done. Morse replied that it was two-fold: provide an intellectual framework for forward planning; and a managerial tool to make sure that there were enough resources to keep overruns limited at the program level not the division level. Morse noted that JWST was the same budget as in FY08 Request; peak funding would occur in FY08 and then roll off. Also he noted that the R&A line would return to pre-cut level in FY09 and then grow from there (up 26% in FY09 and 46% in FY13). He highlighted selected FY09 budget items for Astrophysics.

Morse showed a detailed chart of Astrophysics budget changes relative to the FY08 Budget Request. He discussed large deltas in the context of restructured science themes. There was no mission of opportunity line item and would have to be taken out of the program.

Morse reviewed the Astrophysics Research budget for R&A and Data Analysis and ROSES changes for 2008. He noted that ROSES-2007 APRA-2008 was amended to allow grants of up to

4 years for Detector Development, Supporting Technology, Laboratory Astrophysics and Ground-Based Proposals. Suborbital Investigations would remain at up to 5 years. The announcement was also amended to include technology and training as factors of intrinsic merit.

ADJOURNED AT 12:20PM – RECONVENED AT 12:45 PM

The lunch discussion centered on the FY08-09 budget impacts. Van Citters, Morse and Kovar were part of the panel discussion.

The Chair framed the discussion by summarizing the issues raised by the FY08 Omnibus appropriations. Balick asked Kovar to summarize major impacts of the FY08 budget. Kovar replied that DOE has identified these formally and has sent out a list of the impacts on the FY08 budget; these are available to the AAAC. JDEM and Dark Matter are protected. Freese noted that major impacts for HEP seem to be NOvA and ILC R&D.

Stubbs noted that we need to be very aware of the context here—ongoing war, potential recession, likelihood of a CR extending past January 2009. It doesn't do much good to call out the dollars against this backdrop, but the capricious nature of the process was most impactful.

Lester asked Morse what process would determine if the Alpha Magnetic Spectrometer (AMS) would be assigned to astrophysics. Morse replied that there was currently no Shuttle launch to include AMS. The baseline manifest has all of the equipment necessary to complete the International Space Station (ISS) and to supply it. There was no room for AMS or for a separate launch. Lester asked, "Will the international partnerships play a role?" The Chair replied that this was a good question for Griffin. Stubbs asked, "Is there a lesson here for the joint management that we could have seen this coming?" Morse replied, "What is 'this'? There was a long history there, but the Columbia accident brought about the sea change. The only non-ISS Shuttle flight is HST SM4, which was directed by Congress. The Chair noted that an emphasis the AAAC could make was to put AMS before the NRC either within the decadal survey or as a special panel.

The Chair asked, "Is there anything specific we could touch on for DOE that is relevant for A&A?" Kovar replied that the overall funding for R&D had remained about the same. It's a question of Congress redirecting it, and it is their right to do that. However, they should aim to do so in an adiabatic way so their decisions are not so destructive. Morse noted the AAS statement that one could draw upon to defend the community's process. He noted that the problem for the Space Interferometry Mission (SIM) was the out-year implications of moving SIM into the development ("construction") stage rather than the immediate impact on FY08; following the directed language would cause severe damage to the rest of the program because that action is beyond our budget capabilities. The high priority for SMD/Astrophysics was to return to a balanced portfolio, and we would be unable to do so with SIM in development.

Phinney asked, "Is there a plan to reassess SOFIA?" Morse replied that SOFIA had made remarkable progress in the last year. Senior Reviews will always be done as we move missions into operations, but you should be cognizant that the instrument development budget and the General Observer (GO) budget were all wrapped up in there. That assessment would happen with the usual peer review mechanisms. There was a plan to defray U.S. costs with the addition of a major international partner.

The Chair returned to the SIM discussion and asked, "Will SIM be moved into development?" Morse replied that SIM was ramping down its workforce, so it's not clear that we could reconstitute the workforce within the fiscal year. The plan forward was to study seriously a

smaller implementation of SIM that has been called SIM-lite to see whether it could meet the goals from the various community reports, including the decadal survey and the ExoPTF report, and then ask what the lifecycle cost of that is. Is that feasible? If it's a \$B-class mission, it won't fit. The funds that are in the future missions line could support a \$600M-class mission. This was the same message for JDEM: we don't have a billion dollars. We have roughly half that or maybe a little more. Morse noted that providing an exoplanet "probe" would take out exoplanets from the Discovery class; we would "take ownership" of the exoplanet science.

The Chair asked Van Citters about the FY08 budget language. Van Citters replied that for Arecibo Observatory, we had language in the omnibus that lists the scientific value of Arecibo and then states the Appropriation committee's hope that NSF would reconsider Arecibo. Then there was also language in the NASA section asking to put together an NRC study to assess Arecibo's capabilities for Near Earth Objects (NEOs). The Chair asked, "Did the House Science hearing on NEOs happen?" Van Citters replied yes. Morse said the hearings touched on issues that everyone already knew about. Van Citters noted that the language for NASA said that they should "increase their spending" on Arecibo. Currently there was no NASA spending on Arecibo. Van Citters also noted that the language said to fund AST facilities at Request level; this would be \$6M hit with no money to do it. There was also language about the concern about "infrastructure" and currency exchange rates. NSF was to study those impacts and report.

The Chair reiterated the support for the Senior Review process. Van Citters echoed that the American Astronomical Society (AAS) has issued a very strong statement. Underscoring support for both the Senior Review and the AAS statement would be helpful. He noted the NSF Director's support for the Senior Review in response to a concentrated letter-writing campaign for Arecibo. It's very important to appreciate that support and to highlight that the community will not tolerate non-consensus based activities such as this.

Stubbs asked, "To what extent is DOE participating intellectually and financially in the A&A decadal survey?" Kovar replied that DOE was supporting it. Kathy Turner reiterated that DOE was participating fully in proposal review and discussions.

Morse's parting comment: "understand that the FY09 Budget Request is the same as last year plus new starts. It's going to be a scientific bonanza." He also noted that support for NASA from NSF was outstanding on three long-duration balloons launched this year in Antarctica. Vernon Jones elaborated on NSF-Office of Polar Programs (OPP) and NASA cooperation in the ballooning program and emphasized excellent progress.

ExoPlanet Task Force (EXoPTF) Chair Jonathan Lunine presented the task force findings to the AAAC. He noted that the strategy as presented was the same as seen in the October 2007 presentation of the interim report. There were many nuances and changes in the presentation, however, that demonstrated the substantive discussion that had occurred since.

Lunine identified the task force membership and noted the tremendous amount of work and effort. He reviewed the task force process, including white papers, meetings, presentations, readers and the draft report submission.

Lunine stated that the report identified three compelling questions: what are the characteristics of Earth-mass/Earth-size planets in the habitable zone around nearby, bright stars; what is the architecture of planetary systems; and how do planets and planetary systems form. Given those questions and the charge to the committee, the task force identified three strategic goals to be accomplished by the end of the 15-year time horizon.

Kolb asked if in reaching to these goals, will it tell us anything about planetary formation. Lunine replied, yes and no. No new significant instrumentation was proposed to find these planets; rather, one could use existing instruments and facilities.

Lunine reviewed and justified the major recommendations from the report:

- Towards Earths: intensify radial velocity (RV) studies to reach down to (several) Earth-mass planets around bright stars; search for transiting terrestrial-size exoplanets around nearby M dwarfs and characterize with Warm Spitzer and JWST; develop a space-borne astrometric planet search mission (to identify targets, including masses and orbits); prepare for a space-based direct imaging characterization mission (for launch after targets are known);
- Planet Architectures/Formation: microlensing for planetary masses and separations; ground-based direct imaging with extreme Adaptive Optics (AO); circumstellar disk science; support for activities that maximize the knowledge return from data and train new scientists in the field.

Lunine articulated the recommended two-prong strategy developed by the task force for M dwarfs (Prong 1—fast track that uses ground-based and existing space assets) and for F, G and K dwarfs (Prong 2—requires new technology investments and new space-based facilities). He described the implementation of the two-pronged approach in two scenarios differentiated by a large or small η Earth and a third scenario in the case of high exozodiacal (dust) levels. He summarized the approach on the 0-15 year time horizon as requested by their Charge.

Lunine reviewed the major comments from the external readers as well as the task force considerations of those comments. He noted that no reader challenged the identified strategy. The strategy hinged on a narrowly focused space-borne astrometric mission requiring 0.2 μ arcsec precision and using a blue-ribbon panel for technology reviews. There was a preference in favor of coronagraphy as opposed to interferometry as the first direct detection mission that would come late in the 15 year period.

Lunine described the report's Depth-of-Search figures, which had been redefined to provide a consistent measure of the habitable zone (independent of stellar luminosity). He quickly reviewed figures for all techniques.

Lunine addressed issues of cost and noted: the plan utilizes existing, under development and planned capabilities where possible; the plan identifies three new missions within the 15-year time horizon, two of which are essential and of which one can be stretched out; the key to costing is early, intense technology studies and blue ribbon reviews on cost and risk.

Lunine concluded that the plan addressed the key questions in exoplanet research, the plan provided an opportunity for early discoveries and risk reduction; spaceborne direct imaging is significantly simplified.

Lunine extended thanks to the task force, AAAC, readers, NASA and NSF experts and the community for their input. He also thanked Dana Lehr (NSF), Steve Ridgway (NASA) and the Chair for their involvement. He invited questions.

Stassun commended Lunine and the task force for their excellent, articulate and inspiring report. He asked what would happen if η Earth was extremely small. The report heavily emphasized

finding and characterizing an Earth and leaves the rest of exoplanet science as somewhat “ho-hum.” “We know that there will be a bounty of discovery, but with the emphasis as is, the fundamental question of understanding other worlds is somewhat undercut.” Lunine replied that a section on eta_Earth is zero could be added, but everything we know thus far seems to point to eta_Earth that is not very small.

Weinberger requested a figure to identify how many nights of telescope time and at what aperture was needed to implement the recommended program. One seemed to need hundreds of nights of 8-m class telescope time. Is that realistic? Lunine replied No, one does not need that. Smaller telescopes can be used, so we need to make that clearer. Weinberger said OK, but even if one used 4-6 m telescopes, one needs the lead time to build the spectrographs. Lunine agreed; needed to clarify those needs in the final version.

Phinney asked about support for AO and extreme AO. Van Citters replied that there were existing efforts with support, and this clearly must feed into planning for the future.

Stassun asked, Did the task force see a role for LSST and that class? Lunine replied that the task force had discussed at the beginning considering LSST and the Panoramic Survey Telescope and Rapid Response System (Pan-STARRS) but did not come to any conclusions for particular recommendations. He did not receive compelling input in that area.

Stubbs asked about the process. He was curious to know how the 7 readers were identified who were not authors on one of the white papers. Lunine replied that this was not a necessary restriction (Note- the readers were vetted by the agencies). Stubbs asked whether they were competent readers? Lunine replied, Yes, with both particular and broad expertise.

A discussion ensued on contrasting the ExoPTF recommended astrometric mission with SIM.

Balick complimented the report and asked where one must go from here. Lunine replied that right away there was a need for a blue ribbon committee to look at where the technology uncertainties were for the astrometry and the subsequent direct detection missions. We should study if we could choose now between the interferometric and coronagraphic approaches to direct detection. There also needed to be some kind of committee to look at coordinating the ground-based work and identifying nights and dollars. Morse asked if the task force had identified potential international collaborations. A member of the committee was from Europe to help understand thinking in Europe, but the charge and the effort focused on US interests and missions. Freedman emphasized the need for more specific guidance on ground-based work; this was not as specific relative to the rest of the report. Lunine replied that there was a need for a different committee for that strategy, so we should explicitly recommend that.

The Chair tabled the discussion until the additional timeslot tomorrow afternoon when ExoPTF member Sara Seager would join the group.

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

The next session was a discussion with NASA Administrator Michael Griffin (postponed from 2:45 by request). The Chair thanked Griffin for joining the Committee and congratulated him on a successful Shuttle launch. Griffin replied that this was also a milestone for us in regard to international collaboration.

Lester thanked Griffin for his attendance at the AAS meeting. He noted his scolding of the community with respect to earmarks and asked about the Executive Order (EO) on non-statutory earmarks which provided permission for the agency directors to ignore non-legislative directions. Griffin replied that the EO was very restricted in its application. “With another hat on, I can say that earmarks are a part of democracy. I don’t want to live in a country where citizens don’t have a right to petition their government and their government will never listen.” We would hope that the government would listen to those petitions and place them within broad context with enlightened judgment. “Wearing my executive branch hat, the President submits a budget. Once the President signs his name to it, I’m obligated to support it.”

Rieke noted that “astronomers are about to embark on another decadal survey.” A huge question is how to get the costing done better; clearly a great need there. What other advice would you like to give us on the product you would like to receive? Griffin re-emphasized costing and independent cost reviews. There must be an understanding that once a project is initiated, it is very difficult to pull back once it involves a workforce and a political constituency. Thus, one must recognize that the impact of cost overruns will be to the future portfolio. He recommended including in decadal surveys the assumptions of what a mission is supposed to cost and what should happen if the mission exceeds that cost; we want to know how priority is affected by price.

There was continued discussion of costing and decadal survey guidance. Griffin noted the difference between recognizing larger costs and deciding to do it anyway and instead “letting nature take its course” and continuing to conduct the mission no matter how it exceeds its (cost) box. Example: if the community really wants to do SIM and accepts the collateral damage to the rest of the portfolio, that’s fine. In this case “I question your judgment, but I don’t particularly care.”

Lester asked for examples of how to build “tripwires” into a decadal survey. Griffin replied that he hasn’t seen that yet, but it must be build into formulation. It’s very hard or impossible to stop once a project gets started. It’s very possible to do smart stuff all the way along and the projects still cost more than we thought. It’s rare that we find that the project manager did something stupid; instead, it’s usually that we’re doing something for the very first time. Our ability to foresee what it really costs to do something new is limited.

Morse noted that when we get into the domain where projects exceed their initial estimates by factors of pi, that’s where we get into trouble. The tripwires in my mind are where we jump from medium to large or small to medium. Those types of tripwires—category jumping—or where the project would destroy the portfolio, are needed.

Morse noted that regarding inputs to the decadal survey, the key was to make sure that we have a good partnership between the government, academia and industry of coming forward with honest information. We need buy in from all segments to make a “three legged stool.”

Griffin anticipates that the reliance must be on independent cost estimates rather than on the PI/advocate.

Kolb noted that many of the issues this committee deals with are interagency issues and/or science questions at the interface. From Griffin’s perspective, how should we go about attacking these problems that fall between agencies? Griffin replied that this was similar to problems we had when we did things internationally. It works well to divide the project into several, modular chunks that each partner can offer that integrate into a system that works, e.g. instruments on HST. You need clean interfaces so one can identify where the problems lie. Another example:

Huygens and Cassini. A lot of the design was about defining the interfaces carefully so that when the separate parts come together, it would work. NASA has its culture for scientific missions that are heavily steeped in extensive peer reviews and community input. Other scientific players don't necessarily work that way. If we're going to work effectively across agencies, we need to define interfaces that are clearly defined and that work. Another area was in appropriations, in which DOE and NASA budgets are appropriated by different committees. Congress does not take it well when something that affects one oversight committee now is falling under the purview of another. Committee chairs have different prerogatives and guard them carefully. Griffin returned to the defining of interfaces. He offered an example of working on Hubble in which each contractor delivered a device which met the interface, yet it didn't work because the interface was not defined properly.

Freese asked "How do you see NASA and DOE collaborating on JDEM?" Griffin replied he didn't know yet; that was still under formulation. Morse noted that NASA was trying to maintain the principles that Griffin just articulated. Griffin noted that the U.S. government was going to have to work out whether NASA or DOE was the lead, and the challenge was just as hard on the Hill between the two committees.

Freese asked how NASA priorities could change under a new Administration. Griffin replied that it would depend on which President.

Balick thanked Griffin for his candid answers and asked, as a result of the changes in human space flight, what did Griffin see as the potential for astronomy and astrophysics. Griffin replied, "I'm addicted to astronomy and astrophysics; I love what you guys do extra." What I'm good at is systems engineering, but I'm addicted to astronomy and astrophysics and read everything I can about it." He identified heavy lift capability first as foremost. "I see the opportunities to use these systems to place large telescopes or other instruments at the Lagrange points where they can be in very stable environments." These newer, larger systems, especially with the human transport aspect for servicing, could provide enormous capability. Balick asked how astronomers could get information about the developing capabilities. Griffin replied all you need to do is ask. Morse identified an Academy study on Exploration Science. The Chair asked if the study would be completed in time for the A&A decadal survey. Lester replied that an interim report was due in April. Griffin noted he was very interested in this. One of the great tragedies is that the nation spent \$21.5B building the Apollo transportation system, operated it for 10-11 flights, and then just junked it. "Junking the rockets was incomparably silly." He added, "I would hope that it doesn't happen again."

Balick asked, Do we have evidence that human spaceflight can benefit astronomy. Griffin replied, "I don't think that anyone could have designed a Hubble at that time of such enormous benefit that could avoid human servicing." We usually don't figure things out the first time, and so human interactions with our machines are helpful. The idea of putting up multi-million dollar observatories that are expected to last a decade and expecting that we get it right the first time was silly. What, other than the mirror, about Hubble Servicing was seen historically as stupid? The Chair offered an alternate model of launching new capabilities as built into the planning (instead of human servicing). Griffin replied, "I hear that strategy, but just the expendable vehicle is costly, so I think it is open for reasonable discussion the relative benefits of robotic and human servicing for complex machines."

Stassun noted vigorous activity coming in the next few years in NASA Astrophysics missions. Are we able to maintain that level of leadership or are we losing ground? Griffin replied that the NASA Astrophysics program was a boa constrictor swallowing a very big pig (JWST). "In

between flagships we can have a greater diversity of smaller missions. We should be able to maintain that periodicity. It's really a question of what you, the community, want to do with that money. But expect a constant budget."

Stassun asked if Griffin saw emerging leadership elsewhere. Griffin replied, no, they all want to partner with us. Right now we're in an incredible leadership role in this country in space science. Everybody wants to partner with us.

Freedman asked if there were other things that the science community could do in working with NASA. Griffin referred to his AAS speech a few weeks ago.

Lunine wanted to take issue with the statement of whether the community has a broader mentality about space science overall. There was a herd mentality within the disciplines, but he had not seen colleagues arguing across disciplinary lines. He used to see it more when the NASA advisory structure included the Space Science Advisory Committee (SSAC). The SSAC as an opportunity for folks to think about the opportunities in other disciplines. Maybe that means that we as scientists can only think broadly when there is a sign outside that says, "Think broadly."

Balick noted that he also never goes to his university president to support the music department, either, so it may be a matter of what Griffin is hearing. Griffin noted, "I'm reporting from my perspective."

The Chair noted however that the AAAC Annual Reports have highlighted the value to the national of NASA's overall science program and of its human spaceflight program, and so have taken the high road before getting into the details of the issues for Astrophysics.

Balick noted the 50th anniversary of NASA, and the planning and opportunity to highlight science. Griffin replied that he was not involved in anniversary planning. Morse noted that there was a lecture series out there.

Griffin concluded, "I think our science areas, and Astrophysics in particular, do very well. I broadly think that we do a real good job at that and, if there was more money available, we would do better. It's hard to find a gap of a few months in which a major science accomplishment does not come about. We must be doing something right." He noted that no matter where he goes or who he talks to, everyone has something that they like about NASA; often the Mars Rovers or the Hubble. Those with more sophistication ask about dark energy. We have come to expect satellite imagery and tornado predictions as a service rather than as a result of Earth Science.

The Chair thanked Griffin again.

The next session was a discussion with OMB Program Examiners, Amy Kaminski (NASA) and Michael Holland (DOE).

Kaminski provided an overview of the FY09 budget and brief statements on Presidential priorities. The NASA FY09 budget was \$17.6B, roughly a 3% increase over the FY08 enacted level. SMD in FY09 was \$4.4B with an emphasis on Earth Science to get started on missions identified in the recently released decadal survey for Earth Science. She identified working with SMD to establish priorities and identify efficiencies (e.g. finding a partner for SOFIA in the near future). The key would be cost control.

Holland identified the FY08 Omnibus as a “disaster for DOE Science” and described the broad context for DOE SC. He noted that the net increase to the Office of Science was just over 1%. For a facility-heavy program that uses standing armies and a lot of electricity, that was a highly constrained and tight budget. This was the second year that DOE Office of Science did not get ACI funding out of Congress. He identified a long list of projects that had been stretched out, terminated early or canceled. He described the FY09 request as looking good, an increase over the FY08 request to \$4.7B.

The Chair asked for questions. Stubbs noted he was having a hard time assessing what had happened to the NASA budget because of the changes in accounting. He said it looked like Astrophysics was down 17%, but asked for clarification. Kaminski replied that Congressional mandates made it difficult for NASA to report as needed, so overhead accounting for NASA-wide institutional investments were kept at the top level. At the Directorate level you would see direct costs, but that still included all labor, procurement, travel, etc. Stubbs asked “So what happened to us in Astrophysics?” Kaminski replied that she could provide actual numbers for Astrophysics via email. “For SMD we’re on a 1% growth rate on the direct budget.” She noted specific changes in SMD budget lines that accounted for overall shifts. She agreed that it was very difficult to compare.

The Chair noted that \$200M comes out of Astrophysics in FY09 that runs out through the rest of the 5-year period. “What do we do to ramp that up after the decadal survey comes out? It worries me that we’re not poised to take advantage of the decadal survey since it takes at least two years to respond in the budget process.” Kaminski replied that overall NASA was doing well, but have to recognize that we’re in a box. Under a new Administration someone may have different ideas on what they’re willing to spend on Federal R&D. We need to recognize reality—that could change—with expectations on pacing on the list that was identified in the decadal survey.

Kolb asked what could be done as a committee or as a community to champion the priorities that come out of our science-based process. Kaminski replied, Come talk to us. We don’t see it as lobbying. It’s good to hear about the concepts but speak with a unified voice, rally around specific priorities and advocate for them. Holland replied, Talk about the top line. The way that the budget and political processes are designed, it’s very easy for us to play one project off against the other. You don’t want to fall into that trap. Dodelson asked What if we feel that the community has prioritized in a unified way and yet the budget process did not respond to that? Kaminski replied, “Record that in your report with statements that are as diplomatic and positive as possible. Help us decide what to do when projects eat up more than they were expected to during the prioritization process.”

Weinberger asked How useful do you think it is for the NASA budget to be so specific? Would it be helpful to allow NASA to spend the money at some level with flexibility? Kaminski replied, Good question. We don’t want to track that down to the specific dollar amount, but we do want to understand the pacing of missions and how things are going to flow. Lester noted at some level the detail was for Congress. Kaminski replied, Yes, and on some level we need to know how Congress will respond to the budget.

Holland noted from his perspective that the decadal survey brings credibility—compared for example, to energy technology development portfolios.

Stassun asked to what extent astronomy fits within ACI, or at what level of granularity did ACI apply. Kaminski replied that NASA was not part of ACI. That’s not to say that it was not

important or growing, but ACI was intended to support basic science with a direct impact on economic competitiveness. Arguably all programs could fit within it, but you have to think about where you're going to draw your lines. "If you put too much into it, it can become overloaded and sink," she said.

The Chair thanked Kaminski and Holland for their participation.

The Chair reviewed the agenda items for the next day. There was a brief discussion of issues for the annual report.

MEETING ADJOURNED AT 5:45 PM, 11 FEBRUARY 2008

MEETING RECONVENED AT 8:45 AM EST, 12 FEBRUARY 2008

The Chair called the meeting to order. The Chair asked Van Citters if he had any further comments on Gemini. Van Citters replied that the UK would pay and receive their 2008 time as a partner, and AST had requested a definitive position out of the UK by March 15.

The Chair asked for other thoughts, comments or feedback. He discussed the role of AAAC in highlighting/encouraging the development of a U.S. Optical and Infrared (OIR) "system."

Stubbs highlighted the role of the AAAC as an interface among the three agencies. There was good evidence for progress in that regard, e.g. the Virtual Astronomical Observatory (VAO) MOU and solicitation. It would be interesting to better understand what lessons might have been learned in generating the VAO AO as it may apply to, e.g., JDEM and LSST. Stassun agreed; anticipating interagency activities were becoming more important. Balick asked about the status of LSST. Was there a formal commitment from DOE to build the camera? Turner replied No. Friel highlighted the concept of an agency Joint Oversight Group (JOG) and establishing MOUs early. The Chair asked if there was a lead agency on VAO. Sharp replied NSF, but only in the sense that NSF would be running the reviews. Friel noted the award would be made by NSF; NASA would fund its own Centers if they participate; otherwise, funds would flow through NSF through an interagency transfer. The final management structure would depend upon the awardee. Sharp noted that the weekly/biweekly teleconferences were important to keep coordination moving and to retain attention.

The group discussed the Dark Energy Survey (DES) status and coordination. Both communities, those involved with NSF and those involved with DOE, were coming together.

The next session was a discussion with OSTP, Kate Beers and John Henry Scott.

Beers noted the "lessons learned" exercise conducted last year in regard to the Physics of the Universe (POU) activity. The final report was not public to preserve the ability for the agencies to discuss issues frankly. The Chair asked again for a more public document that drew attention to areas for future attention. Beers replied that she had verbally communicated those issues but she could consider sending major points with agency approval. She noted that the primary issues were very process oriented (e.g. lawyers); OSTP would like to have a third-party legal office to provide a stable, joint process in interagency areas.

The Committee suggested a document from OSTP providing guidance for interagency processes. Scott noted that each interface could be unique (akin to finding the cleavage planes when cutting

a diamond), so there was no single process to define. Balick/Lester noted they were looking for “mugshots” of difficult issues. The Chair was not looking for a roadmap; rather he was looking for what’s been learned.

Freedman returned to the discussion of the role of the AAAC. She was interested in knowing how the AAAC could be more effective. Stassun noted difficulty in getting traction on this issue in these discussions. Why does it seem that we’re trying to uncover something ugly? Friel reminded the Committee that it was legislated to meet four times per year. The AAAC had served a very useful purpose in bringing the agencies together. She noted that the agencies often have to say that they can’t talk about a particular issue because they are not legally permitted to do so (e.g. embargoed budgets, proposals under review) but that doesn’t mean they are hiding issues. It was fair to say that we had a very different (positive) relationship across the agencies since this Committee was formed.

Stubbs asked “How can we make the most use of our four meetings?” It’s less helpful to hear a spiel from each of the agencies. It may be more helpful to hear a joint overview of the status of interagency issues. Beers disagreed. “If you want to get to the core of these issues, you really need to see the entirety of the portfolios from each agency.” The Chair agreed. Moving ahead at the interagency level requires moving ahead at the agency level. Scott suggested defining a role for the AAAC that is unique and not fulfilled by other bodies.

Balick noted the AAAC’s very presence holds people accountable and takes a look at big picture items and forces us to look at the interfaces.

Beers noted Kaminski’s suggestion to visit OMB and that the same goes for OSTP. Scott agreed. He encouraged the Committee to visit OSTP and also suggested that the AAAC learn about who in the policy community is listening to their report and then tailor attention to that.

Weinberger noted, “You guys must be depressed about ACI given the FY08 Omnibus.” Scott replied that words coming out of the Hill seem to be very much behind the innovation agenda and show lots of bipartisan support for ACI. He continued, “The hope is that this particular budget event was an anomaly that happened in the 11th hour.” Beers noted that when you think about advocacy, think broadly. When you go to Congress and support the redirection of funds from projects that are going forward (and will continue to go forward), you hurt everyone.

Lester asked again for other disciplines with interagency lessons and issues—astronomy can’t be the only one. Scott noted HEPAP. Beers replied that there is some particular attention to astronomy because the tools are very expensive. The Chair noted task forces as important interagency activity. Beers stated that the ExoPTF report would go a long way towards encouraging the community to hold off on funding special projects until after the decadal survey.

Balick stated we need more effective communications; the Web has helped. OSTP could play a role for the entire community and competitiveness of the nation by developing a tool for communication (so we don’t have to fly all over the country to conduct these exchanges). Interfaces are needed, e.g. like existing Microsoft tools on a larger scale. Sharp described the Virtual Organizations program at NSF.

Beers/Scott reemphasized again the damaging conduct of lobbying for particular projects.

Beers brought the discussion to inclusion of astronomy in ACI. She noted that high energy physics was in a similar position. From its inception ACI was focused on material science,

chemistry, basic energy sciences...products that drive the economy; she also thought that all physical sciences would benefit from that support. MPS saw increases but the individual disciplines did see differences that reflect these priority areas/targets. Weinberger asked if astronomy should draw attention to parts of astronomy that do produce those things, e.g. detectors. Beers replied that the high energy community undertook an exercise to identify the value of the technology that came out of the need to do their science and its impact (e.g. superconducting radio frequency). Science drives new technology. Scott noted that it is a question of how clearly you can demonstrate and explain that trickle down for your field; the better your field relates to ACI, the better it will be for funding. Weinberger drew attention to the National Radio Astronomy Observatory (NRAO) report that attempts to do that for radio astronomy.

Stassun brought the discussion to broadening participation through workforce development as an important aspect of the economy. He noted that the decadal survey called on the importance of our community in broadening participation. Beers requested quantitative demonstration and an analysis. She noted that Marburger had been advocating for this new discipline of the "science of science policy." He wanted to understand the long-term impact of investments in detector technology, etc. Scott noted that you might be able to say that astronomy drives technology through PhDs that move into tech job areas but should demonstrate that. The Chair noted that this could be an excellent area for the next decadal survey to pursue. Phinney asked how much traction one gets with the argument that 7th graders are pulled into science by astronomy and not by, e.g., many-body theory. Freedman concurred and noted that astronomy is also a more visible science for educating the public. Beers offered health as an example of a motivating science...there are other things out there.

Freedman asked if this argument was over for including astronomy in ACI. Beers suggested using the America COMPETES Act instead (as Congressional law and consensus) and replied one could continue to remind us of your role in competitiveness.

Scott introduced himself and reported that Beers would end her detail in March. He and Jean Cottam would cover DOE, NSF, NASA. The Committee thanked Beers for her participation over the past year; Beers would be returning to the National Institutes of Standards and Technology (NIST) in March. Beers noted that the quality of the reports produced affect the credibility of future documents. She noted that the last report was long but the quality was high. She also noted the National Science and Technology Council (NSTC) reports were good examples to use for balance of advocating particular areas and providing broad context.

The Chair thanked Beers and Scott for their participation.

ADJOURNED AT 10:15 AM – RECONVENED AT 10:45 AM

Friel provided an overview of Conflicts of Interest (COI). There were no formal conflicts for AAAC members because there were no proposals under review. The AAAC members should note/report project and institutional associations and avoid direct involvement in discussions or report writing that affect those associations. She noted that the role of Vice-Chair was useful when the Chair must recuse him/herself from particular issues. She suggested that the members identify associations at the start of the meetings so they are known.

The AAAC members identified their own conflicts, including institutional. This will be repeated at the start of each meeting.

The Vice-Chair would be elected at the May meeting.

Freedman left the room. The Committee expressed their support for Freedman as Chair. They voted unanimously to elect Freedman as Chair-Elect. She would start her term on July 1 when the membership rotates and the current Chair steps down. Lehr would send a list to members providing term end dates.

The next session was a discussion of the role of the AAAC during the Decadal Survey.

The Chair noted that the Committee on Astronomy and Astrophysics (CAA) was disbanded during the process of the decadal survey. (Their charge is incompatible with meeting while the NRC is conducting a current survey.) David Lang, NRC Board on Physics and Astronomy, identified himself in the room.

The Chair asked the agencies for their thoughts or comments regarding the issues they expect during the decadal survey process. Van Citters replied there would be an evolution of things that would need advice and that would keep busy while the decadal survey was going on. He noted that the AAAC in part served as a Divisional advisory committee, particularly for issues that were not discussed/considered at length at the MPS Advisory Committee. He noted the task force reports had generated many recommendations that need to be addressed and considered; he provided the example of AST mid-scale activity as impacted by task force reports.

The Committee noted that the task force reports were very well timed for input to the decadal survey, but didn't anticipate additional task force activities during the decadal survey process. The Community and agencies would be working to respond to those reports generated thus far.

Lester suggested authoring a "mission statement" regarding the role of the AAAC during the decadal survey. The Committee discussed this and agreed that a verbal discussion with the decadal survey chair may be more appropriate. This could be useful to enunciate the AAAC role in the March annual report.

The Committee discussed the role of AAAC before/during/after the decadal survey.

Stubbs suggested that it could be very useful to pull members from the decadal survey committee into the AAAC after the decadal survey concludes. Freedman agreed.

The Chair asked about the timescale of starting the survey activity. Friel reported that the goal was to complete the discussion of the process within a month and to aim for a summer start of the process of chair/panel selection. The current discussions of the proposal were between the agencies and NRC (staff). The NRC uses an internal process to respond and may consult the BPA and Space Studies Board (SSB) chairs in that process.

The Chair recognized the need for an important linkage to set up communication with BPA/SSB and other committees, including the Decadal committee (through its Chair).

There was a discussion of the Annual Report. The Chair asked members to identify issues, concerns, points of note. Balick noted that things appear to be working well. He recognized again that the peer review process is the correct process for prioritization and decision-making, and the community and Congress should be reminded of this. Statements, though, should be couched very carefully to Congress.

Phinney expressed the importance of addressing ACI/COMPETES and funding. The Chair noted a \$200M decrease over five years in NASA Astrophysics—big change.

Stassun noted the VO progress which was very good news. However, the AAAC should also identify projects from decadal survey and other initiatives that could not get started, e.g. the instrumentation careers program at NSF.

The committee identified other items for discussion in the annual report:

- Task force reports
- AST Senior Review—process and political interference
- NASA Senior Review—routine but broadened from previous versions
- NASA R&A line—protection and growth

Balick asked if the decadal survey should intrinsically incorporate the AST Senior Review process or should that be conducted separately. Van Citters replied that the Survey must recognize the context and not assume that all will go forward on top of what we already have, but it would be difficult to incorporate a senior review process directly into decadal survey process. The Decade Survey this time would not “grandfather” things in, for example, LSST is being discussed now; does it need to be re-evaluated in light of other projects? The Chair offered an example of HST as something that should be recognized by decadal survey for phase out—when?

There was a discussion of the phasing of decadal survey decisions with other community input and agency decision/reviews.

ADJOURNED AT 12:20 PM – RECONVENED AT 12:45 PM

The next session was a further discussion of the ExoPTF report with Jonathan Lunine and Sara Seager.

The Chair thanked Sara Seager for joining the Committee. He suggested moving/copying arrow charts to the Executive Summary. Phinney noted that charts on eta_Earth needed to be included. Seager replied that they were in the original version of the report.

Weinberger noted some irregular referencing and suggested numbering recommendations.

The Chair noted that it would be helpful to identify a priority order of recommendations or provide hierarchical groupings. Seager replied that the recommendations were currently in chronological order. Lunine noted that the recommendations were ordered as to the impact on the program. The Committee discussed the prioritization and wanted a clarification of the recommendations, particularly in the initial 1-5 year period.

Stubbs pointed out opportunities for international collaboration. Lunine noted there was a lot of discussion among the task force on this, but was not clear how to articulate it in the report; the task force would consider for its inclusion. Stubbs pointed out that the role of theory was somewhat weak in the document. Lunine/Seager both noted that the strongest role for theory is to address Question 3, which is the lowest priority, but the task force had a lingering feeling that theory is not adequately addressed.

Balick complimented the task force on their report. He addressed the issue of costing, particularly since two agencies were involved in responding to the report. Lunine noted that the

task force was directed to consider costing but not to address it explicitly in the report (other than in general terms). We would need independent experts to provide serious costing models. The Chair agreed, but, it might be useful to indicate the broad scale of the activities (e.g. estimates of observing time; mission scale as Discovery, Probe, etc.).

Lester congratulated the task force on the quality of work but was not happy with the Executive Summary. There were many recommendations, but more importantly, the language lacked excitement in the main document. It needed more effort. He suggested that the task force look for opportunities to use wording that could be “quotable.”

Stassun noted that the report needed to capture the broader sense of understanding other worlds, i.e. in contrast to specifically an “Earth.” Was it the determination of the task force that, if η Earth is small, a direct imaging mission is not warranted? Lunine replied Yes; if η Earth is many orders of magnitude smaller than 0.1, then the task force did not support a direct imaging mission on this timescale (and maybe not ever, but one needs to ask that question explicitly beyond this timescale).

The Chair noted that the task force was best placed to respond to these suggestions, so respond as you find appropriate to suggestions. Freedman suggested taking a step back to think about the audience; otherwise, a terrific report.

Lunine anticipated responding with another draft in a few weeks with a plan for two more drafts—one to iterate with the AAAC, then one more final.

The Chair said fine. He thanked Lunine, Seager and the task force for the enormous effort and excellent report. He expected an excellent outcome once the final revisions were made.

The last session was a discussion with the NSF-MPS Assistant Director, Tony Chan.

There were brief introductory comments from Chan. He noted that the FY09 Request would bring NSF back to the doubling path. (Percentages look large because they were built upon FY08 Request but now measured compared to FY08 Omnibus.) He expects that AST would benefit from ACI as part of MPS; he noted that percentage for AST is higher than some other directorates at NSF. The only question was if the FY09 Request would turn into an FY09 appropriation.

The Chair asked Chan about the specific role of astronomy in ACI. Chan recognized the role of astronomy in competitiveness, and particularly in inspiring the younger generation. Weinberger noted that OSTP did not seem to grab on to that argument. Chan replied that the argument needed to be quantified. Stassun emphasized again the success of astronomy in broadening participation, e.g. percentage of women and minorities. Chan did not perceive that astronomy did any better than other MPS disciplines; astronomy was certainly a strong player. He noted that ACI’s focus was on economic competitiveness and emphasized again that the “rising tide” of ACI should bring along AST. He used the example of CDI and the Sloan Digital Sky Survey (SDSS) for the impact of astronomy and how astronomy could participate.

The Chair asked about the America COMPETES Act. Are there ways in which Congress thinks about this that’s different from ACI that we should roll into our thinking? Chan replied that he had no specific knowledge on this and offered that specificity may be different. The impact of COMPETES had not been seen yet.

Chan noted MPS support of the AST Senior Review.

The Chair asked about MREFC and noted the low budget this year...does that signal potential changes? Chan noted that AST benefits from one of the changes in the inclusion of ATST as a D&D line in MREFC. He also noted that the overall drop was an impact from the new OMB Program Examiner...projects weren't ready. He noted the new NSF Director policy of "no cost overruns." He asked to make two comments on MREFC: (1) private sector role, (2) as these project costs approach \$B, how much can we afford to start? One has to prioritize even more than before, especially in astronomy.

Freedman asked for advice going into the decadal survey. She noted that NSF is a proposal-driven agency. What would be most useful to you? Chan replied that prioritization within a subdiscipline is relatively easy to do. Prioritization across the disciplines would be very helpful. Argue from the point of view of science—what do you need to do the science? Encourage the decadal survey to consider rolling off projects, as well as what comes next. Freedman asked how future Senior Review activities would be phased/interfaced with decadal surveys. Also appropriate for decadal survey to look at international aspects which were of interest to the NSF Director for both financial and scientific reasons. The Chair noted that was being done now with ALMA, some in ATST. The question was how to fold that into the planning process. Chan noted it would be good to identify prospects and identify scientific opportunities.

Freedman recognized the costing effort that NASA would like to see in decadal survey and asked if NSF was interested in that kind of scrutiny. Chan replied that this made him nervous; not really our tradition. It is good to have some budget information but don't want it to be too tightly managed. (E.g., would not want to give decadal survey a "budget.") The Chair clarified that goal was to estimate the scale of the projects and recognize how staging could work. Freedman noted that NSF ought to push us to do some more careful costing effort. Chan recognized that priority depends on cost and cost depends on time; commodities could change things dramatically.

Freedman asked are there things that astronomy could do for MPS when projects had to be prioritized but the costs were more they could we could afford. Chan replied the community needed to ask themselves what was the science being enabled by the discipline and then argue for the project and the funding; the decade survey and the senior review are different but how they interact is important.

Stassun asked, to what extent are interagency initiatives on your radar screen at the directorate level? Chan replied Very much so.

The Chair thanked Chan for participating.

The Chair thanked John Henry Scott for joining the meeting; asked him to send regards to Kate Beers for her excellent efforts and engagement with the Committee over the past year.

The Committee discussed the annual report and suggested adding science highlights. All agreed on this.

The Committee scheduled their March telecon for 3:00-5:00 EDT on Monday, March 10, 2008.

MEETING ADJOURNED AT 2:30 PM, 12 FEBRUARY 2008