NASA ADVISORY COUNCIL

ASTROPHYSICS SUBCOMMITTEE

November 6, 2012

Teleconference

MEETING MINUTES

_____

Brad Peterson, Chair

_____

Joan Centrella, Executive Secretary

Table of Contents

Welcome and Introductions	3
Astrophysics Division Update	3
Briefing on Proposed NAC Data Centers	3
Astrophysics Division Update continued	5
Strategic Implementation for the APD	8
Discussion and Matters Arising	11
Public Comment Period	11
Adjourn	12

Appendix A- Attendees
Appendix B-Membership roster
Appendix C-Presentations
Appendix D-Agenda

Prepared by Elizabeth Sheley
Zantech IT

Tuesday, November 6, 2012

Welcome and Introductions

Dr. Joan Centrella, Executive Secretary of the NASA Advisory Council (NAC) Astrophysics Subcommittee (APS), began the teleconference by asking the participants to identify themselves. The teleconference served as a regular APS meeting.

Astrophysics Division Update

Dr. Paul Hertz, Director of NASA's Astrophysics Division (APD), presented an update on Division activities, beginning with science highlights.

The Origins of Solar Systems (OSS) program, using ground-based observations of orbits along with analysis of chemical composition, found evidence of a planet being obliterated by its parent star. This helps meet the objective of understanding planetary systems. Another science finding came from the Fermi mission, in which there was measurement of the cosmic "fog" produced by ancient starlight. This shows spectral cutoff of gamma rays at different epochs in the history of the universe, due to absorption by this cosmic fog, and helps investigators estimate integrated starlight and extrapolate to the total stellar population of the universe.

The Chandra X-Ray Observatory identified a cluster of galaxies that has been named "the Phoenix cluster." Astronomers originally expected to see more clusters of galaxies with cooling flows but did not due to active black holes, which prevent the gas from cooling by injecting energy. In the Phoenix cluster, the black hole was off, which made the cooling flow observable.

Finally, a deep view of the universe taken from the Hubble Space Telescope allowed astronomers to observe very red, extra bright galaxies at high redshift. These galaxies are bright enough to detect because they are gravitationally lensed. This result will be extended and expanded with the James Webb Space Telescope (JWST), which is optimized to study such objects.

Dr. Hertz then discussed the most recent organizational chart for the Science Mission Directorate (SMD). Of particular importance is that APD now has a Deputy Director, Andrea Razzaghi, who worked at the Goddard Space Flight Center (GSFC) as an engineer for many years, and more recently served as the Assistant Director of the Planetary Sciences Division (PSD). Mark Allen is now Acting Deputy Associate Administrator for Research, a job that has absorbed many of the tasks previously done by the Chief Scientist. Dr. Hertz also pointed out some of the more recent personnel changes within APD.

Briefing on Proposed NAC Data Centers Study

Dr. Larry Smarr, Chair of the NAC Information Technology Infrastructure Committee (ITIC), introduced himself. ITIC was seeking support for a recommendation to NAC:

> *"NASA should formally review the existing national data cyber-infrastructure supporting access to data repositories for NASA SMD missions. A comparison with best-of-breed practices within NASA and at other Federal agencies should be made."*

Dr. Smarr explained that there is a huge increase in the amount of data being generated by missions, along with more and more computational astrophysics, implying that the science part of NASA needs to have the right IT infrastructure to support their missions. There is an ongoing discussion of whether the Office of the Chief Information Officer (OCIO) should be in charge of this IT infrastructure or whether the

science missions should manage it. At present, the scientists run it on a rather ad hoc basis, separately designed for each mission.

When asked about the purpose and scope of the proposed study, Dr. Smarr explained that there are missions with individual data centers that are on different platforms and very hard to integrate despite a growing need to do so. As the data object sizes have grown, access over the Internet has become increasingly challenging. NASA is behind other agencies in developing an integrated system. This makes the Centers and missions, which are data islands, even slower. Mission data reside in highly distributed servers. Much work is done through the archives, and that secondary storage needs stronger user portals and better access. At the same time, there is a public and education-related demand for more images.

The majority of Hubble-related science publications are now based on data from the archives, and the multi-mission data archives are projected to double through 2018. The launch of JWST will lead to even more growth. Earth satellites alone approach half a billion data products distributed each year, a level of access that was not envisioned. The Virtual Astronomical Observatory (VAO) is a data discovery, access, and integration facility, and a great example of how using interoperability of diverse data archives has worked well. The best results have come from the various entities working together organically. Dr. Smarr would like to get that point in front of NASA, and the study will reinforce it. Currently, almost all NASA-directed IT is in the area of administrative computing.

Dr. Smarr said that Dr. John Grunsfeld, Associate Administrator of SMD, would like to be able to pull together both the supercomputer people and a high-performance version of the VAO. Right now, he lacks a mandate to do that. The work in astronomy and imaging has become wildly popular with the public, but there has never been much thought at NASA about what sort of cyber-infrastructure would make it easier to get this information into the public view, which leads to public support for NASA.

Because the current arrangement in the science missions works so well, ITIC is skeptical of traditional centralization of IT at NASA, though they do want the kind of interoperable federation that would enable use of data across missions. Dr. Smarr pointed out that coming Federal government fiscal pressures may provide further support to the forces within NASA that wish to centralize all IT within the OCIO. If this study does not go through, he is concerned that they will have missed the last chance to establish a different science-driven model as an alternative to centralization within OCIO. He is concerned that if centralization were to happen, it might have a negative impact on future data-driven science.

Dr. Hertz concurred. There are always people in a bureaucracy who think that centralization will improve services and save money. Examples at NASA are abundant, and include space communications, education programs, and others. There is a discussion going on about centralizing IT services under the OCIO, including data and science services that each division and mission operates for itself. The proposed study is motivated by that discussion. Dr. Hertz added that APD has a very different situation from that of the Heliophysics Division (HPD). APD has three integrated multi-mission archives, and has made a good start on the type of federation that the virtual observatory represents.

Dr. Smarr reminded APS that Dr. Grunsfeld had asked him to talk to the science subcommittees about this. One of the purposes is to develop a paper on what the architecture of a science-led data cyber-infrastructure would look like, in order to show that the science community has integrated in the right direction. The best examples of science-led data infrastructure would be very helpful. After being asked for more specificity, Dr. Smarr said that ITIC is open to changes in the wording of the recommendation, along with comments, in order to reinforce the science community's points. It would also help to have examples of best practices that he could take to the heads of the NAC Science Committee and the Education Committee before going to the full NAC.

Dr. Steve Ritz asked why the burden of proof was on the scientists, who think that what they are doing works well. He suggested making a simple statement against uninformed consolidation. Dr. Smarr explained that there is a lot going on at NASA beyond what SMD does, sometimes obscuring the Directorate's activities and operations. ITIC is trying to give this issue the necessary visibility. While he thought that Dr. Ritz had suggested a good finding, it would help to have comments that investigators believe that the ownership of mission data centers is a principle that should not be abrogated. It is obvious to the investigators that it should be that way, but that is not necessarily the way NASA operates across the organization. Within NASA, there is a powerful tendency to centralize that APD has managed to avoid thus far.

Dr. Mary Beth Kaiser agreed that the community feels the NASA centers are responsive and working well. She asked about the structure of the committee in the event of the proposed study going forward. Dr. Smarr said that he would want to have Subcommittee members active on the study team, and no one has been selected at this point. When Dr. Kaiser asked about the relative value of a report versus sending a finding, Dr. Smarr replied that the NASA Advisory Council has committees that recommend findings. Each recommendation must be taken by the appropriate NASA associate administrator and reported back, resulting in a written report. Ultimately, the report would help empower SMD. Dr. Grunsfeld would like to have a report through the ITIC backing him up more strongly. Dr. Hertz added that if the OCIO were to recommend a strategic plan for consolidating all Agency IT activities, and if Dr. Grunsfeld objected, it is not possible to predict which way the NASA Administrator would decide in the absence of additional information. A study would provide that additional information.

Dr. Hertz added that APS will need to accept that a study might not provide the desired answer. APS members were free to include their constructive suggestions on how to carry out the study in findings and recommendations for the NAC Science Committee. When asked whether recommendations from the subcommittees to the NAC Science Committee might be another way of swaying the decision without going through the independent study, Dr. Smarr said that ideas on how to shorten the process are welcome. For example, there may be a consensus of principles that could go to the Administrator. Because budget pressures might accelerate any consolidation plans in 2013, he welcomed ideas on how to move faster.

Dr. John Nousek thought that what Dr. Smarr was really seeking was a science representative on the body making the decisions so that science has a voice in this process. He preferred to make a recommendation for that, rather than a charter for the study, which he saw as vaguely defined. Dr. Smarr said that a recommendation for a consensus document to identify the principles of a science-driven IT infrastructure at NASA would be helpful. The IT people are not very familiar with the needs of digital astrophysics, which is why a science-driven recommendation is important. ITIC and SMD could then jointly forward the recommendation to the Administrator in much less time than the study would require. Dr. Smarr then provided a few concluding remarks about NASA IT infrastructure and thanked APS for their consideration of this issue.

Astrophysics Division Update *continued*

Dr. Hertz resumed his presentation with some additional information about staff movement within APD.

Mission Updates

The Nuclear Spectroscopic Telescope Array (NuSTAR) mission began Phase E, the 2-year prime mission, on August 1. There were issues to work out related to pointing, but operational work-around procedures have been developed that have allowed science observations to begin while the pointing issues can be further studied. NuSTAR is participating with other missions on coordinated observations.

Principal Investigator (PI) Fiona Harrison and her colleagues have submitted the first scientific paper from NuSTAR. There have also been image releases.

Recent long-wavelength camera instrument upgrade proposals for the Stratospheric Observatory for Infrared Astronomy (SOFIA) have been consolidated and are moving forward. A competition for Cycle 1 science observations was also recently completed, with observations to be carried out by the end of calendar year 2013. During Segment 3 downtime, the new cockpit avionics were installed, simplifying cockpit operations and enhancing pilots' situational awareness. The team cleaned the telescope, and is completing verification and validation of observatory platform upgrades to improve efficiency and increase the amount of science that can be done in a given flight. There will be at least one avionics check flight and two verification/validation flights prior to the start of science flights. NASA's German partners on the mission have provided an upgraded Focal Plane Imager that is more sensitive and can use more stars to improve the pointing.

In late August, the engineering model for the Astro-H mission underwent cryogenic testing. The failed heat switch was redesigned as well. The mission team has completed and characterized the flight unit for the detector array. The resolution exceeds requirements. Construction is complete on all four quadrants of the mirrors for the calorimeter.

The needs of the European Space Agency (ESA) are driving the Euclid mission. NASA has received proposals for the NASA-selected consortium members. ESA has signed a contract with Teledyne for developmental work on the detectors that NASA will provide. The Agency is also working with ESA on a Joint Project Implementation Plan. The Memorandum of Understanding (MOU) has been completely approved on the U.S. side except for signatures, while ESA is having various required council meetings.

All of the reviews required to terminate the Gravity and Extreme Magnetism (GEMS) mission have been completed. The reviewers all found that SMD had an appropriate process and that the decision to terminate the mission was correct. They did find ways in which SMD could have improved the process, and GSFC conducted a thorough lessons-learned review covering such areas as communication, understanding, and more. Headquarters was reviewing these lessons-learned at the time of the meeting. Dr. Hertz took it as an APD action on the next Small Explorer (SMEX) Announcement of Opportunity (AO) to ensure that the call is for proposals that can be implemented within the SMEX rules. It will also be crucial to ensure that everyone at NASA has the same understanding of the rules.

APD has been aggressively taking advantage of opportunities to do astrophysics on the International Space Station (ISS). The Alpha Magnetic Spectrometer (AMS), a Department of Energy (DOE) project, launched in 2011. The Division is planning to add at least three more particle astrophysics experiments. The Cosmic Ray Energetics and Mass (CREAM) payload is essentially a repackaged balloon payload that will go up via SpaceX in 2014. CREAM and the other two instruments are examples of successful proposals that began with the Research Opportunities in Space and Earth Sciences (ROSES) program. The Calorimetric Electron Telescope (CALET) is a Japanese-led experiment that will have U.S. collaborators on the science team. The Extreme Universe Space Observatory (EUSO) payload is planned for 2017, with ESA and Japanese Space Agency (JAXA) collaborators assisted by NASA. APD will benefit from the NASA Human Exploration and Operations Mission Directorate (HEOMD) involvement in launching and hosting these payloads. In answer to a question about SMD and HEOMD coordination, Dr. Hertz said that he can arrange a presentation in the future about the science involved.

The Division completed the summer and fall campaigns for the balloon program. In Sweden, APD flew a large super-pressure balloon. In Ft. Sumner, NM, a student platform, a second test of an arc-second telescope pointing system, and other missions were flown. The next balloon campaign is from Antarctica.

The Astrophysics Focused Telescope Assets (AFTA) study will devote 7 months to evaluating the 2.4-meter telescopes given to NASA by the National Reconnaissance Organization (NRO). There are several goals to this study, such as a Design Reference Mission (DRM) and an evaluation of the telescope's ability to advance Wide Field InfraRed Survey Telescope (WFIRST) science. The report, due in April 2013, will also evaluate an option for a secondary instrument such as a coronagraph, with a focus on costs and the type of science that could be done. The study team will follow the report with a cost assessment and technology estimate on the DRM. Dr. Hertz is interested in whether the use of the telescope offers an advantage in doing WFIRST relative to what the WFIRST science definition team developed. There is no requirement to use these telescopes; at this point, NASA is studying them to see if such use is in the Agency's best interest.

In answer to a question, Dr. Hertz explained that the study team's instructions were to use the telescopes as built, and to do it as cheaply as possible without throwing the science overboard. He hopes APD can compare the science output and potential costs with the DRMs that the Division has already done. The contractor that developed the hardware also did a mock-up that has been delivered to GSFC. The NASA Administrator said to do both the astrophysics-focused study for a WFIRST-like mission and another study looking across all NASA strategic priorities, including those of HEOMD, to see if the telescopes can be used more broadly. NASA plans to broadly solicit abstracts for mission concepts and select those that best address Agency intent. There will be a by-invitation workshop for the selected abstracts, after which NASA will select those abstracts demonstrating the best value and feasibility. Abstracts making that cut will be sent to design labs, and the results will be reported to the Administrator prior to the Fiscal Year (FY) 2015 budget consideration.

The funds previously allocated for GEMS are planned to remain in the Explorer Program, allowing APD to begin new projects as soon as they are selected in Spring 2013. The redirected funds also allow the Division to move up future AOs and augment the program to follow the DS recommendations more closely, to the high end of the proposed cost cap of $60 million. There will be a SMEX AO in about a year, and an Explorer and Mission of Opportunity (MoO) AO in 2015, subject to future President's budget requests.

The National Science Foundation (NSF) is the VAO lead and, together with NASA, funds a consortium that is in its second 5 years. However, the VAO has not produced what was sought in terms of science output. Subsequently, the two agencies have reduced the VAO budget and have recommended paths to a succession plan with two parts. The first part is to identify an entity to maintain the data protocols and standards, and the second part will look for a way to support development of user tools and make them available to the community. The goal is to change the path forward on VAO, completing the current cooperative agreement but not extending it. A lot of infrastructure has been built up by the consortium. NSF and NASA want to change the management model while keeping the value and standards that enable the capabilities. Dr. Hertz does not think the program has yet realized the science benefits anticipated from this activity, but efforts will continue with the infrastructure to get to that science.

Regarding the IT issues raised by Dr. Smarr, APD is committed to maintaining the value and success of the current astrophysics archives. There are many positives that should not be taken away.

NASA has begun commissioning the Large Binocular Telescope Interferometer (LBTI). However, this project is running behind, so the Division must revisit the budget. Regarding the Keck Observatory Archive (KOA), NASA has agreed that it will archive all data from the observatory, in addition to that from the High Resolution Imaging Science Experiment (HiRISE) and the Near Infrared Spectrograph (NIRSpec). The cost is marginal.

Dr. Hertz showed the results and timelines from the 2012 Research and Application (R&A) competitions. The number of proposals and selections indicates that APD is maintaining its overall selection rate. The Division tries to get funding in place within 6 months of the proposal due date, although the observing programs have a different set of funding profiles. Dr. Nousek said that some PIs have had difficulty with funding delays, and suggested that a useful metric could be the time between selection and funding. Dr. Hertz said that the Division tries to work with the PIs and be responsive to when the funds are needed. If PIs have issues, they should go to the program officer and find out whether something can be done. There are immutable circumstances, such as Continuing Resolutions from Congress, that APD cannot control, however. This policy is written in ROSES and the selection letters. Funding for the next fiscal year should be similar in most areas. Some competitions are for time and money, while some are just for money. The oversubscription rate on time is a factor of six.

Dr. Hertz reviewed the Physics of the Cosmos (PCOS) Strategic Astrophysics Technology (SAT) selections and the Cosmic Origins (COR) SAT selections. Among APD's many 2012 communications activities was the creation of a new astrophysics-only mailing list in the NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES), which has about 1,200 subscribers at this point.

Action Items
Dr. Hertz listed APD action items from the last two APS meetings, along with APD's response. From February 2012, APD took the following as action items:

1. Discuss strategy. *Dr. Hertz was about to give that presentation.*
2. Have a mid-decade review to assess the 2010 DS in light of circumstances that have changed since the DS was developed. *This is pending.*
3. Allocate funds within R&A to respond to the DS for augmentation of certain areas. *Dr. Hertz provided that in the R&A chart. If APS wants to recommend a rebalancing, the members should tell him where they think APD is out of balance.*
4. Restore funds removed from SMD's Education and Public Outreach (EPO) programs. *This is beyond the reach of APD. APS can send a recommendation to the NAC Science Committee advising the Science Committee to write its own recommendation that NASA restore the funds.*

From the July 2012 meeting, Dr. Hertz listed the following action items and responses:

1. Have a conversation on Explorers. *This will happen at the next meeting.*
2. NASA should look at shifting funds in the Explorer budget to earlier phases in order to achieve higher fidelity mission costs. *Dr. Hertz needs clarification on what APS wants here before he can address this action item.*
3. Dr. Hertz should share thoughts on the strategic process. *This was to immediately follow.*
4. Provide the opportunity to discuss the pending plan for the study of the 2.4 meter telescopes. *That was to occur at this meeting.*
5. Follow up with APS on cost containment best practices and strategies. *This will be addressed at one of the next two APS meetings.*

<u>Strategic Implementation for the APD</u>

Dr. Hertz next discussed issues relating to APD's implementation of the DS. At the time of the meeting, the Division was reviewing a white paper on this topic, with the goal of releasing the document by mid-December.

APD is responsible for the stewardship of the nation's capabilities in space astrophysics, and for advancing the nation's space astrophysics goals and objectives. To enable this, the DS provides guidance on science and mission priorities. APD also invests in the Research Program to develop science cases for new missions; receives community input and advice; and implements programs based on choices made by the APD in the context of the science and priorities set by the DS and by the community and stakeholders. APD strives to be as transparent as possible, to nurture the core capabilities at the NASA centers and throughout the Nation, and to maintain flexibility in a constantly changing environment. However, this must all be done in context of a budget.

The reality is that the budget does not allow full implementation of the DS. In addition, the JWST was re-baselined for a 2018 launch with an increased cost commitment. The non-JWST budget is highly constrained while JWST is in development, which means that APD cannot implement new missions other than Explorers until JWST spending decreases. This will occur around FY17, as JWST approaches launch. Therefore, APD must plan against a constrained budget unless there are budget increases that are not now anticipated. Budget issues have also led NASA and ESA to end their joint studies on the Laser Interferometer Space Antenna (LISA) and the International X-ray Observatory (IXO). NASA is partnering with ESA on Euclid, and does have the 2.4 meter telescope assets, however.

The near-term strategic goal is to start work towards the next new strategic astrophysics mission. Because APD cannot assume funding for a large mission, the Division is also studying moderate-cost missions called "probes" that follow the science objectives of the DS prioritized missions. At the same time, APD is maintaining existing programs and offering more Explorer opportunities. The FY13 budget request includes funds for an expanded Explorer program that supports four full missions and four MOOs over a decade. The budget also seeks funds to continue existing programs and operating missions, a new program for mid-Technology Readiness Level (TRL) technology development, and augmentation of the Astrophysics Research Program. Finally, the budget requests funding for Theory and Computation Networks in conjunction with NSF, the Nancy Grace Roman Technology Fellowship Program, laboratory astrophysics consortia, and Euclid participation. APD is responding to every recommendation to some degree, but not to the extent envisioned in the DS.

To prepare for the next strategic mission that will follow JWST, APD is doing studies and technology development for a large strategic mission such as WFIRST, as well as the moderate-sized probes. All of the concept studies flow from the science objectives of the DS-prioritized missions. Dr. Hertz showed a list of activities related to this effort. The WFIRST DRM2 examined a probe-sized mission that would accomplish 60 percent of objectives of the WFIRST DRM1. A study to determine whether there are any probe-sized gravitational wave missions that would take LISA science forward concluded that there are no such missions possible. A similar study for IXO science did find some potential probe concepts, however. APD is also doing exoplanet technology development that could lead to probes. Finally, looking ahead to the next DS, APD is taking a look the science and technology drivers that will be essential for that decade.

While Dr. Hertz could not specify the process involved in identifying the next strategic mission, he did cite principles that will guide the process. A mission that addresses the DS science objectives of WFIRST remains the highest priority for a large mission. To succeed at developing the next mission, APD must retire the technology risks by maturing the needed technology to TRL-6. It is essential to understand the selected mission's cost, programmatic, technical, and institutional risk posture. Whatever costs the concept studies lay out, there is the risk that those costs will be perceived as commitments regardless of

how APD characterizes them as preliminary. If the Division presents the lowest credible cost, that can lead to problems down the road. Dr. Hertz does not want APD to be held to an unlikely mission cost estimate.

He next explained the role of the mid-decade review. APD did the first mid-decade review in 2006, in which the Division asked how well NASA's program addressed the strategies, goals, and priorities of the DS. APD also sought feedback on its progress in that direction and asked about actions NASA could take. That mid-decade review did not revisit priorities. When APD seeks a mid-decade review this time, the Division will expect it to be an assessment of whether the astrophysics program aligns with the DS in terms of the available resources. Dr. Hertz does not expect it to revisit priorities.

APD plans to release a white paper on these issues, describing the APD strategy in response to the DS recommendations consistent with current budget guidance, on December 14.

Discussion
In response to a question, Dr. Hertz said that the discussion of the probes was not specific by design, as it is early in even considering them. He defined a probe as a mission with a $1 billion cost cap. He noted that there are no opportunities to split a $2 billion mission with ESA. The DS was clear that the strategic mission recommended to come next was to be U.S.-led. The partnership in Euclid does not constitute a leading role for NASA. The Agency is waiting for ESA to announce its intent toward its next mission, and Dr. Hertz looks forward to participating in it. There are conversations ongoing with ESA, though he will not discuss ESA plans before they are public. APD's next DS is not due for another 8 years, and he expects ESA to move forward with an L2 competition before then. This has the potential to create a sequential situation that could facilitate joint international planning.

Dr. Karl Stapelfeldt asked how, if APD cannot do a large mission and must choose a probe, the Division would determine that the probe mission selected is not one that does the WFIRST science from the DRM2. Dr. Hertz replied that there has not yet been time to fully examine the WFIRST DRM2 report. However, the DRM2 would do only 60 percent of the WFIRST science. The parameters of the DRM2 accepted a 3-year mission. The question remains as to whether 60 percent of the WFIRST science is compelling. This is the kind of question he would like the National Research Council (NRC) Committee on Astronomy and Astrophysics (CAA) to address. One of the NASA issues is how the Agency's mission assurance and quality assessment resolves the question of moving forward missions that appear to be Category 1 missions but do not meet Category 1 requirements. This will be addressed leading up to 2015, but the resources do not exist to do it all now. If NASA approves the DRM2 version of WFIRST, that could be attractive.

There was debate as to whether the CAA should weigh in on the two versions of WFIRST, DRM1 or DRM2. Dr. Hertz explained that the time to truly compare the two would be after the AFTA study team concludes its work in the spring. At that time, it would make sense to begin addressing the risk versus cost issues. After more discussion, Dr. Bradley Peterson, APS Chair, concluded that there was no consensus.

Dr. Stapelfeldt asked if Dr. Hertz tries to project what funds will disappear from community access as a result of missions that are winding down. For example, because the Spitzer mission is well beyond its baseline and the Herschel mission will be ending soon, the community of users for these missions will come to the end of that funding. These diminishing funds will likely result in more applicants to the grants programs. Dr. Hertz replied that there is not a conservation principle at work. There are always missions coming and going, so support to the community stays at a pretty good level. As the Herschel and Spitzer missions wind down, NuSTAR and Astro-H will bring in new programs, for example.

Dr. Terry Oswalt asked about APD's potential use of commercial spacecraft, and whether this might lead to cost savings. Dr. Hertz said that SpaceX will be sending a science payload to the ISS, and APD already buys communications services commercially. The Division is open to other commercial opportunities, and Dr. Hertz noted that APD competes the spacecraft, integration and test, and instruments in order to seek lower-cost ways to do business. Since APD pays for the launch vehicles it uses, any savings benefit Division programs.

Dr. David Leisawitz from NASA noted that the DS advised U.S. involvement in the ESA/JAXA joint Space Infrared Telescope for Cosmology and Astrophysics (SPICA) telescope. This is no longer an option, and he asked about the policy on related science drivers. Dr. Hertz answered that there is no requirement for linkages to the DS in the Astrophysics R&A program because the program encompasses the breadth of NASA astrophysics.

Discussion and Matters Arising

Dr. Peterson asked APS to consider sending a letter to the NAC with the Subcommittee's sense of the IT situation, reserving the right to endorse a study later if the letter is not sufficient. Dr. Paul Ray said that he found the IT discussion somewhat confusing. He heard two messages: first, that NASA is falling behind, and second, that there could be an attempt to force change on scientists. Dr. Peterson said that if the community advocates for the services it has, APS needed to communicate this to the Science Committee. It is also true that NASA should not fall behind in technology. Dr. Kaiser thought that Dr. Smarr had made the case that NASA was already behind and needed resources. She believed there were two issues to address. The first was community satisfaction with the federated archives and whether there should be a report supporting the archives as they exist. The second issue was whether there is a need for additional funding to ensure that investigators have sufficient cloud computing resources. She thought the report should encompass both of those issues. Dr. Peterson advised mentioning the virtual observatory as well. Dr. Ritz added that the letter should note that the effective organizations currently managing SMD data also continually look for ways to economize and are naturally optimizing all of the time. The science community puts the pressure on themselves and conducts continual self-assessments.

Dr. Ray recommended making an unequivocal statement that centralized IT is not the best approach for NASA science. Dr. Ritz observed that a 1-year study may not be effective, but there may be a need for additional information beyond what they had. Dr. Peterson countered that APS should be able to establish their position without having to do the study. Dr. Hertz noted that Dr. Smarr sought APS feedback on whether APD is optimized and represents a model that is desirable. Dr. Peterson thought that was a hard case to make.

There was further discussion about the need for new capacity, with general agreement that this part of Dr. Smarr's presentation did not lend itself to a sufficiently specific action. Dr. Stephen Murray of Johns Hopkins University said that he was pleased that APS was taking this seriously. He hoped they would emphasize that the astrophysics data archive community is a highly integrated group with interoperability. They are science-driven, not IT-driven. The real question is what enables the most science and best serves the community through the archives. The response might emphasize the science value of the appropriate organizations, their expertise, and the difficulties in consolidating that expertise. Any study team should have a member of the APS on it.

Dr. Jason Kalirai of the Space Telescope Science Institute suggested that Dr. Smarr had a broad perspective and was talking about how to do science in the future, which reflects the way communication is changing, especially with regard to the next generation of scientists. There is probably room for collaboration in taking advantage of the new technologies.

Regarding future APD activities, Dr. Kaiser thought it was premature to close the doors on looking at any potential probes. APS will need more information. She had no problem with the content of the APD white paper as it was described. Dr. Peterson noted that it is not possible to shut down discussion of WFIRST at this point, with Dr. Nousek pointing out that while the mission name may remain the same, that is not necessarily true of its content, launch date, or capabilities.

Public Comment Period

Dr. Leisawitz spoke earlier because he was unable to be present for the public comment period. Drs. Murray and Kalirai made comments during the previous discussion.

Dr. Bethany Johns of the American Astronomical Society (AAS) expressed concern about what may happen under the Continuing Resolution. The funding for JWST is already less than what the mission requires. Dr. Hertz explained that the Continuing Resolution flattens the budget, but Congress had asked for a spending plan for JWST, and he assumed the right amount of funding would be there, though he was not certain. NASA Administrator Charles Bolden has stated that JWST is a priority. He suggested that Dr. Johns contact the NASA public affairs office, which could probably answer her question.

Dr. Kalirai asked if the WFIRST DRM2 assumed a mission lifetime of 3 years. When that was confirmed, he noted that many of the DRM2 objectives are faster than those in DRM1, so the 60 percent figure is probably not correct. Dr. Hertz said that this is indeed a broad approximation.

Adjourn

The next APS meeting will be in February or March of 2013, after the budget is released.

The meeting was adjourned at 3:48 p.m.

Appendix A
Attendees

Subcommittee members
Bradley Peterson, Ohio State University, *Chair Astrophysics Subcommittee*
Joan Centrella, NASA, *Executive Secretary*
Gary Bernstein, University of Pennsylvania (via WebEx)
James Bock, Jet Propulsion Laboratory
Edna DeVore, SETI Institute (via WebEx)
B. Scott Gaudi, Ohio State University
Gabriela Gonzalez, Louisiana State University
Mary Elizabeth Kaiser, The Johns Hopkins University
Vicki Kalogera, Northwestern University
Chris Martin, California Institute of Technology
Gary Melnick, Harvard University
John Nousek, Pennsylvania State University
Terry Oswalt, Florida Institute of Technology
Paul Ray, Naval Research Laboratory
Steven Ritz, University of California Santa Cruz (via WebEx)
Karl Stapelfeldt, Goddard Space Flight Center

NASA attendees
Paul Hertz, NASA HQ, *Director, Astrophysics Division*
Lia LaPiana, NASA HQ
Marian Norris, NASA HQ
Wilton Sanders, NASA
Linda Sparke, NASA HQ
Lisa Wainio, NASA HQ

Webex
Michael Bicay, NASA GSFC
Gary Blackwood, NASA JPL
Blake Bullock, Northrup Grumman
Richard Capps, JPL
Carol Christian, Space Telescope
Dominick Conte, Orbital Sciences
Mary Engola, Ball
Mike Fanelli, NASA Ames
Kathryn Flanagan, STSCI
David Gallagher, JPL
Paul Goldsmith, JPL
Richard Griffiths, NASA
Ilana Harrus, NASA HQ
George Helou, CalTech

Cuong Huynh, NASA HQ
Bethany Johns, AAS
Jason Kalirai, Space Telescope Science Institute
Louis Kaluzienski, NASA
Chryssa Kouveliotou, NASA MSFC
Jeffrey Kruk, NASA GSFC
David Lang, NRC
Peter Lawson, NASA JPL
David Leisawitz, NASA
Dan Leone, Space News
Daniel Lester, University of Texas
William Lightsey, NASA HQ
Jon Malay, Lockheed Martin
James Marr, NASA JPL
StephenMurray, Johns Hopkins University
Mario Perez, NASA HQ
Larry Petro, NASA HQ
Ronald Polidan, Northrup Grumman
Marc Postman, Space Telescope Science Institute
Rita Sambruna, NASA HQ
Mike Sanelli, NASA
Alan Smale, NASA GSFC
Larry Smarr, University California San Diego
William Smith, AURA
Christina Thompson, Northrup Grumman
StephenUnwin, NASA JPL
Michael Werner, NASA JPL
Rick White, Space Telescope Science Institute
Harold Yorke, NASA JPL

Appendix B
NAC Astrophysics Subcommittee Members

Bradley Peterson, Chair
Department of Astronomy
Ohio State University

Joan Centrella, Executive Secretary
Astrophysics Division
Science Mission Directorate
NASA Headquarters

Louis J. Allamandola
NASA Ames Research Center

Gary M. Bernstein
Professor of Physics and Astronomy
University of Pennsylvania

James J. Bock
Jet Propulsion Laboratory

Edna DeVore
Director of Education and Outreach; Deputy CEO
SETI Institute

B. Scott Gaudi
Department of Astronomy
Ohio State University

Gabriela Gonzalez
Professor, Physics and Astronomy
Louisiana State University

Mary Elizabeth Kaiser
Principal Research Scientist
Department of Physics and Astronomy
The Johns Hopkins University

Vicky Kalogera
E.O. Haven Professor of Physics & Astronomy
Northwestern University

Chris Martin
California Institute of Technology

Gary Melnick
Senior Astronomer
Harvard University

John A. Nousek
Professor of Astronomy & Astrophysics
Pennsylvania State University

Terry Oswalt
Professor and Head,
Department of Physics and Space Sciences
Florida Institute of Technology

Paul S. Ray
Naval Research Laboratory

Steven Ritz
Santa Cruz Institute for Particle Physics
University of California

Karl Stapelfeldt
Goddard Space Flight Center

Appendix C
Presentations

1. *Astrophysics Division Update*, Paul Hertz
2. *ITIC Briefing to APS*, Larry Smarr
3. *Implementation of the Decadal Survey*, Paul Hertz

Appendix D
Agenda

Astrophysics Subcommittee meeting
November 6, 2012
Teleconference
AGENDA

Tuesday, November 6

12:00-12:15	Welcome and Introductions	P. Hertz/B. Peterson
12:15-1:15	Briefing on Proposed NAC Data Centers Study	L. Smarr
1:15-2:00	Astrophysics Division Update	P. Hertz
2:00-3:00	Strategic Implementation for the Astrophysics Division	P. Hertz
3:00-3:45	Discussion and Matters Arising	B. Peterson/APS members
3:50-4:00	Public Comment Period	
4:00	Adjourn Meeting	B. Peterson