

NASA ADVISORY COUNCIL

ASTROPHYSICS SUBCOMMITTEE

April 8, 2009

NASA Headquarters
Washington, D.C.

MEETING REPORT

Craig Hogan, Chair

Hashima Hasan, Executive Secretary

Table of Contents

Introduction and Announcements	3
Astrophysics Division Update	3
<i>Missions in formulation/development</i>	4
<i>APD issues</i>	5
WISE Extended Mission	6
WISE EM Forward Plan	7
Discussion with SMD AA	8
ExoPAG	9
Wrap-up and Discussion	10

Appendix A- Attendees

Appendix B- Membership roster

Appendix C- Presentations

Appendix D- Agenda

*Prepared by Joan M. Zimmermann
Harris Corp.*

Announcements

Dr. Eric Smith, Acting Executive Secretary of the Astrophysics Subcommittee (APS) reviewed logistics for the day, noting the meeting was being broadcast on WebEx. Dr. Craig Hogan, APS Chair, and members made introductions around the table.

APD Update

Dr. Jon Morse, Director of the Astrophysics Division (APD) of the Science Mission Directorate (SMD) provided an update on Division activities, noting that it would be necessarily constrained by the current budget embargo. Budget details would be forthcoming in the next few weeks, pending circumstances at the Office of Management and Budget (OMB), etc. Details on the James Webb Space Telescope (JWST) and offsets will be discussed at the next APS meeting. Dr. Morse expected to engage the Decadal Survey (DS) in discussion regarding the 2010 portfolio, as it appears in the budget request. The current portfolio has a large number of missions in varying stages: Kepler has gone into operations, Herschel-Planck is due for launch this month and Wide Field Infrared Survey Explorer (WISE) later this year, and SOFIA is preparing for its first open-door flight test. The NuStar mission is in formulation and approaching key decision point B. JWST is still scheduled for launch within 4-5 years. Within a few years the Astrophysics discipline will have the richest portfolio ever, with missions covering the whole spectrum of research subjects.

The year 2009 is also a very busy launch year for NASA in general; the Hubble servicing mission, SM-4, is on track for a May Space Shuttle launch. In addition, the suborbital campaign is continually in operation across the agency and with Principal Investigator teams. Dr. Morse reviewed some features of the FY09 budget, which he noted as being close to original President's budget request. Looking at the carryover posture, APD has had some projects with months to a year of carryover; the Division is currently engaged in a sweeping-up exercise and is also internally absorbing the \$50M cost of the Hubble launch slip, while ensuring that all projects are using their funds within the fiscal year. It has not been necessary to terminate any programs.

NASA is preparing to execute a Congressionally directed study on servicing opportunities for science missions, as well as for future space observatory-class missions, including a Space Interferometry Mission (SIM) or SIM-Lite concept. Dr. Hogan asked for clarification on the apparently lean Kepler budget. Dr. Morse explained the distribution of carryover of funds from FY08-09; all funds had been directed per the original budget request from February 2008. The launch vehicle was paid for in 2008, and one big cost for ATLO was also covered at that time. Dr. Morse deferred further discussion pending the budget release and approval of the 2010 Operating Plan. Currently, the full cost for Kepler has been kept within the APD; there is no Planetary Division budget for Kepler.

Missions in operation and development

Kepler was successfully launched on March 6, 2009 at the start of its first launch window. Dust cover ejection occurred on 7 April, followed by nominal completion of in-orbit checkout. Kepler is expected to begin routine science operations on 5 May. The craft is in an Earth-drift-away orbit, receding at 1 km/s, and is already well past 1-2M km from Earth. The photometer has been powered up, and the first image will be in Cygnus. About 170K target stars will be used to calibrate the instrumentation and to evaluate telemetry.

Suborbital mission CIBER (Cosmic Infrared Background Experiment) launched from White Sands on 25 February and appears to have obtained good data. The Balloon program finished another Antarctic campaign, with a Superpressure balloon setting a record of 54 days (carrying a Heliophysics Division

payload). Researchers felt the balloon could have stayed up “indefinitely.” As per regulation, the balloon was brought down in a controlled fashion, avoiding populated areas. The Division continues to work on mid-latitude and environmental issues. Currently the balloon trajectory depends on the natural winds of the South Pole vortex. Dr. Morse noted that the Superpressure balloon won NASA’s Mission Madness popularity contest, and that the National Research Council (NRC) has asked the Agency for a study on suborbital missions. The report should be completed by the end of the calendar year.

Hubble SM4 is preparing for a launch on 12 May. The Atlantis orbiter has been rolled out to the pad. A critical part of the mission payload, the spare science instrument (SI/C&DH-r), has been refurbished and is ready to be shipped. The current extravehicular activity (EVA) timeline is very packed, and it is fair to say that John Grunsfeld, Hubble’s “chief repairman,” is well-prepared and has made good use of the slip time. The mission stands a good chance of completing the entire manifest. EVA 1 will include installation of the Wide-Field Camera (WFC3) and the spare science instrument. Hubble’s Near Infrared Camera and Multi-Object Spectrometer (NICMOS) cryocooler is currently down; the mission is letting it rest and will try to bring it back after the completion of SM4.

The Wide Field Infrared Survey Explorer (WISE) payload has completed vibration testing and a cryostat solid hydrogen/cryogen life test, and remains on course for an early November launch. The JWST program is working on all subsystems, flight hardware, and science instruments, has successfully completed the ISIM (Integrated Science Instrument Module) Thermal Critical Design Review (CDR), as well as the overall ISIM CDR. The small-class mission (SMEX), NuStar, is scheduled for launch from the Kwajalein facility on a Pegasus XL vehicle on 6 August. NuStar will describe an almost equatorial orbit, the best environment for a hard x-ray mission. Asked about the launch success rates on Pegasus vehicles, Dr. Morse responded that Interstellar Boundary Explorer (IBEX) and Aeronomy of Ice in the Mesosphere (AIM) had been successfully launched on the Pegasus. The failed Orbiting Carbon Observatory (OCO) flew on a Taurus; the incident is under investigation. All told, Pegasus has performed very well. The Astro-H soft x-ray spectrometer has been selected as a Mission of Opportunity (MoO) for a Japanese mission, and is undergoing a design review. Keck outriggers have been transferred as per a prior agreement with CARA.

JWST mirror segments continue to undergo optical and cryogenic testing, with good progress. SOFIA is in the midst of practicing integrated system operations, and completed its ground-based on-sky observations with the HIPO instrument in December 2008. Airworthiness testing is almost complete, but more technical work must be accomplished before science is addressed.

Within operating missions, Hubble is yellow for the cryocooler issue. Any red areas will be addressed within the FY10 budget request.

Missions in formulation and implementation

Missions in formulation and implementation are largely green, with some yellows noted for JWST in its cost reserve posture. The Stratospheric Observatory for Infrared Astronomy (SOFIA) is yellow for its early science schedule issue, and the program has accelerated technical work to ensure good science operations. First light is expected to occur in Fall 2009. Initial inputs to the Decadal Survey (DS) have been made for various programs, including SIM. Dr. Morse noted that programs giving initial inputs to DS meet the 70% confidence level on costs. There is a lot of interest in mission concepts that follow JWST. The hope is that the DS can work with these upgraded cost estimates and concentrate on the science prioritization. The International X-Ray Observatory (IXO), Laser Interferometer Space Antenna (LISA) and Joint Dark Energy Mission (JDEM) did not have their independent cost estimates done by 1

April, but these will be sent along when they are ready. WISE is mostly green, with some yellows in cost and schedule reserve, but is doing better.

Dr. Morse noted that Astrophysics has received extensive press coverage of late, Kepler particularly. Exoplanets are attracting public attention, and Kepler is addressing an historic and philosophic question. The Fermi telescope has offered the best-ever view of the gamma-ray sky, and International Year of Astronomy (IYA) releases included a new image of M101 on Galileo's birthday, a composite of Chandra, Hubble and Spitzer images.

APD issues

Dr. Morse requested advice on standing up an Exoplanet Program Analysis Group (ExoPAG) and consideration of a WISE Extended Mission, as well as a suggestion on a date for including the Hubble Space Telescope in a Senior Review. The last Senior Review took place in Spring 2008 and included the Great Observatories (GOs) Spitzer and Chandra for the first time. There has been some concern about lumping in GOs with Explorer missions. The Subcommittee recalled having endorsed a Senior Review (SR) 3-5 years after the SM4 mission. Dr. Morse countered by noting that the community has been asking why Hubble has not been included in the 2010 SR, and asked that APS consider this possibility by its next meeting. Dr. Turner noted that the National Science Foundation (NSF) has endorsed the SR concept and has emulated it, and added that it had excluded Gemini for the reason that a great deal of money had already been invested, opting to let the mission play out and not subject it to funding cuts; he felt this to be a good philosophy. Dr. Morse noted that SRs typically include extended missions, and Hubble has been in operation for 20 years. He added that the original plan had been to include it for review in 2014/15, but the community outcry has been considerable. In addition, one cannot presume in advance that SM4 will be successful: is Hubble really going to be back in a prime science phase? Dr. Rob Kennicutt mentioned that he would support a Hubble 2010 SR. Having participated in a previous SR, he felt the discussion had suffered from the absence of Hubble numbers on the table.

Dr. Morse also requested that APD evaluate the newly realigned Einstein, Sagan, and Hubble fellowships, which have had record number of applicants and awards. Dr. Morse felt pleased with the outcome and hoped to increase funding to eventually support 90-100 named fellowships in a steady state. Asked if the stipend included research funds, Dr. Morse reported that salary and sundries are equal across the fellowships. He added that expenditures must be traceable to NASA's goals and missions, and looked to emphasize a better coupling of these issues next year; selections will need to reflect this traceability. Dr. Morse also supported the idea of a senior fellowship in each category for mid- or late-career researchers, and sought a recommendation, perhaps couching it as a prize. He acknowledged the larger issues about funding soft-money researchers, early faculty, etc. But because NASA funds by projects, the alternative is to fund a person to do research over a given period of time. Should this be tied to a named fellowship? Is there a need, who is eligible, how much should they get? Should there be an arbitrary funding number?

Another issue is instrumentation fellowships. Noting that the community supports this explicit instrument-building role, Dr. Morse cautioned that NASA would have to figure out how to redirect resources for the idea. Might such a program be linked to the Suborbital or Explorers program? Should it be done at field centers? Dr. Hogan asked if this issue was on the DS agenda, to which Dr. Huchra responded affirmatively. Dr. Morse considered whether study groups would be needed to look at this between now and the next APD meeting. Dr. Turner felt it that instrumentation was a key issue and could conceivably be tied to projects. Dr. Fred Lo commented that while working on a project, young post-docs can do things on their own; it might be wise to implement an instrumentation grant that young researchers can use to design their own programs. Dr. Morse emphasized the need for longevity, stability and the appropriate environment for instrumentation development; execution is the hard part. Dr. Chris McKee agreed with Dr. Turner, commenting that it made a lot of sense to provide a large number of small

projects to fund young researchers. Dr. Morse felt that coupling projects to the Suborbital program might be a good idea. Dr. Rhoads noted that once an active instrumentation program was placed within a project that already exists, flexibility would be necessary.

APD considered the technology program associated with the project as a locus for instrumentation. Dr. Hogan felt that this might be a way to have field centers manage recruitment. It was noted that there is already a NASA post-doc program at Goddard Space Flight Center (GSFC), about half its work devoted to instruments. Dr. Suntzeff felt that field centers were not good venues for astronomers and that it was important to have astronomy post-docs located at universities as well. Dr. Morse agreed and added that industry also has a great deal of interest in bright young instrument developers, and could offer some funds. Dr. Ronald Polidan, an industry representative and Subcommittee member, noted that Northrop Grumman is now looking to expand its suborbital program into a more general one.

Dr. Rhoads reiterated that soft-money astrophysics should be included in consideration of implementing a senior fellowship. Dr. Morse noted that he would look at the protocol necessary to think about this, and requested feedback from APS about the fellowship by the end of the calendar year. Dr. McKee also recommended, in light of fact that the number of faculty positions has been greatly reduced, to think in terms of how NASA can enhance the strength and continuity of the scientific workforce. Asked to define the goal of a senior fellowship, Dr. Morse replied that he wished to integrate, in a highly visible way, funding for the soft money community.

WISE Extended Mission Presentation/Discussion

Dr. Ned Wright presented particulars supporting an extension of WISE's baseline mission, known as WISE EM, which would extend an all-sky survey in four bands of thermal infrared at 3.3, 4.7, 12 and 23 microns. As the baseline orbit proceeds over six months, WISE can cover the entire sky; the extended mission proposes that WISE continue as much sky coverage as possible until its cryogen runs out. Arguments for extension of the mission include the fact that WISE is extremely sensitive compared to other infrared sky surveys and provides a good submillimeter survey of the whole sky.

WISE is currently seven months from launch. Launch vehicle interfaces have been finalized and there are no major technical issues. The spacecraft is in post-vibration optical testing at present and is due to ship to Vandenberg Air Force Base in August 2009. Recent data indicate a reduction in WISE's predicted lifetime from 13 months to 10 (based on a 7-month requirement for the entire mission); it may be possible to obtain a few extra days of data by removing the cover early. Advantages of having a second partial review of the sky include: costs are mainly associated with operations, with a substantial benefit to having 1.5 coverages of sky. These qualitative advantages include detection of motion, and detection and measurement of variability. Bright infrared objects that oscillate on 1.5 day timescale can be detected, including some asteroids. For longer timescale objects, WISE can provide data pertaining to the Yarkovsky effect in asteroids, Type II supernovae, active galactic nuclei (AGN) vs. starbursts, and long-period variable stars. Detection of motion could provide insight into the proper motion of brown dwarfs. Planets have been observed around brown dwarfs, thus WISE can point out fields for JWST to detect in the future. Calculations indicate that WISE will see 500 brown dwarfs (BDs) in its baseline mission, 800 in an extended mission, and up to 1000 red BDs in a 9-month survey. Given certain assumptions, it has been predicted that there are about 75 BDs within 6 parsecs (pc) of Earth. (If there is a Jupiter-sized planet within this distance, JWST will be able to see it). WISE will be also able to make 5-sigma measurements of proper motions within 6 parsecs. In terms of protostars and protoplanetary systems, variability is also a key discriminant for young stellar objects- the nearest protoplanetary disks can become candidates for follow-up with JWST.

GALEX has recently revealed that long-period variable stars such as Mira (Ceti) have long comet-like tail. In a 6-month period, WISE will be able to see many luminous objects such as these long-period stars.

Ultraluminous infrared galaxies are also strong candidates for protogalaxies; WISE will find the most extreme examples of these. Based on infrared variability, WISE should see approximately 500,000 quasars. WISE could also potentially see many Type II supernovae, due to infrared radiation in the hot dust clouds surrounding them; potentially 60,000 at a 10 kpc distance at 3.5 microns. For Solar System science, WISE could provide a good time base for asteroid motion detection and rotational light curves, as well as observation of comet trails: a 9- or 12-month survey would cover most trails. For asteroids with known orbits, WISE sensitivity will be slightly better than for fixed celestial objects, and thus WISE will be able to see many small asteroids. Thermal IR measurements will provide diameters needed for hazard assessment. Of 215,000 known asteroids, we have revisited only 5000. WISE can increase the revisit number to 55,000, in addition to assessing asymmetry measurements and refining orbital data. WISE would expect to see 120,000 new asteroids in a 9-month mission, and also increase detection of near-Earth objects.

In terms of the Yarkovsky effect, WISE XM could measure morning/evening ratios, giving a sense of rotation and the thermal inertia of asteroids, and an estimate of acceleration. An extended mission could measure the Yarkovsky force around 1000 of 3000 known Baptistina family objects, as well as provide a look at planets in the Oort Cloud. General advantages of two-fold coverage include better handling of latent images, improved reliability, extended opportunities to fill in coverage gaps, and improved signal-to-noise ratio. Benefits of a partial second coverage can also help in the understanding of latency and artifacts. In a 9-month period, Taurus and Ophiocrus are double-covered. WISE can also increase reliability of follow-up missions by identifying false positives and eliminating potentially wasted observing time for JWST, Keck, etc.

A Warm WISE mission is a possibility, although it has not been included in the EM proposal, for study of BDs. A warm mission would lose all the asteroids, however.

In summary, WISE will have a preliminary release of the first 50% of its data 6 months after the last data points are taken, with a final release 11 months later. Dr. McKee commented that there is a lot of community excitement about transient science, noting that an increase in sensitivity would help discovery. Dr. Suntzeff observed that if data cannot be turned around quickly enough for ground-based follow-up, short-scale supernovae cannot be observed. Dr. Wright observed that there is no plan for short-scale supernovae, but took the point, and added that the mission was a question of variability vs. reliability. Dr. Kasting commented that the strongest arguments for an extended mission lay in the observation of Solar System near-Earth objects and refinements in measurement of the Yarkovsky effect.

WISE EM Forward Plan

The cost of WISE EM has been estimated at an extra \$1.1M per month, plus a subjunctive Near-Earth Object mission set called NEOWISE, at \$0.3M per month (\$9M total). This represents a 3% extra cost to the mission. An APS member commented that the extension appeared to be a no-brainer. Dr. Morse noted that the review of the EM went well, but APD will have to find money to do it, which would come out of future mission funds; the question is whether the science opportunity is unique and compelling enough to merit commitment of resources, with the understanding that part of the Near-Earth Object (NEO) science would be funded by the Planetary Science Division (PSD). This would normally be assessed in the SR process, but there is no time to do this from a budget standpoint.

In general, APS felt the science case had been made, while noting that the extra cost exceeded that which is normally associated with extended missions. In addition, from an instrumentalist point of view, subcommittee members felt there was a benefit to covering the sky more than once- there are systematic effects that are not necessarily anticipated. A cautious approach would be to invest in this at least partial second coverage to increase statistical reliability. Dr. Suntzeff commented that some of the science case is

outstanding, but he was disappointed in the inability to access variability data, which makes the transient science impossible. Dr. Morse noted this shortfall, but hoped to execute the resource search across the entire portfolio of future missions. Regarding PSD's portion of the cost, Dr. Morse estimated it at about 25-30%, but he did not think the Planetary Science Subcommittee would be looking at it specifically. He added as an analogy, the EPOXI mission's use of the Deep Impact spacecraft and the subsequent broader scientific impact.

Discussion with Science Mission Director Associate Administrator

The subcommittee engaged in a discussion with Dr. Ed Weiler, Associate Administrator of the Science Mission Directorate (SMD). Dr. Hogan began the discussion by noting rising anxiety in the community about the status of JDEM. Dr. Weiler responded that while JDEM is a top priority, the mission will have to compete against other major missions, and is subject to the outcome of the Decadal Survey. Overall it must stand on its own science. He felt that JDEM would require a good collaboration, at the working level, with both Europe and the Department of Energy, with an appropriate and realistic role for all three. While not always a proponent of foreign collaboration, Dr. Weiler felt that the situation had improved, with increased parallel interests on both sides, and the renewal of an American relationship with Weiler and European Space Agency's (ESA), David Southwood. Dr. Weiler reported having a common goal with ESA on a Mars Sample Return (MSR) architecture. Both agencies have already done the small easy things, but it must be recognized that Flagship missions cost a minimum of \$1B. Dr. Morse has started talks with ESA for a good JDEM mission. The time has come to put nationalism aside in order to do ground-breaking science in view of economic realities. Dr. Morse added that in talking with ESA on dark energy, the Europeans are sensitive about a merged mission concept having a neutral identity (neither Euclid nor JDEM). DS is considering it as JDEM/IDEX (International Dark Energy Mission), the latter representing the international flavor of the concept.

Asked for his opinion on presidential support for science at NASA, Dr. Weiler reported that in terms of Education and Public Outreach (EPO), NASA is reinstating a 1-2% "tax" on every project to include EPO. The \$400M plus-up from Congress, however, all goes to Earth Science. He noted that from 1998 to 2004, Space Science doubled while Earth Science has suffered. In general, the new budget looks good for science. Asked about the balance of small, medium and large missions, Dr. Weiler responded that he recognized the need for balance and was awaiting outcome of the Decadal Survey; while more Explorers are necessary, so is Research and Analysis (R&A). Dr. Fischer inquired after Dr. Weiler's vision for exoplanet science. Dr. Weiler expressed support for Kepler's potential as a ground-breaking mission for exoplanets, which could in turn serve as a major impetus for larger follow-up missions, including spectroscopy of other atmospheres. Dr. Huchra asked what sort of advisory structure for science might be useful to NASA managers. Dr. Weiler remarked that he had found the Space Science Advisory Committee (SScAC) structure to be quite useful, in that the NASA Advisory Council (NAC) did not control it. While he felt that the overall structure is better today than it was 2 years ago, he still felt that SScAC was most useful as tactical advisors, as it left strategy to the Decadal Survey and the NRC. Dr. Turner felt the NAPA study would be useful to the new Administrator. Dr. Weiler commented that the way to make effective decisions is to form networks with OMB, Congress, and the Administrator.

Asked how SMD is looking at technology, R&A, and suborbital programs, Dr. Weiler replied that contrary to the prevailing belief that SMD is not spending on technology; it is in fact rampant in the R&A program, rockets and balloons, as well as in the Earth and Planetary Science Divisions. Higher Technology Readiness Level (TRL) items are in the projects. He recommended against the idea of stealing \$100M from every directorate to fund technology. R&A funding is actually about the same today as it was in 2004.

Dr. Lo asked how the Astronomy and Astrophysics Advisory Committee (AAAC) has been functioning in coordinating activities. Dr. Weiler felt AAAC's role as being somewhere between tactical and strategic, and useful for specialized questions. Dr. Morse added that AAAC played an interagency coordination role, and that APS might consider using AAAC to consider an umbrella approach. For example, the AAAC could help Astrophysics implement recommendations from the Decadal Survey. Dr. Hogan commented that APS would have to triangulate with other visions, such as the lunar and high-energy programs. Dr. Weiler cautioned that the vision for the Moon is not about science, but exploration, and SMD takes its direction from the National Academies of Science (NAS). It would be useful, however, to have a committee in between Decadal Surveys, and perhaps the AAAC could take that role. He added that he hoped to get two top priority missions from the Decadal Survey, and to run studies to help evaluate which is the best one.

Dr. Kasting asked re: exoplanets, whether there was a strategy in place for reassessing results from Kepler for future missions. Dr. Morse noted that this question would be part of the ExoPAG discussion, in effect working toward a structure for reassessing results through creation of a Roadmap. There will be tactical decisions to make year by year. Dark energy is another example.

Dr. Suntzeff commented on the APS consideration of a fellowship program and the inclusion of an additional category in instrumentation. Dr. Weiler recommended that the Subcommittee think about the suborbital program as a source of a post-doctoral program, specifically supporting individuals long-term, echoing some earlier APS discussion. Dr. Polidan reiterated his previous comments on the expansion of industrial fellowships. Dr. Kimberley Ennico asked if secondary payloads and ride-along opportunities would be more visible in future planning. Dr. Weiler cited the COTS program, specifically DragonLab stays in orbit 6 months to year), as a good opportunity. As soon as they become a reality, they will be incorporated into Announcements of Opportunities (AOs). Dr. Weiler also supported the progress of Falcon and Taurus II, and pledged to use them when available. NASA has been militating for access to space for a long time. There is leverage in the competition already, in the market forces.

Dr. Suntzeff asked if there had been active discussion of launching the Alpha Magnetic Spectrometer (AMS) on the Space Shuttle. Dr. Morse noted that AMS is part of a cooperative agreement between Space Operations Mission Directorate (SOMD), DOE, and the Space Shuttle Program (SSP), and is only tentatively on the manifest- it has been authorized but not appropriated. APD and SMD are not participating in it. Dr. Weiler added that AMS would cost \$500M to fly on a last Shuttle flight and may be included as part of the International Space Station Budget.

Dr. Huchra asked about the possibilities of any collaboration with China and India in space. Dr. Weiler felt they would be reasonable as long as they compete through the process; he was not supportive of directed programs. For flagships, he would have to question whether the Chinese or Indians were far enough along technically to participate. Dr. Morse added that the SPICA mission with Japan, was being evaluated by the Decadal Survey, and that China and India had been part of the Chandrayaan mission. South Korea could be considered as a potential partner as well.

ExoPAG Presentation

Dr. Douglas Hudgins presented a rationale supporting the creation of an Exoplanet Program Analysis Group (ExoPAG). ExoPAG is designed to be an open, community-based forum for soliciting and coordinating community input into the development and execution of NASA's Exoplanet Exploration Program. ExoPAG will carry out analyses, provide science and technology inputs to the APS, and provide unfettered communication amongst all interested parties. The structure and function of the ExoPAG is envisioned as having a chair appointed through APS, supported by an Executive Secretary and Executive

Committee, with meetings held semiannually. The ExoPAG would invite tasking from SMD, the NAC Science Committee, or APS, and would report results of meetings and analyses to the APS.

The ExoPAG will respond to the dynamic nature of exoplanet exploration, helping to plan and prioritize activities. In addition it would assess alternative mission/project portfolios, provide tactical advice to help NASA implement its program, and assess the near-term science priorities for a mid-class mission launching in the middle of the next decade. ExoPAG can help the NAC and NASA coordinate interagency and international opportunities and essentially rebuild the former Navigator program, while preparing for the Decadal Survey's identification of priorities. NASA needs community input to build a strategy to support missions articulated in the Decadal Survey. The earlier it is established, the earlier it can have an influence on the budget submission. Dr. Hudgins requested an official APS endorsement, in order to present it to the NAC Science Committee at its next meeting, 14-16 April, 2009.

Dr. Morse clarified that while ExoPAG will include NASA scientists and members of the community, it is not meant to function as an advisory group- it would be constructed as a panel that leads discussions on particular issues, restricted to analysis. Dr. Fischer commented that it seems this has been done before, and that the sense is that the exoplanet community is fragmented and contentious- the function of the ExoPAG sounds like a full-time job as a consequence. Dr. Hudgins felt that a useful parallel to ExoPAG would be the highly regarded Mars Exploration Program Analysis Group (MEPAG). Dr. Jack Burns interjected that while PSD has used the AGs primarily, the Earth Science Division is now standing up an AG as well. Dr. Morse added that APD would like to stand up other AGs for Origins and for Physics of the Cosmos, as a way to engage the broader community to help with strategic decisions, along with APS. He commented that some people actually think ExoPAG is narrow, adding that it would also fit conveniently within the existing FACA structure. The AG will simply analyze specific tasks and questions and report to the APS.

The Subcommittee discussed the pros and cons, with most concerns arising over the analytic rather than advisory nature of the group, its potential complexity and politicization, the demand on the community, and the group's independence. Dr. Morse responded to concern with assurances of neutrality and a focus on specific tasks, while pointing out the short-term need to analyze the new budget scenario and respond to the Decadal Survey with honest brokering at the working level. He added that the ExoPAG would be able to provide tactical and technical analyses as the evolution of the budget and mission planning takes place. Dr. Hudgins commented that the biggest complaint he hears is that the community is not getting through to the advisory structure, and agreed that the exoplanet community is polarized. If ExoPAG is stood up, it provides an ongoing process for input, not a one-time fight to the death such as that represented by a task force. Dr. Huchra agreed in principle with arguments for the ExoPAG, but expressed concern with being able to choose minimally conflicted individuals; for bigger questions like SIM/TPF, the NRC might be the better forum. Mr. Greg Williams felt that AGs in general can help the Subcommittee Chairs organize questions into an open community forum to address specific tasks.

Wrap-Up and Discussion

ExoPAG

The APS discussed the ramifications of standing up the ExoPAG. Dr. Fischer supported the ExoPAG in principle, with a caveat against lobbying, and suggested requesting a report 6 months or a year into the group's convening. Dr. Suntzeff expressed concern with its vagueness and called for a clear procedural idea of how ExoPAG reacts to tasks, as well as for tight control over its proceedings. Dr. Huchra noted that it would represent a lot more work for the APS. Dr. Kathryn Flanagan strongly endorsed the idea. Dr. Lo requested a clear statement of terms of reference before a vote. Dr. Hogan agreed that the APS would convey a conditional endorsement of the idea to the NAC Science Committee.

WISE EM

APS considered the mission extension and generally endorsed the science, deferring the systematic to a future revisiting of the subject. Dr. Rhoads recommended making the systematics a first priority. Dr. Townsley was concerned that the money could go to XMM. Dr. Morse pledged to bring a discussion of budget specifics and offsets in July, and assured the committee no money would be committed before a more detailed discussion could take place with APS. Dr. Ennico requested a clarification of the data product release by the next meeting. Dr. Hogan agreed to draft the recommendation.

Senior and instrument fellowships

With a request from Dr. Morse to attempt to feed input into the FY12 cycle, Drs. Lo, Suntzeff, Polidan, Rhoads, Huchra and Flanagan agreed to serve as a study group to consider the issues raised on the two sets of fellowships, with the intent of bringing new ideas to the next meeting. Issues to be covered included:

measurement of the investment, determination of the number of instrumentalists needed, fostering of work force growth, funding patterns that might nurture the next generation, involvement of a broader cross-section of people without extra cost, length of fellowships, management and implementation, and the creation of a fellowship panel with all possibilities on table. Dr. Hogan requested that the instrumental fellowship be considered with greater urgency than the senior fellowships aside but make progress for instrumentation. The next meeting was tentatively scheduled for 13-14 July, 2009, to be close to or coincident with the NAC “jamboree” at Ames Research Center. Dr. Morse expressed his gratitude to members rolling off the APS. Dr. Hogan adjourned the meeting at 2:55 PM.

Appendix A Attendees

Subcommittee members

Craig Hogan, Chair Astrophysics Subcommittee, University of Chicago
Jack Burns, University of Colorado
Kimberly Ennico, NASA Ames Research Center
Debra Fischer, San Francisco State University (remote)
Kathryn Flanagan, STScI
John Huchra, Harvard University
James Kasting, Pennsylvania State University
Robert Kennicutt, University of Cambridge (remote)
Andrew Lange, California Institute of Technology
Fred K.Y. Lo, National Radio Astronomy Observatory
James Manning, Astronomical Society of the Pacific
Christopher McKee, UC Berkeley (remote)
James Manning, Astronomical Society of the Pacific
Ronald Polidan, Northrop Grumman Space Technology
James Rhoads, Arizona State University
Nicholas Suntzeff, Texas A&M University
Leisa Townsley, Pennsylvania State University (remote)

Other Attendees

Jaya Bajpayee, NASA Headquarters
Jack Burns, Science Committee Chair, NASA Advisory Council (remote)
Randall Correll, Ball Aerospace
Michael Devirian, NASA/JPL
Lamont DiBiasi, DiBiasi Associates
Peter Eisenhart (remote)
Douglas Hudgins, NASA Headquarters
W. Vernon Jones, NASA Headquarters
Lia LaPrana, NASA Headquarters
David Leisawitz, NASA GSFC
Dan Lester (remote)
Jon Morse, Director, Astrophysics Division, NASA Science Mission Directorate
Marian Norris, NASA Headquarters
Anne-Marie Novo-Gradac, NASA Headquarters
Bill Oegerle, NASA GSFC
Michael Salamon, NASA Headquarters
Wilton Sanders, NASA Headquarters
Eric Smith, APS Acting Executive Secretary, NASA Headquarters
Steve Thompson, General Dynamics
Michael Turner, University of Chicago, NAC
Greg Williams, NASA Headquarters
Ned Wright, UCLA
Joan Zimmermann, Harris Corp.

Appendix B
NAC Astrophysics Subcommittee Membership

Craig Hogan, Chairman
Fermilab
University of Chicago

Hashima Hasan
NASA Headquarters
Science Mission Directorate
Astrophysics Division Exec. Secretary

Kimberly Ennico-Smith
NASA Ames Research Center

Debra Fischer
San Francisco State University

Kathryn Flanagan
Space Telescope Science Institute

John Huchra
Harvard-Smithsonian Center for Astrophysics
Harvard University

James F. Kasting
The Pennsylvania State University

Andrew Lange
California Institute of Technology
Division of Physics, Math & Astronomy

Robert Kennicut
University of Cambridge, U.K.

Fred K. Y. Lo
National Radio Astronomy Observatory

Christopher McKee
University of California, Berkeley

James G. Manning
Astronomical Society of the Pacific

Ronald S. Polidan

NAC Astrophysics Meeting Minutes, April 8, 2009

Northrop Grumman Space Technology, Civil Systems Division

James E. Rhoads
Arizona State University, School of Earth and Space Exploration

Nicholas B. Suntzeff
Texas A&M University

Leisa Townsley
Pennsylvania State University

Belinda J. Wilkes
Harvard-Smithsonian Center
for Astrophysics

Appendix C Presentations

1. *Astrophysics Division Update*, Jon Morse
2. *WISE EM Presentation*, Edward Wright
3. *ExoPAG Presentation*, Douglas Hudgins

Appendix D
Agenda

Astrophysics Subcommittee

April 8, 2009

NASA Headquarters

Room 8R40

Washington, D.C.

Wednesday 8 April

8:00 – 8:15 a.m.	Coffee and conversation	
8:15 - 8:30 a.m.	Introduction and Announcements	Craig Hogan
8:30 - 10:00 a.m.	Astrophysics Division Update	Jon Morse
10:00 -10:10 a.m.	Break	
10:10 - 11:10a.m.	WISE EM Presentation/Discussion	Edward Wright
11:10 -11:40 a.m.	WISE EM forward plan	Jon Morse
11:40 a.m.– 12:10 p.m.	Working lunch	All
12:10 – 12:30 p.m.	Discussion	Edward Weiler
12:30 – 1:10 p.m.	Discussion with SMD Associate Administrator	All
1:10 – 1:40 p.m.	ExoPAG Presentation	Doug Hudgins
1:40 – 2:15 p.m.	Discussion	All
2:15 – 2:45 p.m.	Wrap-up, Recommendations, Actions	Craig Hogan
2:45 – 3:15 p.m.	Brief to Morse	Craig Hogan
3:15 p.m.	Adjourn	

