



Department of Astronomy

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Dr. Wes Huntress, Chair
NASA Advisory Council Science Committee

Dear Wes,

The NASA Advisory Council's Astrophysics Subcommittee (APS) met at NASA Headquarters on 30–31 July 2012. In attendance for all or part of the meeting in person or through Webex were Louis Allamandola, Gary Bernstein, Jamie Bock, Edna DeVore, Scott Gaudi, Gabriela Gonzalez, Mary Elizabeth Kaiser, Chris Martin, Gary Melnick, John Nousek, Terry Oswalt, Paul Ray, Karl Stapelfeldt, Steven Ritz, Executive Secretary Rita Sambruna, and myself as Chair. In the course of the two-day meeting, we heard presentations from Paul Hertz (NASA Astrophysics Division), Geoff Yoder (*JWST*), Paul Schechter (*WFIRST*), Linda Sparke (NASA R&A), Fiona Harrison (*NuSTAR*) via Webex, Rob Petre (X-Ray CST), Robin (Tuck) Stebbins (Gravitational Wave CST), Michael Moore (NRO Telescopes), Wilt Sanders (Explorers), Doug Hudgins, on behalf of Scott Gaudi (ExoPAG), Chris Martin (CoPAG), and Steve Ritz (PhysPAG). In addition, we opened the meeting with our mandatory annual ethics training from Katie Spear of the Office of General Counsel. We are grateful for the time and effort put into these informative presentations by each of the speakers. We also note for the record that Scott Gaudi attended only the first half of the first day of the meeting as he was one of 96 recipients of a Presidential Early Career Award for Scientists and Engineers (PECASE) and the award ceremonies coincided with the time of the APS meeting. The Subcommittee warmly congratulates Scott on this recognition.

Findings

The APS Subcommittee is pleased to report the following findings:

- The *James Webb Space Telescope (JWST)* remains on track for a 2018 October launch, with 14 months of funded schedule reserve. Two of the flight instruments have now been delivered to NASA GSFC.
- The *Nuclear Spectroscopic Telescope Array (NuSTAR)* was successfully launched and deployed in June. Early data are extremely promising and regular science observations have now begun.
- In an unprecedented arrangement, the *Galaxy Evolution Explorer (GALEX)* is now being operated by Caltech. This is the first time that a NASA satellite has been operated entirely with private funds. When Caltech ends funding for *GALEX* operations, the spacecraft will revert to NASA control for decommissioning and re-entry.

- The *Wide-Field Infrared Space Telescope (WFIRST)* Science Definition Team has completed its study of two alternative Design Reference Missions (DRMs). The first of these (DRM1) is fully responsive to the requirements outlined by the *New Worlds, New Horizons (NWNH)* decadal report from the NRC and the second (DRM2) outlines a less-expensive mission that will accomplish much, but not all, of the DRM1 goals, but at a much reduced cost (medium-size mission as opposed to a flagship).
- We heard from the X-Ray CST they have studied various notional missions and have identified a number of key technologies that will require ~\$60M to bring to TRL6. Ultimately these technologies will enable missions that will be able to carry out much of the proposed science for *International X-Ray Observatory (IXO)*. The X-Ray CST identified moderate-size missions as well as a scaled-down flagship mission that could carry out much of the *IXO* science but at a lower cost.
- The Gravitation Wave CST has submitted its final report. They have investigated a number of alternative strategies for trying to meet all or some of the *Laser Interferometer Space Antenna (LISA)* goals for lower cost. They find no viable concepts for under \$1B and the lower cost missions incur considerable additional risk.
- The APS was also briefed on the two 2.4-m telescope assets that have been made available to NASA by the National Reconnaissance Office (NRO). The Science Committee has already advised NASA that the suitability of these telescopes for various applications within the broader Science Mission Directorate should be thoroughly investigated. **The APS concurs with this recommendation.**

Concerns and Recommendations

- The non-confirmation of the *Gravity and Extreme Magnetism (GEMS)* SMEX was disappointing as it represents a loss of potentially very valuable science. The APS recognizes, however, based on the reports to date, that this appears to have been a sound management decision. Since the APS meeting, the congressionally requested review has been released¹ and the APS will study this with great interest. There was concern among some members of the APS that this non-confirmation followed two Technical, Management, and Cost (TMC) reviews in spring 2008 (resulting in selection for Phase A) and spring 2009 (resulting in *GEMS* being downselected for flight. Since then, additional reviews have been conducted by the Standing Review Board (SRB), most recently for the instrument and mission PDR on 21-24 February, just prior to the reviews at GSFC (April) and NASA HQ (May) that led to non-confirmation. The question arose as to whether there might have been earlier red flags that the review process failed to notice. Paul Hertz pointed out that there was a “TMC Phase A Performance Study”² that addressed similar issues some 18 months ago and did make some recommendations to improve the process. We had some general discussion of these issues and it was noted that the previous APS Chair’s letter of 26 October 2011 (from Alan Boss) specifically noted in the wake of the *GEMS* non-confirmation that **“APS would like to have a presentation at its next face-to-face meeting on the question of possibly raising the maximum cost limit for Explorer missions.”** Although the previous request had to do with the availability of launch vehicles, **we repeat this request.** Also, though not strictly applicable to Explorers since they are cost-capped, the APS believes that heavier up-front investment is more likely to identify missions that are in trouble earlier. **The APS recommends that NASA look at shifting**

¹ http://www.nasa.gov/pdf/679698main_gems_ebook_public_final_508.pdf.

² See <http://soma.larc.nasa.gov>

more funding to earlier phases for the sake of obtaining higher-fidelity mission cost estimates as early in the process as possible.

- The APS had some concerns about US participation in the European-led Euclid mission. In the “Assessment of a Plan for U.S. Participation in Euclid” (The National Academy Press, 2012), it was recommended that “NASA should make a hardware contribution of approximately \$20 million to the Euclid mission to enable U.S. participation” but that “NASA should seek independent community review of any financial commitment for hardware expenditures beyond \$30 million for Euclid.” During negotiations between NASA and ESA, the latter requested that NASA make a much higher level of commitment to provide additional hardware components (\$50M). NASA further committed to supporting the NASA-selected science members of the Euclid Consortium. When questioned about community endorsement at this higher level, Paul Hertz explained that he had, subsequent to the Euclid report, received an endorsement for a higher level of participation in Euclid from the Committee on Astronomy and Astrophysics, and the specifics of the increased commitment make sense to us. **The APS is satisfied that this constitutes community consultation and understands the decisions that led to U.S. participation in Euclid at the higher level negotiated by the Astrophysics Division, although we would have preferred to have been consulted on the higher level of commitment before the fact.**
- The *Stratospheric Observatory for Infrared Astronomy (SOFIA)* observatory is progressing and the APS looks forward to it becoming a fully operational observatory during the FY12 or in early FY13. We noted, with some dismay expressed by some APS members, that the call for Second Generation Instruments resulted only in an upgrade of a first generation instrument *High-resolution Airborne Wideband Camera (HAWC)*, not a new instrument selection. While Paul Hertz explained the reasoning behind this decision, we stress the critical importance of developing new instruments that employ the latest technology available as soon as possible to fly on this long-awaited observatory. **We fully endorse the Astrophysics Division plan to solicit new instrumentation proposals for SOFIA in FY14.**
- Given that it appears that only one medium-to-large mission will be able to be started this decade (in ~2018 when the *JWST* funding begins to ramp down), the APS is deeply interested in the process by which the Astrophysics Division will choose that mission. We re-emphasize the need for the decadal survey implementation advisory committee (DSIAC), to whom CAA has delegated monitoring implementation of *NWNH* recommendations, to assess opportunities to address *NWNH* science opportunities in light of technical and fiscal changes since the decadal briefings in 2009. **The APS requests that the division director share his thinking on the process as it evolves.**

Further Recommendations

The APS also received reports from its three Program Analysis Groups, the Exoplanets Program Analysis Group (ExoPAG), the Physics of the Cosmos Program Analysis Group (PhysPAG), and Cosmic Origins Program Analysis Group (CoPAG). The APS considered the following requests from them:

- CoPAG asked the Subcommittee for general approval of the direction of their activities. **APS approves.**
- CoPAG asked for the APS to approve modifying the Probe Science Analysis Group (SAG) to consider the NRO telescopes. APS notes that the Science Committee has already made a recommendation to the NAC on study of the NRO telescopes. **The APS requests the**

opportunity to comment on how the study will be done once NASA begins to develop its plan for the study.

- CoPAG requested formation of a Cost SAG to facilitate establishment of best practices of mission cost estimation and cost containment. APS tabled the issue as this is a concern that spans the entire directorate, not just Cosmic Origins. **The APS wishes to follow-up this issue with the Astrophysics Division director at a future meeting and recommends that the director present a summary of NASA’s current “best practices” cost analysis process at the next (non-telecon) meeting.**
- PhysPAG proposed to establish a Cosmic-Ray Science Analysis Group (CRSAG). **APS approves.**

The Subcommittee sincerely thanks Rita Sambruna, Marian Norris, and Ana Wilson for their dedicated support of their activities. The APS wants to acknowledge and commend in particular the fine work done by our Executive Secretary, Rita Sambruna, as she begins a new temporary detail in the Office of Strategy Formulation. It has been a true pleasure working with her, and we wish her the very best for the future.

Sincerely yours, on behalf of the Astrophysics Subcommittee,



Bradley M. Peterson, Chair
NAC Astrophysics Subcommittee

Cc: Paul Hertz
Rita Sambruna