CARNEGIE INSTITUTION FOR SCIENCE

DEPARTMENT OF TERRESTRIAL MAGNETISM

5241 BROAD BRANCH ROAD, N.W.

WASHINGTON DC 20015-1305

Tel: 202/478-8858 http://www.dtm.ciw.edu/boss/ Fax: 202/478-8821
boss@dtm.ciw.edu

February 29, 2012

TO: Wes Huntress, Chair, NASA Advisory Council Science Committee
RE: Report from the Astrophysics Subcommittee (APS)
FROM: Alan Boss, Chair, APS

This letter report summarizes the APS meeting held on February 23-24, 2012 at NASA HQ in Washington, D.C. With three exceptions, all sixteen members of the APS participated in this meeting, either in person or through Webex and telephones.

The Subcommittee is grateful for presentations from Paul Hertz, Eric Smith, James Green, David Pierce, Linda Sparke, Andy Ptak, Tuck Stebbins, Jim Kasting, Chris Martin, Steve Ritz, Hashima Hasan, Stephanie Stockman, Tina Swindell, and for the chance to have a question and answer session with John Grunsfeld. We are also thankful for the ongoing NASA staff and contractor support, in particular the work by Rita Sambruna, Marian Norris, and Ana Wilson.

Division Update: Acting Director Paul Hertz presented the status of the Astrophysics Division (APD) and the President's FY13 Budget Request for Astrophysics. The implications of this Budget Request for FY13 and, notionally, for the out-years of FY14, FY15, FY16, and FY17, were the primary focus of this APS meeting. Most notably, the request includes the needed resources for the James Webb Space Telescope (JWST). JWST was the top priority of the 2001 Decadal Survey for astronomy and astrophysics. **The APS is grateful to both the Administration and Congress for their strong support of this flagship mission, particularly in this time of severe fiscal constraints.**

NASA sent the European Space Agency (ESA) a letter on February 13, 2012 stating NASA's intention to participate in one of ESA's first two Medium (M) class missions, the Euclid dark energy mission, through the contribution of near-IR detectors, with a cost to NASA in the range of $20M to $30M. A similar sum would be spent by NASA to support US members of the Euclid Science Team, for a total cost of about $50M over the next 15 years. **The APS fully endorses NASA's decision to join the ESA Euclid mission by providing detectors and supporting a US science team. This investment will provide US access to this important resource and allow the selected US science team to bring their resources to bear on improving the science output of the mission as a whole.**

ESA intends to select their first Large (L) class mission in April 2012, with the three contenders being Athena (X-rays), NGO (gravitational waves), and JUICE (Jupiter icy moons explorer). The first two missions are derivatives of the former IXO and LISA missions, respectively, which were planned to be joint NASA-ESA missions. ESA is also considering plans for a third M class mission. **As with Euclid, ESA's M and L class missions present important opportunities for renewed partnerships with ESA and should be exploited where possible. The APS encourages NASA to consider providing opportunities for competitive funding of US teams doing studies of potential US contributions to these subsequent ESA missions. One option for such support could be inclusion in upcoming Mission of Opportunity (MOO) announcements. Other options may be possible as well. The APS requests a discussion of such options in the next APS meeting.**

JWST is currently on cost and on schedule for a launch in October 2018, as a result of the strong support of the Agency, Administration, and Congress for this path-breaking large space telescope. Successful and timely completion of JWST within budget is a critical step to enable future APD flagship missions. While JWST's budget has been increased in FY13 and the out-years to support this launch date, the budget for the rest of APD is basically flat during this time period. This means that APD will be unable to develop any new large missions until after JWST launches. As result, the Explorer Program is facing a one-year delay for new missions, and mission-specific technology development (e.g., for the Wide-Field Infrared Survey Telescope, WFIRST) has been stopped. WFIRST and an augmentation of the Explorer Program budget are the highest priority recommendations for large-scale space activities in the Astro2010 Decadal Survey. While WFIRST is currently on hold, NASA is striving to meet the Astro2010 request for an augmentation for the Explorer Program in this decade. **Given the budget reality that no new large missions will be started until the JWST funding profile decreases around 2018, the Explorer Program will be the most important opportunity for new flight programs starting this decade. As a result, and as the launch vehicle situation changes, the APS encourages NASA to revisit the budget limits and launch capabilities provided for the various classes of Explorer missions. However, the possibility of raising the budget limits and launch capabilities for Explorer missions would come at a cost of reduced mission cadence and this trade-off must be a part of the study.**

Astro2010 calls for a mid-decade review to be held in 2014-15 and NASA will request this review by the National Research Council (NRC). In the past, such mid-decade reviews have not considered reevaluating the rankings of the specific mission recommendations, but such a re-prioritization could be specified in NASA's charge to the NRC. NASA intends to ask this mid-decade review how best to achieve the highest priority science goals in Astro2010, given that APD is expected to have only $800M available for new initiatives in this decade, compared to the $4B assumed by Astro2010. **The APS strongly supports the science priorities of the Astro2010 Decadal Survey and does not think it is appropriate to reevaluate them mid-decade. However, the available budget and international partnerships have changed so much since the Astro2010 survey that a reassessment of the tactics to carry out Astro2010 priorities**

seems warranted. The APS recommends that NASA charge the mid-decade review accordingly.

The APS is concerned that the current APD budgetary environment severely constrains the technology development needed for potential strategic missions for the next decade. Assessment of science and technology readiness was recommended for the New Worlds and Inflation Probe missions by a mid-decade review panel. Readiness of missions addressing LISA and IXO science are also likely to be reviewed by such a panel. Without proper support for technology development, none of these missions would be ready to provide the exciting science they promise.

NASA is considering making available a mission development cost modeling system that could be used by all future mission proposal planners, allowing mission costs to be calculated consistently. Such estimates are crucial components of the evaluation and selection of future mission proposals. **The APS fully supports this initiative, which should result in more easily comparable and reproducible mission cost estimates.**

Research & Analysis (R&A) Programs: Linda Sparke presented the status of APD's R&A programs, noting that no program element had a proposal success rate of greater than 25% in FY12, in spite of a 10% overall increase in funding. The $13.2M/year Astrophysics Theory Program (ATP) had a success rate of 17%, while the APD portion ($3.0M/year) of the Origins of Solar Systems Program (OSSP) had a success rate of 14%. The currently planned FY13 augmentations to both the Theory and Suborbital programs are only 10% or less of the Astro2010 recommendations. **Within the tight budget constraints, the APS recommends that APD allocate funds in the R&A programs in a way that responds to the Astro2010 call for augmentations to the Astrophysics Theory, Laboratory Astrophysics, and Suborbital programs. APD should balance proposal pressure across the R&A program, taking into account proposal pressure expressed in numbers of both submissions and resulting award rates.** The APS commends APD for creating in FY12 the Roman Technology Fellowship program, which has been strongly supported throughout its development and design, and for creating in FY13 the Theory and Computation Networks program recommended by Astro2010.

Program Analysis Groups (PAGs): Jim Kasting, Steve Ritz, and Chris Martin presented the status of the ExoPAG, PhysPAG, and COPAG groups, representing respectively the Exoplanet Exploration, Physics of the Cosmos, and Cosmic Origins themes of APD. The ExoPAG requested approval of five new Executive Committee (EC) members and a new chair. The PhysPAG requested approval of a new EC member and the creation of three new Study Analysis Groups (SAGs) on X-rays, gamma-rays, and gravitational waves, to replace the existing TechSAG. The COPAG requested approval of one new EC member, a new SAG to consider the science case for a set of probe-class missions, and of their plans for action in 2012. **The APS concurs with all of the proposed actions by the three PAGs.**

EPO for APD and SMD: Hashima Hasan and Stephanie Stockman presented the status of NASA's EPO program in the FY13 budget request. **In times when there is considerable support for STEM education, the APS regrets the 30% cut in the Education and Public Outreach (EPO) grants budget in SMD, which resulted in the cancellation of the EPOSS and ROSES Supplements grant opportunities for 2012.** We understand that this reduction was also applied to the Science Mission Directorate (SMD) and to NASA's Office of Education. SMD's EPOSS and ROSES supplements support formal and informal education projects that train teachers, engage young people, and communicate NASA's science to the public. NASA is uniquely qualified to communicate its exciting findings to the public and this important responsibility should not be left unfulfilled. **The APS urges that these competitive EPO programs (EPOSS and ROSES supplements) be re-instituted in future years at the FY11 level of funding.**

Response to Science Committee Chair's Request for Astro2010 Grading: The APS assessed the following specific recommendations of the Astro2010 Decadal Survey against the success of the APD plan for achieving these recommendations, based on the FY13 budget request, and assuming that the notional budgets in the out-years are actually achieved. In the listing below, an **N** means the recommendation will not be achieved in this decade, a **P** means the recommendation will be only partially achieved in this decade, a **Y** means the goal will likely be met, while **TBD** means "to be decided":

Status	***Large-scale Space Activities:***
N	Wide-Field Infrared Survey Telescope (WFIRST) with DOE
Y	Explorer Program Augmentation
N	Laser Interferometer Space Antenna (LISA) with ESA
N	International X-ray Observatory (IXO) with ESA
Status	***Medium-scale Space Activities:***
Y	New Worlds Technology Development Program (deferred in ROSES11)
N	Inflation Probe Technology Development Program
Status	***Small-scale Space Activities:***
N	Astrophysics Theory Program Augmentation (10% of requested increase)
Y	Definition of Future UV/Optical Space Capability
TBD	Intermediate Technology Development Augmentation (competitive selection)
P	Laboratory Astrophysics Program Augmentation (25% of requested increase)
TBD	JAXA-led SPICA Mission (future MOO announcement)
N	Suborbital Program Augmentation (4% to 7% of requested increase)
P	Theory and Computation Networks (with NSF, DOE; 30% of requested new start)

In summary, the APS feels that the APD has made a good effort to address the recommendations of the Astro2010 Decadal Survey, given the severe budgetary constraints. A more careful review is necessary to ascertain whether the proper balance has been achieved. We recommend more discussion on this topic at the next face-to-face APS meeting.

Best wishes,

Alan Boss, Chair, APS