THE OHIO STATE UNIVERSITY

College of Arts and Sciences

Department of Astronomy

4055 McPherson Laboratory
140 West 18th Avenue
Columbus, OH 43210-1173

614-292-1912 Phone
614-292-2928 Fax

gaudi@astronomy.osu.edu

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Dr. Bradley Peterson
Chair, NASA Advisory Council Science Committee
The Ohio State University

Dear Brad,

The NASA Advisory Council's Astrophysics Subcommittee (APS) met at NASA Headquarters on March 17 and 18, 2015. The following members of the APS were present: Natalie Batalha, Marshall (Mark) Bautz, James J. Bock, Alan Boss, Patricia Boyd, Joel Bregman (APS Vice Chair), Neil Cornish, Giovanni Fazio, Scott Gaudi (APS Chair), Jason Kalirai, Chryssa Kouveliotou, Kenneth Sembach, and Yun Wang. Fiona Harrison attended part of the meeting remotely. Rachel Somerville was unable to attend. Also in attendance were Paul Hertz (Director, NASA Astrophysics Division) and Hashima Hasan (APS Executive Secretary).

Dr. Hertz presented an update on the Astrophysics Division (ApD) activities. He summarized the ApD budget situation, science highlights, status of ongoing missions, and the development of future missions. Of particular note are: the anticipated selection of small Explorer (SMEX) missions and Missions of Opportunity (MoOs) this year, events that are being planned for the 25th anniversary of the Hubble Space Telescope, and the recent Memorandum of Understanding (MOU) signed by NASA and the National Science Foundation (NSF) to fund and support a new facility-class Doppler spectrometer on the WIYN telescope.

Dr. Hertz noted that the ApD continues to strive to implement the priorities of the 2010 Decadal Survey. The mid-decade review, whose charge is to evaluate the extent to which the ApD is successfully achieving this goal, is moving forward. This mid-decade review committee, has been requested by NASA from the National Research Council (NRC). NASA expects a report by May 2016. Dr. Hertz noted that he has no role in setting up the study committee.

The APS heard summaries and results from several ongoing programs and missions, as well as updates from several missions under study or in development.

- Dr. Vernon Jones (NASA HQ) summarized the current status of NASA's suborbital and balloon program.
- Dr. John Durning (NASA GSFC) updated the APS on the development of the James Webb Space Telescope (JWST), which remains on schedule and on budget, with 10 months of critical path slack. Of particular note is that almost all hardware has passed critical design review (CDR).
- Dr. Keith Gendreau (NASA GSFC) gave an overview of the Neutron star Interior Composition ExploreR (NICER), an Explorer mission currently under development, which is anticipated to be installed on the International Space Station in late 2016. He noted that the mission will likely come in under budget, and the instrument will operate for at least months once it is installed, with a possible extension subject to the Senior Review.
- Drs. Neil Gehrels (NASA GSFC), David Spergel (Princeton U), and Mark Melton (NASA GSFC) presented the final Science Definition Team (SDT) report on the Wide Field Infrared Survey Telescope (WIRST). WFIRST was the highest-ranked large space mission of the 2010 Decadal Survey, and is currently slated to be the next ApD large strategic mission after JWST. They noted that 2.4m astrophysics focused telescope asset (AFTA) and the coronagraph will enable a more exciting science program, and overlap with JWST will provide great opportunities for science return. They summarized the

development of WFIRST by noting significant progress in technology maturation and additional fidelity in the design reference mission (DRM); these achievements were largely enabled by recent significant infusion of appropriated funds.

- Dr. Charles Lawrence (JPL) gave an update on the (near-final) results from Planck mission, which is an ESA mission with significant NASA participation. The primary goal of the Planck mission is to measure the temperature anisotropies of the cosmic microwave background (CMB). He noted that the mission has been highly successful, enabling the most precise constraints on the content and structure of the Universe to date, and that this success would not have been possible without the collaboration between ESA and NASA, as well as a pioneering agreement between NASA and DOE on supercomputing, which was required to reduce the data. He noted that the final data release is expected in 2016.

The APS would like to thank all of the presenters for their excellent summaries of these missions and programs.

The APS also heard the final reports from the Science and Technology Definition Teams (STDTs) of two probe-class mission concepts, whose primary science goals are the direct imaging of exoplanets.

- Dr. Aki Roberge (NASA GSFC) presented the final report of the Exo-S study, which uses an external starshade to suppress the light from the host star, and thus enable imaging of nearby exoplanets. Two different mission concepts were presented: a "dedicated" mission in which the starshade and telescope would launch together in a 3-year mission, and a "rendezvous" mission, in which the starshade would launch to rendezvous with an existing telescope (presumably WFIRST). The STDT found that the dedicated mission would cost slightly over the $1 billion cost goal, while the rendezvous mission would be $600-650 million, including the launch, and about $5 to $10 million in WFIRST modifications. Aerospace Corporation's estimates were similar and noted no problems with the planned schedule.
- Dr. Michael McElwain (NASA GSFC) presented the report from the Exo-C study, which uses an internal coronagraph to suppress the light from the host star, enabling imaging of nearby exoplanets. He noted that the internal cost estimate came in at $950 million, just below the $1 billion cost goal, whereas the Aerospace Corporation's estimate was slightly over the $1 billion cost goal.

The APS would like to thank Drs. Roberge and McElwain for their presentations.

Dr. Priscilla Cushman (U Minnesota), Chair of the Astronomy and Astrophysics Advisory Committee (AAAC), provided an interim report on a study chartered by the AAAC to study proposal pressures. The primary goal of this study is to ascertain the cause of the general decline of proposal success rates for NASA, NSF, and other organizations seen in recent years. She presented evidence that several possible factors were likely *not* the cause of the decline in success rate, and noted that the primary cause(s) remained elusive, thus requiring further study. Therefore, the APS concluded that they did not have enough information to make any formal recommendations, and looks forward to a briefing on the final report from the AAAC study at a future meeting.

Dr. Eric Smith (NASA HQ), the JWST Program Director, discussed the exclusive use period for JWST General Observer (GO) programs. He explained that the Space Telescope Science Institute (STScI) director recommended that the GO exclusive use period be reduced from the current policy of 12 months to 6 months, based on advice from the JWST Space Telescope Advisory Committee (JSTAC). The goal of this change is to maximize the science. **The APS discussed the pros and cons of this change, and ultimately voted to endorse the change of the JWST GO exclusive use policy from 12 months to 6 months**, with all but one APS member in favor, and the remaining member opposed.

The APS also heard updates from all three Program Analysis Groups (PAGs).

- Dr. Scott Gaudi (Ohio State U) reported on the activities of the Exoplanet Program Analysis Group (ExoPAG) since the last APS meeting, including a summary of the ExoPAG 11 meeting in January in Seattle, the ongoing activities of the Study Analysis Groups (SAGs), the activities of the Science Interest Group #1, and the ExoPAG's ongoing efforts to respond to Dr Hertz's charge to comment on the proposed four large

mission concepts for study prior to the decadal survey. The APS received the final reports of two SAGs: SAG 8 "Requirements and Limits of Future Precision Radial Velocity Measurements" and SAG 10 "Characterizing the Atmospheres of Transiting Planets with JWST and Beyond." **The APS accepted the final reports from SAG8 and SAG 10** and commends the SAG members for their work.

- Dr. James Bock (Caltech) reported on the activities of the Physics of the Cosmos Program Analysis Group (PhysPAG). PhysPAG would like to shift the dark energy group into a Cosmic Structure SIG (COSSIG). This would formalize a group that has always been part of PhysPAG. COSSIG will collect the input of measures of cosmic structure based on various techniques to measure the physical parameters of the universe. **The APS voted to approve the proposed COSSIG**. Regarding Dr. Hertz's charge for possible large mission concepts to study in advance of the next DS, PhysPAG is collecting community input, and is formulating questions and issues for the report, which will be written over the summer. The PhysPAG SIGs have generated reactions and questions about the large missions. These include how the X-Ray surveyor relates to Athena; the GW L3 mission implementation; and the inflation probe, for which the SIGs need to know what will go forward even though this would be a probe rather than a flagship mission. The probe mission line is of strong interest to PhysPAG. It comes up in all discussions with some enthusiasm. Dr. Bock closed by noting upcoming PhysPAG events.
- Dr. Ken Sembach (STScI) presented a status of the Cosmic Origins Program Analysis Group (COPAG) activities since the last APS meeting. He reported the activities of the two current Science Analysis Groups (SAGs) and two current Science Interest Groups (SIGs). The COPAG has requested a new SIG on cosmic dawn science in order to identify science cases that provide programmatic focal points and build the long-term technology roadmap. **The APS voted to approve the proposed Cosmic Dawn SIG.** He also updated the COPAG's activities regarding Dr. Hertz's charge to identify flagship missions, indicating that COPAG has had biweekly telecons, has released a call for white papers, has had one virtual town hall outlining the charge, and will have another town hall.

The APS indicated that, at future meetings, they would like to hear a report on the progress of the mid-decadal review, an update on the activities of the Gravitational Observatory Advisory Team (GOATs), a presentation on potential JWST science, an update on ESA's Athena/L2 progress and studies, and a presentation on the final report of the AAAC study on proposal pressures and success rates.

Recommendations: The APS had only one specific recommendation as a result of this meeting:

- **The APS recommends the change of the proprietary time for JWST Guest Observer (GO) programs from 12 months to 6 months.**

Sincerely,

Scott Gaudi
APS Chair
The Ohio State University

Joel Bregman
APS Vice-Chair
University of Michigan