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TO: Ken Ford, Chair, NAC
cc: Chair, NASA science committee

FROM: Craig Hogan, Chair, ApS

RE: Report from the Astrophysics Subcommittee (ApS)

This note summarizes results from the ApS meeting of October 8-9, 2009.

The Subcommittee is grateful for presentations from Jon Morse, John Huchra, James Kasting, Michael Salamon, Eric Smith, Jean Swank, Kathryn Flanagan, Ed Weiler, Vernon Jones, Wilt Sanders, Stephanie Stockman, Denise Smith, Julie McEnry, Fiona Harrison, Mike Werner, and Ken Sembach. We are also grateful for support from NASA staff, especially Hashima Hasan.

We heard impressive reports from two promising missions now in development (GEMS and NuSTAR), as well as spectacular science updates from three operating missions: Spitzer, Hubble, and Fermi. We will not repeat their thrilling science results here, but it is worth noting that all three promise significant science in coming years as well: Spitzer is producing unique and superb capability even now in its warm phase; Hubble's new instruments provide game-changing improvements for some techniques, such as UV spectroscopy and near-infrared imaging; and the newest (and interagency) mission, Fermi, is more than fulfilling its scientific promise and is also doing an excellent job of making its results and data available to the widest possible science community. The Astrophysics Division will have many important breakthroughs to report this year and an extremely high science impact for many years to come.

Also, as in previous meetings we are impressed with the promise of new balloon technology to provide access to near space for large payloads. Increasingly long durations in the near future will provide a significant new opportunity for some kinds of astrophysics research. The science, technology and training impact of this program is particularly impressive given the modest investment.

The International Year of Astronomy has provided a special opportunity to experiment with new outreach ideas. The Division continues to place a high priority on education and outreach associated with all of its programs, an important element of aligning its activities with national educational and workforce needs. Division staff should be commended for playing a central role in implementing a

successful “star party” at the White House the night before our meeting, where the excitement of the astronomy was shared first hand with the First Family and many visiting schoolchildren.

J. Kasting presented a brief report and a near-term plan of activity for the new Exoplanets Analysis Group (ExoPAG), and a candidate list of members for its executive committee. The newly chartered group will serve as a means to provide our subcommittee with expertise and information from a larger community to address specific issues connected with formulating the Exoplanet program. The ApS will approve its tasks and serve as the main conduit for it to communicate with the agency and the NAC. The ApS endorsed the candidate participants and recommend nine for membership on the executive committee.

We also agreed to similar functions and terms of reference, and executive committees of the same or smaller size, for new analysis groups for the other two Astrophysics Division themes, Physics of the Cosmos (PhysPAG) and Cosmic Origins (CORPAG). We again expect an explicit statement that these groups will report to the NAC through this subcommittee. We request that the NAC approve the proposal to establish these groups. If approved, the chairs will be chosen from ApS.

The committee heard a report from a subgroup constituted at our last meeting, about ideas for creating a more vital career path for technology-oriented scientists. A new program to improve advanced technical experience and opportunities at the highest levels would not only propel advances in astrophysics, but would also address core national needs. After extensive discussion we agreed in principle that it would be a good idea to establish a new postdoctoral fellowship program, with a similar visibility and prestige to the Hubble fellowship program, but with some important differences such as: the institutional host would have to provide PI status and other commitments of basic research infrastructure; NASA would have to provide a substantial extra stipend for hardware; the fellowship term might be longer to accommodate a significant project; there might be a requirement for an industrial partnership, facilitated by pre-proposal workshops. The subgroup agreed to continue their work, with Chris Martin as the new Chair. They will report to ApS at our next meeting in January with a proposal specific enough for NASA staff to use in draft implementation documents.

We were asked to assist in drafting new strategic goals and key science questions for the Division. We offer the following as one example:

Astrophysics Division Science Goals:
•Discover how the universe works, determine how the universe began and evolved into its present form, and find life elsewhere.

Key Astrophysics Division Science Questions:
•How do matter, energy, space and time behave under the extraordinarily diverse conditions of the cosmos?

•How did the universe originate and evolve to produce the galaxies, stars, and planets we see today?

•What are the characteristics of planetary systems near other stars, and do they harbor life?
The subcommittee recognizes differences of taste over the precise choice of words, but agrees that the goals and questions must align with current programmatic themes of the Division, capture the scope of all Division activities, and differentiate sufficiently to be useful for setting policy. For example, the

scope of the physics goal ("how the universe works") is intended to include both fundamental laws of nature and the complex behavior of macroscopic astrophysical systems, and this intent is expanded in the corresponding question. We agreed that the Research Objectives could remain the same as before.

Respectfully,

Craig Hogan, Director
Fermilab Center for Particle Astrophysics