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Subject: Astrophysics Subcommittee Report

4 February 2008

Dear Dr. David,

This letter summarizes a few topics where the Astrophysics Subcommittee agreed on advice we wish to convey to the NASA Advisory Council.

First, we acknowledge and thank those who took the time and energy to prepare and make presentations to our Subcommittee: Jon Morse, Heidi Hammel, Zlatan Tsvetanov, Alan Stern, Charles Kennel, Wilt Sanders, Yvonne Pendleton, Hashima Hasan, and Eric Smith. We are more impressed than ever with the dedication and professionalism of NASA staff; their devotion, and the open and creative leadership style in the Astrophysics Division and the Science Mission Directorate, are a large part of what keeps us committed ourselves to this advisory effort.

General Remarks

Our Subcommittee heard from Jon Morse and Alan Stern about activities and plans of the Astrophysics Division and the Science Mission Directorate. Those plans include a significant number of innovative and creative ideas: a new thematic organization of astrophysics; streamlining of administrative processes and reduction of proposal and review overheads for scientists (including longer duration grants, and program consolidation); a Senior Review competitively evaluating operations of major missions, including Great Observatories; consolidation of prestigious postdoctoral fellowships to increase their profile and impact; possible introduction of a senior level fellowship program; and several initiatives to increase flight rate by advancing moderate cost missions, such as NuStar. Without addressing specific issues, in general we feel that these initiatives are moving in a positive direction and demonstrate creative and energetic leadership, sound management practice, sensible priorities, and a sophisticated and practical approach to advocacy for the programs as a whole. We have confidence that in negotiating the many difficult issues and pitfalls in implementing major changes in how these offices do business, there will be appropriate consultation with experts and stakeholders, ultimately leading to many significant improvements. We look forward to hearing more detail in our future meetings about plans for such important and challenging changes as the restructuring of the Division and the consolidation of fellowship programs. **The Subcommittee broadly endorses initiatives being taken by the Astrophysics Division and the Science Mission Directorate: they are headed in the right direction.**

Research and Analysis

We strongly support the Division's major recommitment to R&A activities. An increase in overall funding will increase the cost effectiveness of NASA's science missions, by extracting the science knowledge product from high value NASA data, and by leveraging the efforts of university-supported scientists. The technology development supported by R&A is essential for the development of both future missions and the trained scientific and technical workforce that will plan and carry out those missions. These activities also substantially reduce program risk by providing a well informed and quantitative basis for planning and designing programs optimally to produce high quality science results. We agree with many proposed reforms including adding funds to heavily oversubscribed, high quality programs such as Theoretical Astrophysics. These expenditures are extremely cost effective in terms of value added to missions even where they do not appear in specific mission budget lines.

Decadal Survey Process

We strongly support innovative plans for the upcoming NRC Decadal survey, as well as NASA's continued and principled commitment to adhere to Academy recommendations as the basis for all of its scientific program prioritization choices. The new survey promises to have more thorough and sophisticated budget planning than previous surveys and will be designed to provide NASA with better tools for planning and management, especially for budget discipline and alignment of science goals with fiscal realities.

The issue of priority setting process has come up recently in the context of two specific missions, SIM and AMS, whose priorities have been recently adjusted. We offer brief comments on these cases since they provide specific object lessons that may be useful in planning the next Decadal review. **We also support recent statements by the AAS advocating that the science community respect ongoing scientific review processes as the basis for making program decisions.**

SIM (Space Interferometry Mission) PlanetQuest

SIM has a long history in the astrophysics community. It first received an endorsement in the 1990 Decadal survey, almost twenty years ago. It has a legitimate stature as a significant project. In the context of the modern scientific landscape however, the scientific priority of SIM merits reassessment, especially since it is in a rapidly evolving area of science and a program that has experienced a significant reduction of resources. While the Decadal survey itself needs to decide which missions to consider, NASA should charge the Decadal process to include all missions and projects likely to make significant budget demands on the agency in the years ahead. **We support a comprehensive comparative review of science missions and projects in the next Decadal survey.**

AMS (Alpha Magnetic Spectrometer)

In the case of AMS, we are not aware of any NRC study where the science case for the mission has been reviewed and evaluated competitively with other astrophysics missions. It was not evaluated for scientific competitiveness in previous Decadal reports. It was also not addressed in other comprehensive Academy studies sponsored by multiple agencies assessing fundamental physics opportunities in space. In particular it is not recommended in the highly regarded report, "Connecting Quarks with the Cosmos: Eleven Science Questions for the New Century", that comprehensively surveyed experimental approaches to questions concerning the nature of cosmic matter and energy. The overall health of the astrophysics program is put at risk by any mission whose science value has not been transparently compared with other missions. We strongly endorse the plan to submit AMS to competitive scrutiny of its science value, not just launch readiness, safety or technical capability. We recognize that AMS is a special and difficult case because of its interagency and international nature. Nevertheless, a decision to fly AMS on an expendable launch vehicle would have a major negative impact on the Astrophysics Division's science portfolio; such a decision needs to take into account the science merit of AMS compared to the other priorities of the Division. **Again, we support the principle that the resources available to do astrophysics should be consistently applied to those projects assessed by rigorous science review process to be most worthy.**

Beyond Einstein

Our Subcommittee is greatly impressed with the quality of the recent Beyond Einstein Program Assessment Committee (BEPAC) review, "NASA's Beyond Einstein Program: An Architecture for Implementation". The clearly framed committee charge aligned with specific NASA and DOE policy guidance requirements, and the orientation to a realistic comprehensive assessment of science value, technical readiness and budget realism, successfully demonstrated some of the new methods being considered for the next Decadal survey. We agree with the assessment of the BEPAC co-chair, Charles Kennel, that the science goals of Beyond Einstein are so deep and important that this area of study is now established as a long term part of NASA Astrophysics. The BEPAC report returned clear recommendations of both immediate practical value and long term strategic value. The BEPAC report emphasizes the critical importance of a long term,

sustained program of technology development for all the Beyond Einstein missions. **Our Subcommittee urges that the findings and recommendations from the BEPAC report continue to guide NASA policy going forward to the next Decadal review.**

NASA Keck Telescope Time

The Subcommittee was asked for recommendations on a four-part proposal regarding the NASA share of Keck telescope time.

There was rapid and unanimous support for the first two parts of the proposal. We enthusiastically recommend that the Division renew the NASA-Keck cooperative agreement, and open the NASA Keck time to all of NASA science (astrophysics, exoplanet science, and planetary science). The Subcommittee sees great science benefit in support of NASA missions from continued access to this unique leading facility. Broadening the science scope will further increase the overall impact and value of the facility. NASA will need to broaden the scientific diversity of the NASA Keck TAC as well as its charge to accommodate the expanded science and to optimally utilize the unique capabilities of the Keck Observatory.

The third part of the proposal is to administer the solicitation, time allocation, and awards from NASA Headquarters. The Subcommittee urges caution since the current system works well and there are many pitfalls in making changes. Any new system needs to attend to the need for rapid turn-around on the proposals, the currently-established communication lines with Keck schedulers, and the extra burden on NASA staff. **We stand ready to provide advice about a more detailed proposed plan in the future.**

The final part of the proposal is to enter into an agreement with NSF/NOAO to make a fraction of NASA's Keck time available within the ground-based System beginning in semester 2009A. The initial proposal is to allocate 50% of NASA's Keck time to the NOAO TAC process, with traceability in the proposal process to NASA science goals. The Subcommittee cautions that in practice, contributing NASA Keck time to the ground-based optical System dilutes the resources that can be directed by NASA. Although the addition of this resource to the publicly accessible pool of telescope resources would likely benefit US astronomy broadly, the time would not be optimally used for purposes that are best aligned with NASA's science goals or needs. **We recommend that the Division retain control of the NASA allocation of Keck time.**

Education and Public Outreach

The Subcommittee commends the SMD Associate Administrator for establishing a clear management structure within the directorate. One important aspect of this is the work that the new Senior Advisor for R&A is doing to assess the effectiveness of the SMD EPO programs. While we recognize that the newly established MOWG will provide detailed input for these assessments, the Subcommittee offers some comments.

A recent National Academy report, "NASA's Elementary and Secondary Education Program: Review and Critique," notes that roughly half of all NASA K-12 STEM education is conducted through SMD. SMD should be congratulated on its commitment to priming the NASA workforce pipeline. **We encourage SMD EPO leads to follow the overall recommendations in this document and to work to achieve stability in the management and funding of SMD EPO, including the development and implementation of an evaluation plan for assessing the impact of EPO programs.** The assessment should evaluate separately the success of the "Education" and "Public Outreach" components of the program, with appropriate metrics for each.

A vibrant community of EPO professionals with experience in NASA content now exists to support both mission and non-mission related EPO. NASA has provided critical funding to build up this infrastructure. Rather than rebuild equivalent EPO skill sets from scratch, **we recommend that any new approach for providing non-mission-related EPO funds to PIs or new approaches to mission-related EPO build on this existing quality EPO infrastructure.**

Concluding Remarks

Finally, as always, we are grateful for this opportunity to advise NASA about its astrophysics program, which is unique in the world. This letter has not touched on host of issues where we observe and anticipate exciting progress, including upcoming launches this year of missions with great science promise, from GLAST, Planck Surveyor, and Herschel, to the final servicing of the Hubble Space Telescope. We applaud the agency for these and many other extraordinary science achievements too numerous to mention.

On behalf of the Astrophysics Subcommittee,

Yours Sincerely,

Craig Hogan

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