October 27, 2003

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RE: Joint NSF-NASA Response to the 23 April 2003 Report of the AAAC

Dear Dr. Gehrz:

Thank you for communicating the recommendations and observations that resulted from the 8-9 April, 2003 meeting of the Astronomy and Astrophysics Advisory Committee (AAAC). The National Science Foundation (NSF) and the National Aeronautics and Space Administration (NASA) appreciate your efforts and provide to you and the AAAC this joint response and update.

The Committee stressed that the diverse approach to astronomical research offered by NASA and NSF is an essential part of the success achieved in our field over the last several decades, and that it remains the key to our future success. We certainly agree.

You then urged that NSF and NASA begin to cooperate through coordinated tactical planning, research and analysis, and technology development on four exciting ventures that respond to the scientific objectives of the current long-range plan of the astronomical community as stated in the NRC reports "Astronomy and Astrophysics in the New Millennium" and "Connecting Quarks with the Cosmos". Before we address your specific recommendations, we would like to bring to the Committee's attention that we will soon have a government response, including NSF-NASA-DOE input, to "Connecting Quarks with the Cosmos" that we will share with the committee.

Specific recommendations:

1. Understanding the formation and chemical evolution of galaxies within 1 billion years of the Big Bang, and the formation of stars and planets are two of the most ambitious scientific goals of our time, requiring the space-based James Webb Space Telescope (JWST) and a Giant Segmented Mirror Telescope (GMST) on the ground. Progress on these scientific objectives is heavily dependent on GSMT being developed on the same timescale as JWST, requiring an aggressive technology development program being initiated in the FY2005 budget.

While we cannot comment on the content of the FY 2005 budget request, we ask the committee to note that FY2004 saw the start of NSF funding for the Adaptive Optics Roadmap through the Adaptive Optics Development Program administered for NSF by the National Optical Astronomy Observatory (NOAO). Under this program approximately $3M annually is available to address the highest priority facet of technology necessary for the GSMT. A panel convened by NOAO on 27-29 October reviewed the first round of proposals, and the first round of awards should be made by the end of calendar year 2003.

2. Determining the nature of the dark energy and dark matter in the Universe will require a ground-based Large Synoptic Survey Telescope (LSST), as well as an orbiting observatory, to perform wide-area supernova survey and cosmic gravitational lensing surveys. This exciting and fundamental, but challenging, goal needs the broad capabilities of both LSST and the space mission operating on comparable timescales. LSST has also been identified in the 2002 NRC report "New Frontiers in the Solar System: An Integrated Exploration Strategy" as a key facility, not only for solar system science, but also for detecting solar system objects down to 300-m that are potentially hazardous to the Earth's biosphere. Given the broad interest in this program the NAAAC recommends a coordinated implementation effort between NSF and NASA (and other interested agencies).

As part of the effort recommended in the joint response to "Connecting Quarks with the Cosmos," the agencies are actively discussing how best to apply the strengths of our diverse approaches to astronomical research to the realization of LSST. NSF has started the technology effort for LSST with a three-year, $1.3M award for the development of detector arrays. We expect a proposal for the balance of the design and development before the end of 2003. NASA will contribute its expertise as appropriate.

3. Probing the temporal and structural development of solar magnetic fields and activity will require contemporaneous observations from the space-based Solar Dynamics Observatory (SDO) and the ground-based Advanced Technology Solar Telescope (ATST). The contemporaneous observations will only be realized if ATST can be put on a fast development track starting immediately.

NSF funds ATST design and development at the $10M level. However, early procurement of the primary mirror blank would constitute construction. The NSF will not allow design and development funds to be used for construction of a project that will be considered for Major Research Equipment and Facility Construction funding since such an action would be construed as beginning construction before approval. Given the lead time for procuring a new blank, this decision will push first light with ATST into early calendar year 2012, near the projected end of the SDO mission.

4. Investigations of the polarization of the Cosmic Background Radiation (CMBR) with the objective of detecting the signature of inflation should be undertaken using a combination of facilities such as the Wilkinson Microwave Anisotropy Probe (WMAP) satellite, ground-based microwave telescopes operating from appropriate sites such as the South Pole Research Station, and Long Duration Balloon Flight payloads. We believe that this venture will benefit greatly from interagency collaborations because they are strongly motivated by mutual scientific and programmatic interests, and also by complementary technology capabilities. They are especially ripe for development now, and an effort should be made to identify elements of these programs that could be included in the NSF and NASA FY 2005 budget requests to expedite their early progress.

Again we cannot comment on details of the FY 2005 budget preparation. However, NASA has recently solicited proposals for conceptual studies leading to the "Inflation Probe" or

CMBPOL. NSF is leading an interagency working group (NSF, NASA, DOE) that will use the results of these studies along with other advice from the community to produce a roadmap for technology development, ground-based observations and balloon observations ultimately leading to space-based measurements of the polarization of the CMB.

The Committee believes that the successful pursuit of the activities described above will depend upon the existence of a strong technical infrastructure that includes support for instrumentation development, computing, laboratory measurements, research and analysis (R&A) support, and the availability of large databases through the National Virtual Observatory (NVO). We describe this requirement in more detail in Appendix D. The order of these recommendations does not imply their relative priority. We recognize that the joint efforts that we suggest must be reconciled with on-going programs at the two agencies and near-term existing priorities, all of which are subject to the appropriate peer review process. Nevertheless, we strongly encourage NSF and NASA to explore the implementation of our recommendations as soon as practicable.

We agree that the activities enumerated in Appendix D are important areas that require attention. We mentioned earlier the activity in technology development for the LSST.

With regard to the need to establish archiving systems for the ground-based data, the National Radio Astronomy Observatory (NRAO) and NOAO are both active in establishing robust archive capabilities for their large survey data. NOAO has made the activities of the newly established Data Products Division a high priority in their programming. NOAO and AURA have re-affirmed their data rights policies and will begin archiving all raw data and data products from their facilities. In addition, NOAO is in discussion with other ground-based observatories regarding the archiving of data products from non-NOAO facilities.

At NRAO, a unified science archive for all of its instruments is now almost complete and will be released in the first quarter of 2004. NRAO's data archive will include on-line access to all data ever observed by the VLA, the last few years' data from the VLBA, and all data from the GBT (except high-rate data such as pulsar observations) since 2003. Enhancements to the NRAO archive, including access to high-rate data, are being planned.

Finally, we note that the NSF AST FY2004 budget submission included a request for funds for mid-scale instrumentation needs and highlighted the need for research and development leading to the high priority recommendations from the Decadal Survey.

Sincerely,

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