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Dr. G. Wayne van Citters  
Division of Astronomical Sciences  
National Science Foundation  
4201 Wilson Blvd.  
Arlington, VA 22230

Dear Wayne:

Now that we at Cornell and NAIC have had time to digest the Senior Review (SR) report, we have initiated a public dialog of its implications with our staff and users. We have also begun to move NAIC forward, as we have previously discussed with you, by refocusing the astronomy program in accord with the SR recommendations.

In all candor, however, we—on behalf of the NAIC community—must convey to you our dismay that a pivotal point regarding NAIC in the Senior Review report is factually incorrect. This error, unfortunately, motivates one of the three major SR recommendations for NAIC. We hope to talk with you very soon about how the error can be corrected and the recommendation revised. In addition, several other points made in the SR report are not, in our opinion, addressed adequately or with clarity. Specifically:

1. The report states (6.2.1, p. 62) that "much of the survey work will be completed by 2010". That statement is incorrect. When asked by the Senior Review panel, "When will the surveys be half done?" we responded that the current surveys would be \*half\* done in five years. Furthermore, this time would of course be extended if the telescope operates for fewer hours each year as a result of staff reductions. We also noted that three additional approved survey programs were still awaiting the scheduled delivery of survey-specific signal processors, spectrometers, and that these new surveys would start upon delivery of the new spectrometers (January 2007). They too would require 5-years to be half completed, or 10 years to be completed. Further, all the surveys make discoveries that demand follow-up. The most interesting discoveries are faint sources and/or time-variable/periodic phenomena: both require Arecibo's collecting area to deliver their ultimate science outcomes. Unfortunately, the SR report appears to have based its recommendation regarding the close out date for the Arecibo Observatory on the erroneous premise that the ALFA surveys would somehow come to conclusion in 2010. We encourage you to investigate the logic that led to this recommendation and take the appropriate steps to revise it. We would be glad to help.

2. The statement (6.2.1, pp. 62-63) "Roughly 20 percent of the observing time should be set aside for individual (non-survey) proposals in order to retain some discovery potential" suggests that the SR misunderstood the nature of the ALFA surveys, whose main purpose is discovery. Just as the SDSS, from among the hundreds of thousands of objects in that survey, has pointed the way to a very few, ~17, QSOs at redshifts greater than 6 that are guiding our understanding of the EoR, the PALFA survey, for example, seeks to find especially exotic objects among the 1000+ pulsars it will discover.

Surveys point the way to discoveries. The same cannot be said for individual non-survey proposals that are usually concerned with investigating the astrophysics of specific objects that, however interesting, provides a much reduced chance of “discovery” in the sense implied by the SR report.

3. Perhaps because of the composition of the SR panel, its description of Arecibo (4.4.1) remarkably neglects to mention adequately the unique capabilities of Arecibo for radar studies of the Solar System. The report itself notes only the discoveries of several decades ago, ignoring the long list of recent achievements given in the NAIC report to the SR. We find this particularly galling considering the recent publicity surrounding the discoveries at Arecibo about the Moon reported in the Oct. 19<sup>th</sup> issue of *Nature* and the recent studies of Mars, Jupiter and its satellites, Saturn's rings and satellites and both main-belt and near-Earth asteroids (see, e.g., the cover articles in next week's *Science*). NSF astronomy is receiving wide praise as a consequence of publications such as these for its support of the unique Arecibo planetary radar.

Regrettably, the failure of the SR to appreciate the critical role of the Arecibo planetary radar may lead to its demise. The SR report (6.2.1, p. 62) states "The SR was advised that a minimum feasible operating cost for Arecibo is \$8M, even when it is largely working in survey mode." The \$8M budgetary number does not include any support for the planetary radar program: the \$8M operating budget applies, as the report notes, when the Observatory is doing astronomical surveys. The operating cost of the Arecibo planetary radar is \$1M per year, a figure NAIC supplied to the SR. Therefore, the SR recommendation that the funding for NAIC be decreased to \$8M, together with the recommendation that the NAIC astronomy program focus on survey programs, is a recommendation to terminate the Arecibo planetary radar program. The community should have been told this explicitly in the SR report if indeed that was the conclusion of the SR panel.

4. We believe that others will be as mystified as ourselves with the statement (6.2.1, p. 63) that "This [additional] support might be coupled to Arecibo's status as one of the most important and visible high technology enterprises in the Commonwealth of Puerto Rico." How might this lead to additional funding?

5. The report makes no mention of the important part that Arecibo plays in the NSF's goal to diversify our nation's technical work force. With 85% of its 140 employees and 90% of its 120,000 visitors of Hispanic heritage, the Arecibo Observatory is an inspiration to the largest minority community in the U.S. How can the report have ignored the unique contributions the Arecibo Observatory makes to further the NSF goal of diversifying the U.S. scientific and technical workforce?

6. The report mentions (4.4.1, p. 42) the incremental funding provided by NSF-ATM for research in the atmospheric sciences at the Arecibo Observatory. It does not, however, recognize that AST funding supports the Observatory operations infrastructure necessary for Arecibo's Space and Atmospheric Sciences (SAS) program. What is the NSF plan to reconcile NAIC implementation of the Senior Review recommendations with the NAIC responsibilities to the ATM program as set forth in the current Cooperative Support Agreement with ATM, and with the shared funding of Arecibo Observatory operations?

7. In several places the report recognizes the importance of training the next generation (Principle #2, p. 4) and notes (4.4.1, p. 42) "Twenty four percent of Arecibo users are graduate students." We believe that Arecibo, particularly, offers the 60 students who use the Observatory each year for their research endeavors—graduate and undergraduate scholars alike—extraordinary

opportunities to enhance their research and technical skills in unique ways. At Arecibo, owing to its size and hands-on emphasis, students participate fully not only in observing but also in areas like instrument design and fabrication, planning for survey observations, software development, database management and signal processing. We believe that Arecibo offers a richer technical experience to students than do other national facilities where direct involvement in operations, the signal path and raw data processing, are all treated like a "black box". Graduate students are explicitly mentioned in sections of the SR report associated with other facilities, but the impact of changes in AST funding of Arecibo on graduate and undergraduate student education in the U.S. is not discussed. We are concerned by this puzzling omission.

We would appreciate the chance to discuss these issues with you in order to assure ourselves, and you, that the AST implementation planning for the Senior Review recommendations recognizes the points noted above.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'J. Burns', with a long horizontal flourish extending to the left.

Joseph A. Burns  
Vice Provost for Physical Sciences and Engineering

cc: R. Behnke, NSF  
R. Blanford, Stanford University  
T. Chan, NSF