

**Arecibo Planetary Radar:
Consequences of the NSF Astronomy Senior Review Recommendations**

NAIC Statement

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The Arecibo planetary radar is a unique facility whose achievements are well-known to planetary scientists and the public. There is only one other active planetary radar in the world, the NASA Goldstone Deep Space Tracking Station, which provides a complementary capability to Arecibo. The Goldstone antenna is fully steerable, but it is only 4 percent as sensitive as the Arecibo planetary radar; hence it can only observe objects that are much larger than those that are routine targets for Arecibo.

The NSF Astronomy Senior Review report includes only a single, brief, reference to the Arecibo planetary radar. Perhaps because of the composition of the Senior Review (SR) panel, its description of the Arecibo planetary radar remarkably neglects to mention adequately the unique current capabilities of Arecibo for radar studies of the Solar System. The report itself mentions only the discoveries of several decades ago, ignoring the long list of recent achievements given, for example, in the NAIC report to the SR. We find this particularly unfortunate considering the recent publicity surrounding the discoveries at Arecibo about the lack of water-ice on the Moon reported in the Oct. 19th issue of *Nature* and the extraordinary dynamics of the Near Earth Asteroid (NEA) 1999 KW4, which is the cover article in the November 24, 2006 edition of *Science*. In addition there are recent studies of Mercury, Mars, Jupiter and its satellites, Saturn's rings and satellites and both main-belt and near-Earth asteroids. NSF astronomy is receiving wide praise for its support of the unique Arecibo planetary radar as a consequence of publications such as these.

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 SR 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 intended conclusion of the SR panel. Cornell/NAIC has expressed its concern about the lack of clarity, and candor, in the SR report regarding the Arecibo planetary radar program.

Cornell/NAIC fully supports the goals of the Senior Review and shares in the view that science is a forward-looking enterprise; the construction of new research facilities is essential to future progress. One of the telescopes NSF Astronomy is seeking to build from funds reprogrammed from NAIC and the other national centers is the ~\$200M Large Synoptic Survey Telescope (LSST), a telescope with two main scientific objectives: (1) to compile a complete sample of distant galaxies as a probe of dark energy, and (2) to compile a complete sample of NEOs with special emphasis on Earth-crossing objects. It is NAIC's position that the Arecibo planetary radar is a necessary adjunct to the LSST NEO mission requirement owing to its unrivaled capability to characterize the physical properties of NEOs and to determine their orbital parameters with sufficient precision that the few Earth-threatening objects can be reliably identified from among the enormous sample of NEOs LSST will discover and catalog.

It is the position of Cornell/NAIC that the Senior Review failed to understand the role of the Arecibo Planetary Radar and, in particular, it failed to appreciate that the two primary SR recommendations for NAIC had the effect of terminating this critical program. This error can be rectified by revising the SR recommendation for NAIC from "the SR recommends a decrease in AST support for Arecibo to \$8M ...", to "the SR recommends a decrease in AST support for Arecibo to \$9M..." The additional \$1M per year in NAIC operations funding preserves the operation of the Arecibo planetary radar without violating the apparent SR objective of diminishing NAIC funding overall. The \$1M per year in incremental operations funding is one-half of one-percent of the current AST annual budget. NAIC believes this change should be a key element in the AST implementation plan for the Senior Review recommendations. We have communicated precisely this suggestion to Wayne van Citters, the AST division director.

NAIC will continue operating the Arecibo Planetary Radar until the end of FY2007. Operation beyond this date depends on the availability of funds.

Wayne is requesting community input to help in developing the AST implementation plan for the Senior Review recommendations. Comments can be emailed to astsenior-review@nsf.gov. See http://www.nsf.gov/mps/ast/ast_senior_review.jsp or mailed to Wayne:

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