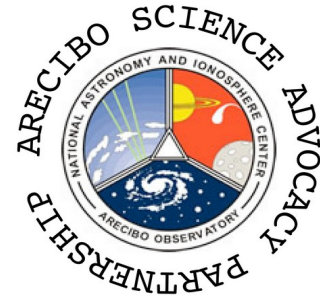


The Arecibo Science Advocacy Partnership



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February 6, 2023

Subject: Arecibo Science Advocacy Partnership Response
to the NSF Reply to Representative Jenniffer González-
Colón's Letter

Dear Representative González-Colón:

Thank you again for your invaluable support in challenging NSF's decision to halt the science mission of the Arecibo Observatory and retain only its STEM education activities. While their response does touch on some of the areas you and others questioned, it leaves other major points unaddressed. It is unimaginable that a "seamless transition" could be accomplished in only eight months for a world class facility with 78 buildings and a staff of approximately 100 people, millions of dollars worth of instrumentation, and in a tropical climate that is harsh on sensitive scientific equipment.

Nowhere does NSF address the specifics of how they arrived at their decision and on what basis. As far as we can discover, no public report has been issued from the NSF Arecibo Observatory Options Workshop held in June 2021. This time-consuming endeavor, to which many scientists devoted many hours, appears to have been window dressing.

Every week, the Observatory is losing staff who have highly specialized skills in the physical aspects and engineering requirements of maintaining the facilities and instrumentation, as well as in the required software, and in maintaining archived data from over 1,000 users throughout the U.S. By the time NSF completes the contracting process for "maintenance," these crucial staff members will no longer be available. Nor does "maintenance" mean the same thing for a specialized scientific facility as it does for a normal building, for example.

The NSF plan will destroy the science mission and staff of the Observatory, scuttle its precious equipment and human capital, and will then invite proposals at a point when the resources are no longer there to support the work: the computers, the specialized software, the staff, and the ongoing research which was the pride of U.S. radar and radio astronomy and atmospheric science.

The radio quiet zone surrounding Arecibo Observatory is a key element in the research done with the sensitive radio and radar instruments—for example, even a garage-door opener can disrupt important scientific projects. Maintaining the zone requires expert staff to critique applications for new transmitting stations, and engineering staff able to track down sources of

radio interference and assist the owners with engineering advice for eliminating the interference.

The Observatory's human and instrumentation resources and facilities represent over 60 years of investment, not only by NSF but by NASA, DARPA, DoD, and universities around the country and even around the world.

It is telling that, rather than being part of NSF's science side, the new organization will be located in the Directorate for STEM Education. These personnel are no doubt experts in education, but they do not have the skills to oversee the maintenance of intricate scientific instruments, much less specialized scientific research.

Nothing in the NSF response gives us confidence that they have thought through in detail such issues as:

- How long users will have access to the Observatory servers and archived data, and where it will be situated and retained after the transition period.
- What will happen to the instruments which are currently operating and producing invaluable science, such as the 12-m radio telescope, LIDARs and the Culebra facility.
- How NSF will train new people to maintain the facility, after throwing aside the irreplaceable human capital that has been developed over many years.
- How the new organization will provide fundamental IT and engineering services so that its "tenants" can use the facilities, install and restart existing and new instrumentation, and conduct scientific operations.
- How they propose to maintain the radio frequency Interference zone (currently the Puerto Rico Coordination Zone), which has been carefully and skillfully negotiated and enforced for more than fifty years. This takes personnel and vigilance, not just good intentions.
- What NSF intends to do with the 56 buildings not mentioned in the ASCER call. Will these taxpayer investments simply be left to rust? Many of these require specialized maintenance that goes far beyond mowing the grass and air conditioning.

The National Science Foundation's two criteria for selecting proposals are intellectual merit and broader impacts. Neither has been properly and adequately addressed by NSF in regard to Arecibo. Broader impacts are defined as the "potential to benefit society and contribute to the achievement of specific, desired societal outcomes." It is hard to imagine how removing a world-class research facility from Puerto Rico will serve the under-represented students on the island, or how intellectual merit could possibly be served by cutting a cost-effective, globally renowned scientific institution, leaving only the remnants of its educational programs. Broader impacts, i.e., benefits to society, would be much better served by retaining the crucial role and workforce at Arecibo, and using the site to re-establish the U.S. leadership in radio and radar astronomy, space, and atmospheric sciences that the 305-meter telescope provided.

Oversight hearings to explore these questions further with the National Science Foundation would have many benefits. When Congress in the CHIPS Act, encouraged NSF to “explore opportunities for strengthening and expanding the role of the Arecibo Observatory in Puerto Rico through education, outreach and diversity programs, and future research capabilities and technology at the site,” it meant those words seriously. Sadly, the NSF has only taken one part of the message to heart. Attached please find our comments on their reply to your letter.

Thank you again,

The Board of the Arecibo Science Advocacy Partnership

Contact:

ASAP Secretary, secretary@areciboscience.org

(you will reach either Prof. Michael Nolan or Prof. Joanna Rankin)

The Arecibo Science Advocacy Partnership (ASAP, <https://areciboscience.org>)

NSF Reply Letter with ASAP Comments

January 19, 2023

The Honorable Jenniffer González-Colón

United States House of Representatives
Washington, D.C. 20515

Dear Congresswoman González-Colón:

Thank you for your letter of November 17, 2022, regarding the National Science Foundation's (NSF) plans for future activities at the site of the Arecibo Observatory (AO) and the Arecibo Center for STEM Education and Research (ACSER) solicitation (NSF 23-505). I appreciate the opportunity to respond to your questions and clarify the fundamental elements of the NSF's plans for ongoing educational and scientific activities at the AO site. NSF is committed to fostering vibrant scientific and engineering ecosystems throughout the country and we remain focused on exploring how the AO site can be a catalyst for inspiring STEM talent and innovation in Puerto Rico for decades to come.

Currently, the site is operated under a cooperative agreement with the University of Central Florida (UCF) that ends on March 31, 2023. After an extensive review of our options, NSF decided not to renew this cooperative agreement, given that the terms of this award are based on operations of the 305-meter telescope, which is no longer functional. However, as mentioned in our last update, we plan to extend the cooperative agreement by six months, through September 30, 2023. With an entire year, we anticipate a smooth closeout of the current award and a successful transition to the next stage. NSF is currently working closely with UCF on planning this extension.

- A six-month time extension is not long enough to complete this transition. This statement demonstrates NSF's lack of understanding of the complexity of the Observatory, and what its unique situation entails. In particular, there appear to be no plans for the basic support for instruments that are still working well and making strong scientific contributions, and which the wider scientific community could propose to use for their research work far into the future.
- NSF informed UCF of this extension less than 24 hours before making the public announcement. If they had intended a "smooth closeout," they would have given proper notice and consulted with UCF throughout the process.

Extensive considerations were given to short-term and long-term options for continued use of the AO site. At this juncture, NSF has decided to engage a site contractor to maintain the site on behalf of NSF in a manner that will allow for maximum flexibility and enable the possibility for multiple users (or “tenants”) to host a variety of initiatives on the site.

- Where is the documentation of these “extensive considerations”, and what short-term and long-term options were considered?
- In particular, where is the report from the Arecibo Options Workshop NSF sponsored in June 2021, more than 18 months ago?
- Will the site contractor's tasks include providing internet and its support for the future “tenants”?
- What does “maintain” the site mean in terms of the more specialized infrastructure that goes beyond general maintenance?
- The discussion of “tenants” sounds like the difference between providing a buffet where people can compose their own meals, vs. requiring them to bring all the ingredients themselves, as well as cookware, personnel, and a camping stove.
- The statement “ensure the continuity of site maintenance independent of the site use” is premised on the notion that any contractor will be able to simply pick up where others have left off. Arecibo maintenance is far more complex than this. It involves sophisticated and specialized software, hardware, and equipment that a standard contractor will not have seen before.
- The maintenance and potential continuation of facilities are intertwined. If they are downgraded by improper and unskilled maintenance, especially in a tropical climate, the possibility of future uses will be foreclosed, and taxpayer dollars wasted.
- It appears that everyone from the electronics and operations teams will lose their jobs in August, if they have not left already. Many of them have contributed to the Observatory for years or even decades. Once that institutional knowledge is gone, it is unrealistic to think that those people could be hired back later, after they have moved on to other jobs. This staff continues to be crucial to enable the facilitation of both the “tenants” and a variety of initiatives NSF talks about. However, NSF does not appear to understand the practical requirements these involve.

NSF plans to engage the site contractor via a direct contract for general maintenance and support through the Small Business Administration’s 8(a) process, the announcement of which is available now on the NSF’s Forecast of Contracting Opportunities (<https://www.nsf.gov/about/contracting/nsf-acquisition-forecast.pdf>). NSF is working expeditiously with the Small Business Administration to identify a contractor, preferably based in Puerto Rico, to take on this site maintenance role.

- Awarding the maintenance contract to a Puerto Rican firm would not compensate in any way for ending the scientific life of Puerto Rico’s world class Observatory. It is a reduction in every way: in status, in contribution to society, in dollars, and in employment flowing to the island.
- This approach combined with the cutoff in August guarantees the loss of invaluable human capital representing decades of training and investment.

- This contractor will be required to find personnel with highly specialized skill sets. The Arecibo Observatory has been training such staff for decades, and right now they are about to be terminated. No Puerto Rican organization who is qualified for the 8(a) program could possibly have such employees on hand.

The plan to enter into a direct contract for site maintenance and support does not preclude future astronomical or geospace science usage of the site. Instead, it provides a flexible foundation upon which such usage may continue alongside other potential uses. For now, NSF is proposing to prioritize investment in educational activities and research, an area in which there is a resounding consensus regarding the site's potential impact. These educational opportunities are identified in multiple community reports as well as in the CHIPS and Science Act of 2022 (P.L. 117-167), which, as you noted, highlights the need to “explore opportunities for strengthening and expanding the role of the Arecibo Observatory in Puerto Rico through education, outreach and diversity programs, and future research capabilities and technology at the site.”

- A new Observatory would re-establish U.S. leadership in these areas: high sensitivity radio astronomy; and asteroid, planetary, and atmospheric radar sciences. Toward that end, the importance of retaining Arecibo's science mission and leadership is clear. This will be impossible with the current plans and budget, which will decimate the current facility and the staff that are the key to the “flexible foundation” NSF mentions.

The ACSER solicitation calls for proposals to establish a STEM education and research center, which would capitalize on the robust educational foundation established at the AO site. It also calls for projects that create and implement inclusive and innovative education research, as well as workforce development initiatives across a broad range of STEM disciplines for students, teachers, researchers, local communities, and the public within and outside of Puerto Rico. Through its research component and educational and outreach efforts, the proposed ACSER could play a significant role in modeling and advancing equitable and inclusive STEM education and research, especially in Puerto Rico and for those individuals and communities underrepresented in STEM.

- How would STEM research in Puerto Rico be advanced without scientific staff at the Observatory? NSF has suggested that professors from the local universities could be mentors. But this is asking Puerto Rico's existing STEM professionals to fill roles that had been filled by AO staff. If the AO scientific and technical staff are gone, and there is no new funding to replace them (within PR), that's clearly a net loss for Puerto Rico's STEM education efforts, and as such contrary to the [National Science Board priorities](#).

As exemplified by other world-leading STEM education centers (e.g., the Exploratorium in San Francisco, and the Museum of Science in Boston), ACSER would not require an active physical science research program. Such a research program could, however, be incorporated in responses to the ACSER solicitation or in future proposals.

- Research requires infrastructure which NSF does not presently plan to support – specifically the servers, the data, and the specialized equipment and staff which are required for scientific endeavors. It will be like the kitchen of a buffet with no food.

- Both the Exploratorium in San Francisco and the Museum of Science in Boston have active, ongoing connections with researchers, active research projects, and scientists on staff, and their budgets vastly exceed the NSF plan for Arecibo funding. How could NSF ever replace the dream of many Puerto Rican students, to participate as an intern mentored by engineers and scientists at a world-class observatory, by a budget of only one million dollars per year for the STEM center, including administrative costs and overhead?
- References to museum programs indicate a basic misunderstanding of the nature of Arecibo's STEM programs, which were based on students working directly with living, breathing scientists who were doing active research. No teacher, however enthusiastic, can replace that.
- Most of AO's past and present educational programs require active Observatory scientific, engineering, and technical staff to mentor the students, in such programs as Research Experience for Undergraduates (NSF's REU Program), the Arecibo Observatory Space Academy (AOSA), the STEM Teaching at Arecibo (STAR), and Enhancing and Nurturing Careers in Astronomy with New Training Opportunities (ENCANTO).

NSF's new site maintenance and support contract will also be able to support other current and future uses of the site for innovative ideas involving the 12-meter telescope, the Lidar and optical laboratory facilities, or new facilities yet to be imagined. There are about six awards currently utilizing the AO site that are being evaluated to determine the best way to support their research goals.

- How are these awardees being consulted on their needs?

Future use of the infrastructure and research resources on the site, including the existing instrumentation, would be identified in proposals and evaluated through NSF's standard merit review processes. Meritorious proposals could be funded, including operational support as needed, and incorporated as tenant activities on the site.

- How will NSF ensure that the scientific community knows that they can propose to conduct such research at Arecibo, and communicate the details of the available infrastructure and its maintenance practices to the proposers?

Building upon this foundational understanding of NSF's plan for a direct maintenance and support contract and the proposed usage for the Arecibo site, I will now turn to the answers to your questions.

1) Congress has repeatedly directed NSF to coordinate with relevant Federal Agencies when making decisions and determinations related to the future of the AO. Which Federal Agencies did NSF coordinate with in developing this proposal? Did NSF specifically work with the U.S. Department of Defense and the National Aeronautics and Space Administration when developing this proposal? If so, how did NSF work with these two agencies in prioritizing national security needs with this current proposal and how will NSF work with these agencies in future determinations as to the best pathway forward for the AO from a national security perspective?

NSF continues to engage with our federal partners on the future of the AO site. The ACSER solicitation is predominately focused on NSF's unique mission, envisioned as a STEM education and research center that will be integral to and complimentary to any future uses at the site and will develop STEM talent in Puerto Rico and beyond. As such, NSF did not consult directly on this opportunity with other agencies. However, NSF has engaged with NASA and other federal agencies in the development of NSF's plans for the future of the AO site. Specifically, NSF has engaged with NASA to begin a study of the next-generation radar needs. This study will pursue a comprehensive evaluation of the needs of NASA's planetary science division, including the need to support planetary defense, the Department of Defense, and the needs of the NSF research community for future planetary science studies that could be supported by radar technology. We anticipate this study to be complete by the end of FY 2023. Its findings will inform future potentially longer-term and larger investments in radar systems by other agencies in support of the planetary science needs and national security.

- This makes sense if the panel includes a diversity of experts and genuinely applies itself to creating feasible possibilities which have the support of the affected communities, including scientists.

NSF will keep Congress informed of the progress on this planetary radar study and will provide a copy of the report upon completion.

2) How do the educational aspects in this proposal differ from current educational programs held at the AO and how will this proposal increase participation and learning opportunities at the AO beyond what the current educational programs? How will this proposal help address educational and research and development gaps in the US as currently written?

A new ACSER could leverage existing programs and opportunities and provide a focus on STEM education and research, including interdisciplinary research and education. The Center could offer the opportunity to address persistent and emerging areas of critical importance to the U.S. in scientific and economic development, thus helping to prepare a STEM-informed public and a diverse STEM workforce.

- At the level of funding proposed, this seems highly unlikely.

The Center could have a significant role in modeling and advancing equitable and inclusive STEM education and research, especially in Puerto Rico and for individuals and communities underrepresented in STEM. It would be poised to serve as a catalyst for increased and inclusive engagement in a broad range of STEM disciplines (not only astronomy and geosciences, but potentially also biology, engineering, and other areas), cutting-edge educational research, and workforce development initiatives by students, teachers, researchers, local communities, and the public within and outside of Puerto Rico.

- No one could imagine that extinguishing the light of the science mission of the Arecibo Observatory and replacing it with a specialized education center is anything but a loss for the people of Puerto Rico – in leadership, in prestige, in employment, and in providing

both training and dreams for young people at a place where they could actually work one day.

3) As mentioned before, the AO has many current functioning technologies that would further any educational and research opportunities held at this facility. Given this current proposal does not mention these readily available technologies – how will NSF maintain and utilize these technologies outside of this current proposal?

NSF's new plan for the management of the AO site maximizes the flexibility to support a variety of tenants, potentially including both scientific and educational users. The site will be maintained by a site contractor that reports to NSF but that supports the tenants on the site through the provision of fundamental services such as security, utilities, and coordination of site resources, including buildings and offices.

- The ASCER call mentions about 21 structures, but the site has over 78 of them. Many have specific requirements for maintenance, which far surpass grass mowing and air conditioning maintenance. Will the maintenance contract include everything inside the boundaries of the site?

The initial focus of the ACSER solicitation is to establish a STEM education and research center, which may leverage existing instrumentation. Innovative proposals may include the 12-meter radio telescope, Lidar facility, and other available scientific resources in their proposed educational outreach and research programs.

- Without the foundation of specialized equipment, staff, software, and other resources, which have been built, cultivated, and maintained at taxpayer expense, how is this a realistic possibility?

There are also about a half-dozen other awards currently using the 12-meter telescope, Lidar, and optical facilities, which NSF is evaluating to determine the best way to meet their research goals through the transition period. For example, there are plans for the 12-meter telescope to be used by the NSF Center for Advanced Radio Sciences and Engineering (CARSE), located at the University of Puerto Rico - Mayaguez.

- Again, how are these awardees being consulted on their needs?

Even if the site's scientific technologies are not fully utilized under an ACSER proposal, the NSF site maintenance and support contract would allow for the submission of proposals that could utilize the scientific resources alongside a proposed ACSER or existing awards. Such proposals would be subject to NSF merit review, and if funded, the awardees would be considered as tenants alongside other users of the site.

- How can research continue in a role of supporting the STEM education center if the instruments and scientists are only considered a "tenant" program?
- Considering that NSF currently plans to shut down the remaining Observatory instruments, of which there are many that are separate from the 305-meter telescope (e.g., the 12-meter telescope, the LIDARs, optical imagers and spectrometers), it is disingenuous for the NSF to suggest that they may fund those instruments in the future. How will NSF ensure that the instruments remain functional, when the responsible organization is pro-

posed to be a small business focused on “general maintenance”? Who will maintain these instruments while the proposals requiring them are being evaluated?

We greatly appreciate your interest in the work of the National Science Foundation. Please feel free to contact Amanda Hallberg Greenwell, Head of the Office of Legislative and Public Affairs, at (703) 292- 8070 if you have any additional questions.

Sincerely,

Sethuraman Panchanathan

Director

Identical letter to:

The Honorable Michael Waltz

The Honorable Rick Scott

The Honorable Marco Rubio

The Honorable Maria Elvira Salazar

The Honorable Darren Soto