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COALITION FOR A NEW ARECIBO OBSERVATORY [1]

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This document is a response by a coalition of scientists and academics historically connected with the Arecibo Observatory and with the local scientific community, to the catastrophic and dramatic collapse of the main instrument of the Arecibo Observatory in Puerto Rico on December 1, 2020. We raise our collective voice to advocate for a scientific future that more solidly engages with the Puerto Rican community, the National Science Foundation, Congress, and the relevant scientific societies to ensure that the ensued gap is properly addressed. We seek to both influence and become stakeholders in the path forward that aims at obtaining a replacement facility.

I.Our coalition

We are a multi-disciplinary, multi-sectoral coalition of scientists, professors, graduate students, and members of international scientific societies. We are former Arecibo

Observatory staff members, users of its facilities, and students who were trained at the Observatory and with deep ties to Puerto Rico - most but not all are Puerto Ricans.

II.The importance of the Arecibo Observatory for Puerto Rico

The Arecibo Observatory started as a Department of Defense (ARPA, now DARPA, the Defense Advanced Research Projects Agency) project during the Cold War, and was quickly recognized to have broad radio astronomical, planetary, and ionospheric scientific applicability. Beginning with the first observations in 1963, the Observatory was used for open civilian research, and in 1969 management was transferred from DoD to NSF. The Observatory has delivered on its promise, enabling Nobel-prize winning research, and accomplishing major discoveries in all three above mentioned disciplines. For the nation, the Arecibo Observatory is a vital asset for planetary defense against the eventuality of a collision with a near-Earth asteroid or other object (NEO). There is no replacement either existing or planned for the capabilities that Arecibo gave the world for the mapping and forecasting of orbits of NEOs. In this context, Arecibo's role was and would be of critical interest to the US and the World.

The Arecibo Observatory has been the only formal national science center with international relevance in Puerto Rico. Throughout its existence, the Observatory has been a unique incubator for many graduate students and postdoctoral researchers. A robust summer student program has recruited generations of undergraduates into research careers. In 1997, a strong educational program was instituted, including a visitor center and museum that attracted about 100,000 visitors each year. The creation of functional links to minority-serving institutions in both the US and Puerto Rico widened the educational reach of the Observatory, including within local academic institutions that previously had only casual and sporadic interaction with the Observatory's scientific and educational capabilities. Thus, the Observatory fulfilled not just a critical national science mission but a strategic educational enhancing role that served as the springboard for the launching of many scientific careers, including many members in this coalition.

Its multi-million-dollar economic impact[1] to the island economy has long been recognized, especially in terms of anchoring the regional economy of the municipality of Arecibo and surrounding areas, stabilizing an otherwise steadily declining economic profile.

III.Our position going forward

Choosing a replacement option for the legacy Arecibo 305 m telescope or deciding to build any other new instrument or facility is decidedly a complex scientific, technical and social task. We recognize that the replacement strategy requires in-depth analysis, and that such strategy has multiple dimensions such as cost and funding model, projected

lifetime, mission requirements and scientific priorities, design innovation, management and maintenance systems, and socioeconomic factors. Our position is that the process of defining success should unambiguously partner with the community of international and local (i.e., PR/USVI) stakeholders, the latter being a critical partner.

Our coalition sees the design and construction of a new national radio science facility and any other new instruments associated with the Arecibo Observatory as a once-in-a-lifetime opportunity for science for Puerto Rico. The aim should be to surpass the capabilities of the legacy Arecibo telescope, thus recovering and enhancing the national scientific and technological infrastructure. This will seed a new generation of both scientists and engineers with expertise in various fields of radio science, particularly in minority communities. This innovation would benefit the island and the region in areas extending from the academic community to industrial and economic growth. Therefore, the design and selection process of any new facility at (or associated with) the Arecibo Observatory should emphasize the following foundational characteristics:

A. Lead to a scientifically and technically modern instrument/facility, reflecting the current state-of-the-art including a strong computational capability.
B. Serve the astronomical, planetary radar, and atmospheric and space sciences meaningfully by inviting and soliciting expert input from the relevant scientific societies as part of the analysis of alternatives prior to final selection.
C. Preserve and enhance the educational mission that was developed at the Arecibo Observatory with outreach to both internal and external interests in Puerto Rico.
D. Include social sciences with the aim of enhancing the effectiveness of the new facility in its mission to communicate and engage society. This seeks to take advantage of studies of community impacts as well as the social relationships involved in scientific discovery and management.
E. Preserve the civilian management of the Arecibo Observatory and guarantee that work conducted at the facility continues to be focused on non-military research.
F. Be endowed with sufficient internal scientific and support staff capable of monitoring and maintaining the health of the instrumentation, and of facilitating future updates.
G. Comprise a scientific staff primarily oriented toward supporting guest investigations that stress community collaboration.
H. Include Puerto Rican scientists, engineers, educators, and other relevant experts -- they should be represented in the planning and decisional process.
I. Seek local support and government commitments that enhance the participation of the local scientific user community. If the government of Puerto Rico provides any financial or in-kind support to a new facility, the science community in Puerto Rico should obtain guaranteed time to use the new telescope or instrument.
J. Siting of new and replacement facilities need not necessarily be at Arecibo proper. Other localities in Puerto Rico may be more advantageous and synergistic for establishing particular capabilities. A network or distributed approach may prove optimal.
K. Maintain strong links with local research institutions.
L. Have a financial sustainment plan to maintain the facility as a relevant one in the out years.
M. Ensure equal and free access to observing time based solely on the merit of the proposed science[2].

References:

1. https://www.nsf.gov/mps/ast/env_impact_reviews/arecibo/eis/FEIS.pdf [2]
2. https://www.sciencediplomacy.org/article/2017/open-skies-policies-in-astronomy [3]

We, the undersigned scientists, professors and graduate students, have agreed on the above statement on March 31, 2021.

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- #AreciboObservatory [5]
- #NewObservatory [6]
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