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The BICEP Array Replacement Tower (BART): Polar Infrastructure Development Supporting Cosmic Microwave Background Research

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Measurement of the polarized Cosmic Microwave Background (CMB) over the past few decades has enabled precision probes of the evolutionary history, composition, and dynamics of the primordial Universe. Next-generation CMB experiments will extend this scientific reach, allowing for tests of the inflationary theory of the early Universe, driven through constraints on the tensor-scalar ratio “ r ” via the search for primordial B-mode polarization. This includes the BICEP Array telescope program, which is targeting observation of B-modes at large angular scales, building on constraints already placed by the BICEP/Keck program. This talk will provide an overview of new infrastructure that is currently in development to ensure the sustainable extension of CMB research at the Amundsen-Scott South Pole Station - notably, the BICEP Array Replacement Tower (BART) project. BART is a straightforward evolution of existing infrastructure at the South Pole aimed at utilizing a limited footprint consistent with heritage facilities to extend experimental cosmology science operations at the South Pole. This discussion will highlight the current status of project design and fabrication, the opportunity for the deployment of a photovoltaic energy system, and plans for future deployment. Finally, the talk will cover the lessons-learned from BART that can be applied to the broader development of polar scientific infrastructure operating at remote, high-altitude, low-temperature sites, in line with current priorities of the global polar science community.

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