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The Search for Inflationary B-modes with the BICEP/Keck Telescopes

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The LCDM cosmological model fits a wealth of observational data extremely well but assumes a very specific type of initial conditions (near-scale-invariant, Gaussian, adiabatic perturbations). Inflationary theories can naturally produce these initial conditions, while also generically predicting a background of gravitational waves—which have so far not been detected. There are a wide range of inflationary models which make different predictions for the strength of the gravitational wave background, which is customarily characterized by the scalar-to-tensor ratio r. Primordial gravitational waves will have left an imprint in the polarization pattern of the cosmic Microwave Background (CMB) which we can potentially detect as a curl component, or B-mode, in the pattern at degree angular scales. The BICEP/Keck series of experiments are small aperture refracting telescopes specifically designed to search for this signal. The latest BK15 results use measurements at 95, 150 and 220GHz, in conjunction with additional bands from WMAP and Planck, to constrain the foreground signal and set the limit $r < 0.07$ (95% confidence). I will describe the current instruments, data and analysis, and also the major BICEP Array upgrade which is projected to reach sensitivity of $\sigma(r) \sim 0.003$ within the next five years.

Presenter: Prof. PRYKE , Clem

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