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# CFA lecture series

**Abigail Vieregg**

*KICP - University of Chicago*

## Detection of B-mode Polarization on Degree Angular Scales with the BICEP2 Experiment at the South Pole

Inflation, the superluminal expansion of the universe during the first moments after the Big Bang, predicts a Cosmic Gravitational-Wave Background, which in turn imprints a faint but unique signature of "B-mode" polarization of the Cosmic Microwave Background (CMB) at degree angular scales. Detection of the B-mode signature from inflation would constitute strong evidence for inflation and a test of inflationary models at the GUT scale, the first direct image of gravitational waves, and direct empirical evidence of quantum gravity. BICEP2, which observed from the South Pole from 2010-2012, is a microwave polarimeter that uses antenna-coupled Transition Edge Sensor arrays to observe the CMB at degree angular scales and is specifically designed to search for this signature of inflation. BICEP2 is the second experiment in a four-stage line of degree-scale polarimeters at the South Pole. I will discuss the recent detection of B-mode polarization at degree angular scales with BICEP2 ( $> 5$  sigma and consistent with tensor modes from inflation), and the promise for follow-up to this measurement with the Keck Array (currently observing) and BICEP3 (deploying this year).

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