APR17-2016-000712

Abstract for an Invited Paper
for the APR17 Meeting of
the American Physical Society

Understanding the large-scale structure from the cosmic microwave background: shear calibration with CMB lensing; gas physics from the kinematic Sunyaev-Zel'dovich effect.

EMMANUEL SCHAAN, Princeton University

I will present two promising ways in which the cosmic microwave background (CMB) sheds light on critical uncertain physics and systematics of the large-scale structure. **Shear calibration with CMB lensing (arXiv:1607.01761):** Realizing the full potential of upcoming weak lensing surveys requires an exquisite understanding of the errors in galaxy shape estimation. In particular, such errors lead to a multiplicative bias in the shear, degenerate with the matter density parameter and the amplitude of fluctuations. Its redshift-evolution can hide the true evolution of the growth of structure, which probes dark energy and possible modifications to general relativity. I will show that CMB lensing from a stage 4 experiment (CMB S4) can self-calibrate the shear for an LSST-like optical lensing survey. This holds in the presence of photo-z errors and intrinsic alignment. **Evidence for the kinematic Sunyaev-Zel'dovich (kSZ) effect (arXiv:1510.06442); cluster energetics:** Through the kSZ effect, the baryon momentum field is imprinted on the CMB. I will report significant evidence for the kSZ effect from ACTPol and peculiar velocities reconstructed from BOSS. I will present the prospects for constraining cluster gas profiles and energetics from the kSZ effect with SPT-3G, AdvACT and CMB S4. This will provide constraints on galaxy formation and feedback models.