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[Colloquium] Determining the Universe's Initial Conditions

Thursday, February 24, 2022 4:00 PM (1h 20m)

Observations of the cosmic microwave background and measurements of the large-scale structure of the universe have revealed the initial fluctuations that grew to form galaxies. I will review measurements showing that these fluctuations were Gaussian random phase and that the basic properties of the universe appear to be described by the Lambda Cold Dark Matter model. I will report recent results from the Atacama Cosmology Telescope that probe not only the initial conditions but also map the integrated matter density, integrated pressure and integrated electron momentum through gravitational lensing and the Sunyaev-Zel'dovich Effects. I will then discuss the use of machine learning techniques to enable rapid forward modeling of the universe and discuss how these can be used in the coming years to recover the initial conditions from observations of large-scale structure.

Presenter: SPERGEL, David (Flatiron Institute & Princeton University)