Astrophysics Seminar

The Cosmological Quest for Evidence of the Birth of the Universe out of the Multiverse Landscape

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One expects that the universe was born out of a complicated string-theory landscape near the Planck epoch. Although the energy scale of the birth of the universe is not accessible in terrestrial experiments, the energy scale of trans-Plankian physics could have been obtained during the early instants of accelerated chaotic inflation. This talk will summarize the quest for cosmological evidence of this birth of space-time out of the string-theory landscape. We will explore the possibility that a set of superstring excitations may have made itself known via their coupling to the field of inflation. This may have left an imprint of "dips" in the power spectrum of temperature fluctuations in the cosmic microwave background. The identification of this as due to a superstring is possible because there may be evidence for different oscillator states of the same superstring that appear on different scales on the sky. Similarly, as the universe emerged it is possible that the interaction with other nascent universes led to the formation of cold spots and/or large-scale curvature in the cosmic microwave background. Such curvature would appear as a cosmic "dark flow" with respect to the frame of the big bang. This talk will summarize current constraints on the existence of such dark flow and prospects for its identification in the future. The existence of extra dimensions during inflation can also impact impact the cosmic expansion after the inflation epoch through the projection of curvature and/or mass-energy from a higher dimension. This can be constrained by the ratio of tensor to scalar fluctuations in the cosmic microwave background and via the effects of modified expansion on the light elements produced during big bang nucleosynthesis.

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