Non-Supersymmetric String Theories

Susha Parmeswaran

Abstract:

In these lectures, I will give an introduction into non-supersymmetric string theories, starting from their construction and rather beautiful formal properties, and reaching contemporary ideas as to their possible relevance to descriptions of our Universe. We'll begin with a brief review on how to construct the bosonic and superstrings, leading us to the three tachyonic-free non-supersymmetric closed string theories. We'll then discuss Scherk-Schwarz symmetry breaking, the non-supersymmetric open string models, and the phenomenon of brane-supersymmetry breaking. We'll understand the interplay between modular invariant partition functions, ultra-violet--infra-red mixing, and a so-called misaligned supersymmetry, and how these properties underlie the finiteness of all tachyon-free non-supersymmetric string theories. Finally, we'll begin to explore possible (cosmological) solutions to non-supersymmetric theories, their low-energy descriptions, as well as amusing speculations on how these theories may help address the long-standing hierarchy problems in particle physics and cosmology, and perspectives from the swampland.

April 10 – April 14, 2023, Timings (TBA)

Venue: Lecture hall in Strings area