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Emergent Strings in type IIb limits of Type IIB String Theory

Wednesday, 9 April 2025 15:05 (35 minutes)

In this talk, I will discuss the realization of the Emergent String Conjecture in the vector multiplet moduli space of Type IIB compactifications on Calabi-Yau threefolds. Based on the classification of infinite distance limits in the complex structure moduli space of Calabi-Yau threefolds in terms of limiting mixed Hodge structures, such limits are expected to correspond to so-called type II_b limits for which $b < h^{2,1}$ an integer. However, neither a tower of light BPS states nor a tensionless, critical string has been so far identified for general such limits. For the special class of type II_b limits realized as Tyurin degenerations of CY threefolds, I will use the additional information encoded in the geometry of the degenerate threefold to establish the existence of a tower of light BPS states and study the worldsheet theory on a geometric string solution which becomes tensionless at the same rate as the tower of BPS states in the type II_b limit. As a result, I will show that this tensionless string corresponds to a critical heterotic string with a perturbative gauge group of rank $2+b$ —consistent with the Emergent String Conjecture. Finally, by reversing the logic, I will discuss how the Emergent String Conjecture yields a new constraint on the type II_b limiting Hodge structures that can have a geometric realization on Calabi-Yau threefolds. This talk is based on joint work with Björn Friedrich, Jeroen Monnee, and Timo Weigand.

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