A Field Trip to the Boundary of the Swampland

Monday 12 July 2021 12:00 (30 minutes)

In this talk I will discuss recent developments of the Swampland Distance Conjecture (SDC) in the context of AdS/CFT and N=1 4d EFTs. First, inspired by this conjecture and supported by SCFT data, we propose that all theories at infinite distance in the conformal manifold possess an emergent higher-spin symmetry, generated by an infinite tower of currents whose anomalous dimensions vanish exponentially in the distance. Interpreted gravitationally, they imply that approaching infinite distance in moduli space at fixed AdS radius, a tower of higher-spin fields becomes massless at an exponential rate that is bounded from below in Planck units. This relates to recent developments of the SDC in N=1 4d supergravity theories, where higher spin fields also play an essential role to comply with the SDC. In particular, in this context the SDC follows from the universal presence of an axionic BPS string, dubbed EFT strings, at every infinite field distance limit that satisfies the Weak Gravity Conjecture. The backreaction of EFT strings can be interpreted as an RG flow of their couplings, such that the string becomes asymptotically tensionless and the EFT eventually breaks down. We propose that any 4d EFT infinite distance limit can be realised as an EFT string RG flow, providing this way a bottom-up derivation of the SDC and a lower bound on the exponential rate. We check our proposal for large classes of 4d N=1 string compactifications and find that, even if there are typically other towers of particles becoming light, the mass of the leading tower always scales with the string tension as m²/sim T^w in Planck units with w=1,2,3. Finally, I will explain what happens in the presence of a scalar potential.

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