COLLOQUIUM

# Glimmers from the Axiverse

**Speaker** **DAVID J.E. MARSH** (King's College London, UK)

**Abstract** In 2009 the highly influential idea of a "string axiverse'' was proposed. I will begin by briefly reviewing the progress myself and others have made on this idea in the last 14 years. The original probes proposed: matter power spectrum, birefringence, superradiance, and axion decays have all matured in precision both theoretically and observationally. I will then describe recent dramatic progress that has been made in constructing explicit axiverses from Calabi-Yau (CY) compactifications across the entire "Kreuzer-Skarke'' database in Type IIB string theory. The resulting axiverse differs from the originally proposed one in 2009, with much lower decay constants, correlated to the value of the Hodge number h11 of the CY, which in turn sets the number of axions. Two further phenomena were discovered recently, termed "kinetic isolation'' and "the light threshold''. Together, these imply that the axion photon couplings are systematically suppressed compared to the inverse axion periodicity. We study the resulting phenomenology in an ensemble of O(10^5) toy models constructed from the Kreuzer-Skarke database up to the maximum Hodge number h11=491. I will outline results on freeze-in production and decay of thermal axions, birefringence of the cosmic microwave background, X-ray spectrum oscillations, and constraints on the QCD axion from supernovae. Compactifications in this corner of the landscape involve many invisible axions, as well as a handful that may be detectable via photon couplings.

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