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Recent Progress on Axions in String Theory

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The past few years have seen major advances in understanding the properties of axions in string theory. This progress is thanks to new computational tools that allow for fast and automated calculations with Calabi-Yau manifolds, which I will briefly describe. I will then describe the predictions string theory makes for axion masses, decay constants, and axion-photon couplings, and how these depend precisely on the topology of the Calabi-Yau. I will describe explicit constructions of fuzzy dark matter, and detailed calculations relating to decaying heavy axions, both of which seem to point to a preference for low reheating temperatures in cosmology. Lastly, I will describe the correlation between QCD axion mass and topology, and how this makes it possible for axion haloscopes to experimentally test the string theory landscape.

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