

Friendship in the Axiverse

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A generic low-energy prediction of string theory is the existence of a large collection of axions commonly known as a string axiverse. In a realistic axiverse, string axions can be distributed densely over many orders of magnitude of mass, and are expected to interact with one another through a joint potential. I will show that non-linearities in this potential lead to a new type of resonant energy transfer between axions with nearby masses. This resonance is not captured by linearized treatments previously discussed in the literature, and generically results in a transfer of energy density from axions with larger decay constants to those with smaller decay constants, leading to a multitude of late-time signatures. These include enhanced direct detection prospects for a resonant pair comprising even a small subcomponent of dark matter (DM), and boosted small-scale structure if the pair is the majority of DM. Near-future iterations of experiments such as ADMX and DM Radio will be sensitive to this scenario, as will astrophysical probes of DM substructure.

Primary author: THOMPSON, Jedidiah (Stanford University)

Co-authors: Dr CYNYNATES, David (Stanford University); Mr GIURGICA-TIRON, Tudor (Stanford University); Mr SIMON, Olivier (Stanford University)

Presenter: THOMPSON, Jedidiah (Stanford University)

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