

# The cosmological constant is probably still zero

*Tuesday 23 May 2023 12:00 (15 minutes)*

We consider a wide class of four-dimensional effective field theories in which gravity is coupled to multiple four-forms and their dual scalar fields, with membrane sources charged under the corresponding three-form potentials. Four-form flux, quantised in units of the membrane charges, generically generates a landscape of vacua with a range of values for the cosmological constant that is scanned through membrane nucleation. We list various ways in which the landscape can be made sufficiently dense to be compatible with observations of the current vacuum without running into the empty universe problem. Further, we establish the general criteria required to ensure the absolute stability of the Minkowski vacuum under membrane nucleation and the longevity of those vacua that are parametrically close by. This selects the current vacuum on probabilistic grounds and can even be applied in the classic model of Bousso and Polchinski, albeit with some mild violation of the membrane weak gravity conjecture. We present other models where the membrane weak gravity conjecture is not violated but where the same probabilistic methods can be used to tackle the cosmological constant problem.

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