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Crunching dilaton, hidden naturalness

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We introduce a new approach to the Higgs naturalness problem, where the value of the Higgs mass is tied to cosmic stability and the possibility of a large observable Universe. The Higgs mixes with the dilaton of a CFT sector whose true ground state has a large negative vacuum energy. If the Higgs VEV is non-zero and below ˜TeV, the CFT also admits a second metastable vacuum, where the expansion history of the Universe is conventional. As a result, only Hubble patches with unnaturally small values of the Higgs mass support inflation and post-inflationary expansion, while all other patches rapidly crunch. The elementary Higgs VEV driving the dilaton potential is the essence of our new solution to the hierarchy problem. The main experimental prediction is a light dilaton field in the 0.1-10 GeV range that mixes with the Higgs. Part of the viable parameter space has already been probed by measurements of rare B-meson decays; we emphasize the possibility for probing the rest of the parameter space at the Forward Physics Facility.

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