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A new WIMP DM connection to the hierarchy problem

Monday, 1 December 2025 17:00 (20 minutes)

We propose a novel link between the hierarchy problem and Weakly Interacting Massive Particles (WIMPs), suggesting that the small mass of the Higgs boson arises from the universe's WIMP-induced proximity to the critical boundary of a phase transition. Intriguingly, such a requirement aligns with a split spectrum of new light fermions and heavy bosons expected from naturalness, and overlaps with the so-called "WIMP miracle": a WIMP with mass around the weak scale not only happens to have the correct thermal relic abundance to be the observed dark matter, it can also naturally destabilise the Higgs potential just above the weak scale. This coincidence may signify a more direct link between WIMP dark matter and Higgs naturalness than anticipated from traditional symmetry-based explanations. Using a higgsino-like singlet–doublet model, we show that our Higgs criticality scenario favours TeV-scale WIMP dark matter. It can be thoroughly probed in direct detection experiments, astrophysical signals and future collider searches, further motivating a comprehensive exploration of the remaining heavy WIMP parameter space.

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