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Right-Handed Neutrinos as the Origin of Fundamental Mass Scales

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Starting from a scale-free electroweak sector at tree-level, we postulate that quantum effects of heavy right-handed neutrinos induce a mass term for a scalar weak doublet that contains the dark matter particle. In turn, below the scale of heavy neutrinos, the dark matter sector sets the scale of the Higgs potential. We show that this framework can lead to a Higgs mass that respects physical naturalness, while also providing a viable dark matter candidate, realistic light neutrino masses, and the baryon asymmetry of the Universe via leptogenesis. The proposed scenario can remain perturbative and stable up to the Planck scale.

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