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A minimal SM/LCDM cosmology

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Title: A minimal SM/LCDM cosmology
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Abstract:
Recent observations point to a surprisingly economical description of the universe on both very small and very large scales. Stimulated by these findings, Boyle and I have proposed a new, potentially more complete theoretical framework than currently popular paradigms. Our search has so far led to 1) the simplest-yet explanation for the cosmic dark matter, soon to be tested by galaxy surveys, 2) a thermodynamic explanation for the large scale geometry of the cosmos, based on the concept of gravitational entropy à la Hawking, 3) a new account of the big bang singularity as a "mirror" enforcing CPT-symmetric boundary conditions, realising Penrose's "Weyl curvature hypothesis" and 4) a new mechanism for cancelling the divergent vacuum energy and the trace anomalies in the Standard Model (SM). The new mechanism successfully predicts the primordial density perturbations in terms of the SM' s gauge couplings. It also explains why there are 3 generations of elementary particles, each including a RH neutrino, one of which is stable and comprises the dark matter. I' ll outline the challenges the new picture faces and the opportunities it presents including prospective observational tests.

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