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Sandwich Model of Extra Dimensions

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Abstract. This research investigates the distribution of fields on a two-brane model, which offers solutions to the electroweak hierarchy problem, the restoration of Starobinsky inflation, and the small cosmological constant. The study demonstrates that fields known split into two independent effective fields localized on adjacent branes during the Universe's evolution. Conditions for this field bifurcation are explored. Crucially, gauge fields remain uniformly distributed over the extra dimensions, preserving charge universality. The model proposes that the observed brane (brane-1) is “fine-tuned” for complex structure formation, while the adjacent brane (brane-2) hosts much heavier particles, precluding complex structures. Interaction between branes via photons and gravitons offers potential explanations for dark matter (located on brane-2) and ultra-high-energy cosmic rays, with the high mass of brane-2 electrons contributing to the Compton scattering cross-section, making them dark matter candidates and a source of ultra-high-energy protons. This “Sandwich model of extra dimensions” is a promising framework warranting further investigation, potentially explaining phenomena like the positron anomaly and small neutrino masses.