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Chaotic behavior of the renormalization group flow and standard model parameters ERVIN GOLDFAIN, OptiSolve Consulting — Despite years of sustained research efforts, a consistent and comprehensive understanding of standard model parameters is missing. For example, models based on the Higgs doublet or supersymmetry, as well as leptogenesis, grand unification and seesaw mechanisms offer at most an incomplete picture with little or no experimental evidence. Our work suggests that the spectrum of particle masses, gauge couplings and fermion mixing angles may be derived from the chaotic regime of the renormalization group flow. We find that the observed hierarchies of parameters amount to a series of scaling ratios depending on the Feigenbaum constant. Since fermion mass scaling ratios and mixing matrices can be parameterized in terms of the Cabibbo angle, this finding provides a natural connection between the Cabibbo angle and the Feigenbaum constant. Moreover, it is shown that the model can accommodate hypothetical generations of both heavy and ultra-light fermions that are expected to emerge beyond the energy range of the standard model. A representative example in this regard is the fourth family neutrino whose detection is anticipated at future linear colliders.

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