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Towards a new paradigm for quark-lepton unification

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The quark and lepton mass patterns upset their naive unification. In this talk, a new approach to solve this problem is described. Model-independently, we find that a successful unification can be achieved. A mechanism is identified by which the large top quark mass renders its third-generation leptonic partner very light. This state is thus identified with the electron. We then provide a generic dynamical implementation of this mechanism, using tree-level exchanges of vector leptons to relate the quark and lepton flavor structures. In a supersymmetric context, this same mechanism splits the squark masses, and third generation squarks end up much lighter than the others. Finally, the implementation of this mechanism in SU(5) GUT permits to avoid introducing any flavor structure beyond the two minimal Yukawa couplings, ensuring the absence of unknown mixing matrices and their potentially large impact on FCNC.

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