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Vectorlike Fermions as Portals into Higgs Vacuum Stability

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This talk addresses the notorious metastability of the Standard Model and promotes it to a model building task. We explore the ingredients required to stabilize the SM up to the Planck scale without encountering sub-Planckian Landau poles. Using the SM extended by vectorlike fermions, we chart out the corresponding landscape of Higgs stability. We find that the “gauge portal mechanism”, triggered by new SM charge carriers, opens up sizable room for stability in a minimally invasive manner. We also find models with Higgs criticality and Yukawa portals opening up at stronger coupling. Several models allow for vectorlike fermions in the TeV range, which can be searched for at the LHC. For nontrivial flavor structure, severe flavor-changing neutral current constraints arise that complement those from stability and push lower fermion masses up to order 10^3 TeV.

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