

 ST. OLAF PHYSICS DEPARTMENT

COLLOQUIUM SERIES

Analyzing Flavor Deconstruction within the Privately Governed Higgs Sector

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In the Standard Model of particle physics, fundamental particles acquire mass through their interaction with the Higgs field, a mechanism confirmed by the discovery of the Higgs boson at CERN. However, the theory does not explain why different particles have vastly different masses, such as the large gap between the top quark and the up quark.

We propose a new theoretical framework in which these mass differences arise dynamically. By introducing heavy messenger particles and additional scalar fields, the effective couplings between fermions and the Higgs emerge naturally rather than being inserted by hand. With interaction strengths of order one, our model reproduces the observed quark mass hierarchy and their mixing pattern described by the Cabibbo–Kobayashi–Maskawa matrix. Future work will explore implications for neutrinos, dark matter, and the matter–antimatter asymmetry.