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Stringy Quivers: Constraints on Chiral Matter and Systematic Phenomenological Searches

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MSSM-like quiver gauge theories naturally arise in D-brane compactifications and make up a subset of the data necessary to fully specify a string vacuum of this type. In addition to requiring field theoretic anomaly cancellation, consistency of the string theory requires that the chiral spectrum of a quiver satisfy additional constraints not present in field theory, rendering many quivers with the exact MSSM spectrum inconsistent. For those consistent quivers with the MSSM spectrum, I present systematic studies of their non-perturbative effects and phenomenology including mass hierarchies, R-parity violation, new possibilities for neutrino mass, and solutions to the mu-problem. For those MSSM quivers which are inconsistent, I present a systematic analysis of possible chiral matter additions which would render them consistent and discuss implications for $U(1)'$ symmetries.

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