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Coherent Transmutation of Electrons into Fractionalized Anyons MAISSAM BARKESHLI, Microsoft Station Q, EREZ BERG, Weizmann Institute, STEVEN KIVELSON, Stanford University — Electrons have three quantized properties – charge, spin, and Fermi statistics – that are directly responsible for a vast array of phenomena. Here we show how these properties can be coherently and dynamically stripped from the electron as it enters certain exotic states of matter known as a quantum spin liquid (QSL). In a QSL, electron spins collectively form a highly entangled quantum state that gives rise to emergent gauge forces and fractionalization of spin, charge, and statistics. We show that certain QSLs host distinct, topologically robust boundary types, some of which allow the electron to coherently enter the QSL as a fractionalized quasiparticle, leaving its spin, charge, or statistics behind. We use these ideas to propose a number of universal, conclusive experimental signatures that would establish fractionalization in QSLs.

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