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**Electron fractionalization in two-dimensional graphene-like structures**[1] CHANG-YU HOU, CLAUDIO CHAMON, Department of Physics, Boston University, CHRISTOPHER MUDRY, Condensed matter theory group, Paul Scherrer Institut, Switzerland — Electron fractionalization is intimately related to topology. In one-dimensional systems, fractionally charged states exist at domain walls between degenerate vaccua. In two-dimensional systems, fractionalization exists in quantum Hall fluids, where time-reversal symmetry is broken by a large external magnetic field. Recently, there has been a tremendous effort in the search for examples of fractionalization in two-dimensional systems with time-reversal symmetry. In this paper, we show that fractionally charged topological excitations exist on graphene-like structures, where quasiparticles are described by two flavors of Dirac fermions and time-reversal symmetry is respected. The topological zero-modes are mathematically similar to fractional vortices in $p$-wave superconductors. They correspond to a twist in the phase in the mass of the Dirac fermions, akin to cosmic strings in particle physics.

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