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Elasticity and Electron Fractionalization in Graphene WILLIAM SHIVELY, DMITRI KHVESHCHENKO, University of North Carolina at Chapel Hill — Much of the recent excitement over graphene comes from the fact that, at half-filling, the energy spectrum may be effectively described by a pair of Dirac fermions, giving rise to a host of effective (2+1)-d chiral gauge theoretic phenomena. In the presence of lattice distortions, hopping electrons bind to topological defects in the honeycomb lattice structure, which can lead to electron fractionalization. Recent work [c.f. Hou et al, PRL **98** (2007); Jackiw & Pi, PRL **98** (2007)] has shown that for Peierls distortions - which in the case of graphene would be described by a Kekulé lattice dimerization pattern - such fractionalization may occur when electrons interact with topologically-induced vortices. Approaching the problem differently, here we develop a general theory of elasticity for honeycomb lattice structures with various non-trivial dimerization patterns, and explore concomitant possibilities of electron fractionalization.

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