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CiSE Computational Physics Challenge Winner: Electron Wave Packet Propagation in Graphene Nanoribbons STEVEN M. ANTON, University of California, Berkeley — While graphene has been studied by theoreticians for over half a century, the two dimensional crystal lattice has only recently been realized experimentally. As such, theoretical work in the properties of graphene has exploded. A variety of these properties, which are truly exceptional and unique, have engendered much research into carbon based electronics, of which graphene is generally the most fundamental unit. In this thesis, we seek to characterize basic electronic properties of graphene nanoribbons. We begin with a tight-binding model of graphene and an analysis of the electronic band structure of the infinite sheet and semi-infinite nanoribbons. Also employing the spectral method, we create, inject, and propagate various types of wave packets infinite wires. A key effect that is expected is the so called Zitterbewegung oscillation of the wave packet center. Results are compared to theoretical predictions based on analytical methods rather than numerical simulations.

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