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Quantum Mechanics on a Mobius Strip: Energy Levels, Symmetries, and Level Splitting in a Magnetic Field ZEHAO LI, RAMDAS RAMMOHAN, Physics Department, Worcester Polytechnic Institute — We investigate the energy levels of an electron on a Möbius strip. Schrödinger's equation on this curved surface is shown to have terms that do not have invariance under parity transformation in parameter space for the strip. The double degeneracy of energy levels that exists for flat cylindrical rings is shown to be removed for the pairs of energies in the Möbius strip due to parity symmetry breaking. The orbital angular momentum is found to have approximately not only integer but also half-integer values of $\hbar$. The splitting of the energy levels in an external magnetic field is displayed. The effects of multiple twists are investigated to further clarify that the parity symmetry breaking is the effect of the curved geometry, while the appearance of half-integer angular momentum states is a topological effect. The implications for twisted rings composed of graphene will be discussed, and carrier transport through the Möbius strip will be considered. This work was supported by AFLR/DARPA under grant FA8650-10-1-7046.

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