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Theory of Symmetry Protected 2D Dirac Semimetals and Derivative Topological States STEVE YOUNG, Center for Computational Materials Science, Naval Research Laboratory, CHARLES KANE, Department of Physics, University of Pennsylvania — We present the theory of symmetry-protected 2D Dirac semimetals. These systems are distinguished from graphene by the presence of spin-orbit coupling, under which the latter becomes a quantum spin hall insulator. 2D Dirac semimetals exhibit behavior distinct from both graphene and their three-dimensional counterparts. We discuss the symmetry requirements for such systems, and using the simplest tight-binding model satisfying them, describe their properties, as well as the states that result from relaxing various constraints, including Weyl semimetal and topological insulator states. Additionally, we provide suggestions for realizing these systems based on Density Functional Theory calculations.

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