



Mathematical Physics

Discrete symmetries of low-dimensional Dirac models: A selective review with a focus on condensed-matter realisations

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The most fundamental characteristics of a physical system can often be deduced from its behaviour under discrete symmetry transformations such as time reversal, parity and chirality. Here we review basic symmetry properties of the relativistic quantum theories for free electrons in (2+1)- and (1+1)-dimensional spacetime. Additional flavour degrees of freedom are necessary to properly define symmetry operations in (2+1) dimensions and are generally present in physical realisations of such systems, e.g., in single sheets of graphite. We find that there exist two possibilities for defining any flavour-coupling discrete symmetry operation of the two-flavour (2+1)-dimensional Dirac theory. Physical implications of this duplicity are discussed.

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