Parity, Time Reversal, and Relativity ROBERT CLOSE — Derivation of the conventional Dirac operators for spatial inversion (P) and time reversal (T) assumes that the squared coefficients of the temporal and spatial derivatives are elements of the Minkowski metric. The validity of this assumption is questionable since each component of the free-particle Dirac equation satisfies the Klein-Gordon equation which, while Lorentz invariant, can be used to describe waves propagating in classical Galilean space-time. The conventional parity operator also violates the rules of geometric algebra for certain vector-like sets of matrices representing alternative velocity representations. Taking the coefficient of temporal derivatives to be unity as in Dirac's original formulation, the resultant operators for spatial inversion and time reversal are found to be consistent with geometric algebra. The new parity operator exchanges matter and anti-matter and is therefore consistent with spatial reflection symmetry (instantaneous parity conservation) for all known physical processes. The combined PT and PCT operators are unchanged by the new definitions.

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None

Date submitted: 20 Mar 2008   Electronic form version 1.4