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This is a continuation of our program to relate the 3- and 4-dimensional Rohlin invariants to gauge theory. Using foundational work of Taubes, we investigate the Dirac operator on an end-periodic 4-manifold. This gives rise to a metric-dependent integral lift of the Rohlin invariant of a homology 3-sphere. Some basic properties of this invariant will be discussed, together with some potential applications. (Received February 07, 2006)