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Periodic Dirac operators and positive scalar curvature on 4-manifolds

Abstract. Which smooth manifolds admit a Riemannian metric whose scalar curvature is positive? This question has been attacked using minimal surface theory (Schoen-Yau) and the Dirac operator (Lichnerowicz, Gromov-Lawson, and many others). Using Taubes' theory of periodic-end operators, we will discuss the Dirac operator on a non-compact 4-manifold that is an infinite cyclic cover of a compact spin manifold X. We show that such an operator is Fredholm for a generic metric, and use this to give a new interpretation of the Rohlin invariant of X. This new interpretation gives rise to a new obstruction to the existence of metrics of positive scalar curvature. This is joint work with Nikolai Saveliev (U. of Miami).