**Small Eigenvalues of the Yamabe Operator**

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We define a differential topological invariant of compact manifolds by counting the small eigenvalues of the Yamabe operator for suitable Riemannian metrics. We bound this invariant from above and from below by the $\alpha$-genus. For simply connected manifolds it turns out to be computable in terms of the $\alpha$-genus and one sees that it can distinguish certain exotic spheres. Hence it is not a homeomorphism invariant.

As methods we use a spectral comparison principle due to Gallot and Meyer, refined Kato inequalities, a surgery result for the Yamabe spectrum, and bordism theory. As a geometric application we show that if a compact spin manifold has sufficiently large $\widehat{A}$-genus, then it has a "neck of bounded size" for all metrics. This is not true if one drops the assumption of the $\widehat{A}$-genus as one can e. g. see in the example of the torus.