

Thomas Tony (University of Potsdam)

Title: Higher Index Theory and Scalar Curvature Rigidity

Abstract: Llarull proved in the late '90s that the round n -sphere is area-extremal, meaning that one cannot simultaneously increase both its scalar curvature and its metric. Goette and Semmelmann generalized Llarull's rigidity statement to certain area-non-increasing spin maps $f: M \rightarrow N$ of non-zero \hat{A} -degree.

In this talk, I will begin with a brief introduction to scalar curvature comparison geometry and review the Dirac operator method. I will then explain how higher index theory can be used to generalize classical extremality and rigidity statements. More specifically, I will present a recent generalization of Goette and Semmelmann's theorem, in which the topological condition on the \hat{A} -degree is replaced by a weaker condition involving the so-called higher mapping degree. A key challenge in the proof is that, in general, a non-vanishing higher index does not necessarily give rise to a non-trivial kernel of the corresponding Dirac operator. I will present a new method that extracts geometrically useful information even in this more general setting.