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**RAPHAEL PONGE**, University of Toronto

*Noncommutative geometry and lower dimensional volumes in Riemannian geometry*

In this talk I will explain how we can define the “lower dimensional” volumes of any compact Riemannian manifold as the integrals of local Riemannian invariants. For instance a sense can be given to the area and the length of such a manifold in any dimension. The reasoning is motivated by an idea of Connes and involves in an essential way noncommutative geometry and the analysis of Dirac operators on spin manifolds. However, the ultimate definitions of the lower dimensional volumes don't involve noncommutative geometry or spin structures at all.