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*The heat kernel on connected sums*

On the one hand, there is a large class of Riemannian manifolds for which the heat kernel, the fundamental solution of the heat equation, satisfies sharp two-sided Gaussian bounds. This class, call it  $H$ , includes all complete manifolds with non-negative Ricci curvature and many more. On the other hand, it is very hard to say something about the large scale behavior of the heat kernel on a general complete Riemannian manifold. The aim of this talk is to describe the behavior of the heat kernel on any manifold that is the connected sum of finitely many manifolds of type  $H$ . There are many concrete interesting examples of such manifolds, the simplest of which may be the connected sum of two (or more) Euclidean spaces.