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Stability of marginally trapped surfaces, and applications to black holes

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A basic result in the theory of black holes is Hawking's theorem on the topology of black holes, which asserts that cross sections of the event horizon in (3+1)-dimensional asymptotically flat stationary black hole spacetimes obeying the dominant energy condition are topologically 2-spheres. Recent interest and developments in the study of higher dimensional black holes has drawn attention to the question of what are the allowable black hole topologies in higher dimensions. We have addressed this question in two recent papers, the first with Rick Schoen, resulting in a natural generalization of Hawking's theorem to higher dimensions. In this talk we discuss these works and some further related developments. The results we describe are based on properties of marginally outer trapped surfaces, which are natural spacetime analogues of minimal surfaces, and which form the focus of our talk.

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