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BLACK HOLES, THERMODYNAMICS, AND INFORMATION LOSS

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A black hole is a "region of no escape" produced by the complete gravitational collapse of a body. Black holes occur in nature and are of considerable importance in astrophysics. Black holes are also extremely important in theoretical physics, as they provide major insights into the fundamental properties of quantum gravity. These insights arise mainly from a truly remarkable relationship between laws of black hole physics and ordinary thermodynamic laws---most significantly, black holes emit thermal radiation at a finite temperature as a result of quantum particle creation. This thermal emission should result in the complete "evaporation" of an isolated black hole within a finite time, and, in this process, a semiclassical analysis indicates that an initial pure state should evolve to a final mixed state, i.e., there should be "information loss." This talk will review the nature of black holes, their thermodynamic properties, and the information loss issue.

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