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The the Black Hole Information Paradox, and its resolution in string theory

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WISCONSIN

Some 40 years ago Hawking found a remarkable contradiction: if we accept the standard behavior of gravity in regions of low curvature, then the evolution of black holes will violate quantum mechanics. Resolving this paradox would require a basic change in our understanding of spacetime and/or quantum theory. In recent years the paradox has found an interesting resolution through string theory. While quantum gravity is normally expected to be important only at distances of order planck length, the situation changes when a large number N of particles are involved, as for instance in the situation where we make a large black hole. Then the length scale of quantum gravity effects grows with N , altering the black hole structure to a “fuzzball”; this effect resolves the paradox.