Relativity and Quantum Black Holes

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Abstract .

Black holes take the hitherto established laws of physics (governing both relativity and quantum mechanics) to the limit in many different respects of which we select two, the first due to Gödel and the second due to Hawking. In the context of classical general relativity, Gödel found an exotic space-time goemetry consistent with Einstein's relativity equations. In this model of Einstein's general relativity, the universe rotates so that spacetime can curve in ways that permits short cuts in spacetime allowing you to beat a light beam and journey back into the past. In Godel's (hypothetical) universe, rotation - unlike the (real) expanding universe - seems to allow time travel. Also the rotation phenemona takes place on a smaller scale in black holes. In the process of unification theories, Hawking imposes the uncertainty principle on the laws of general relativity. From this he concludes that black holes radiate light so that they are not too black after all. The above two examples, among many others not addressed herein, suggest that black holes should play a crucial role as far as unification theories are concerned. In our talk we discuss further the above ideas and other related concepts. Also we pose some questions.