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Hearts of Darkness: Theory and Phenomenology of quantum gravity regularised black holes

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Black holes are the purest expression of gravity and at the same time the places where our best theory of gravitation, Einstein General Relativity, meets its demise in the form of singularities. We know, however, that any successful theory of quantum gravity should be able to resolve these uncharted regions, but can it do so without showing any modification outside the event horizon? can real black holes be undistinguishable from the one predicted by general relativity? The recent direct observation of these tantalising objects represents an unprecedented possibility to answer these questions. In this talk, I shall explore on general grounds what alternative objects we can expect from a quantum gravity induced regularisation of singularities and discuss what observations can or might tell us about their nature.

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