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Universality and Scaling in Gravitational Collapse of Massless Scalar Fields in Loop Quantum Gravity

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Abstract:

In 1993, Choptuik solved numerically the Einstein equations coupled to a massless scalar field. He showed one could form black holes of arbitrarily small mass and that if one studied one parameter families of initial data, the final black hole mass scaled as a universal power law as a function of the parameter, irrespective of the details of the initial data. We will present a review of this topic and then discuss the challenges of constructing a quantum version of it. We will present a candidate semiclassical treatment in loop quantum gravity and show that the salient features found by Choptuik, in particular the absence of a minimum mass for black holes, persists, contrary to what some ad hoc previous studies had suggested.

Speaker's Bio:

Jorge Pullin has been the Horace Hearne Chair in Theoretical Physics at LSU since 2001.

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