Black Holes, Gravitational Waves and Space-Time Singularities

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Recent progress in classical string cosmology

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The equations of classical (i.e. tree-level) string cosmology in $(d + 1)$-dimensional spacetimes with d abelian isometries are well known to be invariant under an O(d,d;R) group of transformations acting on the metric, dilaton and antisymmetric-tensor fields. This symmetry has recently allowed for an all-order classification of higher-derivative (α') corrections by Hohm and Zwiebach. Using a hamiltonian reformulation of their work, I will specify generic conditions under which the solutions provide a regular bouncing cosmology (in contrast to the singular solutions of the lowest order equations) and discuss some of their most interesting properties. Time permitting, I will also mention an ongoing attempt to extend this framework to the collision of plane-symmetric gravi-dilatonic waves whose lowest-order equations are known, since the 70's, to lead inevitably to focussing singularities of the big-crunch type.

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