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Gravitational physics from quantum information constraints

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In this talk, I will review some of the remarkable connections between gravitational physics and the physics of entanglement in conformal field theories. I will describe how the structure of entanglement in a conformal field theory can be captured by the geometry of an asymptotically AdS spacetime, and how constraints on entanglement imply (at least to second order in perturbation theory around AdS) that this spacetime must satisfy Einstein's equations. Further quantum information-theoretic constraints suggest new results in classical gravity, including a family of positive energy theorems for gravitational subsystems.