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The Nature of Classical Singularities

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Almost 40 years ago, Penrose and Hawking proved that, for reasonable matter, some type of singular behavior would arise if gravitational fields were to become sufficiently strong. The nature of the singular behavior was not specified and examples exhibiting a wide variety of pathologies are known. Shortly thereafter, Belinskii, Lifshitz, and Khalatnikov (BKL) conjectured that singularities arising from generic gravitational collapse would be spacelike and local (in the sense that spatial derivatives would not be dynamically important so that each spatial point would evolve as a separate universe). The status of our knowledge about singularities in classical general relativity, both at a rigorous mathematical level and through numerical simulations, will be reviewed.