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The formation of primordial black hole dark matter

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There are strong theoretical arguments which suggest that primordial black holes (PBHs) may have formed from the collapse of large over-densities during the radiation dominated epoch shortly after the end of inflation. Because these black holes can form on much smaller scales than those visible from the CMB or large-scale structure, they have historically been used to place a unique constraint on the amplitude of the small-scale primordial power spectrum.

In addition to their use in constraining the early universe, PBHs also represent a viable dark matter candidate, and the conditions required for the formation of a large enough number of PBHs to constitute dark matter will be discussed. A particular focus will be on a new method using CDM isocurvature perturbations arising from non-Gaussianity in the primordial universe. Isocurvature perturbations produced in such a manner lead to extremely tight constraints on non-Gaussianity, and provides a powerful tool to distinguish between inflationary models which could lead to the formation of PBH dark matter.

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