Quantum cosmology

At laboratory scales, quantum gravity is unlikely to be important -- gravity is such a weak force that quantum corrections to general relativity will probably be too small to measure. (See "Planck units.") But there are a few places where quantum gravity is likely to be unavoidable. One of these is the extremely early Universe.

"Quantum cosmology" is the effort to use quantum gravity to predict some of the properties of the very early Universe -- its topology, for instance, and its initial distribution of matter and energy. This task is rather difficult, since we don't yet have a quantum theory of gravity. But there may be reasonable approximations that can be used to obtain partial information. Among the popular approaches are various saddle point approximations to the path integral (including approximations of the no boundary proposal) and "minisuperspace models," models in which all but a finite number of degrees of freedom of the gravitational field are "frozen out" and held fixed. The quantum geometry program has recently made some interesting progress in such minisuperspace cosmology -- see, for example this review by Bojowald.

Contributors

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