Theory of Gravity on the Planck Scale

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As was first suggested by Bombelli et al. [1] and Requardt [2], we assume the universe is built of discrete Planck units of space-time, averaging 10^{-34} cm on a side and 10^{-44} seconds in duration. We also assume that almost all such units are in a ground state with energy just greater than zero.

We assume further that the mass of a quark is confined to a single Planck unit. Thus this unit would possess energy far in excess of the ground state. As $[V]=[M]=[L^{-1}]$, the surrounding units will decrease in volume (of space and time) in an effort to equalize the energy density.

In order to minimize the overall distortion of space-time, masses would be drawn toward one another. As the distance r from a quark increases, the number of units affected increases as r^2, and the change in volume of each unit decreases as r^{-2}. In particular, two masses m_1 and m_2, a distance r apart would be drawn together by a force proportional to m_1m_2/r^2.

Thus, if our assumptions are valid, the gravitational effects of mass are exactly the same on the Planck- and macro-scales.

[1] J. Lee Bombelli, D. Meyer, and R. D. Sorkin, Phys. Rev. Lett. 59, 521 (1987).

[2] J. Requardt, Phys.A 31, 7997 (1998).