

Objections to Quantum Gravity Theories based on Causal Dynamical Triangulation

Dear Editor(s) of Physical Review Letters,

This memo is in regards to the recently published contribution by Ambjorn J. *et al.* “Planckian Birth of Quantum de Sitter Universe” PRL 100, 091304 (2008).

The article claims that “causal dynamical triangulation” enables a consistent regularization of quantum gravity. A “quantum universe” emerging from a non-perturbative sum over geometries is alleged to recover “with high accuracy a four-dimensional de Sitter space-time”. On closer examination, the approach is built on many objectionable premises. Specifically,

- 1) Quantitative models of space-time near the Planck scale, regardless of how intriguing and attractive they might be, are *non-testable*. One does not know if Quantum Field Theory (QFT) survives past the Cohen-Kaplan threshold of about 100 TeV, let alone what happens in close proximity to the Planck scale. The proposition that the linear size of the “quantum universe” is between 17 and 28 Planck lengths *cannot* be put to test.
- 2) Path Integral formalism and the Sum-over-Histories technique cease to be applicable in the deep TeV sector or beyond due to the likely onset of *non-local interactions* and *chaotic dynamics* of strongly coupled theories.
- 3) Appealing to cosmological models of space-time (such as the de Sitter model) to formulate or interpret dynamics near the Planck scale is an “ad-hoc” ansatz. There is simply no empirical evidence that supports linking the four dimensional manifold of General Relativity with physics on or below the sub-nuclear scale.

Likewise, there is no empirical evidence that the behavior of Newton's constant near the Planck scale can be extrapolated from its properties in classical gravity.

As a scientist working for many years in the field of nonlinear dynamics and complexity theory, I am appalled by the fact that the paper fails to acknowledge a well documented body of concepts and ideas developed in the last 20 years and known as fractal/ Cantorian space-time model. The main contributors to this model are El Naschie, Ord, Nottale, Marek-Crnjak, Goldfain, Tanaka, Iovane, Castro, He and others. There is by now a large volume of contributions and a number of conferences dedicated to this topic, see for instance Elsevier's "Chaos, Solitons and Fractals" and similar resources. The net effect of this regrettable omission is that the audience is given a false account on how scientific ideas take shape and evolve. In the interest of objectivity and fairness, I respectfully request a note of correction from your office or from the authors of the article. It will help setting the record straight and restore honesty in scientific reporting.

Sincerely,

Ervin Goldfain

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