The E/G conjecture: entanglement is gravity and gravity is entanglement

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Abstract:

We postulate the E/G conjecture for the real universe: entanglement is gravity and gravity is entanglement. In other words, entanglement creates gravity effects and gravity results from entanglement effects.

E/G conjecture is a factual duality in multi-fold universes. With its close match and recovery of other superstring-based conjectures, we argue that it plays at the minimum an equivalent role as mathematical model, or as model of the real universe.

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1. Introduction and Context

Strings, superstrings, supergravity and supersymmetry are mathematical framework. Therefore they are mathematically valid that they be physical or not. Just as AdS/CFT correspondences conjecture seems to mathematically work in many contexts (physical or mathematical). This is despite an unphysical model.

2. E/G conjecture and E/G duality

The same is true for the multi-fold model. It works in a multi-fold universe. But it is also a mathematical model. We do not know if it is physical or not, even if we wish and have hints that it may be physical.

It may explains why conjectures like holographic duality, AdS/CFT correspondences conjecture, ER=EPR conjecture, GR=QM conjecture (whatever that one really is) seems to fit so well aspects of the real world. See [4] for a list of relevant conjecture that we found relevant.

We believe that the same is true between the multi-fold universe and the real universe, in case multi-fold universes do not match the real universe

Therefore, we can propose a new key conjecture (factual in multi-fold universe and hints already by many aspects in the real universe): "**Entanglement is gravity and gravity is entanglement**" in the real universe. We propose to call this **the E/G conjecture**.

If multi-fold universes model the real universe, the conjecture becomes a fact: the **E/G (factual) duality**.

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3. Derivation

The E/G conjecture is based on and derived from the reasoning above, [1] and all the material in [2]:

- Multi-fold mechanisms between EPR entangled systems create attractive effective potential, or effective curvature in the region between the entangled systems [1]. It could be recovered also from the ER=EPR conjecture if the wormholes were traversable, which may possibly be the case.
  - There are exception for hierarchical entanglements [1] that match the ER=EPR requirements for associating ER to entangled systems (see[1,3]).
- Entanglements between virtual particle pairs emitted by a particle or energy source generate gravity-like attractive effective potential, or effective curvature in the region between the entangled systems [1]. It can be used to recover GR and more [5].
- [1,2] discuss many resulting effects that:
  - Could explain standard model issues
  - Could explain standard cosmological model issues and observations
- We also positioned the model with respect to superstrings, supersymmetry, and lots of their associated conjecture that are recovered, with variations. It can also explain some of aspects of these theories, by understanding their relations to the multi-fold models [1, 6 - 11, 3].
- On this basis, we believe that multi-fold are mathematical models consistent with these conventional models. Hence the E/G conjecture.

As compiled in [1], other works have previously argued such links between entanglement and gravity (e.g. [12-14]) ; but typically with fully explaining its physical origin, but rather showing hints or statistical argument in its favor. Confusion in these work also exist between entity entanglement or spacetime entanglement etc. Some derive hints of curvature of spacetime as a result. Other make gravity and MOND emerge from entanglement.

4. Conclusions

In the real universe, we propose the E/G conjecture that Entanglement is gravity and gravity is entanglement, meaning that Entanglement creates gravity effects and gravity results from entanglement effects.

In multi-fold universes, the conjecture is a factual duality: Entanglement generates gravity-like effects and gravity is the result of entanglement between virtual particles.

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