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Why is not so easy to change Quantum Mechanics and one of the only possible changes is GRW

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ABSTRACT
The Quantum Theory (QT) of abstract systems (qubits, fields, ?)has been recently derived from six axioms of pure information-theoretic nature. All these axioms have a strong epistemological connotation, and cannot be easily modified without reducing the practical experimental feasibility and epistemological power of the whole physics. On the other hand, as regards the ?Mechanics? of the theory, a possible way of deriving it is getting Quantum Field Theory (QFT) without assuming Special relativity as emergent from countable quantum system in interaction, under the requirements of homogeneity and isotropy of interactions, thus resorting to a Quantum Cellular Automata as a discrete version of QFT. Lorentz Covariance and QFT emerge in the relativistic regime, corresponding to the observed domain of wave vectors much smaller than the Planck?s one.

What about now GRW? On one side, one can see that it really doesn?t violate the principles of Quantum Theory of abstract systems. On the other hand, one may consider applying it to the QCA version of QFT at the Planck scale. The idea is to re-obtain the usual GRW as emergent at the non-relativistic limit. If this is possible, the bonus is to have as a byproduct hopefully a GRW for QFT and to conquer Lorentz-covariance in the relativistic domain.

In the first part of the talk, I will briefly illustrate the basic framework of an operational probabilistic theory (OPT) along with the six info-theoretical axioms for QT: 1) causality, 2) local discriminability, 3) perfect discriminability, 4) ideal compressibility, 5) purity of composition, 6) purification. All six principles can be motivated epistemologically, with the OPT as a general scientific approach, being its framework an extension of probability theory, which in turn is an extension of logic. The OPT adds the ?connectivity" to the probabilistic description, corresponding to linking events in input-output relations, in the building-up of a ?process? analysis.

In the second part of the talk I will briefly summarize the main results of the QCA framework for QFT, with special focus on the derivation of Dirac and Maxwell free QFT, the Double Special Relativity of Camelia-Smolin-Maguejo covariance in the ultra relativistic regime, and the recovery of Lorentz in the relativistic one, along with other interesting features, such as the bosonic nature of radiation as emergent from a fermionic one at the Planck scale.

I will end stimulating a brainstorm about implementing GRW in the above framework, and recovering the usual GRW as emergent.

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