Quantum Physics

On the "principle of the quantumness", the quantumness of Relativity, and the computational grand-unification

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(Submitted on 7 Jan 2010 (v1), last revised 9 Feb 2010 (this version, v6))

After reviewing recently suggested operational "principles of the quantumness", I address the problem on whether Quantum Theory (QT) and Special Relativity (SR) are unrelated theories, or instead, if the one implies the other. I show how SR can be indeed derived from causality of QT, within the computational paradigm "the universe is a huge quantum computer", reformulating QFT as a Quantum-Computational Field Theory (QCFT). In QCFT SR emerges from the fabric of the computational network, which also naturally embeds gauge invariance. In this scheme even the quantization rule and the Planck constant can in principle be derived as emergent from the underlying causal tapestry of space-time. In this way QT remains the only theory operating the huge computer of the universe. Is QCFT only a speculative tautology (theory as simulation of reality), or does it have a scientific value? The answer will come from Occam's razor, depending on the mathematical simplicity of QCFT. Here I will just start scratching the surface of QCFT, analyzing simple field theories, including Dirac's. The number of problems and unmotivated recipes that plague QFT strongly motivates us to undertake the QCFT project, since QCFT makes all such problems manifest, and forces a re-foundation of QFT.

Comments:	To be published on AIP Proceedings of Vaxjo conference. The ideas on Quantum-Circuit Field Theory are more recent. V4 Largely improved, with new interesting results and concepts. Dirac equation solved
Subjects:	**Quantum Physics (quant-ph)**; General Relativity and Quantum Cosmology (gr-qc); High Energy Physics - Theory (hep-th)
Cite as:	**arXiv:1001.1088v6** [quant-ph]

Submission history

From: Giacomo Mauro D'Ariano [view email]
[v1] Thu, 7 Jan 2010 15:21:51 GMT (51kb)
[v2] Thu, 14 Jan 2010 13:10:29 GMT (51kb)
[v3] Fri, 22 Jan 2010 13:19:05 GMT (51kb)
[v4] Sat, 23 Jan 2010 01:19:47 GMT (51kb)
[v5] Mon, 8 Feb 2010 17:38:19 GMT (49kb)
[v6] Tue, 9 Feb 2010 05:27:30 GMT (49kb)

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