# Comments on the experimental disproof of Multisimultaneity

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(Dated: December 23, 2001)

The recent Geneva experiment strikingly displays *lawlike reversibility* together with *quantum nonseparability*. As in any probabilistic physics *correlation* expresses *interaction*, and as Born's probability rules grafted upon de Broglie's wave mechanics turn the probability scheme into the code of an information transmitting telegraph, the Lorentz and CPT invariant transition amplitude reversibly carries a zigzagging causation.

Stefanov's et al. [1] valuable experiment exemplifies once again the counterintuitive phenomenology of non-separability inherent in the Born-Jordan wavelike probability calculus; it stems from the cross, interference, terms present in probability expressed as absolute-squared amplitude. Algebraic nonseparability entails geometric nonlocality; emphasis on its time aspect can be worded atemporality.

Lawlike reversibility versus factlike irreversibility [2] of cause, that is, elementary level law versus macroscopic fact, is crucial. The latter is mere jurisprudence ; to turn juris-prudence into law is a fatal mistake. Euler clarified mechanical law in terms of extremed action, and Bayes probabilistic law via reversal of conditionals.

Mechanical-and-probabilistic reversibility survives the Born-Jordan revolution ; it is expressed via the Hermitian reversibility $\langle\varphi|\psi\rangle = \langle\psi|\varphi\rangle^*$ of a transition amplitude. In an $(x, ct)$ picture the $\varphi \leftrightarrow \psi$ exchange renders PT reversal, and conjugation the C exchange; so Hermitian reversibility renders CPT reversibility.

Quantum transitions are between representations [3], which are not "realistic" but "Picasso style" due to complementarity. Prepared $\langle\varphi|$ and measured $|\psi\rangle$ (retropared says Hoekzema [4] representations are correlated by an N-uple transition amplitude pictured as a Feynman graph; turning upside down Stefanov's et alii wording I state: "Lorentz-and-CPT invariance plus topological invariance of a correlation amplitude are primary traits inherent in the reversible causality concept making no difference between cause and effect".

For example a photon transiting between two linear polarizers is neither in the prepared $\langle\varphi|$ nor in the measured $|\psi\rangle$ representation, but is reversibly transiting between them; a time extended interference exists between $\langle\varphi|$ and $|\psi\rangle$. The Geneva experiment [1] displays such a spacetime extended interferometry over a macroscopic interval.

The wavelike correlation between prepared (emitted, coded) and retropared (received, decoded) representations is reversibly carried as a signal via the network pictured as a Feynman's graph. A concise derivation of the EPRB correlation formula (direct, inverse, or space-time transposed) is thus possible [5].

Reciprocity of the twin faces, cognizance and organization, of information shows up in the reciprocal interventions of pre- and retro-paration; a questions-and-answers game between reality and representation is thus going on, where coding impresses organization and decoding expresses knowledge (reality precedes in decoding, realization follows in coding).

*Lawlike reversibility-but-factlike irreversibility* [2] is formalized as information-negentropy equivalence $N/I = k \log 2$, with $I$ expressed in bits and $N$ in "practical" thermal units (say clausius); *law is expressed by the finiteness, fact by the smallness of $k$*. $\mathcal{N}$ denoting Avogadro's number and $R$ the constant in the law of perfect gases $pv = RT$, one has $k = R/\mathcal{N}$ (incidentally one wonders why the classics did not set $R = 1$ by definition of temperature read on a perfect gas thermometer). Anyhow $k$ is very small "because $\mathcal{N}$ is very big"; so knowledge is extremely cheap and organization expensive; said otherwise : "cognizance is normal and psychokinesis [6, 7] paranormal". If $k$ were zero cognizance would be cost-free and free-will an illusion -a hypothesis that was implicit in the theory named "epiphenomenal consciousness". Interestingly, Born's wavelike probability scheme associates [8, 9] retarded or advanced causation with statistical pre- or retro-diction.

Postulating, as previously said, that probability together with information its alter ego are psycho-physical invalidates Jaynes [7] severance of "ontology and epistemology"; it identifies joint probability to reversible interaction. The quantum paradigm then likens the wavelike probability calculus to the code of an information transmitting telegraph.

I repeatedly said to Suarez that I could not buy his "multisimultaneity" hypothesis which, in his own [1] wording, is "conceptually foreign to both quantum mechanics and relativity". So, once again a definite quantum prediction looked so incredible that an ad hoc counter proposal was elaborated, tested, and refuted, which of course is highly significant [11].

Decoherence at reception (decoding, measurement) and the one imposed at emission (coding, preparation) is a calculation approximation yielding the specific "empirical reality" [10] selected by the experimental setup. A

more subtle essence thus thrown out is the one reversibly telegraphed between preparing and measuring physicists.

Paraphrasing the cosigners [1] I deem *quantum correlation to be a basic concept synonymous to back and forth telegraphed information* (knowledge-and-organization) that is, *to zigzagging causation.*

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