

The Collapse of Objectivity: Non-Locality is Quantum Emptiness

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“The essential fact of quantum mechanics is entanglement” (Leonard Susskind). It was this “lucid mysticism” (Pauli) of QFT with its holistic quantum entanglement—Einstein’s “spooky action at a distance”—that begat the catastrophic violation of the essentialist scientific realist *principle of locality*: no signal or information between “space-like separated” particles can exceed Einstein’s light speed limit; yet superluminal speed seems required for one entangled particle in a two part quantum system to instantly “know” the spin state of the other particle, even when separated by many light years. Enter, the “spooky” antirealist *principle of nonlocality*.

At this inherently vexed nonlocal substrate, the zero point energy field vacuum ground state (ZPE), subject and object merge. There are no “substantial” points/objects, but rather a continuous Heraclitean flux of structural *relations*. Cosmos is process, not things. Things are but Hume’s inferred “bundles of properties”, mass, charge, spin. ZPE pervades the quantum continuum hence wave/particle *processes* are embedded in and subsumed by this whole. Only the whole has properties. Particles are conceptual confabulations, not objective realities. Atomistic ontology breaks down. *Relationship* is all there is. Indeed, for *habitués* of this fuzzy quantum realm, an “affrighted and confounded” (Hume) collapse of objective reality, of a RWOT.

The “unfolding explicate order” of wave-particle parts is for David Bohm (1980) always “enfolded” in his “implicate order” of the great holographic “holomovement” continuum, the “vast unbroken whole” itself. For Bohm it is misleading to speak of observer-independent separate “parts”. He prefers the untidy epithet “relatively independent subtotalities”. Here, QFT fields are not real objective *things*, but

subjective *relations*. Bohm's "implicate order of the whole" helps us to understand the intrinsic connectedness of our above two entangled particles, without exceeding Einstein's light speed limit. How? Separate relativistic particles are *ultimately* embedded in the whole. As are we. Might such Realism obsequies be premature?

Bohm and his mentor Einstein were "hidden variables" realists. Both believed quantum theory incomplete; but Bohm retained non-locality. We need undiscovered hidden variables to explain all this. Hidden variables theory is now refuted. Physical spacetime locality has been tested many times and found wanting. The definitive work consists of John Bell's "inequalities" (1965); then Alain Aspect's proof of Bell's inequalities (1982). All have demonstrated the truth of non-locality. Ronald Hanson (2015 arXiv.org) has finally closed the "locality loophole".

Einstein's 1905 SRT opposed Newton's substance view of spacetime, the *physical* foundational ground of appearing reality. Einstein inveighed for a non-substantial, relational, atemporal spacetime. Yet his inner realist 1916 GRT curved spacetime geometry (*Tij*) seems to commit him to a substance view. And he rejected quantum non-locality to the very end. The bad news for any local realist ontology? *Quantum entanglement/nonlocality means the end of our beloved metaphysics of foundational, local, objective Scientific Realism*. Must 2400 years of Platonic Realism—a physical, observer/model-independent separate RWOT—now be relegated to the ontological trash bin of history? It seems so. Objectivity, causality, even spacetime are *kaput!*

This quantum quandary—quantum emptiness—has shaken the very foundations of classical deductive logic, to wit, Aristotle's Law of Excluded Middle: "either A or not-A"; for any proposition, *either* that proposition is true, *or* its negation is true. Upon this logical bedrock we base our objective atomistic treatment of elementary particle discreteness, countability and physical identity. Scientific Realism, with "common sense

realism” (Russell’s “metaphysics of the stone age”) are no longer tenable. *Either* spacetime reality exists; *orit* does not. If quantum non-locality obtains, then spacetime reality does not. Could be bad for the economy.

Perhaps then, we should dump this learned bivalent Western logical canon for a contradiction-tolerant trivalent (3VL) deductive logic that accesses the subtle precision and depth of the contemplative *Dzogchen* “logic of the non-conceptual” (Kline 2006). Indeed, there’s a lot of reality between true and false. Such multi-valued paraconsistent logics, including Indian *Nyaya* with its five axioms, surpass Aristotle’s “Three Laws of Thought”. Further, the Logical Intuitionism of Brouwer denies altogether the validity of excluded middle. In any case, there are more things in heaven and earth than are dreamt of in our course objectivist philosophies.