A Primitive Ontology for Quantum Spacetime

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A note concerning methodology

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- Let's see how this works.

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- It is then legitimate to search for a theory that coherently merges these features.

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- Possible way out: Adopt a primitive ontology approach.

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- Note how these two tasks mutually "interact".

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- What about the ontological status of Ψ?

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- A driving force behind this attitude is the search for *ontological parsimony*.
- OK, but how can these particles be characterized & individuated?

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- Spatial relations are world-building in that they provide for spatial extension.
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- This suffices to characterize & individuate the N particles in a configuration in an ontic structural realist fashion.

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- This is in line with Leibniz' idea of time as a mere abstraction from change.

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- We can call them *self-subsisting* structures.

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- At each dynamical stage, a concrete and definite configuration of particles is instantiated.
- Can this approach be fruitfully applied to quantum spacetime?

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- We just have to work hard to make the necessary adjustments.

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- Let's see how the metaphysical part of the story works in some general cases.

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- A similar reasoning applies to the case of a discrete spatial ontology.
- Now the supervenience/reduction story should include coarse-graining.
- Less favorable (but most interesting) case: non-spatiotemporal ontology.

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- Possible solution: entanglement.

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- Both compositional and functional strategies would heavily rely on pre-existing spatiotemporal notions.

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- It is called *structural equations modeling* framework.

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- Hence the above set of equations expresses counterfactuals of the form: "If it were the case that X=a, then it would be the case that Y = f(a)".

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- (3) models the dependence of fact E on fact C given $\mathcal{P}$.
- If we set $C = 0$ then $E = 0$.
- This models the counterfactual "If the stone weren't thrown, the window wouldn't have shattered".

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- (4) is the same as (3).
- The only thing that differs is $\mathcal{P}$.

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- More work has to be done.

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- This theory trades the refoliation invariance of general relativity with local conformal invariance.
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- Such a dynamical ordering structure is exactly what a primitive ontology theory needs.

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- However, here we have come up with something very different from the original ideas.
- BSA is good for ontological parsimony, but it faces serious challenges in the quantum gravity arena.
- Be it as it may, it is clear how metaphysics can help in the development of new physical theories.