

## IS SPACETIME AN EMERGENT ENTITY?

As it seems during the last decade or so, the claim about the emergent character of the three dimensional space as we perceive it, as well as of spacetime from the general theory of relativity, is permanently getting support in the camp of physicists suggesting models of quantum gravitation.

But what is it for spacetime to be emergent, and not a fundamental entity? One clear answer is that spacetime does not merely exist by itself, because it is emergent from something else – from some non-spatiotemporal reality. This conceptual position is usually called an eliminativist view. It is, however, a too radical ontological view. It could be supported by quantum physicists, but is reluctantly accepted by philosophers. The latter assertion holds true not for the reason that philosophers cherish a conservative love for spacetime, but because when denying the ontological status of spacetime one meets two conceptual difficulties.

The first one requires an explanation about our false experience not only about a flowing time that has been already accepted by a lot of philosophers and scientists to be mind-dependent, but about our false experience of space as well.

The second difficulty refers to the standard experimental tests and empirical predictions of physical theories being accomplished always at definite places and intervals of space and time. But quantum gravity theoretical schemes could not be tested in this way, and this raises a problem about their empirical confirmation.

There is another emergentist view known usually under the name “derivative spacetime view”. It states that although spacetime exists, it does not exist fundamentally. Thus two modes of existence are presupposed: one derivatively fundamental – that of spacetime and another fundamental – that of a non-spatiotemporal quantum basis. The derivative spacetime view has two philosophical versions. The one is epistemological (or inter-theoretic), i.e. it is

trying to show how spacetime in general relativity is derived from a more fundamental theory of quantum gravity. The other version of the derivative spacetime view is ontological. It pretends to show how spacetime structure is metaphysically related to the more fundamental quantum structure, or how spacetime qualities emerge from other kind of entities. A paradigmatic approach in this respect is the functionalist one that argues that spacetime is exactly what plays the role of spacetime in the framework of a quantum gravitational model.

My claim is that there is an alternative to the general and yet not commonly accepted view about the specific way in which spacetime emergence is being realized. According to this alternative view there is no need to attract any conceptual mechanism of spacetime emergence. My argument to this effect is based on the idea that spacetime is a fundamental entity by itself.

The following example is a pertinent one. Let us have in mind a definite volume of gas, e.g. ordinary air. Shall we say that the air – as a global thermodynamic entity – is emergent out of its constituent molecules, in spite of the fact that its basic thermodynamic features like temperature and pressure are *derivable* from a theory referring to a lower level of structural description? No, we shall hardly do so. We shall argue that the volume of air is one self-identical entity, notwithstanding that its constituents at a micro-level and its global features are described by two different theories. Well, I contend that we confront with a similar situation concerning spacetime. Its “deep structure” together with its geometrical qualities constitutes one and the same entity.

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