

Review of: "The structured vacuum theory"

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Potential competing interests: No potential competing interests to declare.

I have read the manuscript, but I need help finding out how general relativity and electromagnetism basic equations are to be deduced from the proposed Lagrangian density. The important issues of dark matter and energy still need to be addressed.

Many attempts have failed to construct physical theories explaining EXPERIMENTAL data, including gravity, electromagnetism, and quantum phenomena. A microscopic theory of general gravity is still not possible till now. Proposing a new universe theory is challenging since it must explain ALL experimental data concerning gravity, elementary particles, and quantum phenomena, among others, and contain ALL successful existing physical theories as particular cases. It must show how to obtain from it Einstein's equations and the basic equations of the quantum world. Further, to talk about a superfluid, it is indispensable to define properly its basic physical equations and its connection with experimental observations.

Models of vacuum as a superfluid have existed for a long time but have yet to be mentioned in this lengthy work; see some indispensable references below. The very idea of the existence of an Ether with physical, measurable properties is also an old one but should have been mentioned.

Critical experimental unexplained phenomena which are not mentioned nor explained, nor mentioned include:

- 1) Velocity of galaxies in clusters.
- 2) Galactic rotation curves.
- 3) Gravitational lensing.
- 4) Cosmic microwave background particular spectrum.
- 5) Large-scale structure formation of matter, filaments, and voids.

There is only an elementary description of classical kinetic energy for point particles and potential energy, no interactions, no (quantum) field theory, no EM fields, and no strong interactions. Proposed twisted helical streams not deduced, no relations, just pictorial descriptions. No microscopic theory of superfluidity, no particle pairing, no Bose-Einstein condensates.

Since, as the author affirms, this is an initial stage of a more extensive theory, I recommend including a comparison of the results from this proposal with some contained in the vast literature. A far more explicit Lagrangian should be given to make clear how general gravity and electromagnetism are included and why this is a (quantum?) superfluid model. Most important for this ambitious theory would be to consider some thoughts about open problems.

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7) Konstantin G. Zloshchastiev, An Alternative to Dark Matter and Dark Energy: Scale-Dependent Gravity in Superfluid Vacuum Theory. *Universe* 2020, 6(10), 180; <https://doi.org/10.3390/universe6100180>

8) See also https://en.wikipedia.org/wiki/Superfluid_vacuum_theory