

Review of: "Quaternion Quantum Mechanics: Unraveling the Mysteries of Gravity and Quantum Mechanics within the Planck-Kleinert Crystal"

Alexander Unzicker

Potential competing interests: No potential competing interests to declare.

The article makes a couple of important points outside of current mainstream approaches:

1. QM is still not understood, despite long-lasting “consensus”.
2. There is no fundamental reason for the use of the complex unit i ; rather, it is likely that quaternions play a more fundamental role for describing spacetime, as suggested by William Rowan Hamilton.
3. Defects in elastic continua, describes by quaternions, are a more intuitive model for particles than the common picture. The aether, in this context, may be a very useful concept.

While the authors back their arguments with compelling arguments, I see only a few shortcomings:

1. The idea of a defected solid goes not back to Kleinert, but to Eckehart Kröner (Continuum Theory of Defects, R. Balian et al., eds. Les Houches, Session XXXV, 1980, p.222; Kontinuumstheorie der Versetzungen und Eigenspannungen, 1959 (German))
2. As far as I can see, the treatment in section 2 is still linear, while nonlinear concepts, such as going beyond the displacement vector u , may be required (see, e.g. Unzicker <https://onlinelibrary.wiley.com/doi/10.1002/zamm.202100280>)
3. Regarding the refractive index description of gravity, there is much more literature, known also as variable speed of light, beginning with Einstein, Annalen der Physik 35 (1911), p. 905, R. Dicke, Review of Modern Physics 29 (1957), p. 363-376; H. Dehnen et al., Ann. Phys. 461(1960), pp.370-406; K. Krogh, ArXiv.org/abs/astro-ph/991032; Unzicker, Ann. Phys. (Berlin) 18 (1), 57-70 (2009)
4. The Planck length, in my view, is not fundamental and should better be analysed in light of Dirac's large number hypotheses.
5. I disagree with the statement “The gravitational constant has been computed”. The same holds for Planck's constant h . More on the problem of constants in Unzicker, Physics Essays 34 (2021), 372-284.