Review of: "Zeno and Einstein"

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Potential competing interests: No potential competing interests to declare.

I am very grateful for the invitation from the Qeios website to review the article. I also thank the author, Ted Trace, for the article on Zeno's paradoxes.

The author connects Zeno's paradoxes and Relativity in an interesting way. The contrast between “continuous time” and “a set of instants of zero duration” reminds me of Peter Lynds' article, “Zeno’s Paradoxes: A Timely Solution” (https://www.researchgate.net/publication/36443985_Zeno's_Paradoxes_A_Timely_Solution). I believe you and he were inspired by Bergson. However, only you connected Zeno's paradoxes and the relativity of simultaneity.

Although I really liked the article, I have some objections to the work.

1) The relativity of simultaneity and time dilation are both consequences of Lorentz transformations. Thus, the rejection of the relativity of simultaneity implies that the Lorentz transformations are wrong. If the Lorentz transformations are wrong, we will not justify time dilation. Furthermore, Lorentz transformations are derived from the postulates of Special Relativity. Consequently, Special Relativity itself is wrong. Thus, I concluded that the author contests Relativity itself, not only the relativity of simultaneity.

2) The statement “no definitive order can be attributed to events” is not true in a general situation in Special Relativity. We will not attribute order to events in all frames of reference if there is no causal relationship. However, when there is the possibility of a causal relationship, the order of events does not depend on the frame of reference, although the moments themselves are relative. For example, a child cannot be born before its mother, although the timing of both births depends on the frame of reference. For example, a child cannot be born before its mother in any frame of reference, although the timing of both births is relative. The possibility of causality is quantitative. Two events can affect each other only if the spatial distance between them by temporal distance is less than the light speed.

3) The Schrodinger equation is invariant under a Galilean transformation because it is compatible with Classical Mechanics. Thus, in the context of non-relativistic Quantum Mechanics, time must be absolute. A discussion of the relationship between the relativity of simultaneity and the collapse of the wave function requires Relativistic Quantum Mechanics. I don’t master Relativistic Quantum Mechanics, but I recommend the introductory text: “A Quantum Threat to Special Relativity” by DAVID Z ALBERT & RIVKA GALCHEN (https://www.scientificamerican.com/article/a-quantum-threat-to-special-relativity-extreme-physics-special/).

I encourage you to explore in a future article Lockwood's thought experiment, where two “mirrors are connected to a mechanism that triggers a jack-in-the-box but only if the mirrors light up simultaneously”. If this thought experiment implies that simultaneity is absolute, you will find a refutation in the Theory of Relativity itself. Furthermore, I recommend that you explore the relativity of simultaneity in the context of Relativistic Quantum Mechanics

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Personally, I see no problems with the mathematical solution to Zeno's paradoxes. However, I also think that reflecting on the nature of time is always productive.

Best regards,

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