

Review of: "Zeno and Einstein"

Stephen E. Robbins

Potential competing interests: No potential competing interests to declare.

There is much insight, and much that I agree with in this article by Ted Dace, and the fact that someone is willing to take on this subject of Special Relativity (henceforth, SR), a realm which, in my experience, is defended heavily by adherents whose defensive enthusiasm often obscures clear reading of an argument, earns my appreciation. However, there's some inconsistency in the argument that weakens the clarity of its impact.

The Problem in Physics

Let me start with this statement in his conclusions: "By promoting the relativity of simultaneity, Einstein not only denied the objectivity of the present moment – a brute fact verified literally every moment of our lives – but contradicted the evidence for time dilation, the chief experimental confirmation of his own theory."

The problem here is that in SR, the relativity of simultaneity is absolutely intrinsic to its structure, inextricably woven in, and without it, there is no SR. With no SR, there is nothing to relate the evidence for time-dilation to, there is nothing to "confirm," it has no "confirmations." So, while Dace is inescapably implying that SR is cooked as a theory, done, yet the entire article proceeds under the assumption that SR somehow still exists and is still operative in physics. But this cannot be, and with SR's demise, the supposed "explanation" of Michelson-Morley is gone, and with this even the question of the existence of the ether may still remain. In other words, this is not only a problem of the nature of time and indivisibility of motion, as Dace sees, but it is equally a very real problem simply in the realm of physics – one that should be addressed, clearly, explicitly.

Put this in terms of physical theory – the level of physics – and that only. Why intrinsic? Einstein had embedded the Lorentz transformations within a reciprocal system wherein any observer (or reference system, this terminology really being irrelevant despite the view of a reviewer here) can declare himself (yes, or itself) at rest, all others in motion with respect to him (yes, or to "it"). As such, any effects explained by SR can only be measurement effects (for this terminology re SR, see (French, 1968), p. 114) – NOT ontological, real, physical effects. What is a "measurement" effect? I measure a toaster with two rulers which happen to be just as long as the toaster, each then exactly the same physical length, but one ruler is marked as 9" long, the other is marked as 12" long. So, depending on the ruler, is the toaster actually, physically expanding from 9" to 12", or contracting? Obviously this is only a measurement effect – an effect of the (crazy) rulers. In SR, the rulers are light rays and clocks, synchronized clocks (simultaneous with each other) or unsynchronized (not simultaneous) depending, respectively, on whether the reference system/observer is taken to be at rest or in motion. The effects in SR therefore can only be measurement effects. And this was precisely the explanation used - via SR - for Michelson-Morley, i.e., the length contraction of the apparatus arm parallel to the ether, a contraction taken as needed to

explain the lack of an interference pattern, was considered a measurement effect, not (as Lorentz had actually proposed with dynamical arguments along with his equations) a physical, ontological contraction.

Enter Langevin and the twin paradox, where the earth-based twin is now aging more than the rocket twin – with grey beard, wrinkles, arthritis as opposed to youthful skin – a very physical, real – an ontological effect. Firstly, as Dace notes, reciprocity itself would say, no, the rocket-twin can state he/she is at rest, the earth-twin in motion and the “effect” changes places. But correlatedly, Langevin is claiming then that SR can explain real, ontological effects. But the Lorentz equations in Einstein’s system are *compensatory*: time units expand as space units contract; the effects must be of *thesame order*, that is, the effects – both of time and of length – can only be measurement effects, else Michelson-Morley’s measurement effect explanation is destroyed. Lorentz had destroyed (and still destroys to this day given the ubiquitous consensus of physics) the logical, consistent structure of SR. If physics is to explain very real, ontological effects like slowing clocks (Hafele-Keating) or longer-living muons as a function of velocity, it needs a new theory, a different theory to explain these, maybe even one based in the ether, maybe something like Lorentz proposed. SR – structured only to explain measurement effects, is being misused, being employed invalidly in explaining these very real, physical effects, and all the clock slowings and muons living longer can have nothing to do with, cannot be construed as, “confirmations” of SR. Again, a new theory for these effects is needed (effects whose reality no one is denying – the “you are denying these real, proven effects exist, like clock-slowings” being a common, knee-jerk accusation of the SR defender).

Dace, however, assigns the twin’s slower aging, thus the clock slowings as well, to accelerations, and then to the General Theory (GR), arguing that GR is the proper place to house the explanation. This itself is questionable, and whether GR is the “some other theory” needed for these effects, very questionable, but certainly, at minimum, it leaves SR’s status as a theory in physics even more undermined, for the “chief experimental confirmations of his own theory” that Dace says Einstein is denying via his insistence on the relativity of simultaneity are not confirmations of SR at all (which, given its structure, they could not have been in the first place) but of some supposed mechanism in GR.

The assignment of the age retardation effect to acceleration as the source of some absolute force on the body (deemed the implication of GR) is itself questionable. (It would imply the Hafele-Keating clock-slowing relies entirely on the initial acceleration of the jet, the rest of the round-the-globe trip being irrelevant). It is questionable simply at the level of physics, as Bergson noted. Velocity is the rate of change of position, thus intrinsically relative. Acceleration is the rate of change of the rate of change of position. Equally relative. Force, as in $f = ma$, tied to acceleration, then equally relative as well. How does acceleration, simply the second derivative as opposed to the first, become so privileged? Further, as Bergson noted, if we cannot generalize the Lorentz equations to accelerations, calculus is useless. (See Wang (Wang, 2003) for this derivation). Given the generalized Lorentz, the accelerations of the rocket, as opposed to its uniform velocity, have no differential effect whatsoever.

Einstein himself, in 1905 (Einstein, 1905/1923. p. 48), is completely inconsistent on all of this, noting the “peculiar consequence” that were there two synchronous, separated clocks A and B in the stationary system, and if A is moved to B with velocity v in time t , it will lag behind B by $\frac{1}{2} tv^2/c^2$. Note, this movement is within the same reference system, and he is voiding his entire structure of reciprocal observers/reference systems in relative motion in which these effects were

initially described as occurring by his paper, assigning this effect, not to acceleration, not to relative motions, but simply to moving a clock with a velocity, v . What and where exactly would this theory be (other than Lorentz) for the effects of velocity on a body?

Again, as stated above, thus far, this is entirely a problem of physics (see also Robbins, 2010, 2014). This (the several paragraphs above) was the essence of the argument and issue that Bergson was having with Einstein (cf. Gunter, 1969, pp. 135-190) and expressed ultimately in *Duration and Simultaneity* (1922/1923) – an argument about physics, about an invalid use of a physical theory, about a mangling (via Langevin, with Einstein agreeing) of the logic of a theory, and yes, but secondarily, an issue that could have (and did have) profoundly bad results for our understanding of time. In the end, let's note, we have a theory, SR, which contrary to standard perception, possesses zero “stunning confirmations” (as Canales terms these in *The Philosopher and the Physicist*) standing for the explanation of Michelson-Morley and the demise of the ether.

Simultaneous Causal Flows

If I have made it at least initially clear why the problem at the level of physics itself must be kept very clear, let's bring in where Dace is entirely correct on time and simultaneity, though even here, at one level, it will still just be simple physics. So, Bergson, in *Duration and Simultaneity*, discussed the significance of what I term “simultaneous causal flows,” for example a river flowing by, geese flying overhead, rowboats going down the river. The significance is this: these flows cannot be relativized. An example I like (Robbins, 2023a) is the organic growth and unfolding of a rose. Make it a very large rose, starting from a few inches wide to ultimately being 10 feet across, where two petals at opposite sides strike a point on each side (separated by 10 feet) simultaneously, simultaneously that is to an observer who believes himself stationary. A physicist flying by, but who declares *himself* stationary, the rose with its observer in motion, says, “not simultaneous.” But this organic pattern of growth cannot be relativized, not without easily compared/verified distortion of the organic growth pattern of the rose. Further, we could have had the two petals hit switches that set off a bell which only rings when the impulses received are simultaneous. One cannot make the ringing of the bell “go away” because our physicist in relative motion says “non-simultaneous.”

All this is precisely the same argument that Dace gives in his points on “the frame independent present,” and with his scenario of the “jack-in-the-box” inside the moving train which jumps up – an effect that cannot be made to “just go away” by an observer claiming non-simultaneity. These are simultaneous causal flows that cannot be relativized, from players in a symphony (the bass on one side, the tympany in time with the bass on the other side) to “players” (atoms) in a large group, tuned as a symphony to emit overtones as attosecond-scale laser waves. In other words, Einstein's relativity of simultaneity could be so easily dis-confirmed at the level of simple experiments in physics, well, one shakes ones head.

Bergson noted, on this subject, that the theorists of relativity “never speak of anything but the ‘instant’”. This is to say, they are viewing, abstractly, an instantaneous cross-section of a simultaneous causal flow via their abstraction of time as series of discrete seconds – exactly Dace's point (of many good ones on this topic) on their abstraction re time. Even Einstein's instantaneous lightning bolts would in actuality be part of a simultaneous causal flow, a vast, roiling storm system, a system whose “components” cannot be relativized.

Two Other (not as pertinent) Points

Ted often invokes the notion of “quantum jumps,” and though I understand and appreciate the point and the context in which he is using this, IMO, this notion is dead. This then includes the quantum “collapse.” Schrodinger, in 1952 (an article referenced by Dace), devastated this notion with powerful arguments, seeing the probability collapse concept as a distortion, introduced by Born, of wave mechanics (see Robbins, 2021, 2023b). This included his critique of the “photon” explanation of the photoelectric effect – the other part – with SR – of Einstein’s purported dual-whammy against the ether. The physics Nobel Prize of 2023 (see Quanta (2023)) is for attosecond-scale laser technology that has supported experiments (as early as 2010) that reveal atomic-goings on in what formerly would have been considered “instantaneous jumps.” And attoseconds (like the former femtosecond limit) is just a temporary stop into tinier slices of time, with the last stop – the admission of indivisibility. To my knowledge, physics has yet to begin to come to grips with the full implications of this vindication of Schrodinger.

The General Theory as explanation for these effects: The problem starts with Newton’s own assessment of his gravitational equation, $F=G(m_1m_2)/r^2$, namely, “Hypotheses non fingo” (I feign no hypotheses). That is, he saw this as a *description* (mathematical), not a physical explanation of why two bowling balls attract one another. This continued with Euler-Lagrange (incorporating Newton’s equation), now *describing* the path of motion the bowling ball takes when thrown through a gravitational field. On this too, Newton would repeat his statement. Then, as Sean Carroll has discussed (Carroll, 2022; Robbins, 2023c), Einstein in effect took Euler-Lagrange and geometrized it. Newton, unimpressed, would still say, “Hypotheses non fingo.” This is to say, this (GR) is a mathematical structure, a description, with no more explanatory power than, as Dace noted, the pure mathematical structure comprising SR for explaining time-retardations.

Bergson, H. (1922/1923) *Duration and Simultaneity*. New York: Bobs-Merrill.

Carroll, S. (2022). *The Biggest Ideas in the Universe: Space, Time and Motion* New York: Penguin Random House.

Einstein, A. (1905/1923). On the electrodynamics of moving bodies. In H. A. Lorentz, A. Einstein, H. Minkowski, H. Weyl. *The Principle of Relativity*. New York: Dodd Mead.

French, A. P. (1968). *Special Relativity*. New York: Norton.

Gunter, P. A. Y. (1969). *Bergson and the Evolution of Physics*. University of Tennessee Press

Quanta (2023). Physicists who explored tiny glimpses of time win the Nobel Prize, <https://www.quantamagazine.org/physicists-who-explored-tiny-glimpses-of-time-win-nobel-prize-20231003/>, Oct., 2023.

Robbins, S. E. (2010). Special relativity and perception: The singular time of psychology and physics. *Journal of Consciousness Exploration and Research*, 1, 500-531.

Robbins, S. E. (2014). *The Mists of Special Relativity: Time, Consciousness, and a Deep Illusion in Physics* Atlanta: CreateSpace.

Robbins, S. E. (2021). Bergson's holographic theory – 60 – Quantum Jumps – Not, <https://www.youtube.com/watch?v=xvWmvCmiHDc&t=1850s>

Robbins, S. E. (2023a). "Gibson and time: The temporal framework of direct perception," *Ecological Psychology*, 35(1), 31-50.

Robbins, S. E. (2023b). Bergson's holographic theory – 83 – Physics Nobel 2023, <https://www.youtube.com/watch?v=CUWzrqS39Ac>

Robbins, S. E. (2023c). Bergson's holographic theory – 79 – The Gravity of General Relativity, <https://www.youtube.com/watch?v=xJlw4-3jyQA&t=3s>

Schrödinger, E. (1952a). Are there quantum jumps? Part I, *The British Journal for the Philosophy of Science*, 3(10), 109-123.

Schrödinger, E. (1952b) Are there quantum jumps? Part II, *The British Journal for the Philosophy of Science*, 3(11), 233-242.

Wang, L. (2003). Space and time of non-inertial systems. Proceedings of SSGRR 2003, L'Aquila, Italy