the general science journal
January 2023

A Thought Experiment on Absolute Motion

Links to other related works

Antonio Leon
Retired Professor. Independent researcher in the foundametals of science.
Author web page at amazon

Abstract. This short article gives some formal and physical reasons why it would be convenient to reconsider the possibility of Newtonian absolute motion.

Keywords: actual infinity, spacetime continuum, relative motion, absolute motion, discrete space.

1 Physics and mathematics

As is well known, motion is always relative in contemporary physics. Absolute motion is anathema, as are absolute space and absolute time, which, moreover, are unreal, mere illusions for most contemporary physicists. The only real things seem to be mathematical equations. This has been the case since Minkowski-Einstein introduced tensor calculus in general relativity [9]. It could be said that since then infinitist mathematics has ceased to be an instrument for physics to become its incontrovertible guide. The problem is that infinitist mathematics could be inconsistent (see [3, online link]), however empirically confirmed its most formally related theories, the theories of relativity, may be.

According to Einstein, the theory of special relativity (SR) is a kinematic modification to correct the discrepancies between Newtonian mechanics and Maxwell's electromagnetism [1, p. 891-2],[2, p. 44] [8, p. 90]. It is then questionable the claim that electromagnetic phenomena can be used (as is invariably done) as empirical tests of SR. To do so could be to use reason in a circular sense. The only unquestionable proofs of SR should be kinematic proofs, just because SR only introduces kinematic novelties to make kinematics compatible with electromagnetism. In addition, those proofs must be (but never are) universal, symmetric and acausal [5]. On the other hand, inertial spacetime deformations could be only apparent, like refractive deformations; or be caused by the discrete nature of space and time when, on the contrary, they are considered infinitist continuums.

On the other hand, space can expand, deform, vibrate and be the transmitting medium of its own vibrations (gravitational waves). And one wonders how could something that does not exist expand, deform, vibrate and transmit its own vibrations? It may be a mathematical way of explaining reality, but from a physical point of view it is quite bleak. Absorbed in its new (infinitist) mathematical scenario, physics has forgotten to further explore its physical foundations in physical terms. Thus, it has not occurred to anyone to explicitly express the existence of a kinematic property of all physical objects: *preinertia*. A property by which all physical objects, including photons, inherit *in vector terms* (!) the relative velocity vector of the reference frame in which they are set in motion.

Preinertia (which has enormous empirical evidence) makes it (practically) impossible to detect absolute motion [4, online link], and could be another way to settle the Newton-Maxwell conflict. Indeed, the fact that absolute motion cannot be detected does not mean that it does not exist. The third section of this article includes a purely logical (not mathematical) argument that points toward its necessary existence if the universe is, as everything seems to indicate, logically consistent.

2 The actual infinity

In the series of articles "Towards a Discrete Cosmology" [6, online link] it is shown that if space and time were of a discrete and finite nature then there would exist indivisible units of space and time, which would also have to be real, as real as the atoms of ordinary matter. Under such conditions, motion through these physical units would be absolute. On the other hand, if the actual infinite were inconsistent so would be the spacetime continuum, and space and time would have to be discrete, discontinuous.

For these reasons, physicists should be interested in the analysis of the formal consistency of the actual infinite: the consequences of its more than possible inconsistency (see a short formal proof of that inconsistency in [7, online link]) would be devastating for most theoretical aspects of contemporary physics, including the nature of space, time and motion. The brief (and simple) argument that follows, in which all involved infinities are denumerable, is an invitation to begin that analysis:

> Let A and B be two identical boxes. The first contains an infinite number of identical balls; the second is empty. Let $\langle t_i \rangle$ be a convergent infinite sequence of instants t_1, t_2, t_3,... in the finite time interval (t_a, t_b), t_b being the limit of the sequence. Consider now the following infinite sequence $\langle a_i \rangle$ of tasks (a supertask): at each successive instant t_i of $\langle t_i \rangle$ perform the task a_i of $\langle a_i \rangle$, which consists in moving one ball from A to B if, and only if, the number of balls in B remains finite after adding the ball. In addition, each time a ball is added to B a digital display D shows the number of balls in B.
>
> At t_b, the first instant after ALL instants of $\langle t_i \rangle$, the supertask $\langle a_i \rangle$ has been COMPLETED. But B, that can only contain a finite number of balls, cannot contain a finite number of balls. Indeed, let n be any element of the set $\mathbb{N}$ of natural numbers. B cannot contain n balls because n, a_n and t_n have a finite immediate successor (Axiom of the Successor): respectively $n+1$, a_{n+1}, and t_{n+1}. Consequently, at instant t_{n+1} the (n+1)-th ball had to be added. Therefore, the number of balls in B at t_b cannot be $n, \forall n \in \mathbb{N}$.
>
> So, assuming the set of natural numbers in their natural order of precedence exists as a complete totality without a last element, implies on the one hand the completion at t_b of the supertask $\langle a_i \rangle$, and on the other that the set of the natural numbers that could be the number of balls in B and displayed on D once the supertask $\langle a_i \rangle$ has been completed, *is the empty set*. The conclusion of the argument is not the uncertainty about the number of balls in B at t_b, it is the certainty that no natural number can be that number because, as just proved, the number of balls in B at t_b cannot be $n, \forall n \in \mathbb{N}$. A consequence of assuming that the incompletable can be completed.

The existence of ordered sets as complete totalities without a last element, is the great fallacy of contemporary infinitism (see a short proof in [7, online link]). The consistent alternative could be the potential infinity.

3 Motion

The title of this section is the same as that of a chapter of the book [4, online link] whose objective was the same as that of this section and of this article, so before describing the thought experiment that will serve to question the supposed unreality of absolute motion,

I will reproduce a brief fragment of the chapter just mentioned:

> An important consequence of the mathematization of physics is the confusion between the description in symbolic languages of physical phenomena and the physical phenomena themselves [...] [4, p. 205].
>
> It happens, as Galileo would surely say, that we do not have sensors for uniform motion, as we do for heat, humidity, sound, pressure, etc. So, the only way to perceive our uniform motion and quantify it in temporal terms (velocity) is to measure our successive changes of position with respect to another external object. But this is describing motion, not explaining motion. The fact that we need external references to describe motion does not imply that motion does not exist if those external references are not available. [4, p. 206-7].

Let A and B be the only objects in a theoretical universe UT subject to the same laws as our observable physical universe. A and B are not quantum entangled and move relatively to each other with a uniform velocity v in the direction of the straight line joining them. When A is separated from B by 150000 million kilometers it emits a light signal to B, after which A disintegrates completely into energy. The signal from the decay of A will take just over 138 hours to reach B. No physical law of UT could explain B stopping before those 138 hours. Therefore, B will continue to move with the same speed for (at least) those 138 hours. Now, with respect to what is B moving during those 138 hours? The only possibility compatible with the physical laws of UT would be to admit the discrete, physical reality of UT space and refer the motion of B to its indivisible physical units. And that is absolute motion through a discrete and absolute space. Moreover, if after receiving the signal from A, B starts its propulsion engine, the only possible effect would be a change in its absolute velocity.

References

[1] A. Einstein. Zur Elektrodynamik bewegter Körper. *Ann. Phys.*, 17:891–921, 1905.

[2] A. Einstein. *The Theory of Relativity.* Methuen, 1920.

[3] Antonio León. *Infinity put to the test.* Self edition. Printed at amazon.com., 2021.

[4] Antonio León. *Apparent relativity.* Self edition. Printed at amazon.com., 2022.

[5] Antonio León. On the empirical evidence of special relativity. *The General Science Journal*, November 2022.

[6] Antonio León. Towards a discrete cosmology. Paper 1/17: Unsolved foundational problems. *The General Science Journal*, 2022.

[7] Antonio León. Towards a discrete cosmology. Paper 3/17 Finite versus infinite. *The General Science Journal*, 2022.

[8] Arthur I. Miller. *Frontiers of Physics 1900-1911. Selected Essays.* Birkhäuser Boston, Inc., 1986.

[9] H. Minkowski. *The Principle of Relativity*, chapter Chapter V. Space and Time, pages 73–91. Dover Publications, Inc., 1952.