

SPECIAL RELATIVITY VIOLATES PHYSICAL IDENTITY

(The content of this article is partially taken from [6, Chp. 7])

June 15, 2026. Salamanca, Spain.

Antonio León Sánchez

Retired Professor. Independent researcher in the foundations of science.

Abstract.—The Theorem of Physical Identity demonstrated in this article is an almost immediate consequence of the Laws of Logic. However, it is incompatible with the theory of special relativity.

Keywords: First Law of Logic, Second Law of Logic, Theorem of Physical Identity, Principle of Directional Evolution of the Universe, Principles of Special Relativity.

1. The Theorem of Physical Identity

As is well known, the first of the fundamental laws of logic is the Principle of Identity, which can be stated in different ways, all of them expressing the same idea of identity of both theoretical concepts and real physical objects. It can be expressed in different ways, such as: every object is equal to itself; A is A ; $A = A$; A is what it is, and is not what it is not; etc. Naturally, it is a fundamental law of logic to which all formal and experimental sciences must conform. The same applies to the Second Law of Logic, or Principle of Non-Contradiction, which is used primarily in formal proofs and states that a proposition and its opposite cannot both be true at the same time and under the same conditions.

The problem with physical objects is that they can evolve and change; i.e., they can have, and in fact do have, a history of changes. So it is not always justified to say that two physical objects separated in time are the same object. What is logically justified, and must be accepted according to the First and the Second Laws of Logic, is that at a certain instant in time, a physical object must be equal to itself. This is the basis for the two proofs of the following theorem.

Theorem 1 (of Physical Identity) *A physical object cannot have different properties at the same time, nor can it have a property with different values at the same time.*

Proof 1: Let PR be any property of any physical object A , and suppose that at the same instant that object A both has and does not have that property PR . We would have an object A that is (with the property PR) and is not (without the property PR) identical to itself. Similarly, suppose that for the property PR of A , that object A has two or more different values at the same instant. We would have an object that is (with one of those values of PR) and it is not (with another of those different values of PR) identical to itself, which goes against the Principle of Identity. \square

Proof 2: Let PR be any property of any physical object A , and suppose that at the same instant that object A both has and does not have that property PR . According to the Principle of non-Contradiction, and being p the proposition " A has the property PR ", we will have: $p \wedge \neg p$, which is impossible according to the Principle of Non-Contradiction. Similarly, suppose that for a certain property PR of A , this physical object simultaneously has two different values $V1$ and $V2$ for that property PR . Now, let q be the proposition "The value of PR in A is $V1$." We can write: $q \wedge \neg q$. This is again impossible according to the Principle of Non-Contradiction. Therefore, it is impossible for A to simultaneously have and not have a certain property; or to simultaneously have two different values for the same property. \square

The statement of the above Theorem of Physical Identity is almost as obvious as those of the First and Second Laws of Logic, of which it is an immediate consequence. It is also confirmed by the Theorem of the Consistent Universe [7]:

The observable universe evolves under the control of a unique set of unchanging and consistent natural laws.

which, in turn, is an almost immediate consequence of the Principle of Directional Evolution of the Universe, one of the two fundamental laws of all sciences [7]:

The observable universe evolves independently of its rational observers and through causal changes always in the same direction of increasing its global entropy.

But as will be seen in the next section, the physical identity of physical objects poses serious problems for the theory of special relativity.

2. Special relativity violates the Theorem of Physical Identity

Let RF_o be the proper reference frame of an arbitrarily large number of physical objects of different sizes that remain at rest in RF_o . And let $RF_{v_1}, RF_{v_2}, RF_{v_3} \dots$ be an equally arbitrarily large number of inertial reference frames in the same physical space as RF_o and whose spatial axes, for simplicity, coincide with those of RF_o at a certain instant; and from whose points of view RF_o moves at different velocities $v_1, v_2, v_3 \dots$ parallel to their respective axes $X_{v_1}, X_{v_2}, X_{v_3} \dots$.

If the relativistic contraction of FitzGerald-Lorentz in the direction of relative motion were real, each of the objects at rest in RF_o would simultaneously have an arbitrarily large number of different real sizes, each of them in $RF_{v_1}, RF_{v_2}, RF_{v_3} \dots$, which contradicts Theorem 1 of Physical Identity. Therefore, this relativistic contraction can only be apparent, and thus as false as the apparent daily rotation of the Sun around the Earth.

On the other hand, suppose that in RF_o there is a physical source S that emits a photon a^* that follows a trajectory parallel to the axis X_o of RF_o until it reaches a final screen located at a distance d_o from the point of emission of the photon a^* emitted by S , taking a time t_o to travel the distance d_o . In RF_o we will have for this photon a^* : $c = L_o/t_o$, where c is the speed of light in RF_o . In any of the above inertial reference frames, for example in RF_{v_1} , and in accordance with the Second Principle of Special Relativity, we will have for the velocity c of this photon a^* : $c = L_{v_1}/t_{v_1}$. And since, according to the above argument, $L_{v_1} = L_o$, it must also be $t_{v_1} = t_o$. That is:

$$t_{v_1} = \gamma \left(t_o + \frac{L_o v_1^2}{c^2} \right) = t_o \quad (1)$$

This is only true if $v_1 = 0$ and then $\gamma = 1$. Therefore, according to Theorem 1 of Physical Identity, the only valid measurements of space and time are those made in the proper reference frame of the distances and objects involved, all of which are at rest with respect to that reference frame (in our case RF_o). Thus, neither the contractions of space, nor the dilations of time, nor the phase differences in synchronizations can be real. They can only be apparent, and consequently as false as the apparent refractive deformations of solid objects partially immersed in water.

Special relativity is, therefore, an inconsistent theory. And the reason for its inconsistency cannot be the first of its fundamental principles, which establishes the universality of physical laws, because if that principle were false, the consistent evolution of the universe, for which there is overwhelming empirical evidence, would be impossible (Principle of Directional Evolution of the Universe). It must therefore be the second of its fundamental principles, a principle that establishes that the speed of light is always the same for all inertial reference frames, regardless of the speed of these inertial reference frames with respect to the light source. The speed of light would always be the same, but THROUGH THE ABSOLUTE REAL PHYSICAL SPACE in which it propagates.

I conclude by noting that both the increase in mass with velocity and the relationship $E = mc^2$ can be deduced outside of special relativity [9], [4], [1], [8], [5] [2, 3], which is why they have not been included in the above argument (although they obviously could have been).

Bibliographical References

- [1] M. Abraham. Prinzipien der Dynamik des Elektrons. *Ann. Phys.*, 315 (1):105–179, 1903.
- [2] Friederich Hasenöhl. Zur Theorie der Strahlung in bewegten Körpern. *Ann. Phys.*, 15, 344–370:344–370, 1904.
- [3] Friedrich Hasenöhl. Zur Theorie der Strahlung in bewegten Körpern. Berichtigung. *Ann. Phys.*, 16:589–592, 1905.
- [4] O. Heaviside. On the electromagnetic effects due to the motion of electrification through a dielectric. *Philos. Mag.*, 5, 27:324–339, 1889.

- [5] Max Jammer. *Concepts of Mass in Classical and Modern Physics*. Harvard University Press, Cambridge, MA, 1961.
- [6] A. León Sánchez. *Apparent relativity*. Amazon's KDP, 2022. [PDF](#).
- [7] A. León Sánchez. Two fundamental laws for all sciences. *The General Science Journal*, 2026. [PDF](#).
- [8] H. A. Lorentz. Electromagnetic phenomena in a system moving with any velocity smaller than that of light. *Proceedings of the Royal Netherlands Academy of Sciences and Arts*, 6:809–831, 1904.
- [9] J. J. Thomson. On the electric and magnetic effects produced by the motion of electrified bodies. *Philos. Mag.*, 5, 11:229–249, 1881.