

# On the Relativity of Simultaneity

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*This paper re-examines the well-known topic of "relativity of simultaneity." The latter is shown to be a false proposition due to an error in logic and confusion in fundamental concepts and epistemology by Einstein.*

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## 1. Introduction

This paper scrutinizes a basic proposition of the Special Relativity Theory (SRT), the "epochal" topic of the "relativity of simultaneity" (ROS).

The ROS is the conceptual foundation of the SRT, from which the relativistic space-time ideas were poured by Einstein into the Lorentz transformation (LT), leading, as it has been said, to a "great revolution" in man's space-time ideas, despite the fact that the expression for the LT retains the



For example, in deducing the LT in his 1905 paper (Einstein 1936), he took various values for the light velocity, such as  $(c-v)$ ,  $(c+v)$ , and  $\sqrt{c^2-v^2}$  etc.

#### 4. Equivalence of inertial systems not infallible

The fact that for one and the same pair of events, observer  $M'$  has an observational result different from what observer  $M$  has, shows directly that:

- (a) A statement about the velocity of propagation of light has no direct physical meaning without a definition of the source of light.
- (b) The observational effects corresponding to the two (inertial) systems *differ* from each other, and this automatically refutes Einstein's myth that the equivalence between inertial systems is infallible. In fact, the observed radial Doppler shift, which roughly corresponds to what happens in Figure 1, is one of the best disproofs of the infallible equivalence of inertial frames, since one and the same light source gives different observational results for different observers having different speeds relative to the source.
- (c) Indeed, the alleged "Principle of Relativity" has been misinterpreted by Einstein and needs to be clarified and corrected, which will be dealt with separately later.

#### 5. ROS is only an apparent effect

We now proceed to the second question, which is not quite as simple a question as it seemed to Einstein, since it involves a profound epistemological problem.

Epistemology tells us that: what an event (or an object) is observed to be is one thing; and what it is in reality is another, though there is a relation between the two. For instance, the Sun looks like a small disk, but in reality it is quite large. Similarly, whether the two flashes of lightning are observed simultaneously is one thing; and whether they take place simultaneously is another.

Even according to the SRT, if the two strokes of lightning strike at the train instead of the rails, the result should be opposite: It is observer  $M'$  (*not*  $M$ ) who will see the two beams simultaneously; while observer  $M$  must note the beam coming from  $A$  (no longer  $B$ , in this case) earlier than that coming from  $B$ .

Thus, it follows that:

- (a) The simultaneity of two lightning flashes with respect to the system in which the two strokes of lightning strike is uniquely determined. Hence, we may *not* deny the fact that real simultaneity exists in this sense in the SRT. This might be termed *proper simultaneity*.
- (b) The alleged "relativity of simultaneity" is an apparent effect, which we may call *image simultaneity*.

- (c) The law of propagation of light, which Einstein always identifies with the PIVL, has nothing to do with the PIVL;
- (d) There is no physical or real reason for the observers at the train "to come to the conclusion that the lightning flash  $B$  took place earlier...", even though observer  $M'$  sees the lightning flash at  $B$  earlier than the flash at  $A$ .

#### 6. Conclusions

To sum up, this discussion has shown that

- (1) The ROS is a false proposition (Phipps 1991), in which Einstein had made serious mistakes of two kinds: he overlooked a logical flaw in his inference; he confused the concept of "taking place" with that of "seeing" and took apparent effects of events for events themselves.
- (2) The principle of relativity and the law of light propagation have nothing to do with the PIVL; they have been distorted by Einstein and the others and need to be corrected.
- (3) The equivalence between different inertial frames is not infallible. The Doppler effect is the best disproof of the equivalence of inertial frames, since one and the same light source gives different observational results for different inertial frames.
- (4) The "relativity of simultaneity" is only an apparent observational effect; and it cannot preclude the existence of real simultaneity.
- (5) Since the ROS is invalid, it provides no premise for Einstein to conclude that "every reference-body (coordinates system) has its own particular time". Thus the SRT and the relativistic space-time theory are built on a false foundation.

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