Foundations of Physics, Vol. 13, No. 12, 1983

Problems of Synchronization in Special Relativity: A Reply to G. Cavalleri and G. Spinelli

Stefan Marinov[1]

Received January 28, 1983

I defend the opinion that Cavalleri and Spinelli, who in the last years abandoned many of the relativity dogmas and embraced many of the absolute conceptions, are still very far from an adequte understanding and interpretation of physical reality.

I was one of the referees of Cavalleri and Spinelli's paper[(1)] in the present issue of this journal, and my lengthy and detailed criticism is published in Ref. 2, p. 228. Of my 17 critical remarks, Cavalleri and Spinelli (C-S) have taken into account only two, *viz.* Nos. XIII and XVI, and introduced relevant corrections in their paper. The authors have not taken into account the remaining 15 remarks, which remain valid for the revised version of their paper. Here I should like to give only certain general statements:

1. THE MARINOV TRANSFORMATION

At the present time there are three competitive space-time transformations: those of Galilei, Lorentz, and Marinov. Which is the right one? But, first, concerning the names of the transformations: Was the transformation $x' = x - Vt$, $t' = t$, invented by Galilei? Certainly not. Greeks, Egyptians, and Chinese worked with this transformation, and when a Redskin in a reservation sees his boat at a distance x upwards in a river, he

[1] Laboratory for Fundamental Physical Problems, Sofia, Bulgaria. Present address: Niederschöcklstr. 62, A-8044 Graz, Austria.

0015-9018/83/1200-1241$03.00/0

knows very well that after a time t the distance will be $x - Vt$, if V is the velocity of water. The Lorentz transformation was proposed first by Voigt. The Marinov transformation was proposed first not by Tangherlini, as C-S assert, but by Ives. I am sure, however, that the Ives transformation will remain in physics under my name for the following reasons (see Refs. 3–5).

1. I gave first the transformation formulas for the velocities, including those for light.

2. I gave first the connection between the Lorentz velocity transformation and the Marinov velocity transformation.

3. I showed first that the absolute velocity v and the relative velocity v' are physically adequate quantities, while the Lorentz relative velocity v'_L (a term introduced by me for the relative velocity in the Lorentz transformation) is not an actual velocity, but a mathematical result following from the artificially introduced relative time in the Lorentz transformation.

4. I showed first that the Marinov transformations form a group.

5. I showed first that any particle is attached to absolute space through its proper mass and thus that the link of the Marinov transformation to absolute space is not only kinematical, but also dynamical.

6. I made first a strong difference between the notions "Lorentz invariance" (available to an observer at rest in absolute space who describes the motion of a particle moving first with velocity v with respect to absolute space and then with another velocity v') and "Marinov invariance" (available when there is a particle moving with a certain velocity v in absolute space and an observer who first is at rest with respect to absolute space and then moves with a velocity V). For C-S, as for any contemporary physicist, if the velocity between a particle and an observer changes, it is of no importance whether the particle or the observer changes its velocity. Meanwhile these two cases are not identical, because, in the first case, the particle changes its velocity with respect to distant matter and thus its time energy changes too, while in the second case the time energy of the particle remains unchanged. It is important to note that the Lorentz invariance concerns 4-scalars, while the Marinov invariance concerns 3-scalars.

7. I showed that "length contraction" (or "dilation") in the Lorentz and Marinov transformations is not a physical effect but a result of the peculiar character of light velocity. [N.B.: The reasonings of C-S on "noninstantaneous Lorentz contraction," on "acceleration of the atoms," etc. are comical: To produce acceleration of atoms and deformation of crystals one must invest *energy*. Where does this energy come from? For Einstein the contractions are seeming, but for an absolutist (such as C-S) they must be real, physical.]

8. I showed that the peculiar character of light velocity consists in the following. According to the Newton (Galilei, Redskin) conceptions, the velocity of light in a moving frame must be $c' = (c^2 - V^2 \sin^2 \theta)^{1/2} - V \cos \theta$, where c is the velocity of light in absolute space, V is the velocity of the moving frame, and θ is the angle between $\mathbf{c}'$ and $\mathbf{V}$. Meanwhile, the physically adequate formula for the velocity of light in a moving frame is $c' = c^2/(c + V \cos \theta)$, and with this formula one can explain all experiments available. Until now I could not find an explanation for this strange fact; and, as I always note, the deduction which I give of the Marinov transformation does *not* satisfy me.

Now let us return to the question, "Which of the three transformations is the right one?" The Galilei transformation is not true, as it is a "relativistic" transformation; it is not attached to absolute space and of importance is only the relative velocity between both frames. Then it fails to give right answers for high velocities. I showed that the Lorentz and Marinov transformations can be mathematically reconciled, since in the Lorentz transformation time is relative and the velocity of light absolute, while in the Marinov transformation time is absolute and velocity of light relative. I showed that if one calculates correctly (i.e., if one divides the space differentials by the differentials of absolute time, and not, as Einstein did, by the differential of relative time), then the space-time Lorentz transformation leads to the correct velocity transformation. I have experimentally shown that relative light velocity and absolute time are physically adequate quantities. Thus I have demonstrated that the Marinov transformation is the physically adequate one.

2. SLOW TRANSPORT OF CLOCKS

Many (naive!) absolutists think that by a slow transport of clocks one can realize a Newtonian (absolute) time synchronization between spatially remote clocks in a frame moving in absolute space with velocity V. Such was also the viewpoint of Torr and Kolen[6] who even carried out an experiment, hoping to be able to measure the Earth's absolute velocity by sending one-way electromagnetic signals between absolutely synchronized clocks and registering the first-order (in V/c) effects. In his talk at the International Conference on Space-Time Absoluteness (Genoa, July 1982) Professor Torr said he had arrived at the conclusion that during the transport the clock suffers a time dilation such that the expected first-order effect in the anisotropic light velocity will be compensated. However, Torr was of the opinion that a third-order effect may be observed. As his experiment had given a daily sinusoidal effect (over a distance of 500 m) correlated to

sideral time, he accepted it as a third-order effect and calculated an absolute Earth velocity of the order of tens of thousands of km/sec. I showed[7] that, when working with the Marinov transformation, the compensation continues to the third order in V/c.

C-S have also understood that there is a compensation of the first-order effect. But when they write, "These simple considerations seem not yet to have been understood by Marinov," I can only express my regret that they did not attend the ICSTA conference in Genoa and take part in the discussion of the engineering aspect of the problem and in the discussion no longer of the first-order effect (there almost all good space-time specialists arrived at the compensation conclusion), but of the third-order effect.

3. EXPERIMENTAL MEASUREMENT OF THE EARTH'S ABSOLUTE VELOCITY

C-S replaced the naive ether of the 19th century by a new ether which is not naive. Very good. However, in any ether (naive or non-naive) the velocity of light in a moving frame must be direction-dependent. Thus, with the help of a rotating shaft and two oppositely directed light beams, one is able to measure the Earth's absolute velocity. I measured this velocity twice[8,9] and constructed a third very simple apparatus for its measurement.[10] C-S assert that if my experiments gave positive results, I should abandon the "Marinov transformation" (which predicts those results). Strange logic! But C-S assert that my experiment seems not to be reliable, without stating what is the prediction of *their* theory. It is interesting, however, to note that when I invited Professor Cavalleri to see my experiment and to check its reliability, he declined (see Ref. 2, p. 236).

REFERENCES

1. G. Cavalleri and G. Spinelli, *Found. Phys.* **13**, 1221 (1983).
2. S. Marinov, *The Thorny Way of Truth* (East–West, Graz, 1982).
3. S. Marinov, *Found. Phys.* **9**, 445 (1979).
4. S. Marinov, *Eppur si Muove* (Centre Belge de Documentation Scientifique, Bruxelles, 1977, 2nd edn., East–West, Graz, 1981).
5. S. Marinov, *Classical Physics* (East–West, Graz, 1981).
6. P. Kolen and D. G. Torr, *Found. Phys.* **12**, 401 (1982).
7. S. Marinov and J. P. Wesley, *Proceedings of the International Conference on Space-Time Absoluteness*, Genoa, 8–11 July, 1982 (East–West, Graz, 1982).
8. S. Marinov, *Czech. J. Phys. B* **24**, 965 (1974).
9. S. Marinov, *Gen. Relativ. Gravit.* **12**, 57 (1980).
10. S. Marinov, *Spec. Sci. Technol.* **3**, 57 (1980).