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Letter

Comments on the "Absolute Space-Time Theory"

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The "absolute space-time theory", so-called by its author, (Marinov, 1975) seems to be of questionable consistency and represents an attempt to reconcile profoundly distinct and hardly reconcilable Newtonian and Lorentzian concepts. Although making reference to "classical physics," the treatment appears to be untenable from the viewpoint of both major classical theories – Newtonian mechanics and Lorentzian electrodynamics – and reveals a neglect of certain historical facts. The following items are to justify this adverse criticism and to clarify some relevant features of the classical theories.

(i) Newtonian absolute space and Lorentzian stationary aether are fundamentally different and cannot be substituted one for the other, although it is assumed that the aether is at rest relative to absolute space (Painlevé, 1922, pp. 81–104). Newton (*Principles*, Scholium, pp. 6–12) introduced the concept of absolute space to take into account the absolute character of accelerations, but at the same time preserve the relative character of velocities and the so-called "classical principle of relativity" described earlier by Galileo in picturesque terms. Lorentz adopted the stationary aether as a medium for electromagnetic phenomena, in particular to account for the (wave) propagation of light. Newton (*Opticks*, Queries 20–22, pp. 350–353) discussed some old aether concepts, and the one acceptable to him appears to be different from Lorentz's aether as well as from most of the nineteenth century aether concepts (Whittaker, 1951, p. 19). Loosely speaking, Newton's aether would be much "emptier" than Lorentz's aether. The regular vibrations of Newton's aether (unlike Lorentz's aether) should not be supposed to constitute light (although

they would be associated with it). However, Newton never made a clear decision concerning aether but rather asked "Are not all Hypotheses erroneous, in which Light is supposed to consist in Pression or Motion, propagated through a fluid Medium?" (*Opticks*, Qu. 28, p. 362); and in his account of the corpuscular model of light (*Opticks*, Qu. 29, pp. 370–374) he did not mention aether at all. Hence to use the term "absolute space" for the stationary aether is surely misleading, and that is just what the author does: " . . . the hypothetical motionless 'luminiferous ether' of the nineteenth century in which light propagates with velocity c in all directions is a physical reality which we call absolute space" (Marinov, 1975, p. 189).

(ii) According to Newton the flow of time relative to all inertial frames is the same and coincides with absolute time, while according to Lorentz a local time corresponds to any inertial frame (depending on its absolute velocity) moving relative to the stationary aether. According to Newton there are no time dilations due to inertial motion (although clocks can be influenced by accelerations and external fields), while according to Lorentz there is time dilation due to inertial motion even in the case of ideal clocks. The statement that "The Einstein time dilation is an absolute phenomenon (as supposed by Lorentz) and not a relative phenomenon (as supposed by Einstein)" (Marinov, 1975, p. 190) obviously represents a direct acceptance of the Lorentzian time concept, and therefore the "absolute space-time theory" is expected to be a version of the Lorentz theory. However, it should be noted that there are already more sophisticated versions of the latter (Jánossy, 1971).

(iii) Newtonian mechanics is relativistic in the Galilean sense, and the classical principle of relativity can naturally be generalized to include electromagnetic phenomena (Ritz, 1911; O'Rahilly, 1965). The Lorentz theory is not relativistic in the Galilean sense and therefore it was necessary to introduce the FitzGerald contraction to explain the null result of the Michelson–Morley experiment. Accepting the Lorentzian time concept and at the same time denying the existence of the length contraction ("pure fiction," Marinov, 1975, p. 190) *de facto* means going back into the troubles of the nineteenth century aether theories. The most serious trouble is to explain the null result of the Michelson-Morley, Kennedy-Thorndike, Trouton-Noble, etc. experiments confirming the principle of relativity. To avoid this trouble the author introduces a specially contrived procedure for length measurements (Marinov, 1975, pp. 195–200), roughly as a counterpart of the Lorentz contraction, explaining it as " . . . a result of the interference of the two slightly different mathematical apparatus – the nonrelativistic and the relativistic" (Marinov, 1975, p. 206). Apart from the fact that this amendment might seem less acceptable to the "healthy human mind" (Marinov, 1975, p. 207) than the Lorentz contraction itself, there is a remaining trouble with nonoptical experiments confirming the principle of relativity. Even the explanation of the Michelson–Morley experiment (Marinov, 1975, p. 211) can hardly be accepted as a satisfactory one. The reflection of light at mirrors, and in particular the velocity of light after reflection, is not discussed, but according to the author's postulates this velocity should be c relative to "absolute space." But this would not

give the null result as expected, so that it is not clear what the law of reflection should be like to account for the null result consistently with the postulates. The previously obtained relations for the measured length of a rod (Marinov, 1975, p. 199) are used freely, although the measured length might not coincide with the *true* photon path relative to "absolute space."

(iv) It is well-known that the classical (as well as special relativistic) principle of relativity is valid only for the inertial frames, as can be seen from its original precise formulation (Newton, *Principles*, Corollary V, p. 20): "The motions of bodies included in a given space are the same among themselves, whether that space is at rest, or moves uniformly forwards in a right line without any circular motion." The unambiguous qualifying phrase "uniformly forwards in a right line without any circular motion" ("inertial" in modern terminology) clearly fixes the generality of the principle.

It is equally well known that the *accelerated* motion of a reference frame can be detected by experiments performed within it – there are two classical experiments giving positive results – the Foucault pendulum (mechanical) and the Michelson-Gale-Pearson interferometric (optical) experiment. Moreover, there is a recent suggestion to carry out a similar experiment using the interference of slow neutron beams (Page, 1975).

The allegedly crucial "coupled-mirrors" experiment has already been commented upon (Horedt, 1975). Although the author claims his experiment to be an *experimentum crucis* (Marinov, 1975, pp. 189, 212), apparently ignoring previous criticisms, one learns from the next page that it " . . . has not yet given a reliable quantitative value for the absolute earth velocity . . . " (Marinov, 1975, p. 190). It is surely possible to devise an experiment including "coupled mirrors" and "coupled shutters" yielding some indication of Earth's rotational motion. Nevertheless, there are no reasons (neither from the Newtonian, nor from the relativistic viewpoint) to assume that any positive result must be due to the Earth center-of-mass velocity relative to the Galaxy center of mass or to the author's aether improperly named "absolute space."

(v) The author assumes that the velocity of light is constant and given by its well-known value relative to "absolute space" only, while relative to a given inertial frame it depends upon the frame velocity relative to "absolute space" (Marinov, 1975, p. 201). However, the *measured* velocity of light (in terms of local times) should be c in all cases. If this is so, the *measured* length will be used in all cases just as the Lorentz *contracted* length. Moreover, the so-called "measured" length of a rod must then actually be different from its length when at rest relative to the "absolute space" because it should represent the photon path relative to the moving inertial frame. In other words, the length contraction can by no means be a "fiction" (or, more precisely, no more and no less fictitious than the time dilation), and one is again forced to go back to the original Lorentz concepts. The author's suggestion that " . . . we have to assume that during the emission and reception moments the 'photon-runner' covers the middle distance with velocity c" (Marinov, 1975, p. 201) is irrelevant, for there is only a single distance to be measured (or traversed by a photon) relative to a given inertial frame. Apart from this, it is not clear that the author's

assumption " . . . is a result of the absolute time dilation dogma" (Marinov, 1975, p. 201). The implication is surely not unique because, for example, the Lorentz contraction might equally well be considered to be a result of the same "dogma." The author's attempt (Marinov, 1974) to reconcile the corpuscular (Newton's) model with his model of the propagation of light requires further comments. Firstly, Newton's aether would be essentially different from Lorentz's (and the author's) aether, as has already been discussed in (i), and probably closer to Ritz's concepts than to any nineteenth-century aether theory. Secondly, it is well known that the time of emission is by no means equal to the period of the emitted light – the former is related to the coherence length, the latter to the wavelength – and they are different by many orders of magnitude.

(vi) There is no doubt that both Galilean and Lorentz transformation can be derived in different ways, in particular by choosing a suitable synchronization procedure (Marinov, 1975, pp. 191–195). It is also true that Galilean transformation could be used at arbitrary (not only low) velocities to develop an "emission theory" (Fox, 1965), although the author makes no attempts in that direction. Instead, the author endeavors to reconcile the two mathematically and physically distinct transformations. That this is a hopeless endeavor can be shown by analyzing critically the author's own claims. The statement (Marinov, 1975, p. 195) that "The difference between these two transformations is determined only by the different character of synchronization of clocks remote in space" contains only a part of the truth; the difference is much more profound, for the propagation of light is not the same according to the two transformations. There are other important features (not mentioned by the author) making a distinction between the two transformations. Successive Galilean transformations commute (and consequently the classical composition of velocities is commutative), while this is not the case for the successive Lorentz transformations corresponding to noncollinear relative velocities (Landau and Lifshitz, 1971, p. 12). In classical kinematics (Galilean transformation) there are no time dilations nor length contractions, while in special relativistic kinematics (Lorentz transformation) both the time dilation and length contraction follow automatically. Since the author proclaims the time dilation as an "absolute phenomenon" and the length contraction as a "fiction," it is hardly possible even to imagine a treatment consistent with any of the two kinematics. The impression is that the author would like to have the right to use both of them – in any given situation the one that is more convenient.

(vii) The author's recipe (Marinov, 1975, p. 212) for the theory of gravitation is clear; it means, *de facto*, treating gravitation on the basis of special relativity, which was done many decades ago (Pauli, 1958, p. 142). The perihelion displacement is six (rather than two) times smaller than according to general relativity (Goldstein, 1950, p. 214). Since the author gives the factor 1/2 instead of 1/6, a mistake is likely to have happened – and it is not difficult to guess the possible reason for the mistake. The potential adopted (Marinov, 1975, p. 212) is velocity dependent, and such potential can have a precise meaning only when accompanied by the equations of motion where it enters. Such

potential may not be treated like Newtonian potential (dependent upon co-ordinates only), and its relation to the gravitational energy is not usually a simple one (in fact, only the energy integral is unambiguous in those cases). The author's suggestion that his "*experimentum crucis*" with "coupled mirrors" [*vide* (iv)] is more reliable than the well-known tests of general relativity hardly deserves any comments.

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