MATHEMATICAL AND EXPERIMENTAL PROOFS OF THE NON-EXISTENCE OF THE CONTRACTION OF MOVING BODIES

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Abstract:- The present paper is a new version of our work under the same name published some time ago. We have rewritten it with the purpose of giving an adequate response to certain critics and to clarify our point of view.

These critics seem to think that we should have to introduce contraction into our calculations, even though this contraction did not play any role in our mathematical analysis.

We believe that a theory ought not to be prejudged but needs to be derived according to the development (complete development) of the propositions of the problem, and after performing the corresponding checks and experimental verification. In the case of contraction, it was directly deduced from a partial and elemental consideration of one of the propositions made to interpret the result of the Michelson & Morley experiment. It never has been confirmed even after a century by means of new demonstrations and experimental evidence. It is only now, in recent time, that more than half a dozen interferometers are offered, among them our contractometer, that are suitable to prove the non-existence of the famous contraction.

In the present paper, the author shows how the theory of contraction came into being because of the invention of a fictitious velocity vector cK, which indeed does not exist, but which was used to determine the velocity of light in a direction perpendicular to the motion.

In addition, the fixedness of the interference fringes can also be explained by producing the enlargement or dilation of the rods perpendicular to the direction of motion, in proportion to 1/K, instead of the contraction of those parallel to the motion. If two opposed theories are equally useful to interpret the same phenomenon, the conclusion to be drawn is that neither of the two theories is good.

A new astronomical experiment is also propounded by this author to test the existence of the contraction.

1. The Dark Origins of the Theory of Contraction.

Let us recall the composition of velocities formally defined by special relativity, concerning the ray moving perpendicularly to the motion of the apparatus of the experiment (rod OA = L_2, fig. 1(a)). It is asserted that the ray moving from O to A, meets this point at A', so that AA' = Vt. The ray therefore takes the path OA' - ct.

From the resolution of the right-angled triangle OAA' was deduced that the velocity along L_2 is:

$$\sqrt{(c^2 - V^2)} = \sqrt{c^2(1 - (V/c)^2)} = Kc \quad (1)$$

$$K = \sqrt{(1 - (v/c)^2)} \quad (2)$$

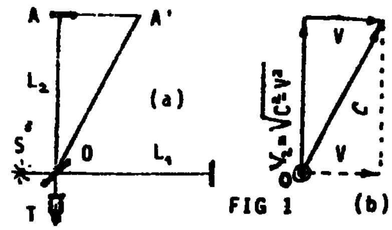

FIG 1

Equation (1) was stated by Einstein himself [1]. Observe in (b) that O is considered in reality as a material point (perhaps, a light particle) subject to the action of two velocities perpendicular to each other, V_2 and V, with a slanting resultant **c**.

From (1) we can derive directly the travel time back and forth along L_2, which is $2L_2$ divided by the velocity, Kc [2]:

$$t_2 = \frac{2L_2}{Kc} \tag{3}$$

Note that Kc is not a relative velocity, as e.g., c - V and c + V are considered to be; it is a contracted ray of light, since its velocity is less than c. Thus the existence of a light path likely to suffer a contraction is a very strange phenomenon, in contradiction to all Einstein's principles. Unless we accept the rod to be really measured as L_2/K, that is, dilated in proportion to $1/K$, perpendicularly to the motion.

2. How the Contracted Ray of Light Applies Along All Rods of a Moving System.

Concerning the rod L_1 parallel to the motion, it is well known that the time to and fro is given by the equation:

$$t_1 = \frac{L_1}{c - V} + \frac{L_1}{c + V} = \frac{2L_1}{K^2c} \tag{4}$$

In the special theory of relativity the identity was assumed $t_1 = t_2$ which gives the result:

$$L_1 = KL_2 \tag{5}$$

This expression places a condition upon the lengths L_1 and L_2, asserting that L_1 must be shorter than L_2 in proportion to K.

We can appreciate in (5) that it represents just one possible proportion between L_1 and L_2:

$$K = \frac{L_1}{L_2} \tag{6}$$

For any other dimension of the rods,

$$K \neq \frac{L_1}{L_2} \tag{7}$$

so that in a second position of the apparatus, the travel times are expressed by

$$t_1' = \frac{2L_1}{Kc} \qquad t_2' = \frac{2L_2}{K^2c} \tag{8}$$

and after repeating the operation made in (5),

$$L_2 = KL_1 \tag{9}$$

from which

$$K = \frac{L_2}{L_1} \tag{10}$$

so that from (6, 10) we should have: $K = 1$, $V = 0$.

These operations are indicating to us that it is not possible to equate the times t_1 and t_2 or t_1' and t_2' when $L_1 \neq L_2$; that is, when the rods are of a different length.

3. There Do Not Exist Rods of Equal Length.

An interferometer is an apparatus made to detect differences of lengths (shifts) in the order of a fraction of a wavelength of the light employed in the experiment. Thus, we can only say of the equality of two rods that they comprise the exact number of wavelengths of light. Since the exactness of measurment of the rods never has attained this limit, we can then affirm that any calculatios based on the equality of the two rods is in error.

This means that the operation of obtaining or deducing the theory of contraction (5) is faulty. If $L_1 = L_2$ does not hold, the operations (6, 10) would lead to the conclusion: $K = 1$, $V = 0$.

4. The Invariance of the Fringes Can Also Be Explained by an Enlargement (Dilation) of the Rods Perpendicular to the Motion [3].

First Position of the Apparatus (2, 4):

$$t_2 = \frac{2L_2}{Kc} \qquad t_1 = \frac{2L_1}{K^2c} \tag{11}$$

We assume now that the rod L_2 is longer than L_1 in the proportion $1/K$. That is, the rod becomes L_2/K in place of L_2. The two times would be:

$$t_2 = \frac{2L_2}{K^2c} \qquad t_1 = \frac{2L_1}{K^2c} \tag{12}$$

so that light would be propagated along the two rods with velocity K^2c.

Second Position: The rod perpendicular to the motion would now measure L_1/K and

$$t_1 = \frac{2L_1}{K^2c} \qquad t_2 = \frac{2L_2}{K^2c} \tag{13}$$

Thus, in both positions of the interferometer tha light would move with velocity K^2c, which can be considered the cause of the steadiness of the interference fringes.

We now see that the same phenomenon could be explained by the theory of the contraction of the rods parallel to the motion rather than by a dilation of the rods placed perpendicular to it. If two opposed or contrary theories can give an account for the same phenomenon, this is because neither of the theories is valid.

5. The Case of the Kennedy-Thorndike Experiment.

Kennedy and Thorndike performed the same experiment as Michelson & Morley, but made use of an interferometer with two different rods $L_1 > L_2$. The interference fringes also remained motionless in all positions of the apparatus.

The relativists have not explained the reason for this case, [4]. They have limited themselves to saying that the theory of contraction was not capable of giving an answer to this experiment. We now see clearly that the whole problem is solved by adopting a uniform velocity Kc or K^2c along the rods, in all positions of the apparatus.

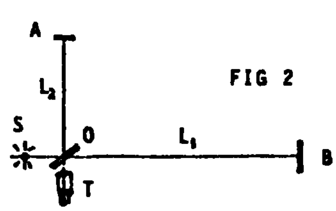

FIG 2

The question then arises how these velocities can be justified? How can we accept a contracted ray of light governing the propagation along the rods? What can entitle us to declare the existence of a non-existent vector velocity Kc?

At this stage of our mathematical reasoning we have nowhere observed anything that would lead us to consider any particular theory, such as the theory of contraction. If one cannot proceed to use (5, 9) then from a strict mathematical point of view we can only consider the actual values given by the equations and operate with them.

So the, we are only permitted to consider:

$$T_1 = t_1 - t_2 = \frac{2}{Kc}\left(\frac{L_1}{K} - L_2\right) \quad (14)$$

$$T_2 = t_1' - t_2' = \frac{2}{Kc}\left(L_1 - \frac{L_2}{K}\right) \quad (15)$$

from which, by making $T_1 = T_2$, we get $K = 1$, $V = 0$.

The reader can choose which solution he likes best:

1) Adopt the velocity Kc for all rods of the moving system;
2) Adopt the velocity K^2c (dilation of the rods perpendicular to the motion);
3) Our solution: $K = 1$, $V = 0$, which is in agreement with the principle of relativity and the behaviour of light in daily experience.

6. In Which We Discover that c Depends on V.

In the 'composition' of V and c described in fig. 1 (a, b), we can deduce that the velocity of light, c, would depend on the velocity of translation, V. The greater V, the greater c. But this contradicts the hypothesis that c is a universal constant.

The reason for this failure lies in this: the composition is a pseudo-geometrical addition of velocities, in which a fictitious vector $V_2 = Kc$ plays an important role.

The point $\underline{A}$ and the ray $\underline{C}$ are two independent, autonomous physical entities, not linked to one another. V cannot change c, and c cannot change V. It is not possible to make a geometric addition of, for example, the velocity of a train with the velocity of a plane flying in the clouds, since they are two independent, autonomous bodies moving along their own trajectories, fig. 3.

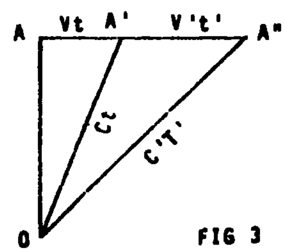

FIG 3

The most we can do with regard to the motion of two independent bodies is to determine their trajectories and calculate the meeting point, taking into consideration their constant velocities. To do so, the paths must be proportional to the velocities. In the case of the triangle OAA' we have:

$$\frac{AA'}{V} = \frac{OA'}{c} = t \quad (16)$$

so that

$$\frac{AA'}{OA'} = \frac{V}{c} \qquad (17)$$

Suppose the velocity of translation, V', is the greater. Then we get the proportion:

$$\frac{AA''}{OA''} = \frac{V'}{c'} \qquad (18)$$

Because the two triangles OAA' and OAA" are not similar

$$\frac{V}{c} \neq \frac{V'}{c'} \qquad (19)$$

Thus, c' > c, since the length of the hypotenuse of the right-angled triangle depends of the size of the altitude Vt. In short: in the 'composition' adopted, c depends on V. Therefore this 'composition' is in error, [5].

7. An Astronomical Experiment to Test the Theory of Contraction of Moving Bodies.

The Earth's velocity (30 kms/sec) is not the only one at hand suitable for testing the contraction of moving bodies. It is known that the solar system moves with a velocity of about 300 kms/sec which is ten times the Earth's velocity around the Sun. Hence, in principle, we have at our disposal an important means to put into evidence the contraction. Suppose, fig. 4, the Earth were situated at aphelion and that we can determine the direction of the translation of the solar system (velocity V') and the point of the Earth's surface on which this direction is perpendicular (plane P). Then we set a Michelson interferometer there. In this position V' does not produce any contraction of the rods since all are perpendicular to V'. But then the orbital velocity, V, intervenes, producing the contraction of the rod parallel to V, or nearly so. We now take pictures of the position of the finges.

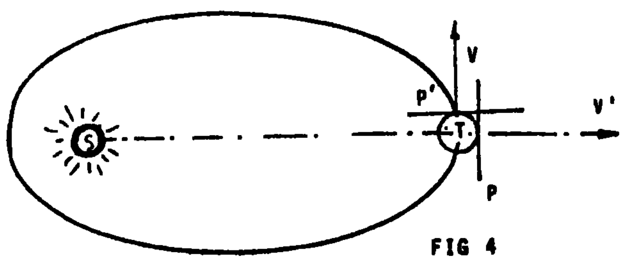

FIG 4

Some six hours later, the plane P is in P', nearly parallel to the velocity V' and perpendicular to V. Now, the rod parallel to V' must undergo a contraction considerably larger, since V' is ten times V. Hence, the fringes must show an important shift.

If, as we expect, no change at all occurs in the fringes, there is only one possible interpretation: the contraction of moving bodies does not exist. §

The velocity V' can also be observed in any other position of the Earth. sometimes it would be added to V, and sometimes subtracted, which would introduce important changes in the position of the fringes.

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§. Editorial Comment: The author's scheme is appealing as it permits his apparatus to be rigidly mounted to the Earth. It merits careful attention and the readership is invited to make a critical analysis of such an experiment and to present practical suggestions relative to the technique to be employed in its implementation.

References

[1] Einstein A.: **Sobra la Electrodinámica de los Cuerpos en Movimento**, Part 1, #3, Ann. der Physik, V. 17, 1905.
[2, 3] Morales, J. A.: **La Relatividad**, Málaga, 1975, pp. 52-3 & p. 11.
[4] **Special Relativity**, by French, A. P., MIT, p. 82.
[5] **Falacias de la Teoria de la Relatividad**, Panama, 1968, pp. 32-3 & 52-3.