

# Does really stellar aberration contradict ether drag

Hamid V. Ansari

Department of Physics, Isfahan University, Isfahan, IRAN  
Personal address: No. 16, Salman-Farsi Lane, Zeinabieh Street, Isfahan,  
Postal Code 81986, IRAN

## Abstract

As we know the Michelson-Morley experiment proves that there is no ethereal wind on the ground. It is thought at present that the existence of the stellar aberration necessitates existence of ethereal wind on the ground if the ether is to exist. Comparison of these two experiments results in believing that the ether does not exist. We prove that if the ether exists the stellar aberration can occur with the ether drag and then does not necessitate existence of the ethereal wind.

A new model in the form of undiscovered tiny particles is presented for the ether. With accepting this model and by using the results of the Michelson-Morley and Michelson-Gale experiments a model consisting of an ethereal stack stuck with the earth in its motion in the space is presented such that the earth can rotate axially inside this stack freely. We shall also see why atomic clocks are slow when are in (fast) motion.

## 1 Introduction

As we know for familiarizing the mind of a student with the relativity, usually initially some experiments are cited that it is claimed that the classical physics is not able to justify them, thereafter on the basis of these failures of the classical physics the theory of relativity is formulated and explained. The most important experiments of this kind cited in the beginning of almost every elementary text about the relativity are failure of the Michelson-Morley experiment and attraction of the stars light by the sun when passing beside it.

Since the failure of the Michelson-Morley experiment was the first experiment that seemed to be a confirmation for the relativity, especially historically, it is still cited as the first evidence to confirm the relativity in the elementary textbooks. The object of this paper is to prove that the

failure of the Michelson-Morley experiment cannot be a confirmation for the relativity.

In the present elementary books of the relativity it is explained that before appearance of the relativity the hypothesis of the existence of ether as a fine substance pervading the space and serving as the medium for the transmission of electromagnetic waves had been postulated as a certain principle for many years; also it was supposed that the earth in its revolution around the sun bored through the fixed ether and then there must be an ethereal wind on the surface of the earth. Necessarily, speed of such a wind differed in different directions, then on the basis of this fact, the Michelson-Morley experiment was designed for detecting this ethereal wind. But this experiment did not detect such a wind expected due to the revolution of the earth around the sun.

To justify this failure according to the hypothesis of the existence of ether, it was claimed that in fact the earth dragged the ether along with itself and then there was no ethereal wind to be detected by the Michelson-Morley experiment. In rejecting the ether drag opinion, most of the authors of the modern physics and relativity books introduce the stellar aberration as a chief reason, while they are in a glaring error demonstration of which is the object of this paper. We only want to prove that the existence of the stellar aberration cannot really reject the opinion of the ether drag by the earth, cause of which can be thought (by the student) eg as the gravitational attraction of the earth on the much tiny particles making the ether.

In the 13th paper of the book, in fact I have investigated this probability that the space is full of some undiscovered much tiny electrostatic and magnetostatic dipoles. There, it has been explained that how an electromagnetic wave can propagate through these tiny particles when orientation of electrostatic dipoles causes orientation of magnetostatic dipoles which in turn will cause orientation of some further electrostatic dipoles and so on. This is not the subject of this paper, but is indicative of this fact that if we suppose that the space is full of some much tiny particles acting as a vehicle for propagating the electromagnetic wave through the space, this supposition will be supported by some strong reasoning presented elsewhere. Let's call these particles as "ether", but keeping in mind its new form.

## 2 How the stellar aberration can be deduced

The reasoning leading to the rejection of the existence of ether is as in the following: We suppose that the ether exists. The Michelson-Morley experiment shows nonexistence of the expected ethereal wind on the ground, and existence of the stellar aberration (which is shown by the angle  $\alpha$  obtained from the relation  $\tan\alpha = v/c$  in which  $v$  is the orbital speed of the

earth surface) necessitates existence of the expected ethereal wind on the ground. Since these two experiments contradict each other, we conclude that the initial supposition, ie the supposition of the existence of ether, has been wrong.

We show that this reasoning is not valid (it is obvious of course that the invalidity of this reasoning does not necessarily prove the existence of ether) because the existence of the stellar aberration does not necessitate existence of the ethereal wind expected on the ground, and even if the ether is dragged along with the earth in its revolution around the sun, we shall still have the same stellar aberration as mentioned above: If we suppose that the ether around the earth is being dragged along with the earth in its revolution around the sun in such a form that the dragged ether consists of some layers such that the speeds of them decrease as their distances from the earth increase (and so for instance the lowest layer has the same speed of the earth surface and the highest layer has the same speed of the fixed ether ie zero speed), then we shall prove that always we shall obtain the relation  $\tan\alpha = v/c$  for the stellar aberration angle  $\alpha$  in which  $v$  is the orbital speed of the earth surface and  $c$  is the speed of light in the fixed ether. We consider Fig. 1 without losing the generality of the discussion. (In this figure  $S$  is the earth surface.  $n_1$  is the lower layer of the dragged ether.  $n_2$  is the upper layer of the ether.  $n_3$  is the fixed ether.  $\mathbf{v}_1$  is the velocity of the lower layer of the dragged ether relative to the fixed ether.  $\mathbf{v}_2$  is the velocity of the upper layer of the dragged ether relative to the fixed ether.  $\mathbf{c}$  is the velocity of light in the fixed ether.) When the light hits the surface  $S_2$  normally, we can say that from the viewpoint of the upper layer of the dragged ether, firstly, the light has the velocity  $\mathbf{c}$  relative to the fixed ether, and secondly, the fixed ether has the velocity  $-\mathbf{v}_2$  relative to the upper layer of the dragged ether. Therefore, the light has the velocity  $\mathbf{c}_2$  relative to the upper layer of the dragged ether. In this same manner since light has the velocity  $\mathbf{c}_2$  relative to the upper layer of the dragged ether and the upper layer of the dragged ether has the velocity  $-(\mathbf{v}_1 - \mathbf{v}_2)$  relative to the lower layer of the dragged ether, light has the velocity  $\mathbf{c}_1$  relative to the lower layer of the dragged ether; and also since light has the velocity  $\mathbf{c}_1$  relative to the lower layer of the dragged ether and the lower layer of the dragged ether has the velocity  $-(\mathbf{v} - \mathbf{v}_1)$  relative to the earth surface, light has the velocity  $\mathbf{c}_0$  relative to the earth surface.

We can write these results totally in the vector diagram shown in Fig. 1 in which  $\alpha$  is the same stellar aberration angle. It is seen easily from the diagram that we have:

$$\tan\alpha = \frac{v - v_1 + v_1 - v_2 + v_2}{c} = \frac{v}{c}$$

Then, if, on supposition, the ether adjacent to the earth surface is being dragged completely along with the earth (ie for instance in the above discussion we have  $\mathbf{v}_1 = \mathbf{v}$ ), we shall have the same result  $\tan\alpha = v/c$  in that manner. Therefore, the stellar aberration is not at all in contradiction

with the ether drag, or in other words the stellar aberration does not necessitate boring through the ether by the earth in its orbital revolution causing any ethereal wind.

In the above reasoning we used a good approximation: If in Fig. 2, for example,  $\mathbf{c}_1$  is the velocity vector of light in the layer 1 and  $\mathbf{v}$  is the motion vector of the layer 2 relative to 1, we supposed that the velocity vector of light in the layer 2 is the same  $\mathbf{c}_1 - \mathbf{v}$ , while, considering the optics of the mediums 1 and 2, this is not exactly the case, but when the ratio  $|v/c_1|$  is very small this approximation is very good.

A simple analogue of the reasoning presented in this section is when a car is moving in a rain falling vertically. The raindrops hit on the floor of the car within an acute angle relative to the motion direction of the car, and if we let the raindrops come into the car via a hole in the car's roof, they'll reach the floor of the car within the same acute angle although the air inside the car is being dragged.

### 3 An ethereal model

Now let's accept the existence of ether in its new concept. The Michelson-Morley experiment indicates that this ether is being dragged with the earth in its revolution around the sun, and this is itself a rational matter, because the tiny particles (making our ether) have some mass inevitably which the massive mass of the earth attracts them strongly, and consequently a fixed pile of them around the earth are being dragged along with the earth in its rotation around the sun.

On the other hand the Michelson-Gale experiment indicates that in each point on the earth surface there exists an ethereal wind arising from axial rotation of the earth inside a fixed ether surrounding the earth (because this experiment reveals the fringe displacement expected for the earth rotation around itself, or in other words the angular velocity of the axial rotation of the earth can be obtained from this experiment). This surrounding fixed ether can be the same fixed ethereal pile mentioned before in the Michelson-Morley experiment. We can liken the general situation to a cylindrical strong magnet which, eg, a thin glass tube has covered it and this tube (with the magnet inside it) is being transmitted much fast through some vast and crowded stack of much tiny shavings of iron. Certainly some of the shavings continue to be attached to the outer surface of the tube for always and are ever along with it in each desired form of its motion. Now suppose that meanwhile the cylindrical magnet rotates about its axis inside the tube without any rotation of the tube. Certainly no change will take place in the position of the shavings attached to the tube. That the pile of ether around the earth doesn't accompany the earth in its axial rotation is quite understandable considering that almost there is not at all any friction between this pile and the earth surface. The situation is almost similar to the atmospheres around

the earth and sun that since cannot accompany them completely in their axial rotations, cause some winds on their surfaces.

The ethereal wind arising from the axial rotation of the earth can be used for justifying the observed small fringe displacement in the Michelson-Morley experiment (notice that there are some reports about some measurable fringe displacements in this experiment, but these displacements are always much smaller than what is anticipated for the speed of the revolution of the earth around the sun which is too much more than the linear speed of its rotation about itself).

Considering the above model we may predict that the period of an atomic (or molecular) oscillator will increase if it is set in a fast motion, because when it is in a fast motion on the ground it will endure an ethereal wind which anyway has its effect on this atomic oscillator causing its period to lengthen. The situation is quite like a wave travelling between two specified points in a motionless medium: when the medium is set in a (fast) motion from one point toward the other one the time during which the wave reaches the same point it had left is longer than when the medium is motionless. That's why atomic clocks are slow when are in (fast) motion.

## 4 Effect of the presence of water

Now pay attention to Fig. 3.

Suppose that  $\mathbf{c}'$  is light velocity in the ethereal pile accompanying the earth which has hit on the water surface. According to Fresnel's dragging coefficient  $\mathbf{v}' - (\mathbf{v}'/n^2)$  is the velocity of the ether dragged by the water velocity  $\mathbf{v}'$  which is the same linear velocity of the earth surface in its axial rotation. With aid of the diagram shown in Fig. 3(b) we shall obtain  $\mathbf{c}'_1 = \mathbf{c}' + (-(\mathbf{v}' - (\mathbf{v}'/n^2)))$  which is the velocity of the mentioned light relative to the ether inside the water. But the magnitude of this speed will be reduced by a proper refractive index, eg  $n'$ , in the form of  $\mathbf{c}'_1/n'$  after entering of the light into the water, of course if we arrange the conditions such that this entering into the water occurs normally. Therefore, we shall obtain only with approximation (but with a good approximation) the relation  $\tan\alpha' = v'/c'$  for the aberration angle  $\alpha'$  arising from the axial rotation of the earth when the experiment is performed in water (in fact we have  $\tan\alpha' > (v'/c')$ ). Since  $v'$  is much small in comparison with the orbital speed, not only this much small excess aberration arising from performing the experiment in water but even in principle the aberration arising from the axial rotation of the earth is almost indistinguishable by the apparatuses designed chiefly for detecting the orbital aberration; then practically there is not any difference between the aberrations obtained in the experiments performed inside and outside the water at present.

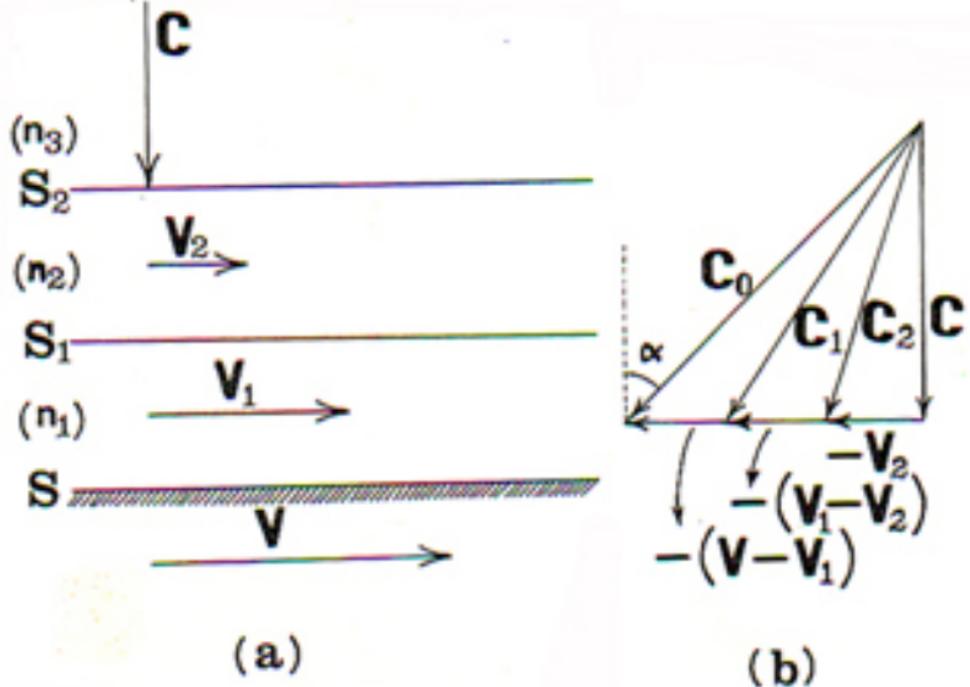


Fig. 1

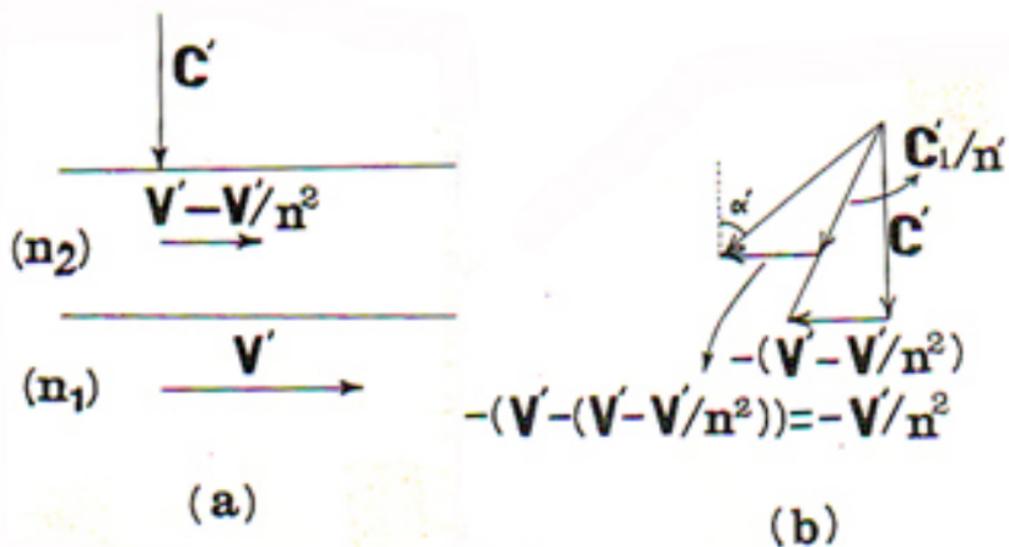


Fig. 3

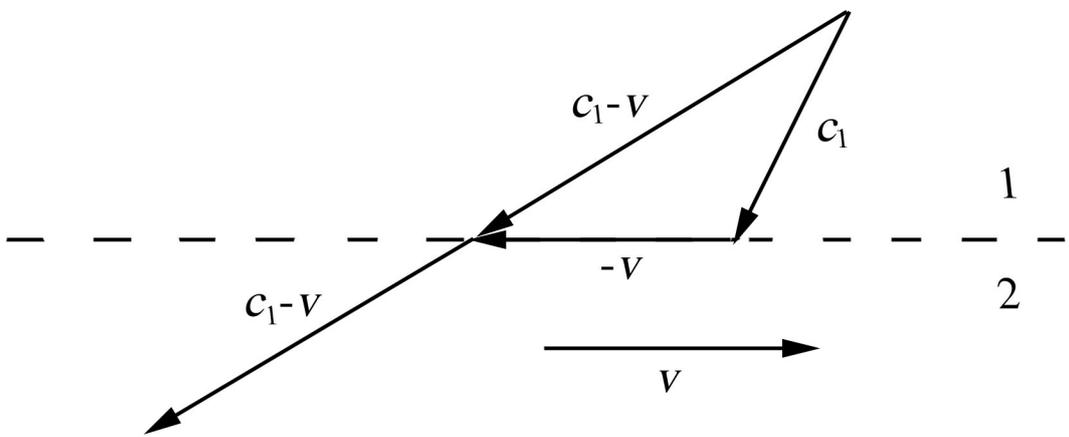


Fig. 2