Stellar Aberration and the Unjustified Denial of Ether

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In the 18th and 19th century, physicists were looking for a medium by means of which light propagates; they called it 'ether'. In theory, one can assume two ethers: one not influenced by anything and therefore at absolute rest: the immobile ether; or another one that can be influenced, for example by a moving mass: the dragged ether. In 1727 James Bradley observed the star called *y*-Draconis and found the first evidence of stellar aberration, an effect correlated with the movement of Earth around Sun. After a long debate, science concluded that stellar aberration was not possible with dragged ether. Then in 1887, Michelson and Morley publicized their famous experiment, which proved that immobile ether could not exist. The fact that both ethers were thus denied by science, combined with the observation that the speed of light always appears to be constant and independent of the movement of the source, made Einstein's Special Relativity Theory inevitable. But the scientific debate concerning the dragged ether and the stellar aberration had one serious omission - one here shown to explain that with dragged ether, stellar aberration has to occur.

Stellar Aberration and Dragged Ether

Figure 1 illustrates a photon coming from the star *y*-Draconis to the plane of the Earth orbit, the X-Y plane (X, not shown, is out of the page). The Earth is momentarily at maximum X excursion, and is moving in the Y direction at maximum speed, 30 km/sec. The photon path from *y*-Draconis has zenith angle $\zeta = 15°$ from the Z axis, or equivalently elevation angle $\varepsilon = 75°$ from the Y axis. Bradley kept a record of this elevation angle throughout the year, looking for a small sinusoidal pattern of change that would arise from parallax. But for *y*-Draconis the parallax is virtually zero because the distance to *y*-Draconis is so much larger than the distance from Earth to Sun. Instead of the expected parallax, Bradley found a sinusoidal pattern that was out of phase with parallax: the elevation part of what we now call 'stellar aberration', which in general also includes an azimuth part not initially recorded by Bradley.

What can stellar aberration really be? How can dragged ether be involved? It would appear that if ether could drag the photon, it would go right, not left. So the observed stellar aberration is not a simple ether-drag phenomenon. Something more subtle is involved.

There are some constraints to be met in analyzing the problem. If dragged ether exists in the vacuum of space, then it has to have exactly the same physical characteristics as vacuum; it has to have universal light speed c for all electromagnetic waves, and no influence on the impulse of electromagnetic waves. So the ether cannot change the speed or impulse of a photon during its passage from *y*-Draconis to Earth.

Light coming from *y*-Draconis to Earth must experience some transition from ether under the influence of *y*-Draconis to ether under the influence of Earth. As the distance from *y*-Draconis increases and that to Earth decreases, the influence of *y*-Draconis decreases, and that of Earth increases. The two ethers move relative to each other, comparable with moderate air flows in the atmosphere, or ocean currents that gradually merge.

For the stellar aberration ultimately observed, it is of no importance over what distance the transition takes place. The transition can be gradual or it can be abrupt. In Fig. 1, the transition is abrupt. But the effect will be the same regardless of the transition. The impulse of the photon, direction and magnitude, is determined in Ether I. The passage from Ether I to Ether II brings the photon into ether with exactly the same characteristics. The only difference is that Ether II moves in comparison to Ether I with a speed of 30 km/second. Because Ether II is moving compared to Ether I with 30 km/s, the photon must adjust in some way to the new situation in Ether II. The big circle on Fig. 1 expresses the constraint that, whatever the adjustment is, it must preserve light speed at c. The adjustment that is actually observed includes the usual Doppler shift in frequency, plus the observed stellar aberration angle change β.

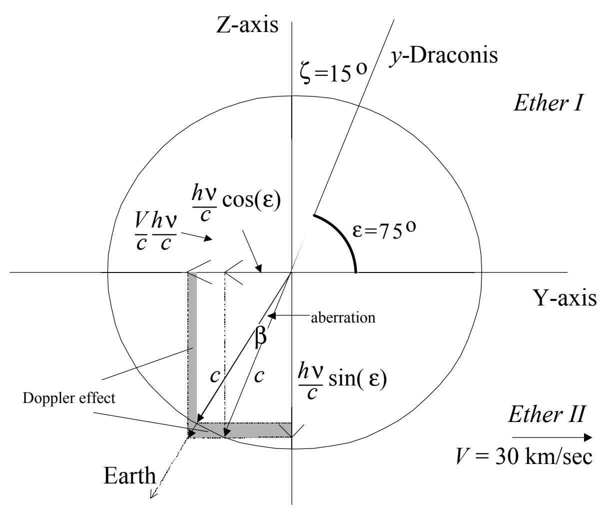

Figure 1. The stellar aberration of a photon in transition from Ether I to Ether II.

Since vacuum, and hence ether, has no characteristics to achieve any actual change in photon impulse, the observed stellar aberration must be *apparent*, not real. Indeed, if there were no such stellar aberration, so that the photon would appear to continue on in the same line, then the actual direction and impulse of the photon would have to change, which is *not* possible.

The impulse and speed of the photon in an arbitrary direction can be decomposed into a component vertical relative to Earth's orbit plane (Z-direction), and two transverse components in the orbit plane (X and Y). Adding the Ether II 30 km/s speed in the transverse direction keeps the impulse of the photon towards the observer on Earth the same in Ether I and Ether II. However, since the total speed is the vector sum of the speeds in the two directions, it increases the speed of the photon. But experience tells us that the measured speed of light in vacuum (ether) never exceeds c. The described transition of the photon entering Ether II from Ether I is therefore incomplete. The photon speed has to be re-adjusted to c. In Fig. 1 this is achieved by reducing the vector sum of the speed in Y- and Z-direction to the circle with radius c.

But as soon as we correct the speed to c, the impulse of the photon is changed in both directions, so the impulse too needs to be re-adjusted. We consider the impulse I_p of a photon to be

$$I_p = h\nu / c$$

where ν is its frequency, and h is Planck's constant. In this formula, h and c are natural constants and therefore by definition determined. So there is only one variable by which we can adjust the impulse: the frequency ν. The increase or decrease of the frequency of the photon when Earth is moving towards and from *y*-Draconis is called the Doppler effect.

Apparent Angle Change in a Force-Free Ether

How can there be an apparent change in angle and impulse of a photon, the stellar aberration, when there is force-free ether? The stellar aberration is observed from Earth, but actually there is no real change of the path during the passage of the photon from the star *y*-Draconis to Earth. To comprehend this, the reader must consider that the ethers in Fig. 1 are moving relative to each other at speed of 30 km/sec.

In Fig. 2 we consider the photon from the star *y*-Draconis arriving and observed on Earth. The stellar aberration takes place at the surface where the two ethers have a relative speed to each other. At $t = 0$ the photon from *y*-Draconis enters the Earth-influenced ether. Earth is then at the position **A**. At the moment the photon enters Ether II, the stellar aberration angle change β and Doppler effect occur. The photon now travels with speed c in Ether II. It takes the photon t seconds to arrive on the surface of Earth to be observed. During that t seconds, Earth moves $t \times 30$ km/sec meters to position **B**, as does Ether II, which is under influence of Earth. When the photon reaches the observer on Earth, he observes the stellar aberration β, but yet the photon has kept the original direction it had when it was emitted from the star *y*-Draconis. The photon for the observer on Earth seems to come from **B**, but that is only appearance.

The direction of the photon in Ether II has changed by β, but because Ether II moves relative to Ether I, the original direction of the photon is maintained. The stellar aberration in Ether II compensates exactly for the relative movement of Ether II compared to Ether I, so for any observer at rest with Earth or *y*-Draconis, the photon keeps the same direction and impulse before or after penetrating Ether II.

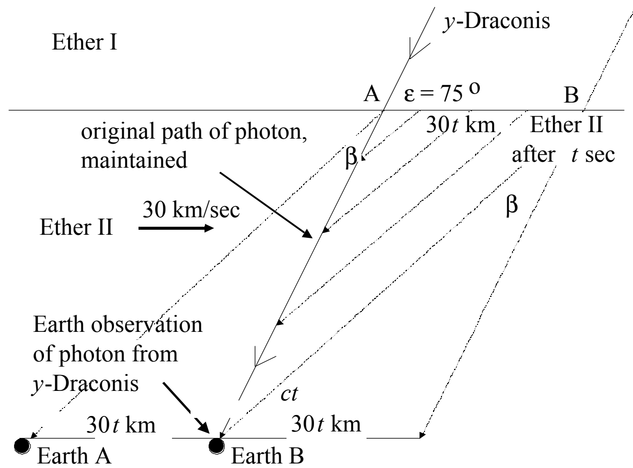

Figure 2. The apparent change of direction/impulse of the photon from *y*-Draconis.

Mathematical Solution for Stellar Aberration and Doppler Effect with Dragged Ether

The impulse of a photon in the direction of movement is: $I_p = h\nu_1 / c$. The impulse of the photon in the Y- and Z- direction is (Fig. 1):

$$I_y = -(h\nu_1 / c)\cos\varepsilon, \quad I_z = (h\nu_1 / c)\sin\varepsilon$$

Because Ether II moves with speed v towards Ether I in the Y-direction, the impulse of the photon in Ether I, for the observer in Ether II, in the Y-direction will be:

$$I_{y1} = -(h\nu_1 / c)\cos\varepsilon - vh\nu_1 / c^2$$

The impulse of the photon for an observer in rest with Earth or the ether under influence of Earth is different from the impulse the same photon has for the observer in rest with *y*-Draconis. The same arguments are valid for the angle of the photon traveling to Earth from *y*-Draconis.

In the Z-direction the impulse and direction of the photon is the same, whether the photon is observed by an observer in rest with *y*-Draconis or Earth, because the speed of both ethers to each other in that direction is zero:

$$I_{z1} = (h\nu_1 / c)\sin\varepsilon$$

For the observer in Ether II, the impulse of the photon, after or before penetrating Ether II from Ether I, cannot change, whether the photon is observed under influence of *y*-Draconis or Earth because vacuum does not have the ability to change impulse.

The stellar aberration can now be determined by the following equations:

$$I_{y2} = -(h\nu_2 / c)\cos(\varepsilon - \beta), \quad I_{y1} = I_{y2}$$

$$I_{z2} = (h\nu_2 / c)\sin(\varepsilon - \beta), \quad I_{z1} = I_{z2}$$

The reduced formulas are:

$$\nu_2 = \nu_1 \sin\varepsilon / \sin(\varepsilon - \beta)$$

$$\cos(\varepsilon - \beta) = (\nu_1 / \nu_2)\left[\cos\varepsilon + v / c)\right]$$

The stellar aberration and the Doppler effect, due to the passage of the photon from Ether I to Ether II, are described by the equations:

$$\beta = \arcsin\left[\sin\varepsilon \Big/ \sqrt{1 + v^2 / c^2 + 2(v / c)\cos\varepsilon}\right] - \varepsilon$$

$$\nu_2 = \nu_1 \sqrt{1 + v^2 / c^2 + 2(v / c)\cos\varepsilon}$$

Discussion

The stellar aberration predicted by the theoretical formulas derived in this article matches the actual, empirically measured, aberration of any star at any time during the year. The empirical aberration evidence supporting the dragged ether theory is thus overwhelming. The same cannot be said for the poor explanation of stellar aberration given by SRT. The explanation of stellar aberration given by ether theory is better, and should be preferred by Science.

The denial of both the dragged and immobile ethers opened the door for Einstein's SRT in 1905, but that denial of the dragged ether was premature. This observation does not mean SRT is false, but it does mean that the dragged ether can offer a viable alternative theory. This may prove important because SRT contradicts QM. Both theories imply numerous paradoxes, which can be explained only by means of assuming an incredible reality. In theory, nothing is impossible, but the more simple and straightforward a theory is, the more appealing the theory becomes. Science therefore should look into the possibilities the dragged ether offers. In a survey primarily devoted to the dragged ether (www.paradox-paradigm.nl) the possibilities to describe and understand physical phenomena appear to be vast. The mechanical quality of the dragged ether seems to coincide well with the uncertainty principles and the wave/particle duality of QM. It is time that science should re-open the ether debate and consider the ether explanations versus those of SRT.

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