

The Forbidden Ether

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The two main pillars in the foundation for the special relativity theory are given alternative interpretations. Starlight aberration, as well as Michelson-Morley's experiments, is thereby demonstrated to be wrong and useless. A new interpretation is also given to the Sagnac effect, and this produces evidence for entrained ether. The existence of ether is found to be very helpful when we want to describe different phenomena in physics.

Background

The special theory of relativity (SRT) has dominated theoretical physics for about hundred years. Many tests have been done and indicated SRT as a *possible* solution together with other theories. However, Einstein's theory has never been demonstrated as superior to other theories. Since its beginning SRT has been controversial, and we have therefore reasons to suspect fundamental misinterpretations in the empirical background. The ether can than have been abolished on false grounds due to apparent conflicts. Starlight aberration disproved the entrained ether and Michelson-Morley's experiments (MMX) seemed to be in conflict with the autonomous ether.

The Ether

The ether is not observable, and not well known. Clear evidences, regarding the ether's structure, are therefore missing, and assumptions about the ether must be sought by excluding the least plausible alternatives. The ether's invisibility indicates that the ether can be constituted by subatomic, neutrino-like particles with very small mass. These masses are probably not zero since the ether can transmit forces. The particles are moving omni directionally, probably with very high velocities, since the ether seems to penetrate large masses. Static conditions in this flow of particles can explain gravity and ether-wind, and dynamic vibrations in the flow can explain light. Light can be waves and packets of waves moving with constant speed in the ether. The ether has therefore an autonomous existence

constituted by particles, but light waves can be considered as just a collective behaviour of ether particles. Light is not directly visible, but can affect loaded particles (electrons, protons and ions) in an observable way. Our knowledge about light comes from observing matter exposed to light. The quantization of energy relations in matter can therefore not with certainty be extended to exist in light.

The Wave Motion of Light

The speed of light is a property of space, and has the same value in every point in space (with the exception of a very, very small reduction in a strong gravitational field). *Since all points on a plane wave-front are given the same velocity in a right angle to the surface we can conclude that the orientation of the wave-front is conserved.* Wave velocity (\mathbf{c}) and ether-wind (\mathbf{v}) have the same dimension but represent very different phenomena and we must therefore be careful when we make additions of these two vectors. (Stokes made a subtraction instead.) The sum of \mathbf{c} and \mathbf{v} describes transport of information, but wave motion is still \mathbf{c} independent of \mathbf{v} . The effect of \mathbf{v} is just a transformation of the same \mathbf{c} to a different inertial frame. It is demonstrated in Fig 1 how a transverse ether-wind can change direction of information flow without changing the wave-front's orientation. The ether's state of motion has therefore a one-dimensional effect on wave motion, and wave motion can be described as $\mathbf{c}(1+v_L/c)$, where v_L is the component of ether-wind, (\mathbf{v}), longitudinal in relation to light. An ether-wind blowing inside the wave-front's plane

is also in the plane of oscillations and can therefore not affect orientation of that plane, i.e. the wave motion. Universally constant c implies conserved c for a wave motion. The *sharpness* in images of distant stars supports the idea of conserved wave-front. Transverse oscillations seem to be easier united with subatomic particles than with a solid or liquid ether. A change in transverse ether-wind from zero to v_T is irrelevant for wave velocity (still c) but changes the flow of information from c to $c+v_T$. Since a telescope detects wave motion we can conclude that starlight

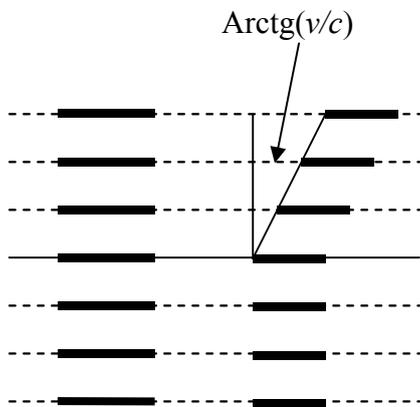


Fig 1 Transverse ether-wind and conserved wave-front

aberration provides no information about the ether's state of motion. The notion of conserved wave-front as a consequence of universal light speed has been missed and caused a wrong interpretation of starlight aberration. The extreme distances to fixed stars imply fixed wave-fronts in our planetary system. Starlight approaching our planet is experiencing a change in transverse ether-wind when light moves from an ether dominated by the Sun to an ether dominated by the Earth. It has been assumed that this change would affect light just as much as is needed to compensate aberration. Fig 3. According to the theory presented here this ether-wind changes only direction of information flow from c to $c+v_T$ while the direction observable in a telescope is unchanged, c . This is

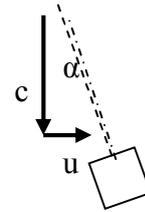


Fig 2 In telescope's frame: $\alpha = \text{arctg}(u/c)$, u = observer's velocity. Autonomous ether

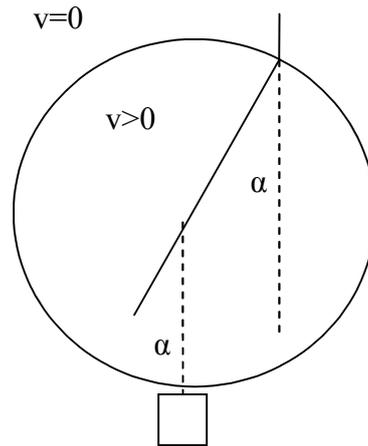


Fig 3 Wrong interpretation of entrained ether observed in a telescope, but valid for flow of information.

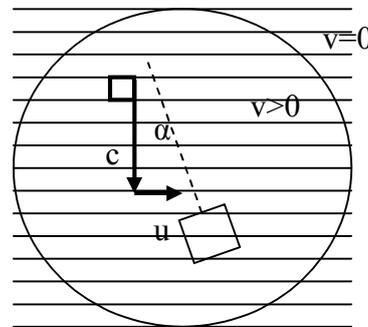


Fig 4 Conserved normal: $\alpha = \text{arctg}(u/c)$. Observable direction in a telescope. Entrained ether.

illustrated in Fig 1 and 4, and the entrained ether has therefore the same aberration as the autonomous ether, and the entrained ether is not ruled out. Instead starlight aberration is an illusion caused by the time delay inside the telescope in combination with the *observer's* transverse speed (u) – a kind of raindrop effect. When light moves

from lens to detector the detector must move into the point of focus that was defined when light passed the lens. This effect is $\arctg(u/c)$. If we could follow the direction of a focused beam instead of detecting wave-front, than we could probably find u to be compensated by v_T .

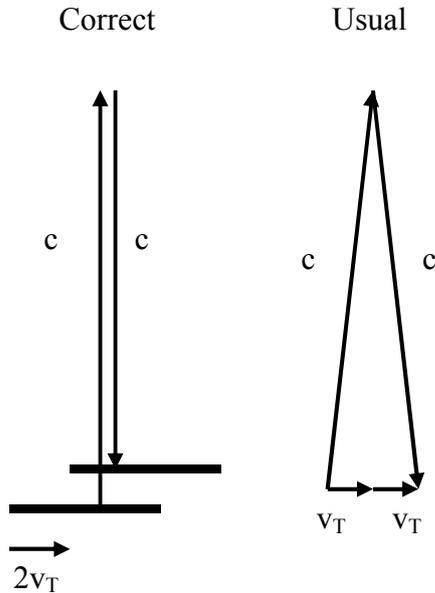


Fig 5 Interpretation of MMX in the ether's frame

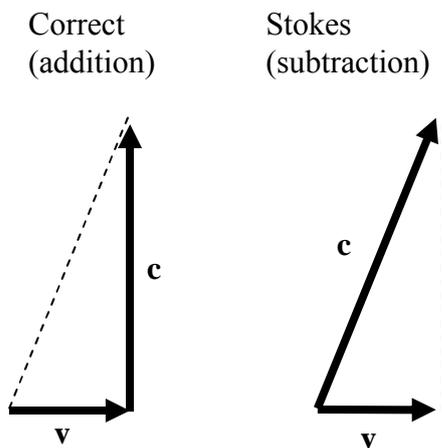


Fig 6 Michelson's experiment (conserved wave-front)

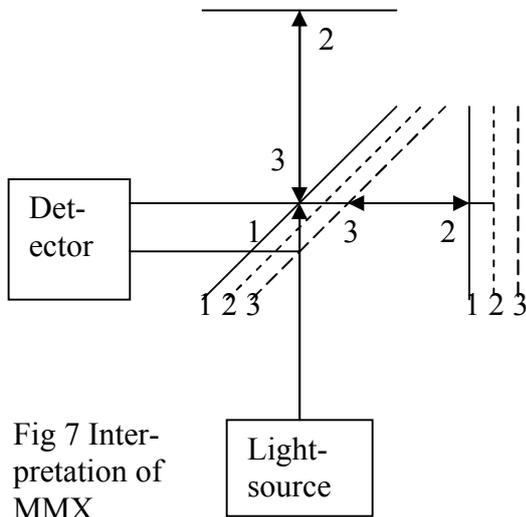
Although wave-front bending can not be caused by transverse ether-wind such bending can be caused by a gradient in light speed i e refraction. This is exemplified by the light's bending around

the Sun, but this is a *very* small effect that must be integrated over a long path to be detectable. This effect is also much smaller than starlight aberration although the Sun is 300000 times heavier than the Earth.

The fact that wave-front's orientation is independent of transverse ether-wind has relevance for interpretation of MMX results also. The wave-fronts of light are defined in a high precision optical cavity, where the wave-fronts are controlled by optical feedback to be parallel to the cavity. Light is forced to go forth and back in the cavity many times before leaving it. Light's observable wave motion is therefore in a right angle to the cavity independent of transverse ether-wind and independent of the cavity's motion in its own plane. Only flow of information depends on transverse ether-wind. This is demonstrated in Fig 5 and 6 in agreement to Fig 1 to 4. This idea is supported by the fact that *all* mirrors in the equipment are unchanged, and wave-front conserved in relation to the equipment. We can conclude that the usual interpretation of MMX is based on a *tacit and false* assumption that light, after a path length of say 10 m, has to hit the *same point* on the mirror as where it started. Instead the returned light hits a point 10 μm away from its starting point on the mirror if the transverse ether-wind is $10^{-6} \times c$. We can see in Fig 5 and 6 that speed of information is c in the ether's frame and $(c^2 + v_T^2)^{1/2}$ in equipment's frame, but only c is visible. Stokes' reduction of MMX prediction by 50% due to a factor $(1 - v_T^2/c^2)^{1/2} = \gamma^{-1}$, is wrong.

The equipment's position is moved in the ether, but relative orientations are conserved. Therefore, the traditional illustration of MMX is wrong in relation to wave-front normal, since wave-fronts are parallel to the mirrors. Instead we get as follows for wave-front normal: See Fig 7. For a two-way light path of 10 m in each arm, and an ether-wind of $10^{-6} \times c$ due to the rotation of our planet, we find that the side wards difference between the two returned beams is 10 μm .

Light's velocity (c) is defined by the ether, and the ether's state of motion (v) is the reference for c . The value of c is constant over a frequency range of many orders of magnitude. The ether's state of motion means that light speed, in relation to the equipment, is changed by factors $(1+v_L/c)$



and $(1-v_L/c)$ in two opposite directions. v_L is longitudinal component, and transverse components are irrelevant. Two-way light speed is changed by a factor $(1-v_L^2/c^2)$ (invert, add and invert) (without Stokes' 'correction'). This means a second order effect caused by a difference between two effects. This effect is the target for Michelson-Morley's experiment. But two nearby atoms in a crystal communicate their relative positions by changes in ether fields that they both generate (one atom is in the field of the other), and we must consider the ether-wind's effect inside the crystal also. Therefore, *information is transferred forth and back between atoms in the same way as between mirrors in the test equipment, in order to define relative positions. This is done with the same ether related velocity. The result is the same second order contraction in the two separation defining fields together as in the two-way observed field. The searched effect is therefore compensated by physical contraction of length. We do not need time dilation or clock biasing. Michelson-Morley's method (MMX) is therefore useless, and his prediction should be*

reduced by 100%, due to length contraction, and the Lorentz transform abolished. This fact is confirmed by experiments with cryogenic, optical resonators in [1], resulting in *observed* second order effect $<10^{-14}$. The *real* effect is described by Palacios' transform, and contains a length contraction of $(1-v_L^2/c^2)$ in the order of 10^{-12} .

Detecting the Ether-Wind

We have found that the ether-wind can not be detected by transverse effect due to conserved wave-front and not by second order effect due to contraction of length. We must use first order effect, but Roemer effect and Doppler effect are demanding relative velocity between source and detector and have therefore ambiguous interpretations. Remains first order effect of translational motion. Such detection was done by Sagnac in 1913, but his method demanded rotating equipment and relative motion between source and detector. Sagnac effect was therefore classified as an effect of rotation. This is a wrong conclusion since the effect is distributed along a line, and not over an area. The effect exists in *any* small element on the line, but not *inside* the enclosed area. R Wang [2] has demonstrated Sagnac effect in translating equipment. This confirms, empirically, that Sagnac effect is an effect of *translation*. This result proves also that the ether exists. Sagnac effect is the time delay caused by the last points motion in relation to the ether when light goes between two points. This reasoning leads to a time delay of xv_x/c^2 (v_x is observer's velocity component in the direction of the path length x , in relation to the ether). For a circular path we let x represent circumference around a circle, and v_x is peripheral velocity. Stokes rule about how an integration around a closed path can be substituted by an integration over the enclosed surface can be applied. This gives $2A\Omega/c^2$ (or doubled for two directions). Here Ω is angular velocity of circular area A . This is physically a misleading form, although mathematically correct, since we

are concerned with an effect of translational motion.

R Wang [2] detected manmade velocity. A detection of natural velocity with not rotating equipment would be even more convincing. The only available natural velocity in relation to the ether is probably the velocity caused by the rotation of the Earth. This means a velocity as low as max $1.55 \times 10^{-6} \times c$. An other complication is that we are in conflict with Einstein's clock synchronization problem. Exact synchronization of separated clocks is not possible. We must find a way to circumvent that problem, based on some kind of approximation. In other words: the time difference between clocks (or frequency difference between oscillators) must be approximately *constant* instead of exactly zero. A kind of circumvention is demonstrated in GPS (the global positioning system) by involving an increased number of satellite based clocks. A *constant* error in the simple clock in the GPS receiver can thereby be made irrelevant. Position can then be decided based on *one-way* light speed. A side effect from GPS is a better understanding of the ether's state of motion.

Although the GPS system is based on one-way light speed *no* correction is needed for Sagnac effect in relation to the centre of our planetary system, or to the centre of our galaxy. The only needed Sagnac correction is related to the centre of our planet. This proves that the ether is *translated* by the Earth, but probably not *rotated*. Since the entrainment probably concerns only one type of motion we could need a special name for it, perhaps 'generated' ether represented by a preferred *field* (can locally be approximated by a frame). The GPS satellites have orbits 26600 km away from the centre of the Earth, and an even more certain verdict about the ether's state of motion would be found if we could detect the ether-wind from the rotation of our planet in a lab on Earth. This means an ether-wind of max $1.55 \times 10^{-6} \times c$ blowing in

western direction. This ether-wind is much smaller than Michelson's assumption and this fact provides a *second* explanation to Michelson's results. Methods for detecting such a small ether-wind are described in [3] and in [4]. Dr Su's article contains detailed mathematics but has no explanation to starlight aberration. The most simple method consists of two gas lasers separated a couple of meters and connected by a single mode optical fibre. The signals are compared in an interferometer. More details below.

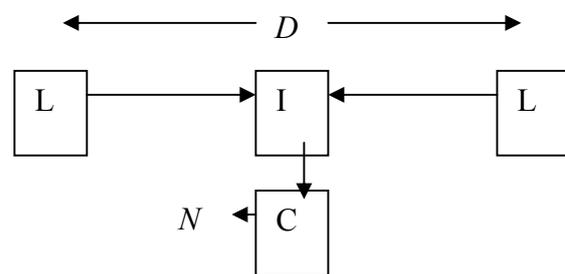


Fig 8 Detecting Sagnac effect on a rotating platform L=Laser
C=Counter I=Interferometer
N=Output from counter (or phase-detector)

The Rotation of the Earth

The idea comes from a test with atomic clocks connected over some kilometres with coaxial cables. Dr Su suggested scaling down and connecting two gas lasers over a few meters with single mode optical fibres. The equipment is mounted on a slowly rotating platform with high mechanical stability. The measurements are made in such a way as to making a *constant* frequency difference irrelevant. Fig. 8 demonstrates the method without synchronized clocks. It is probably the easiest method since light is transmitted in cables and not in open air. This makes sensitivity to vibrations less. The platform rotates slowly around a vertical axis, and the platform must have good stability to avoid vibrations (optical table). Two gas lasers (HeNe) with high frequency stability are used together with mono-mode optical fibres. The difference in laser frequencies is low enough to fall inside the bandwidth

of detector and following video amplifier driving a counter. Perhaps the lasers must be individually chosen to the purpose of producing low frequency difference. The equipment is rotated with constant speed. The phase difference between the two signals is a sinus function of azimuth angle (or time) plus a linear function proportional to the *small* and constant frequency difference between the two lasers. See Fig 9. The counter is not stopped, but sampled by a computer each time direction is pointing east or west. (Number of samples= n .) To avoid the ether-wind's effect inside the lasers they are mounted with their cavities in a vertical position. With $\lambda=0.63\mu\text{m}$ (HeNe), $D=1$ or 2m should be enough to give significant result.. The ether-wind v is derived from data according to the following. (η =Refractive index >1). Ether-wind (v) is given by:

$$\Delta N_{2n} = N_{2n} - \frac{N_{2n+1} + N_{2n-1}}{2}$$

$$\overline{\Delta N} = \frac{1}{n} \sum_n \Delta N_{2n}$$

$$\frac{2v}{c} = \frac{\lambda \overline{\Delta N}}{\eta D}$$

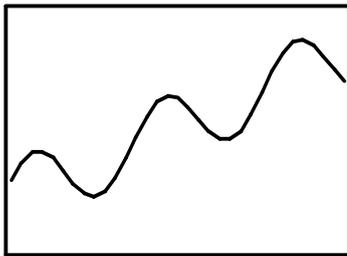


Fig 9 $N(t)$ =Phase difference (counts) as a function of time (t)

An alternative method is a fast sampling of the time function $N(t)$ and then applying Fourier transformation. This demands a very constant speed of rotation. As alternative to the platform a boat can be used, but more vibrations can demand a longer wavelength. We want to detect an effect about hundred times greater than Michelson's.

Ether Speculations

The lack of knowledge about the ether concept has made a taboo of the word 'ether'. However, an omni directional flow of fast particles having very small mass has been described in [5] and in [6]. An illustration to this idea is given in Fig 10.

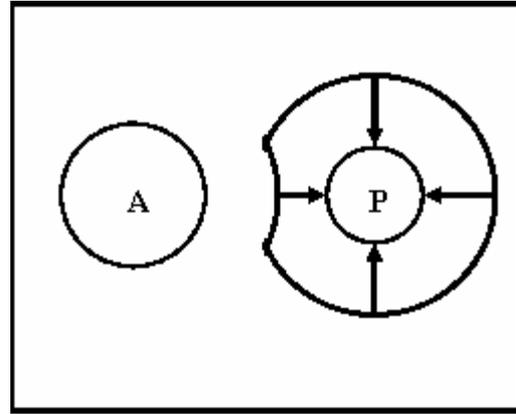


Fig 10 An attenuation in A creates an asymmetry in the flow around P

Attenuation in the active mass (A) causes an asymmetry in the flow around the passive mass (P). This is done by a partial shadowing effect. The asymmetry causes a mean flow in direction towards A. This fact has been called 'falling ether' in [7], and can perhaps explain the Pioneer anomaly. Another possible effect of the reduced flow is a very, very small decrease in the number of particles per unit volume. This can have a small reducing effect on light speed, and explain the small bending of light around the Sun as an effect of refraction, and the gravitational slowing of GPS clocks can also depend on a reduced light-speed. If this is true we do not have to bend the space. This particle based ether model can explain pushing gravity as a consequence of the falling ether. An upper limit on the gravitational force is defined by max asymmetry when the flow is attenuated, not partially, but to zero in one half sphere. A moving body interacting with the ether can generate a wave in the ether, like a boat moving in water. This can give a physical identity to the concept wave function. Changing the wave function can demand energy and explain inertia. This idea raises a very fundamental

question: Is ‘particles’ the basic concept and ‘waves’ just a description of the collective behaviour of ‘particles’? The opposite relation is a more common opinion.

Discussions

The Sun’s relative contribution to the gravitational force is about 0.6×10^{-3} on the Earth, 10^{-2} in the GPS satellites positions and as an average along the signal path, 0.33×10^{-2} . If we make a very rough guess that ether-winds are combined in relation to gravitational forces we get an estimate of 0.33×10^{-2} times the relative velocity of the Sun, or $0.33 \times 10^{-6} \times c$. A signal propagation time of 70 ms would in that case give a Sagnac effect of 23 ns (7m). These values are only guesses, but perhaps testable in the GPS system, since they are parallel to the orbital velocity of the Earth. If such an effect could be confirmed it could also be modelled in the GPS system.

Conclusions

The two main pillars behind special relativity, starlight aberration and MMX, are *both useless* methods. The wave-front’s orientation is *always* constant and in a right angle to the true direction to a generating fix star, or parallel to the surfaces in a generating optical resonator. Information is transferred between atoms, as well as between the mirrors in MMX tests.

The Sagnac effect is a very *useful* phenomenon that has been missed due to a wrong classification. Experience from the GPS system indicates entrained ether, represented by a preferred *field*. Detecting the ether-wind from the rotation of the Earth can probably confirm this. This can be done by Dr Su’s method [3].Fig 7.

Introducing the ether concept can substitute many other (wrong) hypotheses.

Question: Can a small Sagnac correction, related to the Sun, be of interest for the GPS system?

Question: Can ‘waves’ be interpreted as describing a collective behaviour of (more fundamental) ‘particles’?

Result

We have seen that empirical facts can be explained by *classical* concepts without the *unlinear* Lorentz transform with elastic time and space. GPS experiences has demonstrated an *existing* ether, translated by the Earth. We have seen how we can find out if the ether is rotated by the Earth or not.

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