

# The Most Fundamental Paradox

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## Abstract

The wave or particle confusion is not a kind of complementarity – as Niels Bohr said. However, the paradox can be solved by introducing a particle-based ether and a light model based on waves only. By strict following the wave model we can see that the introduction by Potier of an ether wind effect in the transverse arm in Michelson and Morley's test equipment (MMX) was a mistake. This error was helpful in creating the wave or particle paradox and, in the end, also produced the twin paradox.

## Background

Fundamental physics has developed very slowly during the last 100 years. This fact is in strong contrast to the very fast developments of technologies, like space technology. This contrast is clearly manifested in today's uncertainty regarding the structure of light and also in the twin paradox. Therefore, we have a strong reason to discuss the essence of light and ether. Instead of very old results like MMX we should regard science based on modern advanced technology, like space technology.

## Light, ether and mirrors

The motion of the ether in relation to an observer is described by a vector,  $\mathbf{v}$ . The motion of light, in relation to the ether is described by a vector,  $\mathbf{c}$ . This means that the true motion of a *beam* of light is a vector sum,  $\mathbf{c}+\mathbf{v}$ . Although we use vector addition of  $\mathbf{c}$  and  $\mathbf{v}$  we must remember that these 2 concepts are very different.  $\mathbf{c}$  represents a moving and oscillating phenomenon (or a process).  $\mathbf{v}$  is instead a local and constant ether property. *This difference is very important when we introduce reflectors or refractors.*

The introduction of a mirror means boundary conditions that have relevance in relation to  $\mathbf{c}$  – but *not* in relation to  $\mathbf{v}$ . Mirrors reflect light but *not* ether wind, since mirrors are transparent in relation to the ether. This irrelevance means that mirrors reflect the wave front independent of ether wind inside the wave front. So, only orientation of wave front is relevant. This means that, in relation to the mirror, we must describe light as  $\mathbf{c}(1+v_L/c)$ , with  $v_L$  as component in ether wind parallel to light motion. This light description is apparent direction – the *ray* concept – and represents the wave front. The ray has no physical reality but is a mathematical concept defining a wave front, with physical reality. This means that when we use the *law of reflection* in a mirror (or when we design a lens in a camera) we have to *use the ray concept* – not the beam concept. This idea is in agreement to Michelson's first interpretation regarding MMX. Therefore, he concluded that there is no effect of the ether wind in the transverse arm of MMX.

We can now conclude by using the ray concept in MMX that aligning the system means that wave fronts become parallel to the distant mirror. We also find that this parallelism is preserved when the equipment is rotated during measurements and  $\mathbf{c}$  is always orthogonal to the distant mirror. Therefore, we find that we have *no effect* of the ether wind in the transverse arm in MMX.

## The mistake

In 1882 a different interpretation of MMX was presented by Potier. He used the beam concept, instead of the ray concept. So, he got  $\mathbf{c+v}$  orthogonal to the distant mirror instead of just  $\mathbf{c}$ . By use of this assumption he got an effect in the transverse arm equal to half the effect in the longitudinal arm. Michelson resisted this interpretation until 1887, when he gave up after a nervous breakdown, since he was in conflict with most scientists.

Potier had not followed the wave model in a strict way, and seems to be influenced by the particle model in some way. Thereby Potier started the wave or particle paradox. As a cover up for this mistake time dilation was invented – not discovered – and this caused the twin paradox as well. This was a tragedy for Michelson as well as for science.

In the longitudinal arm of MMX measurements are done based on ether disturbances moving *sequentially* forth and back between mirrors. The separation between atoms in a crystal is controlled by ether disturbances moving *simultaneous* forth and back between atoms. It is therefore reasonable to assume that the effect, searched in the longitudinal arm of MMX, is *real but compensated* by contraction of matter. This contraction exists also in the definition of the unit of length. So, compensated effect in one arm, and not existent effect in the other arm means that the zero results in MMX can be explained based on the Galilean transform without dilation of time.

## The global positioning system (GPS)

The behavior of atomic clocks (not of time) in GPS can be described as a second order effect of ether wind  $v$  changing clock frequency as  $f=f_0(1-v^2/c^2)$ . Bound electrons moving forth and back in relation to the ether wind can explain this effect.

The advanced functionality of the GPS system can be united with an ether as a frame translated, but not rotated, by our planet (Earth centered inertial frame, or ECI). However, it is not reasonable to assume our planet to define the ether in the whole Universe. So, such a frame cannot define the ether. Instead, unification with GPS is possible with an ether wind having spherical symmetry in relation to our planet, and approaching zero at large distance. This follows from the fact that GPS transmitters and receivers are located on 2 concentric spheres. This means that an ether wind blowing in negative radial direction to Earth is possible. Such an ether wind can explain gravity, and also the Pioneer anomaly. An ether of this kind was suggested by Fatio 300 years ago. Fatio's model assumes small and fast particles moving in all directions. When this flow is attenuated inside matter fewer particles are leaving that matter in relation to arriving particles. This difference produces a negative radial ether wind  $v$  that can be assumed to cause gravity as a force proportional to  $v^2$ . The Fatio model can also explain the anomalies in gravity that are produced by solar eclipses, and also tidal water.

If we assume the radial ether wind to have the same magnitude as the tangential ether wind in a satellite, caused by motion, we can predict the clock effects in the GPS system. We can use the frequency dependency given above. (The effect due to tangential ether wind must be reduced by a factor  $\frac{1}{2}$ , since the satellite has not stability in relation to the direction of motion.) The effects predicted by SRT plus GRT together can be described by *one ether wind model*. However, this model predicts the same as GRT for light in radial direction only.

In this theory the particle model for light is not needed. However, the quantity  $hf$  is said to represent quanta of energy. We can explain this by regarding the fact that we detect light by electrons. Therefore, quantization of charge in electrons can explain the observed energy quantization, instead of due to quantization of light.

## Result

By disregarding the important distinction between the beam concept and the ray concept Potier caused the wave or particle paradox, with a devastating effect for physics. Ironically the difference between these 2 directions is as small as  $10^{-6}$  radians (horizontally) and caused by planetary rotation. So, in most other cases the difference can be ignored – but not in MMX.

## Conclusions

The wave or particle paradox was created as early as in 1882 with the introduction of a false interpretation of MMX. This mistake created the absurd concept dilation of time – as a cover up. Assuming an ether according to the 300-year-old model by Fatio means that light can be described as a wave motion without light particles. This ether model can also explain gravity and the Pioneer anomaly. It is also possible that quantization of energy according to Planck's constant can be caused by charge quanta in electrons, instead of by light quanta. The predictions regarding clock behavior in GPS described by SRT *plus* GRT can be explained by *only one* ether model.

Radial and tangential ether winds become:

- By Sun:  $v=437$  km/s near surface, 29.8 km/s at 1 AU and 1.5 km/s at 20 AU.
- By Earth:  $v=7.91$  km/s near surface and 3.87 km/s in a GPS satellite.

The zero result of MMX was surprising, but the wrong expectations were devastating.

## Remarks

Many dissidents have been critical to time dilation and MMX. It is remarkable that they have not been critical to Potier's interpretation.

We can test the ideas presented here by shifting the orientation of an atomic clock, from horizontal to vertical direction, and observe the clock frequency.

## References

- Printed book: *Physics Without Photons* and
- Free e-book: *Physics Without Mathematics* (almost the same content, without mathematical symbols, in order to be attractive to not scientists, since scientists have ignored my ideas).
- Available together with other articles at <http://www.naturalphilosophy.org/site/member/?memberid=22&subpage=abstracts>