

Physics versus math

Chaos in physics

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Background

Mathematics is an important tool in physics that many times seems to be overestimated, and mathematical thinking and physical ideas have been intermixed. Mathematical *descriptions* of phenomena have often been regarded as *explanations* of real processes.

One example is Ptolemais's interpretation that the observations on planetary motions could be explained by substituting simple circles by epicycles. Epicycles are motions consisting of a combination of two circular motions of different frequencies. So, starting with the unproved idea that Earth is at the center, this more complex model could describe the phenomenon that is observed for other planets. This interpretation survived for many hundreds of years.

Copernic presented an alternative, although he had to wait until the end of his life to present the idea, in fear of the priests. He found out that only one of the circular motions represents reality, and the other circular motion is an *illusion* caused by the fact the observer was in motion, since the Earth is also in a circular motion. So, the epicycles described only a phenomenon, but not the reality. Ptolemais was fooled by mathematical thinking, and reality was revealed by Copernic.

In science truth was dangerous in those days. Galileo was kept arrested in his own home by the church. However, Giordano Bruno was burned to death for his ideas. So, he was treated even worse than Galileo.

Tycho Brahe and Kepler

Tycho Brahe spent his whole life on observing planetary motions. He got a small island from the king and could use that income to build instruments (by himself) and observatories. He found out that, instead of observing from towers, you should rather dig a hole in the ground to avoid stray light.

Tycho Brahe managed, by self-made instruments, to increase precision in observations several times, in relation to what had been done for hundreds of years. This advanced precision was a very important step in physics. At the end of his life, he was worried about whether his great work should be forgotten.

Kepler was a mathematician that was an assistant to Brahe. Kepler managed to inherit a part of Brahe's material from Brahe's relatives. Due to the high precision in the data Kepler managed to observe the elliptic form of the motions of the planet Mars. He derived from this the two first laws of planetary motions. The third law came some years later.

Kepler's mathematical work is more known than Brahe's work. However, Kepler's work could very well be done by another mathematician. However, Tycho Brahe managed to get support from the king and worked life long on his project. So, he was a very unique scientist, and our world could be forced to wait a very long time for someone else to do his work. Therefore, it seems unfair that Kepler today is more famous than Brahe.

This story is an example to the fact that we value mathematical routine work higher than very unique efforts in physics during a whole life time.

Faraday and Maxwell

Just like Tycho Brahe, Faraday was a devoted scientist. His most important contribution to science was his studies on the connection between electricity and magnetism. This marked a very important step in the development of physics. Faraday worked many years on this problem.

Faraday's work on the ether concept, together with works from other scientists, was translated to mathematical form by Maxwell. He presented a specification of the ether concept in four mathematical equations. This description was therefore a work by several contributors and Faraday's contribution seems to be the most important contribution. So, these four equations could very well be called Maxwell's and Faraday's equations.

Faraday's work is a most pioneering work in physics, and Maxwell's mathematical work is more a routine work. So, this fact is also a demonstration to the fact that we value works in mathematics higher than works in physics.

Although we have a mathematical definition of the ether by Maxwell, we nevertheless regard the ether as not existing. This is very problematic, since without an ether we cannot explain the following:

1. The propagation of transverse waves in light.
2. The propagation of radial forces in gravity.
3. The propagation of longitudinal forces between atoms for controlling their separations in a crystal.

Perhaps dark matter and dark energy together constitute the dark ether.

Newton and Fatio

Newton used Kepler's three laws of planetary motions to arrive at his law of gravitation, with a force proportional to inverse, and squared, distance between two bodies. This was a pure mathematical work. However, a person, Fatio, known to Newton, sent a physical hypothesis to Newton. But Newton refuted the idea and stated that he did not need a hypothesis. He seems to regard the relation to Kepler's laws to be an evidence that made a hypothesis not needed.

This decision by Newton seems to be an important mistake. A physical *explanation* was refuted in favor of a pure mathematical *description* of a phenomenon. Here we again find an overestimation of mathematics, and a disrespect for physics. Newton did not see that his law, together with the laws of Kepler, both were in need of physical explanations. We can call this phenomenon a mathematical idealism.

Newton seems not to be aware of the fact that his law, based on mass point approximation, demands spherical symmetry in bodies. This kind of symmetry is also produced by gravity, but this means that Newton's law of gravity is an approximation. We can see this by splitting up a body in small elements, and then apply the law of gravity on each element. We can then make an integration over volume, and find a new form of the law of gravity. This new variety of the law is independent of spherical symmetry, and is therefore an *improved* version. Newton's law is therefore an approximation to this version.

Fatio's model of the ether is based on small, and fast, particles moving in all directions. This flow can be assumed to exist in all points inside a body, and also to be attenuated by matter. This

attenuation is disturbing the spherical symmetry in the particle flow. Therefore, in the neighborhood of a body the flow away from that body is slightly reduced. This phenomenon can explain gravity as a small reduction of a pushing force. Gravity is not a pure pushing or pulling force.

This means that our new version of Newton's law can be united with Fatio's hypothesis much better than Newton's original approximation. Fatio's fast particles seemed absurd in Fatio's time, but today we accept such extreme behavior in particles that we call neutrinos. Our new model is also more general by not being dependent of spherical symmetry. Therefore, it seems to be very unhappy, for science, that Fatio's idea was refuted by Newton.

By being a weak force, and by producing approximate spherical form, gravity seems to be hiding its secrets for us. Newton's mistake by not observing his law to be approximate is also an example to the fact that we often think in mathematical terms instead of in physical terms.

Our thought experiments demonstrates that our modified version follows logically from Newton's version, and is also more general. Therefore, Newton's gravity is only an approximation to our modified version, and this modified version can be united with Fatio's model. So, Newton made a great mistake by abolishing Fatio's idea. Mistakes are possible also for our most important scientists. Kepler was also a great scientist that made a mistake by suggesting that Platonic bodies could explain the radial separations of our planets.

The wave model for light

The wave model describes light with a wave vector, \mathbf{c} , that is orthogonal to a wave front, and always related to the ether's state of motion. This is a fact that is important to remember, and since we do not know the component in the ether wind that is falling inside the wave front, we must describe light by disregarding this *transverse* component, since light moves in relation to the ether **independent of equipment motion** in MMX. Light description becomes therefore $\mathbf{c}(1+w/c)$, with w as the *longitudinal* component in the ether wind. This is apparent light motion described by the **ray** concept. This concept must be used when we will describe wave fronts inside a beam of light, since light moves in relation to the ether.

However, sometimes we want to describe the beam itself, and in this case, we must use the **beam** concept, and that means the vector sum, $\mathbf{c}+\mathbf{v}$. Therefore, the beam concept often is less important, and only detectable based on max *amplitude* in the direction of most light intensity. This detection is often possible only with low accuracy.

In coherent systems we use reflectors, or refractors, to form (in collimators) or to detect (in telescopes) flat wave fronts. Reflectors and refractors have relevance in relation to wave vector, \mathbf{c} , but not in relation to ether wind, \mathbf{v} . So, we find that advanced optical systems, detecting light direction with extreme precision, only can find the apparent light direction defined by the *ray* concept. This kind of detection is based on *phase*. Therefore, it is important to make distinction between detection based on phase and detection based on amplitude. So, we need to know when we have to use the description,

$c(1+w/c)$, (high precision, phase detection) instead of the description, $c+v$, (low precision, amplitude detection). So, we must remember that it is the ether wind falling inside the wave front that causes this difference between ray and beam.

The great mistake of missing this important distinction has caused lots of problems in physics. We have misunderstood stellar aberration and the famous experiments made by Michelson and Morley (MMX). We have got the wave-particle paradox, the twin paradox, and, since we could not handle the wave model, we have used the particle model instead, and thereby produced lots of dubious explanations to different phenomena. Perhaps the use of the word 'ray' has been misleading us into thinking in particles. We must therefore remember that the ray (wave front normal) is just an *abstraction* that we use to define the *reality* that exists in the wave front.

Stellar aberration

In stellar light we cannot see any beam direction and must use the ray concept in a telescope. This telescope detects flat wave fronts that are constant in relation to the equipment, independent of the ether wind. So, the ether wind, v , cannot explain stellar aberration. The ether wind is also too small, since the Sagnac correction in the global positioning system indicates that v is equal to about 10^{-6} times c , in light moving horizontally. So, ether wind *cannot* tilt the wave front.

However, observer motion u is about 10^{-4} times c , and can explain stellar aberration. Stellar light moving with velocity c in relation to our sun is moving with velocity $c-u$ in relation to our

planet, if \mathbf{u} is our sun-related velocity. This means that observer velocity \mathbf{u} can change our perception of light direction with an angle equal to $\arctg(-u/c)$ in the special case when \mathbf{u} is transverse to \mathbf{c} . This is caused by a coordinate transformation of light behavior from frame of Sun to frame of Earth. Therefore, we find that observer motion can explain an *illusion* of wave front tilting, since the transformation demands a changed orientation in the model.

This mistake is of the same kind as Ptolemais's mistake by not regarding observer's change in *position*. In stellar aberration we have disregarded observer's change in *velocity* (in relation to light speed). In both cases we have mathematical descriptions in error accepted as physical explanations.

We have found that stellar aberration *cannot be used* for ether wind detection.

The measuring arm in MMX

The ambition with MMX was to detect the sum of ether wind effects in two transverse forces moving in antiparallel directions to each other. However, this ether wind effect can be equal to in sum of the same effects in two longitudinal forces moving in antiparallel directions to each other's. The reason for this is that atoms in a crystal must control their separations by means of forces moving in the ether – since the ether is all there is.

If this hypothesis is true the expected effect in MMX is compensated by the same effect in the separation between atoms in a crystal. This effect is *two times* the officially accepted FitzGerald contraction.

Therefore, Maxwell may have done an important mistake by suggesting MMX experiments, since MMX cannot be used for ether wind detection.

The reference arm in MMX

Michelson's initial interpretation assumed no ether wind effect to exist in the reference arm in MMX. However, in 1882 such an effect was suggested by Poitier. Michelson protested first, but in 1887 he had to give up – after a nervous breakdown – since most scientists were against him. By reasons like what we found for stellar aberration we will see that this was very unhappy – not only for Michelson, but for science as well.

In MMX a collimator defines flat wave fronts to be constant in relation to the equipment, and they are also adjusted to be parallel to the distant mirror. So, MMX is a coherent system that operates with *fixed* wave fronts, and therefore an ether wind blowing inside the wave fronts cannot tilt a wave front by the same reasons as we found regarding stellar aberration. We can also see this fact in another way by regarding the fact that the distant mirror produces a virtual image of the light source at a position that is *fixed* in the equipment frame. Therefore, we find that a transverse ether cannot tilt a wave front, just as we found for stellar aberration. So, Potier introduced an important error.

This mistake indicates a particle-based and mechanics-related thinking. If we instead were discussing the shooting with a canon this reasoning would be correct, since moving the gun adds to the behavior of the bullet. But the light model states a different behavior for light in MMX, since wave front

orientation is *fixed* by mirrors, and light moves in relation to the *ether*. Therefore, moving the equipment cannot tilt a wave front in MMX, and therefore, no effect in reference arm of MMX. The fact that ether wind can be blowing inside a wave front and thereby cause the difference between beam and ray has not been regarded.

We have found that ether wind cannot cause the effect of ether wind that was introduced by Potier in the reference arm.

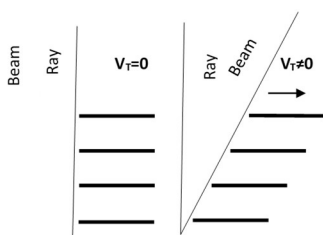


Fig. Light behavior in the reference arm in (the coherent system) MMX (in the frame of the equipment). Beam depends on ether wind, but ray does not.

See Fig describing how an ether wind inside the wave fronts can change beam but not ray, and that transverse ether wind v_T is irrelevant.

The special theory of relativity (SRT)

SRT was based on stellar aberration and MMX. We have found both theories to be *useless* in relation to the ether wind, and contributing *nothing* in relation to the existence of an ether. We have also found that the results from MMX can be explained without assuming time dilation and also without the twin paradox. So, we can use the Galilean transform instead of the nonlinear Lorentz transform.

SRT started with an unproved assumption and a mathematical derivation was invented afterwards, by mathematical trickery.

Doing this demanded a mathematical error as well. This was done by writing the following two equations:

$$x^2 - c^2t^2 = X^2 - c^2T^2 = 0$$

and after doing that the last equality was 'forgotten'. This mistake produced the absurd Lorentz transform.

However, SRT is stated to explain also the behavior of atomic clocks. For reasons of completeness, we therefore need an alternative explanation for this phenomenon.

Atomic clocks

In atomic clocks a bound electron is moving, inside the plane of the orbit, force and back in two antiparallel directions in one dimension. However, this motion is in one dimension of two in the plane of the orbit. Therefore, we can expect an effect of ether wind to be half the effect in MMX. This means an effect in proportion to:

$$1 - \frac{v^2}{2c^2}$$

Since the effect in MMX is proportional to:

$$1 - \frac{v^2}{c^2}$$

We can conclude that we have an effect *inside* the clocks.

The fact that the effect is smaller by half fooled scientists to invent time dilation to fill out the gap, since scientists assumed the effect to be in MMX instead of in the clocks. However, in MMX there is no clocks, no clock effect and zero result.

The clock effect is caused by ether wind *inside* the plane of the orbit. Perhaps an equal effect is caused by ether wind *transverse* to the plane of the orbit. However, this problem is not addressed here.

The wave-particle paradox

We have not understood the wave model, and therefore the transition from light particles into light waves is not yet completed. Misconceptions regarding stellar aberration and MMX have produced SRT, time dilation, twin paradox and the wave-particle paradox. We have much more to learn regarding the wave model – and unlearning to do regarding the particle model.

The bad understanding of waves has forced us to invent problematic interpretations based on particles instead. The wave model demands a mathematical and *abstract* tool, the ray concept to describe the *reality* that exists in the wave front. We will see that thermal radiation, photoelectric effect, Compton effect, photo luminance and experiments with a beam splitter *can all be explained by the wave model*.

When the wave model is correctly used, we can see that the particle model for light is superfluous – as Einstein said about the ether. Instead, the ether is needed and particles may be needed for describing the ether.

So, here we also see mathematics being used in a bad way. By starting with an unproven assumption, mathematics was used to deliver motivation for an axiomatic statement. This was done by mathematical trickery.

Explanations based on the wave model

The radiation from hydrogen is an example of an effect that can be explained by the wave model in a better way, than by a particle property. In hydrogen the electron's binding energy is quantized, and this means that a bound electron can only have orbits with a radius that is limited to one in a set of specific discrete values. This means some discrete states.

The remarkable fact is that we cannot observe any radiation from these states. However, we observe radiation from frequencies that represents the differences between these states. The official explanation to this phenomenon is that the electron particle has capacity to radiate only during transition between two states. This description of the electron behavior is ad hoc and without motivations. So, we have a reason to search for an alternative explanation.

We find that all electrons in one specific state radiate at (and are sensitive to radiation from) one and the same frequency. This means that they all are in a 2-way communication. Therefore, it is possible that they all can cooperate and together produce zero radiation. This is possible by a wave property called *destructive superposition* in light. We seem to have missed this possibility by not enough regarding the fact that we need radiation from *many* electrons to reach a detectable level.

So, we have found a *wave* property that explains this radiation better than the official electron behavior.

This explanation for hydrogen radiation can probably also be used for **thermal radiation** in general.

We have seen how an electron orbiting with a frequency, f , can cause ether *waves* with frequency, f . However, this process can also go in opposite direction. This means that an electron orbiting with frequency, f , can be sensitive to light with frequency, f . This phenomenon is demonstrated in the **photoelectric effect**.

The official explanation to the photoelectric effect assumes electrons having an initial velocity that is small and therefore *ignorable*. Instead, we assume here electrons to be oscillating with frequency, f . The electrons are held in orbits by a balance between two radial forces. Therefore, light with frequency, f , can cause a force (transverse to electron motion) that operates in radial direction – thereby disturbing the existing balance. This means that an ether **wave** can change electron's *potential* energy. This is in contrast to the official explanation that is stating that a light **particle** can change *kinetic* electron energy.

We have now seen that a wave explanation can give us a better explanation to the photoelectric effect, since the assumptions that initial speed is low and that a particle moving *towards* a crystal can force an electron to leave the crystal at a *right* angle are both dubious.

We have used an interference effect at frequency, f , to explain thermal radiation and photoelectric effect with a process between a charged particle and the ether. Thermal radiation is charge producing ether waves. Photoelectric effect is ether waves affecting potential energy in a bound electron, when the process goes in opposite direction to thermal radiation. So, these two phenomena are related to each other; both phenomena are explained by the wave model for light.

The Compton effect can also be explained by the wave model in the same way if we regard the Compton effect as two processes.

1. In the first step an X-ray wave packet (not a particle) can affect the potential energy in an electron and cause the electron to escape its kernel. So, a wave causes emission of a particle in the same way as we have seen in the photoelectric effect.
2. In the second step this electron is captured by another atom in the same way as we normally generate X-rays by fast electrons hitting a crystal. This *short* process can be compared to the *continuous* process in thermal radiation. In both cases an oscillating charge produces oscillating ether waves.

So, we find that the wave model alone can explain the Compton effect, and that light particles are not needed in this case either. We also can see that this explanation to the Compton effect is simpler than the official version.

The photo luminance can also be explained by two processes in very high agreement to how Compton effect was explained.

1. In the first step continuous light (instead of wave packets) is illuminating a mineral, and is thereby causing electrons to escape in almost the same way as in the Compton effect. So, a wave causes emission as in the first step in the Compton effect.
2. In the second step the electron is captured by another atom, in the same way as in the Compton effect. This short process generates a wave packet in the same way as in the second step in the Compton effect.

This demonstrates that we only need the wave model for light to explain photo luminance.

The experiments with beam splitters are using continuous radiation from lasers to illuminate two photodetectors with equal amounts of light. The detectors register equal amounts of electrons. However, the outputs are not correlated, and this follows from the fact that electrons behave individually. So, the experiment with a beam splitter is also explained by the wave model for light.

We have used an interference effect where oscillating light *waves* can interfere with oscillating electrons. This interference effect can work in both directions and thereby explain:

1. Thermal radiation.
2. Photoelectric effect.
3. Compton effect.
4. Photo luminance.
5. Experiments with a beam splitter.

We have used only the wave model for light. So, we do not need the particle model for light that was introduced in 1905 by means of the photoelectric effect. This was an idea presented by Einstein, who, for 50 years, tried to find certain proof for this statement. At the end of his life, he admitted his failure on this point. Therefore, we have strong reasons to believe that he had made a wrong statement. We should not be surprised, since Einstein had earlier made important contributions to science, and people in that position are often able to convince community of ideas that are too fantastic.

One example of this fact is Kepler's suggestions regarding how Platonic bodies could explain separations between planets.

If Einstein was wrong about quanta in light, we have a reason to ask ourselves if we have been fooled by an illusion. In experiments with light, we do not observe light directly, since we cannot see the light, because light is not visible. What we really observe is electrons dropping out from a photodetector. So, we are in fact observing matter. Therefore, the fact that the charge in the electron is quantized can create the illusion that light is quantized.

We seem again to be confused by our models. We have been used to represent light by lines that we call rays. This can produce associations to particles. But these lines have no physical reality. Instead, these lines represent the normal to a wave front, and that wave front contains the reality. So, we see again that we have a bad understanding of waves, and the transition from light particles and light waves is still not finished. This can indicate a bad understanding of the distinction between mathematics and physics.

Fatio's gravity model

We have earlier seen that the effect in atomic clocks due to velocity in SRT instead can be explained by an ether wind *produced by* velocity. This fact implies a question: can the effect described by GRT also be explained by an ether wind? This invokes another question: how large is that ether wind if this hypothesis is true? We find by a simple calculation that this ether wind becomes equal to the escape velocity, $v_{esc} = 11.2 \text{ km/s}$ near Earth. This seems very reasonable since this

value is relevant for matter, and the ether must also contain matter to be able to transfer gravity. So, the *two* effects of SRT *and* GRT can instead be explained by *one* effect of ether wind.

The effect from GRT is not identical to the effect of the ether wind. The two effects are equal only in radial direction to Earth. We can see this by regarding that ether wind is a vector, but GRT is based on gravity potential, which is a scalar concept. This fact opens a possibility to do a discriminating test between this ether model and GRT. We can measure the first order effect of the ether wind, v , in 3 dimensions by a method described in the following papers:

1. J. E. Persson, PHYSICS ESSAYS **23**, 4 (2010)
2. J. E. Persson, Infinite Energy **93**, 35 (2010).
3. C.-C. Su, Eur. Phys. J. C **21**, 701 (2001).
4. The Roland de Witte 1991 Detection.

The fact that we are forced to use 2-way light for finding a numerical value on the light speed c , does *not mean* that we cannot use 1-way light to see changes from the ether wind.

We have earlier seen that radial light speed, on the surface of Earth, is $c \pm 11.2 \text{ km/s}$. This means that radial 2-way light speed is $c - 0.42 \text{ m/s}$. However, our experience of light speed is mostly from light moving tangentially to Earth.

We found earlier that Fatio's hypothesis can *explain* Newton's *description* of gravity. However, Fatio's model can also explain another phenomenon, not explainable by Newton's gravity law, since Fatio's model can explain gravity anomalies during solar eclipses. We can see this by regarding how every point in a body attenuates the flow of ether particles. Since this

attenuation creates an exponential, and nonlinear reduction of the flow we can see that the sum of gravity contributions from the Sun-Moon system is slightly reduced during a solar eclipse, when the contribution from Sun is passing the Moon.

This effect (Allais effect) is estimated to be just detectable by a very sensitive gravimeter. Therefore, efforts have been done to detect this effect. However, a mistake has been done here, by not regarding the fact that this effect is not real on Earth, in a free fall. Instead, this effect is converted into a motion of our planet a small amount away from the Sun-Moon system. This is caused by the equivalence principle. A part of our planet, with the size defined by the Moon, is moved (perhaps in the order of 1 meter). Perhaps this effect also can explain a very small increase of distances in our planetary system?

As a consequence of this we should instead try to detect a small deformation of our planet. It is not possible to measure this deformation directly due to lack of reference. However, there may be a possibility to see a part of this effect by using a pendulum. There may be a difference between the averaged value of a larger part of our planet, in relation to the effect on the small mass in the pendulum. So, we can try to use a very long pendulum at rest. This should be done during a solar eclipse in a low elevation angle. We should expect effects in the beginning and in the end of the eclipse.

Newton seems not to have observed that his model was dependent on spherical symmetry and *approximated* gravity. The fact that gravity causes spherical symmetry means therefore that this property of gravity can be said to hide the nature of gravity. Mathematics provides a very effective

model, but the negative side of this is that it is difficult to see the nature of gravity. So, we see here an example of how mathematics again is fooling us, just by being effective. We seem to have more to learn regarding the relations between mathematics and physics.

The Pioneer anomaly

The Pioneer anomaly is a mysterious problem, and it can be interesting to test if the idea with a radial ether wind, equal to the escape velocity, can explain this effect. We find that in radial direction we have a light speed at 1 AU from Sun of:

$$c_{rad} = c \pm v_{esc} = c \pm 42.4 \text{ km/s}$$

Therefore, the two-way light speed in radial direction at 1 AU becomes:

$$c_{2rad} = c - \frac{v_{esc}^2}{c^2} \times c = c - 6 \text{ m/s}$$

Therefore, the change in c_{2rad} between 20 and 70 AU becomes:

$$\Delta c_{2ra} = -6 \left(\frac{1}{70} - \frac{1}{20} \right) = 0.214 \text{ m/s}$$

This means an increase in the 2.29 GHz carrier frequency of about 3.25 Hz.

So, we find that the hypothesis of a radial ether wind, equal to the escape velocity, implies an *increased* light speed in the Pioneer space station. Therefore, an increase in light speed may have produced an **illusion of a decrease** in the space station speed. So, is it possible that the Pioneer anomaly is just

a measurement error? This idea must be worth testing, since our experiences of the behavior of light is mostly from light in horizontal motion. So, radially moving light in Pioneer experiences is important. We can observe changes by ether wind in 1-way light in 3 dimensions on Earth, as earlier was mentioned on page 22.

If the Pioneer anomaly is just a measurement problem, this fact can indicate that we have been fooled by our mathematical models also in this context. We found that a numerical value on light speed, c , could only be reached by measuring round trip time in 2-way light. Therefore, in error, we concluded that 2-way light must also be used for detecting *changes* in light speed due to ether wind. de Witte demonstrated another method, that unfortunately demanded too long measurement distances. This made the experiment dependent on planetary rotation, which caused systematic errors. However, his method can be scaled down by using HeNe lasers connected over a few meters by optical fiber. The frequencies in the 2 lasers, should be chosen to be very close. The equipment should be slowly rotated by an advanced platform, and a linear function should be eliminated from a sinus function of observation angle. This sinus function should provide values on ether wind, v , in 3 dimensions. See page 22. Another possibility is to use lasers with extremely short pulses in about the same way. However, this demands a longer measuring distance.

The fact that small second order effects are sensitive to gravity means that almost all light speed measurements are made in horizontal direction, and on second order effects. So, the Pioneer experience is a unique measurement, that is done in radial direction, and we must remember that we only observe

second order effect. There is therefore no possibility to see a supposed radial 1-way ether wind. So, it is completely reasonable to assume that light speed in vertical direction is $c \pm v_{esc}$. We must therefore conclude that there are strong reasons to make such tests, based on 1-way measurements, to find effects of the ether wind.

It is a remarkable fact that technology allows a possibility to detect the extremely small effect in the Pioneer anomaly. Unfortunately, scientists do not have the fantasy to regard the possibility of a vertical ether wind with capacity to explain gravity. Scientists seem to be resistant to making discoveries in physics.

Anomalies in gravity constant, G?

Observations on artificial satellites in large orbits from communication and navigation satellites, having orbits with about 24- and 12-hours periods, have indicated a suspected decrease in gravity constant, G, for large distances. G is derived from the relation between orbit radius and period time.

However, this idea can be a mistake. We must remember that satellites orbiting Earth also are affected by gravity from the Moon and the Sun. For larger values on the radius of orbits these contributions become relatively more and more important. These contributions can cause a change in orbiting speed during every orbit. This can mean a second order effect that slightly can increase the period of orbit, and thereby explain this effect.

If this is true, we have another example, where we have forgotten the physical meaning, by doing an unjustified

simplification of what the model means, and disregarded small effects. We have not been careful enough in handling our model. Again, we have been fooled by mathematics.

We must not forget that it is always important to regard the anomalies, since the anomalies are telling us where to improve our models.

The *potential* forces in light

We have earlier described how an interference effect between ether waves and orbiting electrons can explain photoelectric effect and also explain an experiment with a beam splitter by the photoelectric process. A process in opposite direction described how an orbiting electron produced *continuous* radiation. We also found that Compton effect and photo luminance can be explained by two processes, where ether waves first act on an electron, and later the electron (by being captured) generates a packet of ether waves. However, between these two processes there must be a finite time interval, since the electron must move until it hits another atom.

There is also an interesting case when these two processes are combined in opposite order. This means that an electron acts on the ether, and then, after some time, the produced ether waves act on another electron. This means that electrons can act on each other by means of the ether, and also that the time interval between the two processes depends on light speed, c . So, the force on the second electron cannot be real until after this time interval, since we will not accept action at a distance without time consumption. Therefore, we find that the

transverse force in light must be regarded as *potential*. After a finite time interval, the force is *realized* in the second electron. This must therefore be done by energy from the ether, and energy is therefore not transferred by light. This seems realistic, since forces in light are transverse to motion. So, instead of transferring energy, light is containing information needed to harvest energy from the ether. Therefore, we conclude that forces in light are of *potential* nature.

The forbidden ether

In 1905 a paper by a young patent clerk caused the ether concept to be regarded as 'superfluous'. However, an eminent and experienced scientist was ignored between 1925 and 1955 when he (after life-long studies in physics) tried to get acceptance for an idea stating that 'physics without an ether is unthinkable'. This is remarkable. It is also remarkable that we have Maxwell's 4 equations giving a *mathematical* ether specification, but nevertheless we will not allow any *physical* reality to exist behind this concept. We also accept dark matter and dark energy, but still, we deny the possibility that these 2 concepts can constitute a dark ether – containing large amounts of energy. We have based this decision on wrong interpretations of stellar aberration and on MMX (in both arms). This means that we have used the law of energy conservation in error, by disregarding ether contributions.

We have more arguments for the ether by regarding that all important light and X-ray behavior can be explained by the wave model, and by the fact that *potential* light forces demand energy from the ether. So, we can conclude that the Lorentz transform – not the ether – is superfluous.

There were many errors causing the ether to be abolished:

1. Not regarding ether-based control of atomic separations in a crystal in MMX.
2. Not regarding that mirrors define c (not v). So, no wave front tilting in stellar aberration and MMX reference arm.
3. Giving relevance to MMX, although the test failed to fulfill prediction.
4. Assuming Sun-entrained ether, without concluding Earth-entrained ether as well.
5. Not regarding the Sagnac correction in the global positioning system (GPS), implying ether wind as low as 10^{-6} times c , thereby disproving effect in reference arm in MMX.

So, we have not observed that advanced, and modern, GPS results are contrasting to the turn in 1882 to 1887 from Galilean to Lorentzian transformations. We did not observe the need for this feedback. GPS is important in this context, and GPS, as a spherically symmetric system with high precision, can be united with a spherically symmetric ether wind. The spherically symmetric force of gravity can also be united with a spherically symmetric ether wind. Since the ether must explain gravity, we have strong reasons to conclude that there is an ether wind blowing in negative radial direction – a falling ether.

The Pioneer experience is of second order (2-way light speed) in radial direction to our sun. We have no experience of first order effect in radial direction (1-way light speed). Therefore, we have not disproved the idea that we have an ether wind

equal to the escape velocity. The assumption of a radial ether wind states that we are surrounded by a radial ether wind in direction towards the Sun of 42.4 km/s. We do not see this ether wind since it is converted, by the equivalence principle, into an acceleration directed towards our sun. Instead, we can see the ether wind, generated by our own planet, and equal to 11.2 km/s on the surface of planet Earth. It is probably possible to detect this ether wind, in 1-way light speed, as indicated on page 22. Such tests are strongly recommended here.

We have also seen that the assumed *decrease* in speed in the Pioneer space station may instead be an illusion due to an *increase* in the 2-way speed of light. This increase was estimated to be 0.213 m/s between 20 and 70 AU from Sun. This was based on the assumption of a radial ether wind equal to the escape velocity.

We arrived at the radial ether wind by starting with the idea that we could substitute SRT time dilation's dependency on speed with a clock effect, instead caused by *ether wind due to speed*. Then we searched for the ether wind that could explain GRT's effect in the same way. This resulted in an ether wind equal to the escape velocity. This seems reasonable since the escape velocity describes how matter with zero initial velocity have that velocity when arriving to our planet, and the ether must also have mass in order to cause gravity.

However, it is important to notice that equality between GRT and gravity force due to a radial ether wind only exists in radial direction. This opens a possibility to decide between GRT and gravity due to escape velocity by measuring ether wind as a function of elevation angle in 1-way light, indicated on page 22.

Is it really possible that we have missed a radial ether wind as large as 11.2 km/s? Yes, this is possible, since we have been limited to results with 2-way light.

This means that Einstein's abolishing of the ether appears to be his greatest blunder. Einstein also seems to be quite certain about this fact. So, he spent many years of his life trying to correct this magnificent error. It was therefore unhappy for science that he was ignored for so many years.

However, even more devastating to physics was the mistake to introduce wave front tilting in MMX, and in stellar aberration in the year 1882. The forces between atoms in a crystal was also disregarded. It is always the first errors that are the most important, and later errors are often just secondary effects. However, these effects are in this case very important. Gravity could not be explained, and the law of energy conservation was applied in error. So, we can learn from this that results from space technology (Pioneer) and satellite navigation (GPS) must be regarded when we evaluate decisions that were made in 1887. We seem to have a problem with our ability to be critical to existing theories. Therefore, we often convert a hypothesis into a dogma, without well-established empirical results.

SRT spoiled the time concept by the introduction of multiple time concepts. Harald Nordenson described this very clearly in two books https://en.wikipedia.org/wiki/Harald_Nordenson from 1922 and 1969. He regarded SRT as a kind of very bad philosophy rather than as physics. The twin paradox (implying individual aging) supports Nordenson's opinion. Nordenson

was a member of the Royal Swedish Academy of Sciences, and produced qualified philosophical analysis of SRT in his books.

Theoretical physics of today is in a chaotic state. Hopefully, modern technology can help us to clear out very old misconceptions, since fundamental understanding in theoretical physics has not advanced for many decades. This is remarkable in a time where applied physics has advanced extremely, as seen in space technology and in satellite navigation.

Physics versus math

Mathematics is an important tool with intimate relation to physics. So, it is not always easy to see the difference between model and reality. But this distinction is important. Since variables, not regarded in the model nevertheless can exist, and be relevant, so, we should always regard our models as approximations to reality. The models must nevertheless be internally consistent and exact as demanded by logic. However, this idea is in contrast to a book called *Our Mathematical Universe* written by Max Tegmark. Ideas opposite to Tegmark's are presented in *Lost in Math* written by Sabine Hossenfelder. She exemplifies this in the field of particle physics, where she is very critical to the use of concepts like beauty and supersymmetry as evidences for truth. In this book Sabine's criticism is expanded to larger parts of physics.

Ptolemais did not regard the fact that the observer's *positional* vector was changing in the frame related to our sun. An error of the same kind is done by scientists today, regarding stellar aberration. Scientists do not regard the fact that the observer's

velocity vector is changing in the frame related to our sun, where wave vector in light, \mathbf{c} , is constant. So, this mistake is balanced by Potier's mistake in transverse arm in MMX. He did not observe that collimators define wave front *orientation*, \mathbf{c} , and not vector sum, $\mathbf{c}+\mathbf{v}$. So, ether wind \mathbf{v} cannot tilt a wave front. Instead, observer velocity, \mathbf{u} , can create an *illusion* of tilting. These mistakes are confirmed by the Sagnac correction in GPS, indicating that u is about hundred times larger than v . In the horizontal plane where MMX operates. This is an example on how two mistakes can 'help' each other.

We do not have any explanation to the force of gravity. This is not surprising since a very prominent and respected scientist (Newton) has told us that we do not need that hypothesis, and we accepted that statement, since he was famous. Another, also very famous scientist, (Einstein), helped him to hide the truth by abolishing the ether, that is the cause of gravity. So, we always tend to accept bad ideas from celebrities, just as we accepted complementarity in light from Niels Bohr. So, we should be more critical to *what* is said instead of judging too much based on *who* has said it.

In connection to the introduction of GRT Einstein also was thinking in terms of a mathematical Universe when he stated that 'geometry is a part of physics'. However, in later years, when he really knew physics, he said that 'physics without an ether is unthinkable', but scientists were not interested at that time since Einstein had then become a dissident. So, Einstein was accepted for wishful ideas, but not for uncomfortable ideas.

We can see 3 very important arguments for the ether:

1. To explain light propagation.
2. To explain gravity propagation.
3. To explain forces between atoms for controlling atomic separations in a crystal.

And, mathematics is not a part of physics but rather a metaphor for a physical reality. So, we must carefully observe the distinction between perception and reality. Nevertheless, mathematics has often been estimated higher than physics. We have earlier seen this by comparing Tycho Brahe to Kepler, and also in a comparison between Faraday and Maxwell.

Another conflict with logic is to draw general conclusions from failures. MMX has been repeated for decades, and always failed to fulfill predictions, and scientists concluded general impossibility of detecting the ether wind from a lot of failures. Apart from the fact that MMX was misunderstood in both arms there is also another error, since all we can conclude from these failures is an indication that ether wind detection *based on MMX* is impossible, and *not* that ether wind detection *in general* is impossible.

Another example is circular reasoning, is observed in experiments with entanglement in light. Based on the assumption that light is particles we can demonstrate that two particles created simultaneously must be entangled. By doing such a test with large spatial separation between the particles scientists seems to believe that they have proved something. However, based on the assumption that light is a wave motion we can interpret the phenomenon in a very different way. Confirmation of the wave interpretation can easily be found by just doing the test with different optical length in the two arms.

This means that, if the wave hypothesis is correct, the two 'entangled' phenomena become separated in time. This would disprove the particle hypothesis. So, we see that, if light is waves, it is easy to disprove the particle model. However, this has not been done. Physicists seems not to regard advice from the philosopher R Popper, that positive results are only a possible truth, and instead we can *disprove* the alternatives.

Since entanglement is an absurd idea, it had been more logical to do an attempt to *disprove* the particle model. Since scientists have not done that, this is an exemplification of wishful thinking.

However, we have also seen earlier that light particles are superfluous, since five of the most important phenomena in light was explained by simple interference effects (in both directions) between light *waves* and electrons. The failures in observing these possibilities demonstrates the fact that we do not understand the wave model. Therefore, we use the tool that we understand, namely the particle model, and produce dubious particle-based explanations *in despair*. We should have the courage to think in terms of wave fronts. We should find that we need 2 concepts: *ray*, when detection is based on phase, and *beam*, when detection is based on amplitude. This follows from the fact that an ether wind can be blowing inside the wave fronts, as earlier was demonstrated.

The present chaotic situation in physics is resting on 3 'pillars':

1. SRT, based on individual aging.
2. GRT, based on bending of an etherless nothing.
3. Quantum mechanics, based on spooky action at a distance without time delay.

So, scientists of today have a really hard work when they try to find a unification of these 3 absurdities.

It is suggested here that we should use experiences from satellite navigation (Sagnac correction in GPS), in space technology (Pioneer anomaly) and gravity anomalies (Allais effect) in relation to the course, and decisions, in physics taken as early as in 1882. Scientists seems to be too occupied with 'sexy' futuristic ideas and therefore, forget to also look backwards.

Bending of light by our sun

The bending of light by our sun is explained by making an ad hoc assumption that light has mass. This dubious assumption is demanded in order to explain light bending based on the particle model for light and the force of gravity, implying that mass is necessary. By using the radial ether wind equal to the escape velocity, we can find an explanation based on the wave model for light. In this assumption we do not need mass in light.

The radial ether wind near the Sun is $1.46 \cdot 10^{-3} \cdot c$. This means that we have an ether wind, transverse to wave front, in the order of $10^{-3} \cdot c$ near Sun. Therefore, light speed is increased to about $(1+10^{-3}) \cdot c$ just before the point nearest to the Sun, and just after light speed is reduced to $(1-10^{-3}) \cdot c$. This change is largest nearest to the sun and light is therefore first bent away from the Sun, and later bent back to the same direction. However, light is not bent back to the same position. So, a small difference of second order remains. We can very roughly estimate the size of this difference as observed from Earth by

observing that the size of the Sun is about 10^{-2} radians seen from Earth. See fig 2. We find that from Earth we should observe a bending to be somewhere in the order of 10^{-5} radians in agreement to observations. (A more accurate calculation should be done).

We have found an interpretation based on waves instead of on particles without mass in light. This interpretation means that light bending *and* gravity are *both* caused by the ether wind. So, bending is *not caused* by gravity force. Therefore, light particles with mass are not needed.

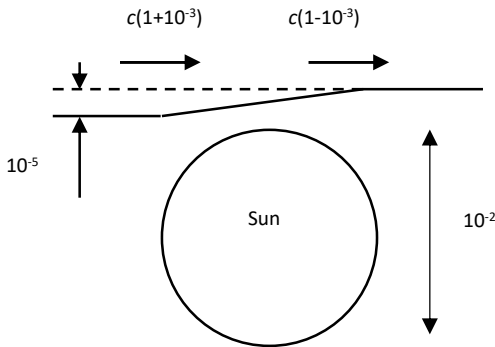


Fig. 2 Light bending near the Sun, caused by a gradient in longitudinal ether wind.

In the chapter [Explanations based on the wave model](#) we demonstrated 5 different phenomena by using the wave model. We have now also explained the Pioneer anomaly, Allais effect and bending of light near our sun by the wave model. So, the particle model is not needed in all 8 phenomena. We have also described how a modified version of the entanglement experiments has capacity to disprove the

particle model for light. Such tests are therefore recommended here.

So, we seem to arrive at a conclusion that there are no light particles. Instead, light particles are illusions caused by the fact that we never observe light. We observe electrons dropping out from a photodetector, and the fact that electrons are discrete particles produces the illusion that light is quantized.

We should also ask ourselves, if the fact that bound electrons take discrete values on radius of orbit can be regarded as an evidence for quantization of energy.

Summary

Mathematical modelling is an important and powerful tool in physics that is very intimately related to physics and giving us simple and clear descriptions. However, simplifications can also hide information and cause confusions, if we cannot clearly see the difference between physics and mathematics. This seems to be the reason to the present chaotic situation in Physics. This chaos started when Maxwell introduced the wave model for light. We have not really understood the wave model, and not given up old particle-based explanations either. Therefore, we can say that the transition from particles to waves for light is not completed.

Most advanced optical experiments are made in coherent systems, where reflectors and refractors are used to produce, or detect, flat wave fronts. An important mistake, regarding coherent systems, is not observing that an ether wind blowing inside a wave front is irrelevant in these systems, since light always moves transverse to the wave front in the ether's

frame. So, coherent systems are sensitive to *phase*, and defining wave front *orientation*. In these systems we therefore must describe light as $\mathbf{c}(1+w/c)$, with w as the component in \mathbf{v} that is parallel to \mathbf{c} . This is the ray concept, defined as the normal to the wave fronts. We use advanced coherent systems to detect the ray concept with very high precision based on phase. In coherent systems light moves with wave front normal along optical axis. So, the ray does not exist as a physical object, but as a mathematical tool defining the real wave front's orientation. Therefore, in coherent systems, wave fronts are always transverse to the optical axis.

The vector sum, $\mathbf{c}+\mathbf{v}$, can only describe the direction of max intensity in a *beam*, and not describe a wave front. Beam can only be detected based on *amplitude*. So, we see that it is important that we must have *one* light model for describing the beam and *another* model for describing ray. Therefore, Potier made a devastating mistake in 1882 in the experiments, (MMX), made by Michelson and Morley, by using the beam concept instead of the ray concept in the reference arm. He thereby created an illusion of an effect in the reference arm in MMX. It seems to be a particle-based thinking that would have been correct in relation to a cannon, but not in relation to light.

More confusion was created with MMX by regarding the motion of 2 antiparallel forces in light, but disregarding the motion of 2 antiparallel forces between atoms in a crystal. So, the assumed effect in the measuring arm is compensated, and the ether wind causes no visible effect in any of the 2 arms in MMX. And not in stellar aberration either.

These mistakes indicate a very bad understanding of the wave model, combined with difficulties in giving up old particle ideas. We have earlier seen wave-based explanations to:

1. Thermal radiation.
2. Photoelectric effect.
3. Compton effect.
4. Photo luminance.
5. Experiments with a beam splitter.
6. Clock effect – not time dilation.
7. Pioneer anomaly.
8. Gravity due to radial ether wind.

All these explanations can be regarded as a certain indication that we *do not need any particle model for light*.

This seems to indicate that it may be correct to give Einstein a Nobel prize for adding the work function to photoelectric effect, and not for adding particles to light. Einstein may be wrong about photons, as he admitted when he had searched them in vain for many years. He could not see the light but looked at matter in the form of discrete electrons dropping out from a photodetector, and was fooled to assume hf to quantize light instead of an evidence of electron quanta. Planck may also have been thinking like Einstein.

However, it also seems as we have found a great support for a famous statement that '*physics without an ether is unthinkable*', stated by Einstein. The fact that we need an ether can mean that we need the particle model also for explaining the ether. Such an ether that seems interesting is Fatio's model since his model can explain anomalies not explainable with Newton's model.

No particles in light means problem for entanglement in light. However, it is possible to decide this question by doing the entanglement test with different optical lengths in the 2 arms. Such testing is recommended here. If the 2 indications can be done at different times entanglement is disproved.

The effect, observed in Hydrogen gas – that electron orbits adjust themselves into discrete values on the radius of orbit – has been regarded as an evidence for energy in general to be quantized in matter. This conclusion is not self-evident and can be influenced by the wrong assumption that electrons radiate only during transitions between different states. So, when we explain the Hydrogen behavior with the wave property of destructive superposition instead of the particle property of turning radiation on and off, we also should put energy quanta into question.

Einstein once said something like, we need an infinite number of frames. This statement can be regarded as indicating that the ether is not a frame, but rather a field. This is in line with our radial ether wind, that can explain gravity. So, if we start with experiences from behavior of space stations and GPS and use that in combination with the physics that existed before 1882, we can find a physics without all absurdities. We get:

- No light particles.
- Galilean transform – no time dilation.
- Gravity from ether wind – not from geometry.
- Clock dilation – no time dilation.
- Radiation from bound electrons.
- Quantization in electron charge – not in energy.
- No spooky action at a distance instantaneously.

So, it seems very urgent that we also look in backwards direction sometimes, instead of just dreaming about instant communication with distant galaxies. We may find that the reality around us is much simpler when we thought, and also that many absurdities disappear. We therefore find that we have been fooled by our models, that sometimes *describe* perceptions instead of *explain* reality.

We seem to be fooled by math to an extent much larger than reported by Sabine Hossenfelder in *Lost in Math*. Nevertheless, we can conclude that physics without math is unthinkable, since all empirical physics depend on mathematics. So, we are dependent on the powerful tool called mathematics.

Conclusions

1. Use latest experiences from science *and technology* in relation to later *and older* decisions made in science.
2. Be aware of how mathematics interacts with physics and demand internal consistency in combination with an approximate relation to reality.
3. Do not draw conclusions from experiments failing the predictions – like Michelson-Morley's tests.
4. Look out for absurdities – like the twin paradox, and spooky action at a distance without time delay.
5. Look out for anomalies – like Allais effect and Pioneer anomaly.
6. Learn the wave model.

If we follow these rules, we may perhaps navigate back to a classical physics following the laws of logic. This will mean that the so-called modern physics will become unmodern.

Remark

According to Fatio's model ether wind, v , can never be larger than c . This means that we also have a maximum value on the force of gravity, since we have explained gravity with the ether wind.

Results

1. Ether wind dependent clocks – not velocity dependent aging according to SRT.
2. Ether wind dependent gravity – not geometry dependent gravity according to GRT.
3. Light is continuous or in packets – not in particles according to quantum physics.