Light without Energy

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Abstract

This article presents alternative interpretations to the empirical evidences behind the theory of relativity and the quantum theory of light. These interpretations indicate the existence of an ether. It is demonstrated that the absurdities existing in modern physics can be eliminated. However, the implied ether must not only exist; the ether must have very remarkable properties. It must have its own state of aggregation and light does not transfer energy.

Keywords: Theory of relativity, quantum physics, atomic clocks, Pioneer anomaly.

Background

In quantum physics a *wave* property, f in hf, is said to prove light to be particles. It is also stated that photon particles colliding with electron particles are said to cause the electrons to move in the direction from which the photon was coming. In the theory of special relativity photon particles are said to move with the same speed c in relation to *all* not accelerated observers and space and time are regarded as elastic concepts. In the theory of general relativity gravity is explained as the bending of *nothing*.

These inconsistencies are well known and will not be directly addressed here. Instead the empirical background to this so called modern physics will be discussed. Alternative interpretations will be presented on many points. It is demonstrated that the absurdities can be eliminated by introducing an ether. The ether is a concept that seems to be eliminated due to *lack* of knowledge. This is bad logic. However, as we will see, the ether suggested here must have remarkable properties.

Quantum Physics and Ether

The law of energy conservation is the starting point for quantum physics. An electron in a state of constant energy cannot radiate energy. According to experience absorption and emission of light is related to energy change in charged particles. It is therefore concluded that this exchange of energy is with light. Light is therefore assumed to transfer that energy. Contribution of energy from, or to, the ether is not regarded. If we include the contribution from the ether it is possible that the contribution from light is zero. This idea can be united with the fact that we have experience only from absorption and emission but not directly from *transfer* of light. It is therefore possible that light does not contain energy. Light can be considered to contribute information only to a process where energy is exchanged between electron and ether. Information without energy can for instance be represented by polarization of ether particles. Energy is needed only when polarization is changed but not for maintaining constant polarization. Energy must not necessarily be transferred by light. Light is a field without energy and transfer of energy starts at first when an electron is placed in this field. Light propagation over billions of light-years and destructive superposition can be united with the idea of no energy in light. If these ether particles have mass, gravity and energy can be explained by the same ether particles.

Assuming light without energy means that bound electrons can radiate continuously without losing energy. We do not need quanta of light. Electrons, as well as kernels, can contribute to blackbody radiation. Atomic kernels can dominate at lower frequencies, and lighter electrons can dominate in the high frequency range. The fast decrease in radiation intensity, at higher frequencies, can be caused by light frequencies equal to integer multiples of electron's orbiting frequency.

The common explanation to the photoelectric effect is based on a light particle colliding with a loosely bound electron particle. Kinetic energy is supposed to be exchanged. Light particles moving *towards* a crystal are assumed to force an electron to move *away* from the crystal. This assumption is not realistic in relation to the laws of mechanics. Instead, we can find a more logic model based on the wave interpretation of light. The inertia from electron mass is compensated by a Coulomb force from electron charge. These forces are transverse to motion. Light with a frequency equal to (or to an integer multiple of) the electron's orbiting frequency produce a force transverse to motion and can make interference with the two balancing forces. Due to this interference, the disturbing force can be integrated over many orbiting periods. This means that *waves* of light can change the *potential* energy of the electron without large changes in kinetic energy. When potential energy is changed to about zero the electron can escape its kernel with about the same kinetic energy as it had before the interference. This means that the electron must have a certain amount of kinetic energy before the interference to allow emission (or escaping). The electron must be *tightly* bound. The frequency dependency in kinetic energy in emitted electrons is thereby explained by this demand on high initial kinetic energy. Quantization is therefore not needed.

A remarkable fact in the common interpretation of the photoelectric effect is that a *wave* property, f in $\Delta E = hf$, is said to prove light to be *particles*. In this article h is instead considered as a scale factor only. The assumption of interference demands light frequency to be an integer multiple of the electron's orbiting frequency. This fact can explain the very fast decrease in radiation intensity at higher frequencies in the blackbody radiation. When the contribution from kernels is very low in blackbody radiation it is observed that the electrons produce a sharp line type spectrum. This fact supports the idea that bound electrons in atoms radiate blackbody radiation.

X-rays appear to be generated when a fast electron is captured by an atom. X-rays are then generated for a short period of time. A process in opposite direction is also possible. This means that X-ray waves interact with a *bound* electron in the same way as light in the photoelectric effect. This means an interference phenomenon. When the electron's potential energy is near zero the electron can escape its kernel with about unchanged kinetic energy. However, the electron can be captured by another atom. This capturing can generate a new X-ray wave packet with somewhat different properties in relation to the first wave packet. Since escaping and capturing is done in different atoms such differences are possible. They can be different in direction, frequency and time duration. This process is called Compton effect but is in reality two processes. The involved electron escapes one atom but is captured by another one. The Compton effect is therefore best described by the *wave* model for light and interaction with a *bound* electron.

By assuming light without energy we can abolish many quantum paradoxes. However, there is a cost for this simplification and it is not enough to introduce an ether. We must also ascribe remarkable properties to this ether. The ether is not solid, liquid or gas, but must have its own state of (no) aggregation. Ether particles do not collide with each other, and the ether must be super fluid.

Accepting electrons to radiate without losing energy can perhaps help us to understand why planets can be orbiting without losing energy. The planets can generate a wave function that hides ether wind around our planet from observers on our planet, just like how electrons generate blackbody radiation. Near our planet we have instead a vertical ether wind explaining gravity. Maintaining the wave function demands no energy but we need energy to change the wave function. This fact can explain inertia.

If we accept light without energy and super fluid ether we can abolish the wave or particle confusion as well. Light is waves and ether is particles. Destructive superposition in light can be explained. All we have to do is to accept light *waves* to interact with *bound* electrons in the photoelectric effect and in the Compton effect.

The Three Directions of Light

Light is transverse oscillations in two dimensions inside a wave front. This is demonstrated by the concept polarization in light. The state of motion of the ether defines the reference for the constant wave velocity c. The propagation of transverse light waves is different from (and more complex than) the propagation of longitudinal sound waves. It is therefore not correct to use sound waves as a model for light waves. We must remember that c and v are very different concepts. v is a real motion of matter but c is a motion of behavior only. c and v also differ in many orders of magnitude in strength. If we use light that is focused into a very narrow beam and detect the direction of that beam we find that the vector sum **c**+**v** describes this *real* motion of light very well. In this case we use not coherent detection.

However, the direction of the center of a focused beam is equal to the direction of the normal to the wave fronts *only* in the frame of the ether. The beam direction is changed by a changing transverse ether wind but the wave front orientations inside that beam are *not* changed. This follows from the fact that the ether wind in transverse direction has the same effect in *all* points on the wave front. The wave velocity c has also the same definition in all points on the wave front.

In an interferometer we have mirrors in the interferometer and in laser cavities that define the wave fronts to be parallel to these mirrors. Wave fronts are defined by mirror orientation *independent of mirror motion inside mirror plane.* Moving the mirrors inside their own plane does not change direction of light but means only that light after a round trip (in Michelson's interferometer) hits a different point (in relation to starting point) on the mirrors. This fact is normally not observable in an interferometer. Interferometers are sensitive in *one* dimension only and transverse mirror motion (or ether wind) cannot be detected. Therefore, in an interferometer, light's wave vector **c** is always orthogonal to mirrors independent of transverse ether wind. This means that in optical experiments where mirror feedback defines wave fronts we always get the same value c transverse to mirrors. Interferometers are *blind* to transverse ether wind. The irrelevance of transverse ether wind in interferometers means that relevant description of light is $c(1+v_c/c)$ in this case (v_c is component in **v** parallel to **c**).

The irrelevance of transverse ether wind means that Stokes was wrong when he reduced Michelson's prediction by 50 % due to transverse ether wind. Stokes used Pythagoras theorem in a wrong way and his effect does not exist. Einstein was also wrong when he assumed the effect real but hidden by something he called dilation of time. Instead time dilation does not exist either. It is demonstrated in Fig 1 that unchanged boundary conditions mean unchanged light behavior.
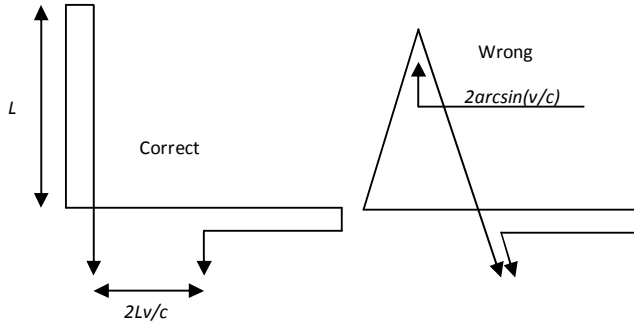
Fig 1. Michelson and Morley's Experiment. Wave fronts defined by mirrors in laser cavities and in interferometers do not change when the equipment is moving inside mirror's plane. The orientations of mirrors still define light to move with the speed c transverse to mirrors. Instead speed in relation to equipment is changed to $(c^2+v^2)^{1/2}$.
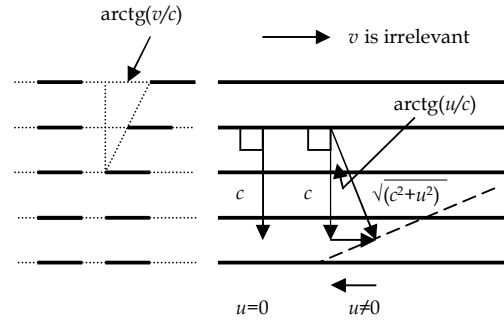

Fig 2. Stellar aberration. The left diagram demonstrates how vector **v** is relevant in focused light. The right diagram demonstrates how transverse ether wind becomes irrelevant if light is *not* focused. We can also see how observer motion **u** produces an aberrated (and false) wave front orientation.

The fact that the waving is controlled by boundary conditions implied by mirrors means that we have different meanings in the concept direction of light. When a focused beam is detected not coherently we can see the *real motion* of light that is defined by **c** and **v** together. However, in interferometers we only have possibility to observe $c(1+v_d/c)$ and direction is defined by **c** only to be in a direction transverse to mirrors. We can only see *wave motion* and only *one* component in the ether wind is relevant. In telescopes we have a third meaning in the concept direction of light. Telescopes detect also the wave orientation independent of **v** but changes in the detector motion **u** transverse to light produce an aberrated and false wave front orientation. The effect is observed in stellar aberration. The transverse component u_T in **u** changes apparent direction to a fix star an amount equal to arctg(u_T/c). We have therefore a third meaning in the concept light direction as *apparent wave motion*. This direction depends on **c** and **u**.

This explanation was provided by Bradley for light as particles. The effect of observer motion must be the same for light as waves. Both phenomena move with the speed c along a straight line. This is valid for light as long as we consider light direction as the normal to the wave fronts and transverse ether wind is irrelevant. Therefore, stellar aberration reflects our own state of motion. Stellar aberration cannot tell us anything about the ether wind due to irrelevance of transverse ether wind. This is described in Fig 2. We can therefore conclude that the concept direction of light can have three different meanings. Real motion dependent on **c** and **v**, wave motion dependent on **c** and apparent wave motion dependent on **c** and **u**.

Gravity and Ether Wind

The mass of our planet generates a spherically symmetric property in the ether. This property is called gravity and the effect of gravity can be explained by an attenuation of a flow of ether particles passing through our planet. The ether, in itself, is not entrained but the gravity property is entrained. Gravity should not be described as a bending of nothing, but rather as a property of the ether.

The high stability in the orbits of planets around our sun demonstrates no aberration in gravity. The force of gravity is directed exactly towards our sun. This fact has been compared to the aberration in light from our sun and generated the idea that gravity propagates with an enormously high speed. This idea can be wrong since gravity can be considered as stationary (in relation to its source) in space. Lack of motion can explain lack of aberration. Observer motion is relevant in relation to moving light but not in relation to stationary gravity. The speed of ether particles can be relevant in relation to *changes* in gravity but not in relation to *constant* gravity.

Gravity theories based on particles moving towards, or from, a massive body have been suggested. However, the most interesting model is based on particles moving in *all* directions. Such a model was suggested by Fatio, and was further developed by Le Sage. This model contains a cause of gravity, since an attenuation of ether particle flow is caused by matter. The attenuation produces an asymmetry in the flow of particles. An ether wind is produced and this ether wind produces gravity. The number of particles leaving a body is reduced in relation to the number of approaching particles. The magnitude of the generated ether wind is many orders of magnitude smaller than the speed of individual ether particles. This is valid for bodies of the size of bodies in our planetary system.

The value of the vertical ether wind, causing gravity, is not known. However, a preliminary hypothesis was made in [1]. It was assumed in that article that the magnitude of the vertical ether wind near our planet was equal to the speed of a satellite in a circular orbit around our planet at the same altitude as the ether wind. This hypothesis was also used, in the same article, to estimate different phenomena.

Ether theories are usually separated into three categories, namely autonomous, entrained and nonexistent. The theory presented her belongs to none of these. It is instead assumed here that it is only properties that are entrained. These properties are an ether wind defining the reference for the constant wave velocity of light *c,* and the field of gravity caused by this ether wind. However, the presence of mass not only generates an ether wind directed towards the center of this mass, but also hides the surrounding ether wind from observers near this mass. Therefore, we cannot detect the speed due to our planet's motion in relation to our sun. Celestial bodies can be assumed to generate a wave function in the ether. Energy is not needed to maintain this wave function, but energy is needed to change this wave function, which can explain inertia.

It was earlier stated that charged particles interchange energy with the ether. Not with light. Light contributes with information only. The information can be represented by polarization. However, these ideas can only be possible if we can assume remarkable and super fluid properties of the ether. On the other side there are many advantages with such a theory since lots of absurdities and paradoxes can be abolished. Light without energy has much to offer.

Newton and Einstein describe the *effect* of gravity by existence of mass. The Fatio and Le Sage model explains also the *cause* of gravity by attenuation (or shielding) of existing ether flow by matter. Ether particles are moving in all directions and the shielding effect produces an asymmetry in the flow that causes the ether wind and thereby gravity. The produced force has a very small and not linear effect in Le Sage's gravity that is not present in Newton's gravity. This difference can be exemplified in a homogenous sphere. Newton predicts a linear function of radius but according to Le Sage we should expect an exponential function approaching an upper limit. This limit is very high and the difference between the two theories is therefore very small, for bodies of the size of our planet.

During a solar eclipse a small decrease related to the mentioned nonlinearity in the combined gravity from Sun and Moon should produce a very small increase in vertical gravity as indicated in a very sensitive gravimeter. This effect has been very roughly estimated to be somewhere between 10^{-9} and 10^{-8} in relation to gravity on Earth. See [1]. An effect of about this magnitude was detected in China in 1997 during a solar eclipse. See [2]. The registration was about zero in the middle of the eclipse with two bumps with 'wrong' sign just before and after the eclipse. This phenomenon is explained by the notion that this problem is a four body problem. The gravimeter detects not only the effect in the gravimeter but detects instead the difference between effect on gravimeter and effect on nearby parts on our planet. These two effects are about equal in the middle of the eclipse but the effect on our planet dominates just before and after the eclipse. This explains the two bumps. Observations of the same kind have been made in high TV-towers. Horizontal motions during eclipses have also been observed to demonstrate effects before and after the eclipse of opposite sign in relation to the effect in the middle of the eclipse. The idea that we have a four body problem is supported.

The shielding effect has been studied by Majorama who used the term 'apparent mass' to explain the shielding effect. Majorama's ideas seems interesting but his empirical results appears to be much larger than estimations by this author.

First Order Effects of the Ether Wind

The first order effect of motion in relation to the ether was detected by Sagnac. He demonstrated a translational effect in light propagating along four straight lines. Translational effect has also been observed in the global positioning system (GPS). The effect is observed when clocks in two time stations on Earth are compared. Compensation for the rotation of our planet must therefore be done in GPS. When two clocks are separated a length L and an ether wind v is blowing in the direction of L we must compensate for a change in propagation time L/c by a factor $1\pm\beta$ ($\beta=v/c$). The size of this compensation is still the same even if the comparison is done over a not straight line. The effect detected in four straight lines by Sagnac can today be detected in *one* straight line. Dr C C Su has described how this can be done. See [3] and [4]. Two HeNe lasers with good frequency stability are connected to an interferometer. They are separated a couple of meters and mounted on a platform with very high mechanical stability. By changing direction of measurement vertical or horizontal ether wind can be detected.

Stellar aberration has been regarded as relevant for the ether's state of motion. We have earlier seen that transverse ether wind is irrelevant in telescopes and that instead telescopes transverse motion is relevant. Stellar aberration reflects therefore only observer motion in agreement to Bradley's interpretation. Stellar aberration is useless in relation to the ether wind.

Another manifestation of a first order effect of the ether wind is observed in the bending of light near our sun. The *wave* motion of light depends only on the longitudinal component in the ether wind. This component is first positive and later negative for light tangential to the Sun. This is an effect of the falling ether near the Sun. Since the effect is largest nearest to the Sun. we get a bending first away from the Sun and later back to the same direction. The bending is *not* to the same position. The difference can be calculated by integrating the gradient in longitudinal ether wind along the path of light. This calculation has not been done but a very rough estimation has been done in [1]. This estimation gave an apparent change in direction of 10^{-5} radians. This is in agreement to observation. A more accurate calculation should be done.

<h1 style="text-align:center;">Second Order Effects of the Ether Wind</h1>

The separations between atoms in a crystal are controlled by fields in the ether generated by the atoms. Changes in these fields are propagated with the speed c in relation to the ether. When the crystal is moving with the speed v these changes propagate with the speed $c(1\pm\beta)$ in relation to the atoms ($\beta=v/c$). The ether is the only possible medium for this interaction. In this way positional information is transferred between atoms. Two nearby atoms are in a two-way communication based on the ether. The ether wind has opposite effects in two opposite directions but a very small difference means that a second order effect is produced. The separation is reduced by a factor $1-\beta^2$ in the same way as the reduction of two-way speed of light. Michelson also used two-way communication based on the ether in his measurements with light together with Morley. The only difference is that Michelson used *sequential* communication and atomic separation is based on *simultaneous* communication. It is therefore reasonable to assume that the reduction in two-way light speed is compensated by an equal effect in atomic separation. This means that Michelson's method is *useless* in relation to the ether wind. The autonomous ether is therefore not refuted by Michelson's experiments.

Bound electrons are orbiting a kernel in atomic clocks. The electron's inertial force is balanced by a Coulomb force. Changes in the Coulomb force field can be propagated with the speed c from kernel to electron. An ether wind β ($=v/c$) means that the Coulomb force appears to emanate from a point β times radius behind the kernel. However, the inertial force is also changed in the same way since the form of the field is still a circle. Therefore we get no accelerating effect of β.

The simple explanation above does not regard the ether properly. If we instead assume the existing ether correctly we can conclude that the Coulomb force is changed by ether wind in one dimension only. Light is a wave motion. Therefore the *form* of the Coulomb field is changed. The field is not a eccentric circle but two half ellipses in the plane of orbit. In front of the kernel the field is compressed by a factor of $1-\beta$ and behind it is extended by $1+\beta$. No changes are caused in the points beside the kernel. See Fig 3. When the electron adapts to this field the electron is accelerated and decelerated by β in the direction of the ether wind. The effect of this acceleration and deceleration is that electron speed is changed between $w(1-\beta)$ in front of the kernel and $w(1+\beta)$ behind the kernel and w beside the kernel. Therefore the electron is moving with the speed adjusted by $1\pm\beta$ transverse to the ether wind. Speed proportional to $1\pm\beta$ means time proportional to $(1\pm\beta)^{-1}$ for the same distance, that is a half period. This means that the time for a full period is changed in proportion to $(1-\beta^2)^{-1}$. The frequency of an atomic clock is therefore proportional to $1-\beta^2$ with β as the component of the ether wind that is falling inside the plane of electron's orbit.
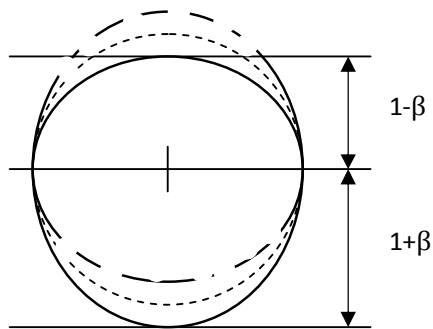

1-β

1+β

Fig 3 The effect of the ether wind β on the Coulomb force field. Only one dimension in the field is changed by the ether wind. In front of the kernel the field is a compressed ellipse in the electron's orbiting plane and behind we get an extended ellipse.

Blackbody radiation, photoelectric effect and Compton effect have all been explained by the wave model for light. It is therefore logical to explain the structure of the Coulomb field by the wave model for light. When **v** is orthogonal to **c** we find that v is irrelevant for the *wave motion*. Light waves move from kernel to electron with speed c independent of v. The Coulomb field is therefore changed $1\pm\beta$ in *one* dimension only. We get two half ellipses in the plane of the electron's orbit. We can conclude that we have a slowing of electrons moving forth and back in relation to the ether wind that is of second order in β. This electron behavior is therefore comparable to light behavior in Michelson and Morley's interferometer experiment. This means that we can explain a phenomenon observed in atomic clocks in the global positioning system by means of *one* mechanical process inside the *clocks*. In the theory of relativity this behavior is explained by *two* metaphysical properties of the *time* concept. These properties (called dilation of time) are not needed in the theory considered here.

By using the assumption about a vertical ether wind equal to the speed of a satellite in a circular orbit on the same altitude as the ether wind we can calculate the change in clock speed when a GPS satellite is put into orbit. Frequency proportional to $1-\beta^2$ is assumed. The satellite is assumed to be stabilized in the direction towards Earth. Clocks are assumed to be orthogonal to this direction. Due to lack of stabilization in the direction of motion the horizontal component is reduced by a factor 0.5. This factor represents the average value of a squared sine function. On ground the assumed vertical ether wind is 7.91 km/s (60 µs/day) and horizontal (due to planetary rotation) in the order of 0.3 km/s (≈0.1 µs/day). In a satellite we have a vertical and horizontal ether wind of 3.87 km/s (14.3 µs/day). With the clock orientation orthogonal to the direction to the Earth we get 60-14.3-0.5(14.3-0.1)=38.6 µs/day. Increased speed. If the clock instead is oriented along the direction towards Earth we get instead 0-(14.3-0.1)=-14.2 µs/day. Decreased speed. The contribution from vertical ether wind is zero, but the contribution from horizontal effect is higher, since satellite rotation is irrelevant, and motion is always inside the electron's orbit.

Two spacecrafts, Pioneer 10 and 11, have demonstrated a very small reduction of speed in their motion in a radial direction out from our solar system. This represents a very small anomaly in relation to modern theories in physics. This phenomenon has been discussed for many years but has still not got a clear explanation. The effect has been detected by means of high precision, two-way Doppler measurements. A new interpretation is presented in this article. This new interpretation is based on the assumption that apparent deviation is only an illusion. Instead of a decrease Δu in Pioneer speed the real effect is an increase Δc_2 in the two-way speed of light. This represents a change in local ether conditions. This is a confirmation of the existence of an ether, but is not in conflict with modern theories of gravity.

In [1] the two-way speed of light was described as $c_2=c\cdot(1-\beta^2)$. ($\beta=v/c$) with v as the ether wind. Horizontal ether wind v is a very small translational effect of the rotation of our planet. In vertical direction the effect is greater and causes the force of gravity. The relation above is in agreement to Michelson's own prediction without the reduction that later was done by Stokes.

The orbiting speed of our planet is $v=10^{-4}c$. According to earlier given hypothesis we therefore get a two-way speed of light as $c_2=c\cdot(1-10^{-8})$ in radial direction in relation to our sun. This is valid at a distance of 1 AU (astronomical unit) from our sun. At the distance r_{AU} we get $c_2=c\cdot(1-10^{-8}/r_{AU})$. Therefore we can find the change in f as $\Delta f/f=2\Delta u/c=2\Delta c_2/c=2\cdot10^{-8}/r_{AU}$. With a carrier frequency f of

$2 \cdot 10^9$ Hz we get $\Delta f = 40/r_{AU}$ Hz. Assuming r_{AU} to change from 20 to 80 AU we finally find that the change of frequency is 1.5 Hz. This result can explain the Pioneer anomaly.

Stokes' reduction of Michelson's prediction by a factor of 0.5 is not correct. Instead Michelson's original prediction is correct but hidden by a contraction of physical objects. Second order effects of the ether wind are instead demonstrated in atomic clocks and in the Pioneer anomaly. See [5].

Summery

Quantum physics is based on the law of energy conservation stating that bound electrons in a state of constant energy cannot radiate energy. However, the contribution from the ether to the energy balance is not regarded. Electrons exchanging energy with the ether means that we no longer need interchange with light. Light can be a field without energy in itself and energy interchange starts at first when an electron is placed in the field. We have no evidences stating that energy is transported with light. Light without energy means that bound electrons can radiate blackbody radiation. Light waves can continuously change *potential* energy by interference in electrons and photoemission can be explained. Interference can also explain how X-rays can change potential energy in a similar way and allow an electron to escape its kernel. When the escaped electron is captured by another kernel a new X-ray wave packet is generated and Compton effect is explained by *two* processes. Therefore light can be explained by the wave model only. The notion that the ether can transfer light without energy can perhaps help us to understand how planets can move without losing energy.

The real motion of light is described by a vector sum of wave velocity and ether wind. This motion is relevant when light is observed in a focused beam. The wave motion of light is defined by optical feedback in cavities and interferometers and depends on the ether wind in *one* dimension only. We cannot observe transverse ether wind in interferometers and only the longitudinal component of the ether wind is therefore relevant. The aberrated wave motion is relevant in telescopes where detection is coherent (as in interferometers) but where observer motion creates an illusion of a changed wave front orientation. Therefore, stellar aberration reflects only observer motion and not ether motion. Stellar aberration cannot rule out the entrained ether.

A theory of gravity described by Le Sage predicts a very small decrease in gravity from the combination of our sun and our moon. An effect in agreement to this idea was observed in China in 1997. See [2]. An effect of the same kind has also been observed in horizontal motions in very high TV-towers.

Sagnac detected a translational effect of the ether wind in four straight lines. In the global positioning system the effect of motion in relation to the ether is observed when time in time stations on our planet are compared. The time for light to travel between two points is changed by a factor $1\pm\beta$. This effect is the same even if the comparison is done over a not straight line. The effect Sagnac detected in four straight lines can to day be detected in *one* straight line. Dr C C Su has described how this can be done. See [4]. A first order effect of the ether wind is also detected in the bending of light near our sun. This effect is *not* produced by transverse ether wind. It is produced by the gradient in longitudinal ether wind. See [1].

Michelson failed to detect a second order effect of the ether wind in two-way speed of light between mirrors. The searched effect is compensated by the same effect in the separation of the mirrors. An effect comparable to the one Michelson searched has been observed in atomic clocks. The second

order effect is also observed in the Pioneer anomaly. The theory described here predicts a change in frequency of 1.5 Hz when space station is moving between 20 and 80 astronomical units. This is in agreement to observation. See [5].

Light without energy means light without quanta of energy. This means also physics without the wave or particle confusion. Ether is particles and light is waves. If we are brave enough to assume light without energy we can also accept wave functions generated by matter and adapting surrounding ether in such a way as to allow constant motion of planets without loss of energy. However, *changing* this wave function demands energy and explains thereby inertia. The presence of matter produces an ether wind by an attenuation of ether particles. This ether property causes the force of gravity. This means that there is an upper limit on the force of gravity defined by an existing flow of ether particles. We do not need black holes. Cosmological red shift can be explained by falling ether instead of by expanding universe.

Discussions

Maxwell shifted light model from particles to waves based on the assumption about an existing ether. This giant step forwards was followed by a step backwards when the same ether was denied. Many years of failures to unite the ether concept with observations was considered as evidences for the ether to be nonexistent. But failures have many reasons and prove therefore nothing. Nonexistence cannot be proved, and is therefore only a conjecture. An important reason to problems in physics is an ambiguity in direction and apparent direction of light. Another difficulty is the fact that **c** is many orders of magnitude larger that **v** and **u**. Scientists have been very stubborn in the denial of the ether concept. In order to exclude the ether lots of absurdities have been included instead. We have got multiple time concepts (twin paradox), multiple universes (universe means everything), black matter (without black ether) and lots of more of this kind.

Instead of basing physics on failures in Michelson and Morley experiments and in stellar aberration we should base physics on successes like atomic clocks, GPS system and Pioneer space station. Atomic clocks and Pioneer space station indicate that Michelson's hypothesis was correct but his test was interpreted in error. First order effects in the GPS clock synchronization and in the bending of light near our sun give also support for the ether's existence. This indicates also that Sagnac's effect in four straight lines also can be demonstrated in one straight line as suggested by Dr C C Su. [3], [4] Therefore, light needs a waving ether and gravity needs a falling ether. Mass and energy are needed in the ether, but not in light. All light behavior can be explained by the wave model. Therefore a Nobel Prize for the particle interpretation of photoemission was unhappy.

It is very easy to test the theories presented here. By changing the orientation of an atomic clock on ground from horizontal to vertical we should increase clock speed by 7×10^{-10} or 60 μs/day. We can also use Dr Su's method to measure the vertical ether wind.

Conclusions

The concept direction of light is ambiguous and depends on how light is detected. Ignorance of this fact has created the *false* idea that stellar aberration excludes the entrained ether. This error produced the wave or particle confusion with much consequences.

Without an ether electrons were assumed to exchange energy with light instead. This error created the idea that light must be *quantized* into particles.

Without an ether as the reference for the speed of light the observer was used as a reference for light speed. This assumption created the theory of *special* relativity with elastic space and time.

Without an ether as the cause of gravity geometry was used to describe gravity as a bending of nothing. This assumption created the theory of *general* relativity.

With an ether many paradoxes can be eliminated but the ether must have its own state of *aggregation*. Light must be without energy.

With an ether we can explain stellar aberration, Michelson and Morley's experiments, Sagnac effect, bending of light near our sun, slowing of atomic clocks, cause of, and anomalies in, gravity and the Pioneer anomaly.

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