Lorentzian fluid dynamics and general relativity / Using an acoustical analogy to uncover the ether frame of reference.

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While it is well known that Lorentz ether theory predicts all the confirmed results of special relativity, it is not true, as is commonly assumed, that such Lorentzian ether analyses demand that observers always measure a constant speed of light. An acoustical analogy involving open-air sound clocks reveals that the speed of sound will only appear to be constant for observers using acoustic-based instruments and moving at constant velocity with respect to a uniform wind-velocity field. However, acoustical experiments conducted 1) by accelerating observers (e.g., on rotating platforms), 2) in regions with varying wind velocities or 3) that rely on non-acoustical methods of measurement can easily determine the effect of wind velocity on the speed of sound. Extending this Lorentzian fluid dynamic analysis to the ether, it is shown that the Sagnac effect, gravitational time dilation of light clocks, and Shapiro time delay correspond to these acoustical experiments, respectively, and they have, in fact, detected the effect of the ether wind. Even according to general relativity, these well known effects demonstrate a variable speed of light, and, according to ether views, they have empirically confirmed that ether flows at a velocity of $\sqrt{2GM/R}$ toward gravitating bodies, a velocity that leads to identical predictions for electromagnetic phenomena as general relativity. Thus, the simple postulate that the vacuum is filled with a material ether that induces Lorentz contraction and responds to the force of gravity, encompasses all special and general relativistic predictions for electromagnetic phenomena, provides a physical explanation for all of the fluid characteristics demonstrated by the vacuum, and may help explain otherwise surprising solar system phenomena like the post-formation expansion of Ganymede.

I) Introduction

The vacuum shares so many characteristics with fluids that it is becoming increasingly more difficult to dismiss all the parallels as a conspiracy of coincidences. As is common knowledge, many of the classical phenomena of electromagnetism were predicted and/or confirmed by scientists who used the fluid ether view to generate predictions. These include Huygens' correct explanations for reflection and refraction, and his prediction that light is a wave and that it moves more slowly in water than in air [1], Young's two slit experiment [2], Doppler effect [3], Maxwell's displacement current [4], the Sagnac effect [5] and the stationary-square-ring Sagnac effect [6]. While it has always been known that certain aspects of electromagnetism have very precise fluid dynamic analogues, like for example, the Biot Savart effect [Fig. 1] [7], Marmanis [8, 9] has now shown that each of the Maxwell equations have fluid dynamic analogues.

Lorentz also followed the ether view, and his ether equations became the mathematical framework for Einstein's special relativity (SR) [10]. Herbert Ives [11], the first to confirm Lorentzian clock retardation (i.e., relativistic time dilation of a moving clock), did so as a consequence of his views of the ether and considered it confirmation of the Lorentz ether theory (LET). Erlichson [12] detailed the differences in the derivation of LET and SR, contending that the theories are empirically indistinguishable in the presently testable domain.

Recently a number of researchers have extended the investigation of the fluid dynamic analogies to the gravitational systems of general relativity, particularly phenomena related to black hole physics. The acoustic "dumb hole"/ black hole analogy includes event horizons, trapped regions, Hawking radiation, and ergospheres [e.g., 13, 14]. These models have now been pushed into the mainstream by a cover story on the subject in *Scientific American* [15], which asked the provocative question: "Could spacetime literally be a

kind of fluid, like the ether of pre-Einsteinian physics?"

In 1981, William Unruh [16] had generated much of this recent interest in fluid dynamic analogues with a now-classic paper that related Hawking radiation to the thermal spectrum of sound waves given off at an acoustic horizon of a dumb hole. Even earlier, in a pair of articles in *Physical Review* in the 1950's, Robert Kirkwood [17, 18] put forth an ether view of general relativity, contending, in particular, that the relativistic description of the motion of light through curved spacetime was really the result of light waves moving through an ether that flowed directly toward gravitating objects at some distance *R* with a velocity v_R where:

$$v_R = -\sqrt{2GM/R} \qquad (1)$$

This notion naturally predicts that light cannot escape from any region where v_R = - c, which leads to the Schwarzschild radius for black holes:

$$R = 2GM/c^2 \qquad (2)$$

This is perhaps the most straightforward ether theory relating to the acoustic black hole analogy – as it allows the prediction of the precise velocity of the ether everywhere the force of gravity can be determined.

Kirkwood begins with the principle of equivalence and ends up deriving his equation for ether velocity by determining the continuing effect of a gravitational field on a very distant, slow moving mass. But it may be simpler just to note that equation (1) depicts the velocity of the ether as if it were being acted upon by gravity and so is continuously accelerating from great distances toward gravitating objects. At the surface of the Earth, this ether velocity, $\sqrt{2GM/R}$, is roughly 11200 m/s, and, as will be shown, many of the expected consequences of ether flowing into the Earth at 11200 m/s have already been observed and are predicted by GR.

II. Lorentzian acoustics

A simple acoustical analogy for LET involving open-air sound clocks [Fig. 2], may help illustrate the rationale behind 20th century tests on the effect of an ether wind on the velocity of light. If we vertically aligned open-air acoustical clocks and attached them to the roofs of moving cars, the relative velocity of the wind through the clock will slow the speed of sound by the well known Lorentz factor gamma,

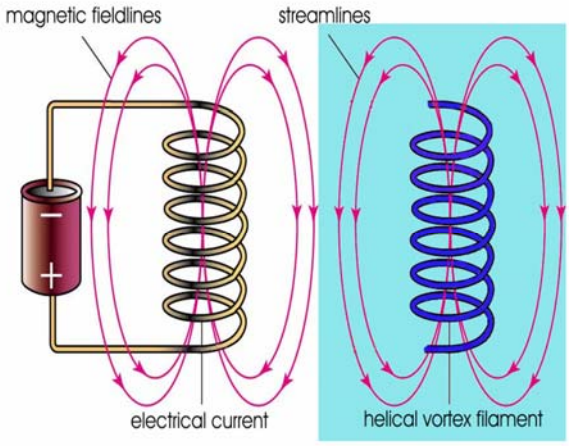

Figure 1 depicts the Biot Savart law for both fluids and electromagnetism. The formulas and physical depictions are precisely analogous, exhibiting a one-to-one correspondence for all values involved.

where c is the speed of sound. The rate of the clock, of course, will retard similarly. If wind speed is uniform throughout a particular region, any efforts to compare the rates of moving clocks within that region, by either separating and reuniting them or by using moving clocks and acoustical signals will have purely relativistic consequences: The local velocity of the atmosphere cancels from all equations, the variable *v* in the gamma factor becomes the relative velocity of the clocks, and the preferred (atmosphere) frame cannot be found via experiments of this kind (Fig. 2). This simple acoustical scenario, which holds for all fluids, reproduces some of the most extraordinary aspects of special relativity, but for it to re-create all results of SR and LET in all particulars, objects would also have to Lorentz contract in a headwind.

If we imagine an extra-terrestrial race of blind scientists, forced to work exclusively with acoustical instruments that Lorentz contract, it is possible that they would develop two competing theories to explain these effects: a Lorentzian fluid dynamic (LFD) view and an acoustical SR. The former would represent the physically accurate depiction of a fluid atmosphere that had physical effects on acoustical instruments, while the latter would deny the existence of this physical medium and derive the equations of acoustical SR based on the principle of the constancy of sound and the principle of relativity. On such a planet, how could theorists who preferred a fluid atmosphere hope to determine its local velocity?

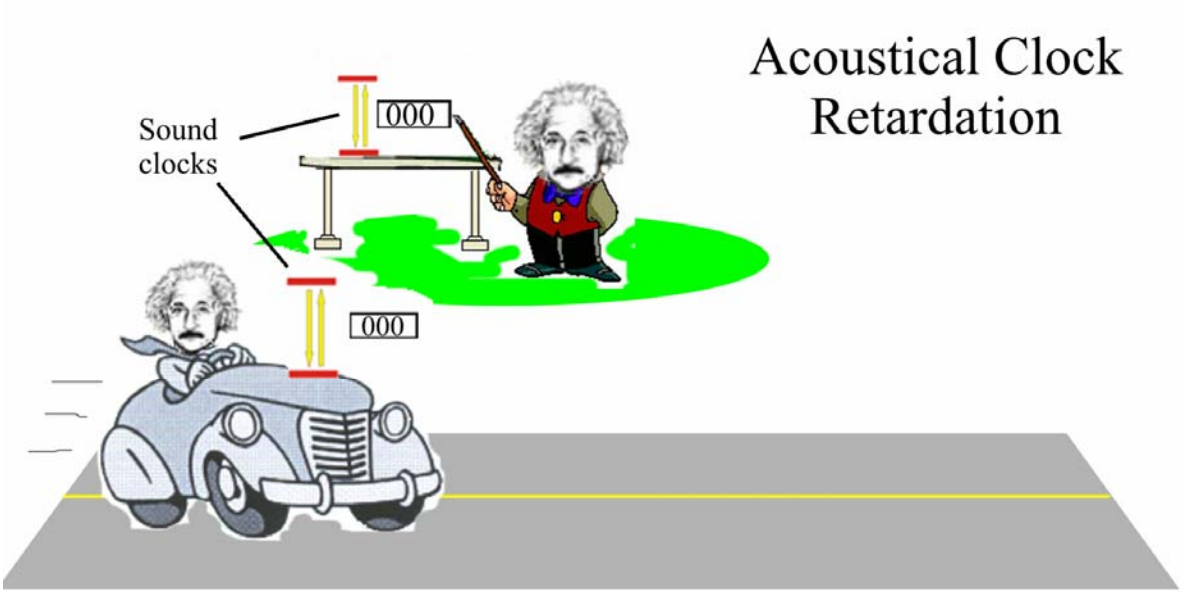

Fig. 2a -- Clocks begin synchronized.

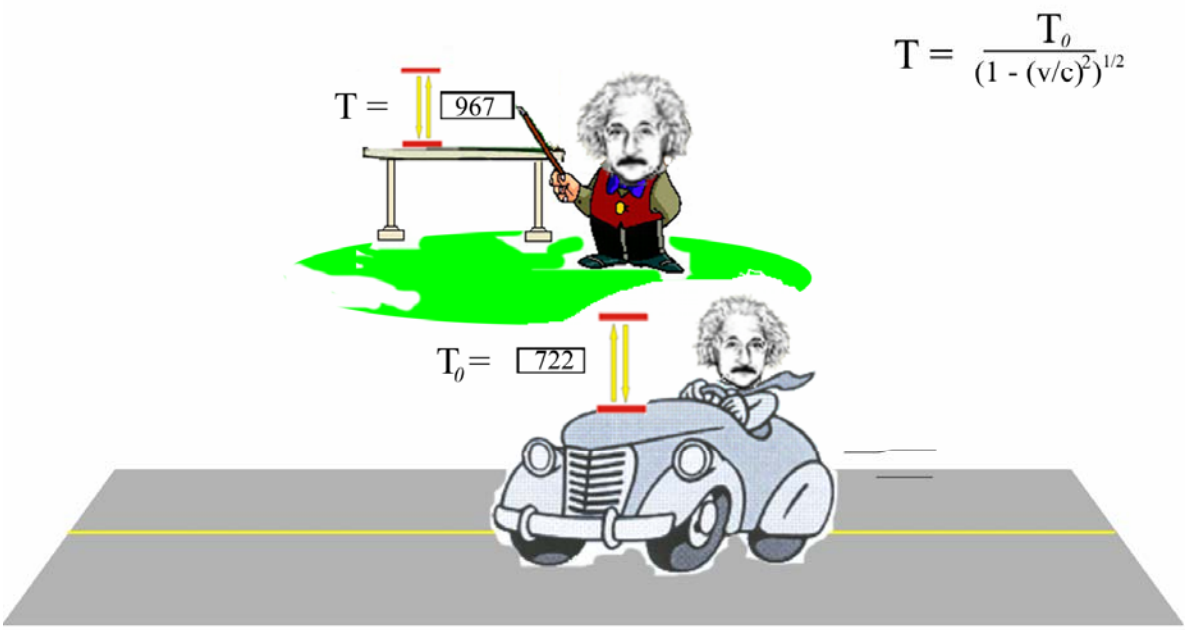

Fig. 2b -- The "round-trip" car clock has slowed by a factor of gamma, where *c* is the speed of sound. Background wind velocity is irrelevant.

Figure 2. The open-air sound clocks depicted here use sound pulses between the roof and base to measure a unit of time. As in the twin paradox, the car drives the one sound clock some distance away and returns. As long as the background wind velocity for both observers remains uniform and less than the speed of sound, the round-trip sound-clock will slow with respect to the stationary clock by the factor gamma, where c is the speed of sound in the atmosphere frame and v is the relative velocity of the clocks. The results of such experiments are independent of background wind velocity and cannot be used to determine wind velocity. Even if the observers try to use acoustic signals to communicate the clock ticks during their trip, the relativistic Doppler equation applies and, again, wind velocity is irrelevant.

Again, the acoustical analogue for SR only holds for observers using acoustical instruments and moving at a constant velocity with respect to a uniform wind field. But the blind scientists could always create wind-velocity differentials by sending acoustical signals in opposite directions around a rotating platform. The co-rotating sound wave would have to travel against the wind, while the counter-rotating sound wave would move with it.

Also, acoustical clocks could be used to exploit naturally-occurring wind-velocity differentials. For example, the drag force of an ideal gas wind flowing toward low pressure systems reduces as the square of the distance. Blind scientists who followed acoustical LFD and who suspected that this inverse square force was related to the local velocity of the medium could set acoustical clocks at different distances from the low pressure system and compare the rates of the clocks (Fig. 3a). Or, if the scientists were able to determine the distance to remote objects through some method not dependent on the speed of sound, they could conduct an MM-type experiment by comparing travel-times to objects in different locations relative to the low-pressure system. In these cases, the variations in the speed of sound would confirm the local velocity of the medium toward low pressure systems, and the preferred (atmosphere) reference frame would be recovered.

As will be shown, the optical analogues for these acoustical experiments have already been performed, and some of them by etherists searching for the effect of the ether wind on the speed of light. All results have been non-null; and all are consistent with a material ether flowing toward gravitating bodies at $\sqrt{2GM/R}$.

Sagnac, general relativity, and the variable speed of light

As the etherist Georges Sagnac empirically confirmed in 1913, a light ray reflected around a rotating table against the direction of rotation takes less time to complete the loop than a light ray reflected around the table with the direction of rotation [5]. The Sagnac effect is confirmed daily with light signals of the GPS system. And, Sagnac, himself, noted the significance of the fact that this speed of light experiment had an acoustical analogue:

In a system moving as a whole with respect to the ether, the elapsed time of propagation between any two points of the system should be altered as though the system were immobile and subject to the action of an *ether wind*.....The observation of the optical effect of such a relative wind would constitute *evidence for the ether*, just as observation of the influence of the relative wind of the atmosphere on the speed of sound in a system in motion would...constitute evidence of the existence of the atmosphere around the system in movement.

The Earth also rotates through the ether as it flows toward the center of planets. So, according to the Sagnac effect, light sent around the world should move faster west than east by an amount determined by the rotational velocity of the Earth at the latitude of the experiment. In 1985, Allan *et al.* conducted this "Around-the-World Relativistic Sagnac Experiment," confirming the effect [19].

Michelson and Gale, both etherists, realized that the westward ether-wind velocity produced by the rotation of the Earth through the ether would be latitude dependent, faster at the equator and slower nearer the poles. They managed to exploit that difference with an interferometer experiment based on the time differential for two light rays moving around the perimeter of a rectangle that is stationary with respect to the Earth's surface. In the Northern Hemisphere, the light ray moving clockwise around a stationary perimeter moves *with* a faster (and *against* a slower) westward wind than its counter-clockwise counterpart and so should complete the circuit in less time [6]. In the Southern Hemisphere the opposite is the case. Thus, in the lab or Earth surface frame, the clockwise and counterclockwise rays are moving at different speeds. The principle of this "stationary square ring" Sagnac effect serves as the basis for laser ring gyros, which confirm this effect for light moving around a circuit with an area less than .02 m^2 (20). Michelson-Gale titled their paper, "The effect of the Earth's rotation on the velocity of light" – and used a straight-forward ether-wind analysis to predict the effect and derive the equation. As with the around-the-world Sagnac experiment in which the westbound ray circumnavigates the globe faster than an eastbound ray, the Michelson-Gale results confirm that the speed of light is faster west than east with respect to the surface of the Earth.

As detailed in the Lorentzian acoustical analogy, if the background wind speed remains uniform throughout an entire region, acoustical clocks cannot be used to help uncover the local velocity of the wind. However, this is not the case if the wind velocity is location dependent.

If we imagine light moving horizontally back and forth between two mirrors in a typical light clock system, with each light clock situated at different

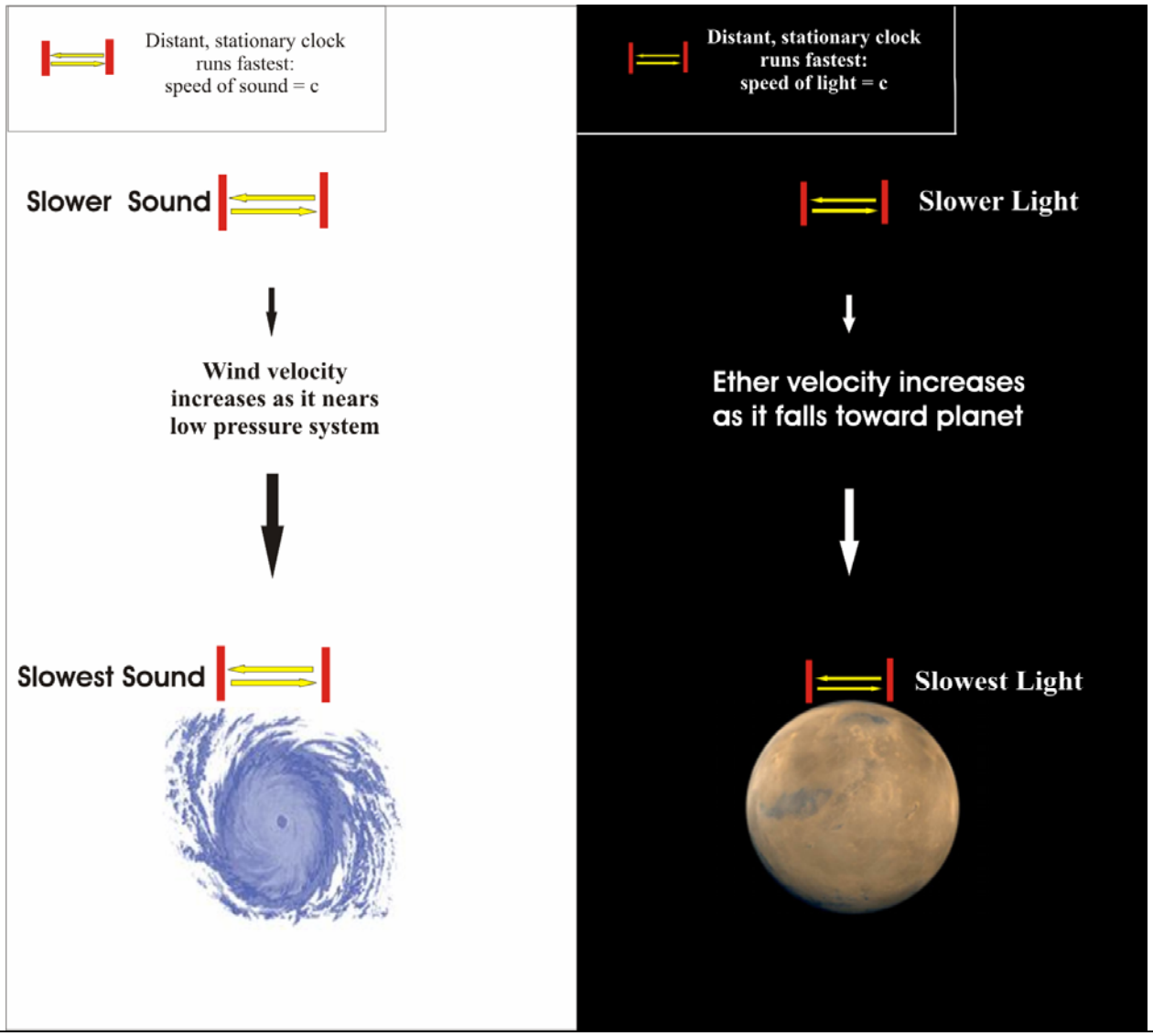

Figure 3 compares acoustical clock retardation as it relates to the force toward a low pressure system with light clock retardation as it relates to the force toward a gravitating body. The sound clocks (left) and light clocks (right) are placed in different locations in a varying wind (ether-velocity) field. All of the clocks are stationary with respect to each other, and the effect is absolute. If v_R is the velocity of the wind (or ether), and c the speed of sound (or light), the formula for the speed of sound (or light) within each clock-system is identical:

$$c\sqrt{1-\frac{v_R^2}{c^2}}$$

In both situations, the velocity of the wind (or ether) can be independently determined through an analysis of a background, inverse square force. Plugging in equation (1), which relates the local velocity of the ether to the force of gravity, gives the empirically confirmed gravitational time dilation formula of general relativity.

distances from a planet (Fig. 3) and all of them stationary with respect to planet-centered inertial frame, the theory that the ether is free-falling toward gravitating bodies predicts that the back-and-forth speed of light will be c $\sqrt{1-\frac{v_R^2}{c^2}}$ where v_R is the local velocity of the ether. According to equation (1), this will reduce the number of back-and-forth trips of light rays in the light clock in the strongest gravitational field such that

$$T = \frac{T_0}{\sqrt{1-\frac{v_R^2}{c^2}}} = \frac{T_0}{\sqrt{1-\frac{GM}{Rc^2}}} \qquad (3)$$

where T is the number of back-and-forth trips of a ray of light in the light clock far from the gravitating object, and T_0 is the number of back-and-forth trips of light in proximity to a gravitating object. In the ether view, length contraction of clocks leads to the same mathematical result for all electromagnetic systems no matter what their orientation. This is also, of course, what GR predicts, and it is confirmed daily with the GPS system. Moreover, it is an absolute effect. Since we may keep all clocks stationary with respect to each other, all observers can watch and record each other's clocks through a telescope without worrying about Doppler complications. All would agree that light is taking longer to move the same distance in the light clock closest to the planet. Also, each observer could use the same distant stable-pulsar clock to measure the speed of light in their apparatuses, and each would agree that the light ray in the clock nearest the planet had moved the slowest.

Kirkwood's physical description of general relativity as an ether flowing toward gravitating bodies naturally predicts that the speed of light will vary with the force of gravity as it approaches the gravitating object. General relativity, of course, predicts precisely the same effect, according to the same equation. As Irwin Shapiro noted in 1964 [21]: "...[A]ccording to the general theory, the speed of a light wave depends on the strength of the gravitational potential along its path" and that this would increase travel-time for light rays that moved back and forth in the direction of the sun. This time delay, now known as the Shapiro effect, has been empirically confirmed for radar-ranging signals reflected from Venus and Mercury. As expected, when the signals are sent back and forth to Venus or Mercury when the line of sight is very distant from the sun, the delay is very small. When the signals are sent back and forth directly past the sun, the delay becomes much greater.

This is conceptually equivalent to a Michelson-Morley experiment conducted on a solar system scale, in which the back-and-forth speed of the light rays are compared when moving in different directions with respect to the expected ether velocity (Fig. 4). Since no molecular material connects Earth, Mercury, and Venus, the possible complication of Lorentz contraction is avoided. Distance instead is determined by careful orbital analyses. If Michelson and Morley had the technology to conduct this experiment, the predicted non-null result would have empirically supported the ether. This is significant because the Michelson Morley experiment has been the only blemish on an otherwise perfect record of more than 300 years of successful, quantitative ether predictions, and this blemish has now been removed.

Whither ether?

While many etherists of the past disagreed about the general constitution or local velocity of the ether; they all agreed upon one thing: It was material. First and foremost, their essential motivation for hypothesizing the existence of the ether was to provide a local, mechanistic cause for light and electromagnetism. As one of the first to posit a luminiferous ether, Christiaan Huygens, wrote in his *Treatise on Light*:

It is inconceivable to doubt that light consists in the motion of some sort of matter.....[A]t least in the true Philosophy, in which one conceives the causes of all natural effects in terms of mechanical motions….

Maxwell expressed similar sentiments about his views of the ether in the paper where he develops the equations that now carry his name. Maxwell clarified specifically that he rejects objects affecting other objects "at a distance according to mathematical laws." Instead, he assumes that "within that space there is matter in motion, by which the observed electromagnetic phenomena are produced."

The material nature of the ether has found support with the empirical confirmation of pair creation, the process by which colliding photons can produce an electron-positron pair or a proton-anti-proton pair. In the ether view, this confirms that electrons and protons, the building blocks of atoms, are simply organized conglomerations of the ether. Interestingly, P.A.M. Dirac, who predicted pair creation in 1930 [22], was yet another etherist.

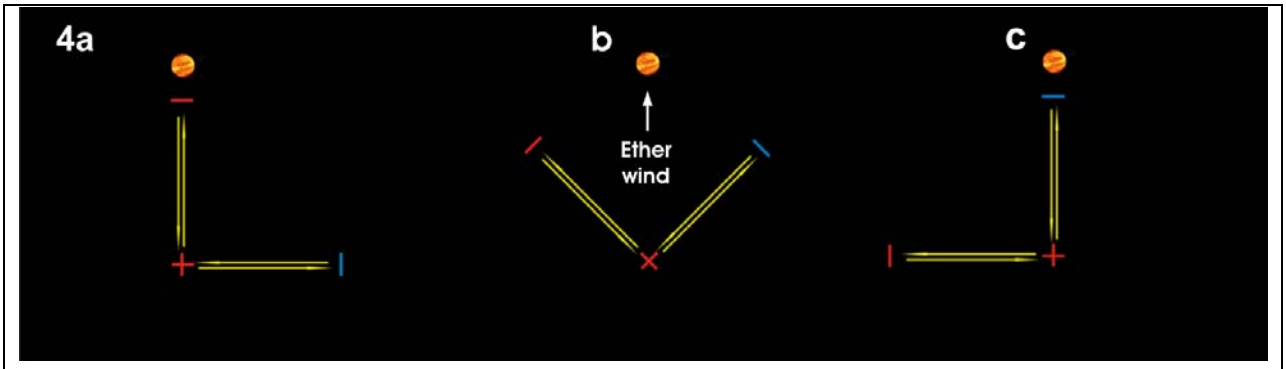

Figure 4. The Michelson-Morley-Shapiro experiment. The legs of the hypothetical experiment above are of equal length and rotated so that they continue to change their angle with respect to the sun's gravitational field. The Shapiro effect, which has been verified with radar ranging signals reflected from Mercury and Venus, confirms that the difference in travel-times between the light rays depicted above will be greatest when one ray moves directly back and forth into the ether wind, i.e., directly toward and away from the sun (4a,c). No difference in travel time occurs when both rays move at the same angle with respect to this wind (4b). This is, in all respects, a non-null Michelson-Morley experiment confirming a difference in light speed that is predicted by the expected difference in ether velocity.

If 1) the ether is material the way past etherists supposed and pair creation and its response to gravity implies, and 2) atomic matter comprises organized systems of the ether, then an influx of ether may lead to the condensation of atoms near the cores of the dominant gravitational body – not necessarily by pair creation but by some organizing process that favors the production of matter over anti-matter. This leads to the startling and very risky prediction that planets and moons (and of course stars) will increase in density or even begin to expand, from the inside-out, throughout their existence unless they can expel mass at an equal or greater rate than the ether inflow. It is this particular prediction, the possible increase in density or post-formation, internally generated expansion of planets and moons, that clearly differentiates the ether inflow model of Lorentzian fluid dynamics from conventional views in physics and planetary science, and so it has become the focus of the analyses of this author over the last few years [23, 24, 25, 26, 27].

Fortunately, recent photographic evidence from Galileo has removed ambiguity: Ganymede's surface reveals so many signs of extension, that it is now conventional that this Jovian moon has probably experienced post-formation, internally-generated expansion. Ganymede is the largest moon in the solar system, larger than even Mercury [28], and 66% of its surface is bright and juvenile [29]. As Prockter [28] writes about this surface: "The bright terrain formed as Ganymede underwent some extreme resurfacing event, probably as a result of the moon's increase in size." Collins *et al*. [30] agreed that the formation of the grooved terrain on Ganymede was likely the result of post-formation "global expansion."

One informal hypothesis used to explain the dilation of Ganymede [31] is that the moon, in the not too distant past, may have received a "shot of heat" that managed to expand a frozen subsurface ocean, rifting the surface. Ganymede's orbit is currently too circular to allow significant tidal flexing, so, according to the theory, perhaps Ganymede became entangled in a particular grouping with the other Jovian satellites, deforming its orbit into an ellipse. The resulting tidal flexing may have been able to provide the heat necessary to cause expansion of the hypothetical subsurface ocean. Afterward, Ganymede may have moved past the resonance back into its more circular orbit.

An expanding frozen ocean, however, is unlikely to have produced the amount of extension displayed on Ganymede. Even if the expansion were to increase the moon's radius by 10% that would equate to merely a 21% increase in surface area produced by riftings.

And Ganymede is not the only problem. Riftings, volcanism, massive resurfacings, separation of ancient crust by juvenile crust and other signs of expansion are common throughout this solar system, and planetary scientists have been attempting to explain these observations away one terrestrial body at a time. Those cases

where extraterrestrial bodies lack the required number of regions where subduction or compression can even be supposed are described as "problems" that need to be solved [e.g., 32]. Numerous hypotheses follow. In every case, the assumption of a static radius remains conventional as long as any hypothetical, compensating process is imaginable. For example, Prockter and Pappalardo [32] point out that Galileo's depictions of Europa show "examples of extreme extension (tens of percent regionally)...yet no subduction zones or large-scale compressional features were recognized [references therein]. Thus, the problem of compensating icy satellite extension has been compounded". In a creative effort to explain this problem, Prockter and Pappalardo [32] infer that certain structures identified in three narrow regions of Europa are folds, and, perhaps, "similar subtle undulations may be widespread on Europa but would be difficult to identify because of Galileo's limited imaging coverage". In this manner, "Europa may hide its compression."

Even assuming that such folds are in fact pervasive on Europa's surface, this view faces the same problem as the notion that mountain building compensates for a certain percentage of seafloor spreading on Earth: While riftings necessarily add new material to the planet's surface, increasing the global surface area, mountain building or fold creation does not withdraw material from the surface, or, at least, it does not do so in any obvious way. Orogenic "crustal shortening" or fold creation may help reduce the flying distance of crows, but it increases terrestrial circumference (walking distance) and surface area. "Crustal shortening" cannot cancel surface-area increases produced by riftings; only a process that physically removes material from the surface can do that.

Another terrestrial body showing very obvious indications for expansion is the Earth. Unfortunately, it is impossible to review all the evidence for post-formation expansion of the Earth in a single article, but many books and more than one hundred articles have been published on the subject of Earth expansion in the last forty years, including papers in journals like *Nature*, *Science*, *Modern Geology*, *Journal of Biogeography*, etc [33] Two recent articles provide a brief summary of some of that evidence [23, 24]. It will just be noted here that, as with Ganymede and Europa, much of the Earth's surface is juvenile: All seafloor material, more than 67% of the Earth's surface, has formed within the last 200 million years. And the extension that brought much of this terrain to the surface, seafloor spreading, is similar, at least superficially, to the riftings on Ganymede and Europa.

The problem is that most planetary scientists are unaware of any mechanism that can produce significant expansion of terrestrial bodies, so they are always trying to retrofit surprising evidence of expansion into a fixed-radius framework. But the question is no longer whether the surfaces of these bodies provide evidence for planetary and lunar dilation; the question has now become whether it is even possible for the conventional hypothesis of a fixed-radius to be plausibly maintained by any imaginable hypothesis. The ether inflow theory would provide an explanation for the now-accepted expansion of Ganymede – as well as all of the obvious signs of expansion exhibited by Earth, Europa and other solar system bodies like Enceladus, Venus, etc.

Conclusion

So much focus has been placed on the question of the local velocity of the ether that one may forget that velocity-effects on wave-speed compose just one small aspect of fluids – and they are by no means the most compelling or conspicuous aspect. The only reason that the question of ether velocity has received so much attention is because essentially all of the other obvious fluid qualities of the vacuum have already been confirmed -- by etherists. This includes, as noted, the wave effects: reflection, refraction, interference, Doppler shift, etc., the vortex-source-sink flow field effects exhibited by the Maxwell equations; and the gravitation-related effects like black holes and their acoustical analogies. Those who believe these vacuum processes have nothing fundamentally to do with fluids must think of these shared physical characteristics as a remarkable series of coincidences.

In contrast, the mere postulation of an all-pervasive fluid ether explains these apparent coincidences, necessarily predicting that all of these effects and equations will characterize the vacuum. If you include the hypothesis that the ether responds to gravity and induces Lorentz contraction, then all of the electromagnetic consequences of general relativity and special relativity follow as well.

The only empirical objection to the ether view was the alleged inability of etherists to detect the effect of an ether wind on the speed of light. But as has been shown, this ether wind has been confirmed many times in a variety of different ways. Usually, these effects are described as "time delays" or "time slowing" rather than a change in the speed of light, but that is merely semantic. The time-delay effects on light laboring through the gravitationally induced ether wind, causing a light ray in certain locations to take longer to move the same distance, are empirically indistinguishable from a varying speed of light. In fact, all of the scientists who derived these equations or confirmed these results – Sagnac, Michelson, Gale, Shapiro and Einstein – described such effects as the result of a variable speed of light (emphasis added in each case):

- Shapiro, in his derivation of the time delay that now bears his name, wrote: "...[A]ccording to the general theory, **the speed of a light wave depends on the strength of the gravitational potential along its path**…The right hand side of [the equation] is due primarily **to the variable speed of the light ray**; the contribution from the change in path…is negligible"[21].
- Michelson-Gale titled the paper where they predicted and discovered the stationary-square-perimeter Sagnac effect, "**The effect of the Earth's rotation on the velocity of light**." And they used an ether wind assumption to derive the correct equations. [6]
- Sagnac, as noted, considered his experiment as empirical confirmation of an ether wind on the velocity of light [5], but even modern descriptions of this effect admit light speed variations. As Klauber writes: "**The variable speed of light** found in the Sagnac experiment is then shown to be characteristic of non-time-orthogonal reference frames, of which the rotating frame is one"[34].
- Even Einstein, when referring to the bending of light in gravitational fields, wrote: "…[A]ccording to the general theory of relativity, the law of the constancy of the velocity of light in vacuo, which constitutes one of the two fundamental assumptions in the special theory of relativity [. . .] cannot claim any unlimited validity. A curvature of rays of light can only take place when **the velocity of propagation of light varies with position**"[35].

The fact that the speed of light varies in a gravitational field means that the speed of light varies everywhere in the known universe. Some physicists trying to reconcile this with the second postulate of special relativity often try to claim that the speed of light is constant even in general relativity, despite the measurements described and the quotes above. But as everyone knows, when SR predicts a constant c for inertial frames, it means that light is measured to take the *same* amount of time to travel the same distance. It means that $d/t = c$. If the empirically confirmed examples, detailed here, of light taking *different* amounts of time to travel the same distance in different locations [*where* $d/t < c$] are also considered examples of "the constancy of the speed of light", then the phrase has no meaning and the constancy of c becomes unfalsifiable. If the Shapiro time delay had been empirically contradicted, and it was discovered that light takes an equal amount of time to travel the same distance regardless of the strength of the gravitational potential, this would have been a confirmation of a constant velocity of light even in a gravitational field. How could a non-delayed travel time [$d/t = c$] and a delayed travel time [$d/t < c$] both be examples of light always traveling at c? What is speed if not distance/time?

Moreover, this variation in the speed of light is precisely what would be expected given the ether inflow model. That each of these effects can also be explained without reference to the ether is not particularly compelling because one can use an acoustical special and general relativity to describe analogous acoustical phenomena without reference to the atmosphere – but it would be wrong: The speed of sound, after all, is *not* constant, and the atmosphere *does* exist.

In contrast, LFD explains both the acoustical and electromagnetic phenomena with the same reasoning and same equations. Moreover, the accuracy of the LFD explanation and predictions for sound cannot be denied. If "Lorentz ether theory," which is simply one possible ether theory that fits within an LFD framework, were to be falsified, all physicists would still agree that a moving open-air sound clock would retard according to the gamma factor, not because the speed of sound is constant, but because of the effect of the relative motion of the medium. This tremendous

generality of LFD has often been overlooked by those discussing the merits of the ether interpretation. It is obviously significantly simpler and more elegant to explain Lorentzian effects exhibited by both acoustical and electromagnetic systems with one all-encompassing theory (Lorentzian fluid dynamics) rather than three very different theories (Lorentzian fluid dynamics for acoustical systems, and special and general relativity for electromagnetic systems). LFD requires no additional principles, like constancy of light speed, a malleable time, bodiless waves, etc., to explain what are identical effects for both sound and light.

LFD also provides a physical explanation for the otherwise purely abstract distinctions between special relativity and general relativity. Inertial observers in the "local flat spacetime" of special relativity depict observers moving at constant velocity through a uniform wind field. In regions of greater extent in a gravitational field, "spacetime begins to curve," i.e., the ether wind begins to vary, and new equations are needed to describe the resulting variations on the velocity of light and the rate of electromagnetic systems. "Local flat spacetime" is a uniform ether wind-field. "Curving space," at least in terms of electromagnetic effects, depicts the continuously changing flows of an ether as it falls toward gravitating bodies.

The difficulty of finding the effect of ether velocity on the speed of light has been the only reasonable rationale for its theoretical marginalization. Since the expected variation in speed of light with a predictable ether velocity has now been confirmed in a wide variety of experiments, both in laboratories and throughout the solar system, this lone objection has now been removed.

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