Re-examination of the Experimental Evidence for a Nonzero Aether Drift

Part 3: Controversy and Aetherometry

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ABSTRACT
In part 1 of the present work we detailed the results of Michelson-Morley (MM) type second-order interferometric experiments, and in part 2 the results of first-order experiments (Sagnac and Michelson-Gale (MG) type) that successfully detected either the rotation of the apparatus or the earth. Whereas the former where found to give a null result with respect to the detection of either a static ("luminiferous" or electromagnetic) aether or an aether drag, they presented small residuals that lent themselves to unending speculations which more recent work has prolonged. The second type of experiments also raised provocative questions, beginning with "Why can rotation, even terrestrial, be detected by the relative motion of high-frequency (optical) or low-frequency (microwave, radio) photons, but the earth's translation around the sun cannot?" The overall controversy demands an integrated approach, yet many candidate interpretations fail to explain or even address the entirety of the phenomena. Even Special and General Relativity fall short of the mark. We revisit the controversy and then present the fundamental features of the aetherometric theory of these interferometric phenomena, since it makes specific claims that provide a consistent explanation for the results of all five types of interferometric experiments that should be under consideration: MM-type; Sagnac; Ives & Stilwell; MG-type and planetary Sagnacs; and Silvertooth-type.

1. INTRODUCTION

The "null results" of the classical aether-drift experiments in the first half of the 20th century are nowadays interpreted as confirmations of Special Relativity, though they are also compatible with nonrelativistic models, such as Aetherometry. However, there is still much gratuitous controversy as to the precise significance of the small residuals detected in early MM-type experiments and as to whether any more recent experiments provide support for an "aether drift". The statistical analysis presented in Part 1, like the analysis of Miller's (1933) results by Roberts (2006), indicates that no significant aether drift has ever been detected.

If the residuals of MM-type experiments were in any physical sense real, they would contradict standard relativity theory, which states that the speed of light is constant in inertial (nonaccelerating) reference frames, regardless of the motion of the source or observer. However, given that relativity theory postulates the equivalence "in principle" of inertial and noninertial (rotating) frames, it is illogical for it to accept that absolute rotation can be detected but not absolute linear motion, especially since linear motion is only the limit of rotational motion when the radius becomes very large. Moreover, the real problem lies elsewhere: given that the residuals are nonsignificant, how else can the null results be explained without taking recourse to relativity theory and thereby falling prey to its inconsistencies and arbitrary postulates?

To this set of problems is added another, relating to the first-order experiments of the Sagnac or Michelson-Gale variety. Here, the results present an irreducible but varying value that detects rotation, either of the apparatus (simple Sagnac experiment), or of the earth, or *of something that rotates with the earth*. The latter is the joint problem of the global Sagnac and the MG experiments.

How these problems are interrelated typically prescribes the variety of solutions that have been proposed, some so ultra-sophisticated that they bend the facts (i.e. the data). Is there a theory that can cogently relate the unadulterated facts and the physical problems they pose, and propose simple explanations without invoking absurd hypotheses (such as Big Bang cosmology, expanding universe, missing mass, dark matter, dark energy, zero-angular-momentum stars that once fell into the galactic center, etc., etc.)? For example: if Kepler's third law[1] breaks down in accounts of galactic motion, how can one legitimately use it to determine the missing mass? Only by making the arbitrary assumption that mass is missing. It is just another petitio principii that passes itself off as science.

Aetherometry is still a theory under development, but it presents an entirely new approach to the astrophysical and cosmological problems that intrude into the field of interferometry. It claims to unify the results from all five different fields of interferometric experimentation and observation, and to do so while abiding entirely by the aetherometric law of the geometric composition of velocities (Correa & Correa, 2008a). In what follows, we will contrast a variety of controversial interpretations of the results of these experiments with the answers provided by Aetherometry.

2. INTERPRETATIONS

2.1 Vigier

J.P. Vigier (1997a) opposed the dismissal of the smaller-than-expected aether drift in MM-type experiments as experimental artefacts:

> The absence of an absolute ether drift in some Michelson type interference experiments can be explained by the simple fact that 1) *when one measures δλ/λ the average value over a whole day is always zero due to the earth's rotation,* i.e. *the plotted values follow a sinusoidal curve*; 2. their values within a few hours (or minutes) vary with the chosen time interval for the same reason since the axis of the telescope takes different orientations; 3. in all such experiments (to the best of the author's knowledge) the maximum and minimum of *δλ/λ* occurs at the same sidereal time (~3-4 hours and 14-15 hours) and cancel around 9 hours and 21 hours. (p. 75)

He says that when made over a sidereal day, all such experiments have shown this sinusoidal pattern with a maximum and minima separated by 12 hours (e.g. Esclangon, 1927; Riis et al., 1988) – a pattern readily interpretable in terms of absolute earth motion. Note that Miller found a minimum at 17 hours (not 14-15 hours), this being, in his view, the right ascension of the apex of "absolute" motion (in reality his results are very messy: see Part 1, section 7). (The findings of Joos (1930) are unclear in this respect, as he did not plot them against sidereal time.)

Vigier says that, given their potentially radical implications, there is a definite need to repeat such experiments with improved technology, including in space. He thinks that if repeated

[1] Kepler's third law of planetary motion states that the ratio of the square of a planet's period of revolution (T) to the cube of its mean distance (r) from the sun is a constant (K): $T^2/r^3 = K$.

with lasers “their precision ... would be sufficient to detect (with the reduced values that result from Relativity Theory) the earth’s orbital (~30 km s^{-1}) and absolute (~300 km s^{-1}) motions given by astronomical observations” (1997a, p. 75) – an indication that he has no faith in Miller’s cosmic solution. It is noteworthy, however, that neither the direction of the solar system’s galactic orbital motion nor that of its accepted “absolute” motion have a right ascension of 14-15 hours or 17 hours, but rather of 21 hours and 11 hours respectively.

Vigier (1997b) argued that the results of the MM experiment and subsequent experiments by Morley and Miller are compatible with Special Relativity, and that the Sagnac effect can be reconciled with General Relativity, if photons are assumed to have a very small mass of approximately 10^{-65} g. (Experimental limits placed on photon mass include 10^{-48} g (Fischbach et al., 1994) and 3.2 x 10^{-47} g (Bonetti et al., 2016).) While upholding relativity theory, Vigier argues for a preferred reference frame in the form of a Dirac-type aether (consisting of particle-antiparticle pairs).

2.2 Cahill

R.T. Cahill (2004, 2005) argued that post-1930 MM-type experiments, conducted in a vacuum, have given null results due to length contraction, allegedly resulting from the “quantum-foam” structure of space. In MM-type experiments in which the light beam traveled through a gas, on the other hand, small fringe shifts remained detectable, depending on the refractive index of the gas concerned; the medium was usually air, but in three cases (which yielded smaller aether drifts) it was helium. After extensive data manipulation (including dismissing data that do not display a sinusoidal form as “low quality”), and assuming the reality of length contraction and time dilation, he reconciles Miller’s results with those of four other fringe-shift experiments (Michelson & Morley, 1887; Illingworth, 1927; Joos, 1930; Jaseja et al., 1964) and two first-order coaxial cable travel-time experiments, by Torr & Kolen (1984) and De Witte (Cahill, 2006b). Since Joos’s experiment did not yield the result his theory required, Cahill simply discarded 95% of Joos’s reported results, taking into consideration only one of the 22 curves, as the others did not “look right” and must therefore have been “poorly recorded”!

He concludes that the earth and solar system are moving at 420 ± 30 km/s in the direction RA = 5.2h, Dec = -67°. He distinguishes this motion from the velocity of ~370 km/s derived from the dipole anisotropy of the microwave cosmic background radiation (mCBR; also known as the cosmic microwave background, CMB), which he regards as a motion relative to the distant universe but not local space. His interpretation includes an alleged “gravitational space-foam inflow” of about 54 km/s, whose turbulence is said to cause the considerable fluctuations of aether-drift residuals.

Cahill (2006a) has conducted his own experiment to measure the anisotropy of the one-way speed of electromagnetic waves in a coaxial cable, which led to a similar result: 400 ± 20 km/s in the direction RA = 5.5 ± 2h, Dec = -70 ± 10° – a motion which receives no support from astronomical observations.

2.3 Consoli et al.

M. Consoli & E. Costanzo (2003, 2004) accept Cahill's view that Lorentz contraction in conjunction with the different refractive indexes of the light-path medium can reconcile the results of various aether-drift experiments. They argue that in mediums where the refractive index differs significantly from unity, Fresnel's drag becomes substantial and cancels the effect of the Lorentz transformation. They claim that their analysis shows that the small aether drifts observed in the 1887 Michelson-Morley experiment, Miller's 1925-26 experiments, the 1927 Illingworth experiment, and the 1930 Joos experiment correspond to an actual velocity in the plane of the interferometer of 204 ± 36 km/s. They conclude that the fringe shift is determined by the solar system's velocity within our galaxy and not, for example, by its velocity relative to the centroid of the Local Group. While highlighting the "internal consistency" of Miller's cosmic solution, they neglect to mention that Miller derived an apex in Dorado – a full 143° from the apex of solar galactic motion in Cygnus.

On the basis of a partly different analysis, and assuming a superfluid "quantum aether", Consoli et al. (2013) argue that the aether-drift experiments by Michelson-Morley, Morley-Miller, Miller, Kennedy, Illingworth, Michelson-Pease-Pearson, and Joos can be interpreted as indicating that the earth is moving at a velocity of "about 300 km/s", but with values ranging from 185 to 600 km/s – as compared with the velocity of 369.82 ± 0.11 km/s derived from mCBR dipole anisotropy measurements (Planck Collaboration, 2020). They say little about the direction of motion, but in the case of the Joos experiment they calculate that it is RA = 11.2 ± 2h, Dec = -13 ± 14°, compared with the mCBR -derived direction of RA = 11.1961h, Dec = -6.944°, and argue that "it is necessary to change the theoretical model to try to make Joos's experiment completely consistent with the earth's motion with respect to the CMB".

Consoli et al. (2006) analyzed the results of an experiment conducted by Hermann et al. (2005) to test the isotropy of the speed of light using a continuously rotating optical resonator. They concluded that the results showed that the earth was moving towards RA = 13.6h (±0.8h), Dec = -30° (+16°/-22°). The central values are in reasonable agreement with the accepted coordinates of the Great Attractor (RA = 13.4h, Dec = -44.5°), a concentration of mass that is believed to control the overall galaxy flow in our local universe. They point out that the results of such experiments are usually interpreted on the assumption that the mCBR-based apex is correct.

The work of Cahill and Consoli demonstrates that through arbitrary data selection and manipulation and ad hoc assumptions it is possible to extract widely differing results from "aether-drift" experiments. It also highlights the fact that, since the mCBR was discovered, all cosmic speed and apex measurements have been made to fit a certain interpretation of its anisotropy.

2.4 Múnera

H.A. Múnera (1998) tries to adjust the outcomes of certain aether-drift experiments to bring them closer to Miller's results, but some of his statistical and analytical techniques are highly dubious. Reanalyzing the results of Illingworth (1927), he notes that the average velocity for one typical session is 2.12 km/s, but that the true velocity is between 0.89 and 3.35 km/s at

50% confidence level. His analysis of the July 9, 1927, session yields a velocity of 3.13 ± 1.05 km/s. It is illegitimate for Múnera to convert all the negative fringe displacements obtained by Illingworth into positive values, so that a mean is always positive, even though he admits that Illingworth established a nonzero velocity at the beginning of each run (see Part 1, section 6). Múnera thereby presumed that the interferometer has no intrinsic error drift that might work in either direction, i.e. randomly, and his treatment of the data effectively eliminates the possibility of accurately determining such an error.

Múnera (2002, 2006) points out that the experiments by MM, Miller, and others were designed to measure fractions of a wavelength, and that large variations were ascribed to thermal effects and recalibrated away. A steady drift of the fringe shifts is present in the MM (1887) data; it did not merit any comment from MM but was recognized by Hicks (1902), who ascribed it to thermal effects. Miller recalibrated his interferometer each time the fringe displacement exceeded two fringes, to "correct" for this "thermal drift". As noted in Part 1 (section 5), if the interferometer will go on drifting through many wavelengths with a negative tendency, as Miller's did, an operational cut-off is essential. In the MM and Miller experiments, measurements were made every 22.5° during the rotation of the interferometer. Although it was impossible to know how many fringes the reference fringe had moved between measurements, it was assumed that it had moved through less than one fringe. In the repetitions by Kennedy (1926) and Illingworth (1927), the apparatus was rotated 90° between measurements, but it was still assumed that the reference fringe had moved less than one wavelength.

Múnera argues that the initial fringe shift should not be expected to be the same as the final shift after a full rotation, even though the apparatus then has the same orientation with respect to the laboratory; instead of being entirely due to thermal effects, the additional shift may in part be a signature of the earth's motion. In Múnera's (2017) own interferometer experiments (see Part 2, section 5), the automatic data-gathering system made readings every 0.25° (at one-minute intervals), when the fringe shift was assumed to be less than one wavelength, and the outcome was that far larger fringe shifts were obtained than other experimenters had measured, which he believed allowed direct determination of the earth's velocity through space.

2.5 MM vs. Silvertooth

By contrast with MM-type experiments (except Múnera's), the Silvertooth experiment seemed to measure the full value of the earth's "absolute" velocity (378 km/s), producing results in good agreement with the mCBR-derived value (Silvertooth 1987, 1989; Silvertooth & Whitney, 1992; Wesley, 1987). The Silvertooth experiment is compatible with absolute space/a static aether, and contradicts an entrained aether and length contraction (which have been used to explain the results of MM-type experiments). So if Silvertooth really did detect the earth's absolute velocity, why did his experiment succeed while most MM-type experiments failed?

Silvertooth and H. Aspden have suggested that this is because MM-type experiments (including modern versions with lasers) involve two-way light travel, whereas the Silvertooth experiment involved one-way light travel, as did the Sagnac and Michelson-Gale rotational experiments. However, Silvertooth's result is at variance with most other one-way tests of light-speed anisotropy.

Aspden (1990) argued that when light rays are reflected back on themselves, the energy set up by the resulting standing wave condition could affect the speed of light and nullify the effect being detected. If the neutralizing effect is only partial, this could account for the small aether-drift residuals found in some MM-type experiments, with the wide variations in the experimental results being attributed to experimental and ambient factors.

Scientists who regard the small aether-drift velocities as significant tend to ignore or reject the Silvertooth experiment, which apparently detected the earth's "absolute" motion directly, without the need for any scaling factors. They can invoke aether drag and/or length contraction and follow Miller in applying a scaling factor to turn the small residuals into a much higher velocity (e.g. DeMeo (2001, 2002), Cahill, Consoli). Or they can follow Múnera and argue that if the proper experimental and data-reduction procedures are followed, such experiments can detect the full value of the earth's "absolute" velocity. If aether drag is invoked, one would have to argue that the aether is dragged by the earth's translatory motion but not by its rotary motion, in order to explain the Michelson-Gale experiment.

The table on the next page shows the widely varying velocities and apices of terrestrial/solar motion derived from light anisotropy experiments and other methods.

2.6 Whitney

C.K. Whitney (2006) has used a so-called Two-Step Light theory to analyze various optical experiments – Bradley's stellar aberration (1728), Fizeau's experiment (1851), the Michelson-Morley experiment (1887), the Sagnac effect (1913), the Silvertooth experiment (1987), and Wang's experiments (from 2003). The theory proposes that light propagation proceeds at c relative to matter, which is a non-sequitur, since light is always referenced to matter, or to its state of motion – and the whole argument has been which state or states of motion it is referenced to. Whitney proposes that light propagation consists of two phases: 1) expansion from the source, attached to the source, followed by 2) collapse to the receiver, attached to the receiver. It is unclear what expansion or contraction means in this context: is it light that "expands" and "contracts" in speed, or distances or paths that do so? Her analysis purportedly shows that "linear velocity transverse to an optical system aperture should be, and is, detectable" – though no one, to our knowledge, has stated either the contrary or that such observation per se contains a decisive insight.

Whitney writes: "The MM analysis was based on the assumption of light speed corrections in the light-speed numerator, rather than the denominator as Two-Step Light implies." This means that "phase corrections are in the phase numerator, and they are first order in v/c. There is no phase correction at second order in v/c, such as was sought." In other words, the design of the MM experiment was flawed:

> The light went out and back, being recombined essentially at the beam splitter. A tiny tilt was introduced to create fringes, which were observed in the focal plane of a small telescope. (...)

> The reason for the null is the collocation of beam recombination with the beam splitting. That made the phase increments going out and back along both arms dead zero. The only fringe motion possible would arise due to the small telescope, in analogy to Bradley aberration. The focal length of the telescope was short, so the motion of the fringe pattern had to be small, consistent with the tiny phantom fringe shifts that researchers have documented for over a century. (p. 29)

Curiously, there would be no controversy about residuals if the results were “dead zero”. Whitney suggests that if the MM experiment “were redesigned to follow four, instead of just two, sides of a square, with the focal plane diagonally across from the input aperture, it too could detect orbit velocity. But that design has a confusing factor: besides linear velocity, it also senses rotation.” Yet somehow she argues that “rotation” vs. “linear” is a false dichotomy, and one that makes Special Relativity untestable, since there is no experimental platform that is not accelerating (i.e. rotating/revolving):

> The operative distinction appears to be 1) velocity across an optical system aperture, as in Bradley’s stellar aberration and the Silvertooth experiment, vs. 2) velocity along the rays to a focal plane, as in Fizeau experiment and the Sagnac effect, and even the MMX [MM experiment], where reversal of the rays explains the *non*-effect that occurs. (p. 30)

Whitney says that her approach is a unifying one that “makes all the experiments morph into each other”. She describes it as a revised version of Special Relativity, and leaves open the question of an aether, yet it seems to amount to much ado about nothing.

TABLE 1 Determinations of absolute solar motion

Method	**Source**	**v (km/s)**	**RA (h)**	**Dec (°)**
Two-way light anisotropy	Miller (1928)	>200	17	+68
	Miller (1933)	208	4.9 ± 0.03	-70.55 ± 0.5
	Múnera (2017)	500	16.67	-75
		365	5.4	+79
One-way light anisotropy	Silvertooth (Wesley, 1987)	378 ± 8	11 ± 1	-20 ± 2
	Marinov (1987)	386 ± 38[a]	12.5 ± 0.5	-22 ± 6
		363 ± 40[b]	12.5 ± 1	-24 ± 7
		327 ± 20[c]	13.3 ± 0.3	-21 ± 4
	Cahill (2006a)	400 ± 20	5.5 ± 2	-70 ± 10
Muon-flux anisotropy	Monstein & Wesley (1996)	359 ± 180	8.7 ± 3.5	-1.1 ± 10.0
mCBR dipole anisotropy	Planck Collaboration (2020)	369.82 ± 0.11	11.1961 ± 0.0005	-6.944 ± 0.007

Miller (1933) reports an aether drift of ~10 km/s at the earth’s surface, while Múnera (2017) reports an aether drift of 365 or 500 km/s at the earth’s surface.
Marinov (1987): a) simplified Silvertooth experiment; b) toothed-wheels experiment; c) coupled-mirrors experiment.
Cahill (2006a): coaxial cable experiment; he obtained a similar result from his reanalysis of several other one-way and two-way light anisotropy experiments (Cahill, 2005).

2.7 Sagnac and Michelson-Gale experiments

As noted in Part 2 (section 7), the Sagnac and Michelson-Gale experiments have been construed as consistent with Special Relativity, General Relativity, absolute space, a static aether, an aether that is dragged by the earth's translatory motion but not its rotary motion, or a rotating aetherosphere, provided the latter's motion does not significantly affect the behavior of light.

The global or "open-loop" Sagnac experiment and the Michelson-Gale experiment are able to detect the earth's rotation. Relativists have come up with various conflicting and confusing explanations for this. General Relativity invokes the "dragging of spacetime" in the neighborhood of a rotating body (the Lense-Thirring effect). But it is a mystery why, according to relativity theory, rotation should be measurable because of a spacetime drag of inertial frames (e.g. a gyroscope's axis), while translation remains unmeasurable and unable to drag its own inertial frame, even though translation is also a gravitational motion and there must be equivalence "in principle" between inertial and noninertial frames. Relativity claims that there are relative and absolute rotations, and absolute rotations (of the ensemble of distant stars and the spacetime envelope) that are relative to the inertial effects of frames in translation, while appearing to claim that all motion (including rotation) is relative (Correa & Correa, 2000).

3. AETHEROMETRY

3.1 The ambipolar-electric nature of the aether

Building on the work of pioneering scientists like Nicola Tesla, Wilhelm Reich, and Harold Aspden, Aetherometry has developed a large body of experimental and analytical evidence for a dynamic, massfree aether. The aether is not "luminiferous" (i.e. is not composed of electromagnetic waves), nor is it passively dragged or entrained by the earth in its translatory and rotational motions. Rather, the earth is *propelled and entrained by an electric aether*, consisting of longitudinal-wave radiation that carries ambipolar (phenomenologically neutral) charge rather than monopolar charge. Massbound charges are always monopolar (either positive or negative) and energy-structured so as to conserve their mass and charge. When exposed to ambipolar radiant energy, massbound charges can capture it as their own kinetic energy – and that is the true explanation of charge acceleration by an applied electric field.

3.2 Nature of photons and propagation of light stimulus

According to Aetherometry, photons are transient, locally-produced massfree energy vortices, characterized by transverse sinusoidal waves of electromagnetic energy; ionizing photons result from the decay of elements of matter, whereas nonionizing (blackbody) photons are generated when matter particles decelerate or collide, thereby shedding their kinetic energy. All electromagnetic energy is sourced in the kinetic energy of massbound charges.

When considering the various “aether-drift” experiments, it is important to bear in mind that, from an aetherometric perspective, it is ambipolar excitation waves that travel through space, *not* photons themselves. Only ionizing photons (x-ray, gamma-ray) have the ability to travel through space, but they are of no relevance in optical, radio or microwave experiments (Correa & Correa, 2012). Blackbody or optothermal photons are shed locally by decelerating matter particles, and their effective lifetime depends on the short length of their path. The idea that the sun does not emit electromagnetic radiation but ambipolar radiation is derived from experimental investigations of the nature of solar emissions conducted with a variety of devices (Tesla coils, electroscopes, ionizers, photoelectric cells, Faraday cages) (Correa & Correa, 1999a,b,c, 2001b,c,d).

Moreover, the massfree excitation waves responsible for the propagation of the electric field are not constrained by “light” speed (c); the latter only applies to the globular-vortical motion of electromagnetic energy that locally forms each short-lived photon. It is the velocity of a photon’s internal energy (of its waves), no matter what its frequency or energy level, and it is referenced to the inertial frame of the photon emitter (electron, proton, etc.). Thus, in its proper frame, every photon has the same internal velocity.

In other words, light does not involve the substantial movement of photons through space (as in the ballistic theory), or their transmission by electromagnetic waves. Light rays are generated by sequential concatenations of photons that are constantly forming and dissipating. Since Aetherometry holds that the production of blackbody photons is mediated by decelerating or colliding massbound charges, a moving material medium must always exist for the coherent concatenation of photons into light rays. That medium consists of the collectivity of moving receivers/emitters, whose field acceleration and deceleration vectors are substantially uniform and parallel. Proximity effects also exist – such as those that permit masers and lasers – whereby sequential photon absorption and re-emission by electrons occurs with minimal electromagnetic energy decay.

The invariant speed c therefore has nothing to do with the forward propagation of the ambipolar radiation that acts as a light stimulus. When treated aetherometrically, the angular frequency or the quantum energy of each photon serves as an indicator of the velocity (and voltage) of the massbound charges before they shed those photons; and that velocity, in turn, indicates the velocity (and voltage) of the ambipolar field that accelerated those massbound charges to begin with.

It is an error to look for absolute velocities sourced in electromagnetic frames, for there is no absolute electromagnetic aether representing a universal state of rest. Moreover, since photons are shed from charged particles of matter (whether electrically neutral or not) or, to put it a better way, from the charges in every molecule, they share the inertial frame of reference of those particles or molecules.

3.3 Doppler effect and Sagnac effect

In Part 2 we described the laboratory Sagnac experiment, where light is sent in opposite directions around a rotating platform: the counterrotating beam appears to travel at c + v while the corotating beam appears to travel at c - v, whether the observer is located on the rotating platform or in the fixed laboratory. If the platform rotates anticlockwise at linear speed v, the detector moves *towards* the clockwise-traveling ray but *away from* the counterclockwise-traveling ray, with the result that the former travels a shorter distance than the latter. The Sagnac effect enables a platform to determine whether it is stationary or rotating, lending to rotation what appears to be an absolute character.

A Doppler shift is a frequency shift caused by the relative motion (approach or separation) between a source (e.g. of light or sound) and an observer/receiver. In the case of the linear light Doppler shift, the relativistic formulas differ from the classical formula by including a second-order term – i.e. one proportional to $(v/c)^2$ – in the form of the Lorentz factor γ:

$$\gamma = 1 / \{\sqrt{[1 - (v^2/c^2)]}\}$$

which is treated as either a multiplier (Larmor-Lorentz Relativity) or a denominator (Einstein's Special Relativity) when applied to the classical formula.

Aetherometry, on the other hand, argues that there is no real second-order effect (Correa & Correa, 2008a), only the geometric mean of two distinct first-order effects, i.e. the square root of their superimposition.

The classical treatment of the light Doppler only recognizes the differential between the velocities of the source and receiver, so that the frequency change is given by:

$$\upsilon' = \upsilon \{[1 +/- (v_o/c_m)]/[1 -/+ (v_s/c_m)]\}$$

where v_o is the velocity of the observer, v_s is the velocity of the source, and c_m is the velocity of light in a material medium. Special Relativity (SR) adds multiplication by the second-order term:

$$\{[1 - (v_s^2/c^2)]/[1 - (v_o^2/c^2)]\}^{0.5}$$

However, this simply reveals the correctness of the law of the geometric composition of velocities and velocity differentials, since

$$\upsilon' = \upsilon \{\{[1 +/- (v_o/c)]/[1 -/+ (v_s/c)]\} \{[1 - (v_s/c)^2]/[1 - (v_o/c)^2]\}^{0.5}\}$$

$$= \upsilon \{\{[1 +/- (v_o/c)]/[1 -/+ (v_o/c)]\} \{[1 +/- (v_s/c)]/[1 -/+ (v_s/c)]\}\}^{0.5}$$

so that, for the relative speed of the combined motion, one arrives at the general formulation for the light Doppler:

$$\upsilon' = \upsilon [1 +/- (v/c)]/[1-(v^2/c^2)]^{0.5} = \upsilon [1-(v^2/c^2)]^{0.5}/[1 -/+ (v/c)]$$

$$= \upsilon \{[1 +/- (v/c)]/[1 -/+ (v/c)]\}^{0.5}$$

It follows that the frequency shift for source and receiver approaching is:

$$\upsilon' = \upsilon \{[1+(v/c)]/[1-(v/c)]\}^{0.5}$$

and for their separation is:

$$\upsilon' = \upsilon \{[1-(v/c)]/[1+(v/c)]\}^{0.5}$$

None of this involves any Lorentz transformation(s)!

Aetherometry argues that c is referenced naturally to the inertial frame of the emitter, and thus that these formulas only apply to the motion of receivers that do not share the inertial frame of the emitter, or to motions of the emitter and receiver relative to an inertial frame (e.g. of a material medium intervening in the concatenation of the ray) that neither one shares. Furthermore, the aetherometric treatment also suggests that the Sagnac effect can be understood as an *angular* light Doppler shift (requiring no second-order effect), where a "light loop" is set in (apparent) motion (Correa & Correa, 2008a).

The issue cannot be resolved by the Sagnac experiment for the simple reason that Aetherometry and SR yield the same results (conversely, Larmor-Lorentz Relativity (LLR) gives a result slightly different from either), since the geometric mean of the velocities affecting the light loop, from its own perspective as a rotating frame (corotating or counterrotating) in its own right, is equivalent to a second-order term:

$\{[1 + (v/c)] * [1 - (v/c)]\}^{-0.5} = [1 - (v^2/c^2)]^{-0.5}$

Nevertheless, there is an irony to the aetherometric approach, because it argues in reverse that it is when the first-order effect (the Sagnac effect as an angular Doppler effect) is produced that a second-order term must be introduced (i.e. "comes into play"), and *not* when it must vanish! It is the Sagnac effect that requires the introduction of a second-order term associated with the moving light loop, not the Sagnac effect that must be explained by cancelation of the second-order term or its vanishing (as most, if not all, have argued).

3.4 The 1938 Ives-Stilwell experiment

The issue between SR vs. Aetherometry could only be found in the analysis of the 1938 Ives-Stilwell experiment. Relativists of both the SR and LLR schools like to call it a verification of time dilation, since it showed that their second-order effect models came much closer to predicting the observed linear Doppler shift of light than the classical Doppler theory. However, Aetherometry predicts values that are significantly closer to the particle velocities and second-order Doppler effects reported by Ives and Stilwell than those predicted by either SR or LLR, and it achieves this by consistently applying the law of the geometric-mean composition of velocities (see Fig. 1). This involves taking into account not only the relative state of motion of the proton doublets produced in the experiment, and the state of motion of the photon-emitting electrons with respect to these doublets, but also the collisions that decelerate both to the final velocity at the time of photon emission (Balmer line).

In Aetherometry, then, the second-order linear Doppler effect is merely a consequence of the proper application of the law of the geometric-mean composition of velocities, including proper treatment of the relationship between field energy, kinetic energy and photon emission, and there is no need to invoke any Lorentz-Fitzgerald transformations (length contraction or time dilation). In effect, the results of the 1938 Ives and Stilwell experiment confirm Aetherometry's contention that SR is inconsistent in its application of the law of velocity composition, and in error when it comes to the determination of the voltages corresponding to the velocities of massbound charges. The same applies a fortiori to LLR's interpretation.

3.5 An ambipolar aetherosphere with a graviton/antigraviton structure

According to Aetherometry, the earth is embedded in a faster-rotating aetherosphere with a stratified structure; successive inner rings rotate more and more slowly with respect to the outer ones, with the direction of the overall flux becoming increasingly inclined towards the vertical as the earth's surface is approached (Correa & Correa, 2004). This can be extracted from a comparative analysis of how gravitational motion changes from satellizing orbitals to free fall. At the geostationary distance – at 6.626 R_E from the center of the earth on the outer boundary of the second Van Allen radiation belt – the outer aetherosphere rotates slowly at 3 km/s, and synchronously with the earth's surface. A maximum speed of orbital motion,

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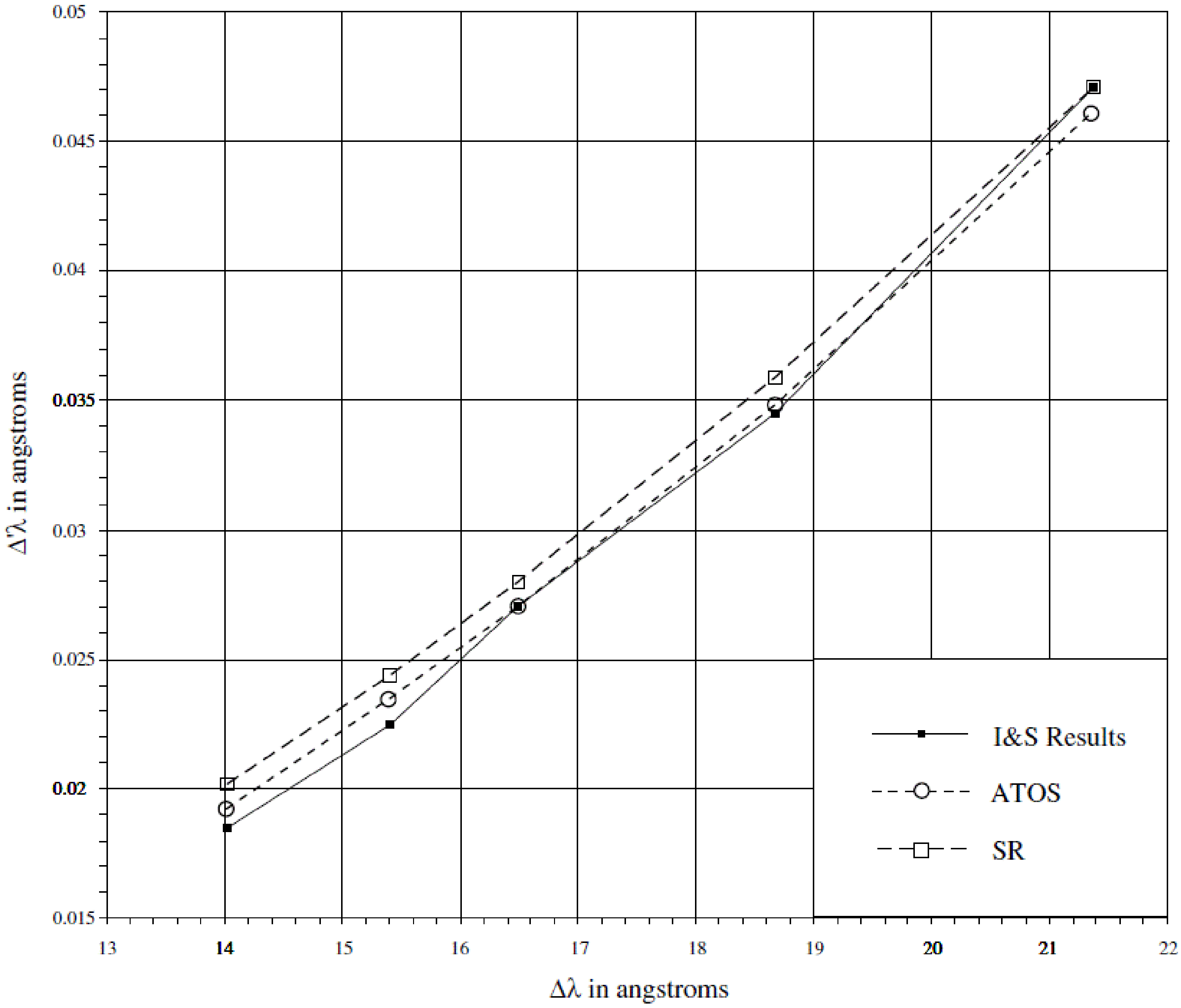

Figure 1 Computed and observed second-order shifts plotted against first-order shifts. The observed second-order shifts (small closed squares) are those reported by Ives and Stilwell. The second-order shifts predicted by SR (large closed squares) deviate from the results of Ives and Stilwell by, respectively, 8.4%, 7.4%, 3.5%, 4.3% and 0.2%. The second-order shifts predicted by Aetherometry (closed circles), deviate much less from the results of Ives and Stilwell by, respectively, 3.8%, 4%, 0%, 0.9% and 1.4%. (Correa et al., 2008d, fig. 2)

7.84 km/s, is reached at ionosphere altitudes (ca. 100 km above the earth's surface). Next, as the satellizing motion yields to free fall, orbital motion decays in cycloidal arcs even as the speed increases at first to a maximum of 7.9 km/s in the mesosphere, at some 80 km above the surface – at or near the E-layer (Correa & Correa, 2001d, 2004). Thereafter, the gravitational massfree flux precipitously slows down in increasingly shorter cycloidal arcs to near the surface's speed, 0.46 km/s at the equator. Most of the aether flux changes direction from horizontal to vertical. Vertically, it continues to move with its maximum velocity, but horizontally (rotationally, on the line of horizon) it slows down.

This is best understood by regarding the aetherosphere as an ambipolar flux that modulates the balance between massfree gravitons and antigravitons, in a layered structure. The greater the distance from the earth's surface, the greater the density of antigravitons and the cancelation of gravitons, with the result that the net local gravitational field or its flux is predominantly rotational. Conversely, the closer one is to the terrestrial surface, the greater is the density of gravitons, which verticalize the gravitational field and leave behind a "weak" rotational envelope.

In effect, aetherometric research has identified a greater cancelation of gravitational acceleration at the equator than at the poles that is *not explainable* by either centrifugal or Coriolis forces (Correa & Correa, 2008c). In other words, neither newtonian (classical) nor relativistic theories can account for it. Aetherometry proposes that the identified counterflux is an ambipolar, massfree field reaction resulting from the interaction of the cosmic and galactic aether fluxes with ongoing nuclear fusion reactions in the innermost and densest core of the earth. The interaction causes a constant antivertical release of antigravitons deep inside the planet, that varies between the equator and the poles, and is distinct and separable from the mass-dependent (or centrifugal) reaction, which is zero at the poles. Further, from a detailed analysis of earthquake mechanisms focused on Lisbon's 1755 disaster, the Correas have suggested that flux disturbances of the massfree reaction are responsible for earthquake nucleation and initiation (Correa & Correa, 2008c).

The counter-gravitational reaction field presents antivertical speeds that vary from 0.487 km/s at the poles to 0.594 km/s at the equator (Correa & Correa, 2008c). If the antigravitic emission curves antisymmetrically to the curvature of the gravitational field in near-space, it will generate atmospheric envelope rotations with velocities that are distinct from the rotational speed of the earth's surface, and which will vary locally in the form of coalesced streams. The theory is that these streams are the tracks of cyclonic and anticyclonic cells. In other words, these cells form vortices due both to the unevenness of the "stream impulses" and the interaction of the atmosphere with solar radiation. At the equator, the rotary motion of the tropospheric envelope may reach W-to-E velocities on the order of:

$$v_{env} = [\sqrt{(v_{MR}^2 + v_{FR}^2)}] \sin \theta = \{\sqrt{[(463.85\ m/s)^2 + (594.17\ m/s)^2]} \sin 45° = 533\ m/s$$

where subscript "MR" stands for the centrifugal mass-reaction, and "FR" for the massfree field reaction (note that the inverted cycloid will ramp up diagonally) so that the angle it forms with the line of horizon (θ) is near 45°). The height of the disturbance likely reaches the ozonosphere (25-30 km altitude) in the lower stratosphere, given its magnitude:

$$h = v_{env}^2/g_E = 28.785\ km$$

This should surprise no one, since the existence of very-large-amplitude solitary waves in the troposphere – typically associated with either pressure elevation or depression and the tracking of atmospheric systems – have been known since 1990 (Ramamurthy et al., 1990).

These findings suggest that the aetherosphere is layered, and has a proximal (low-altitude) ring (the atmospheric envelope) which rotates eastward slightly faster than the earth's surface. At the poles, when the mass-reaction goes to zero, the atmospheric envelope rotation will decrease to a maximum of 0.34 km/s, due to the massfree field reaction. Above the ozonosphere, the rotary flux increases its velocity to a maximum, and then, in its outer ring, decreases it until the direction and speed join the ambipolar flux on the plane of the ecliptic that drives the translation of the earth.

3.6 The rotational envelope structure of the lower-altitude aetherosphere

Optical interferometric detection of the effect of a rotating atmospheric envelope with velocities on the order of 0.5 km/s or less is evidently beyond the resolution of the MM-type experiments. Illingworth (1927) reported that any aether drift could not be greater than 1 km/s; and with his most elaborate optical interferometer, Joos (1930) concluded that it had to be less than 1.5 km/s. But such experiments were set up to search for the so-called second-order effect in the propagation of light. This is not the case with the bizarrely confounded Michelson-Gale experiment, which at one time was fraudulently hailed in the official propaganda media (viz. *The New York Times*, January 9, 1925) as no less than (generic) proof of Einstein's theory (as if he had only *one*)!

We have discussed this experiment in Part 2, but now want to draw the reader's attention to the simple facts *it may well have implied*, as it aimed at detecting a first-order effect. Conducted underground, in Clearing, Illinois (~42°N latitude), the MG interferometer employed a split-beam rectangularly-looped through a vacuum tube that was 1829 m long (in one of its embodiments) and had parallel E-W segments of 612 m, and N-S segments of 302.5 m. The results varied – possibly with some as yet undetermined quasi-diurnal cyclicity – from a fringe shift of +0.55 to -0.05 (on other occasions, with a slightly different total length, Michelson reported different values; in one instance, a maximum of +0.44 and a mean of +0.26). If the results are physically meaningful, the MG result could not, therefore, have simply detected the earth's speed of rotation, which is *not* variable, at least not down to less than a millionth of a meter per second.

The length of a degree of longitude at that latitude is:

$$(2\pi R_{Eeq}/360°) \cos 42° = 82{,}726.54 \text{ m}$$

Since the fringe shifts were obtained against a control calibration loop of the same length that only travelled a negligible distance in the direction of the earth's rotation, the observed fringe shifts occurred in the E-W direction (note that use of a control is a rare bird amidst all interferometric experiments, and one of the fundamental reasons why it is worth considering the results of the MG experiment). The number of fringes may be determined as:

$$N = 0.55/[\sin (612 \text{ m}/82{,}726.54 \text{ m per deg. long.})] = 4259.7$$

A +0.55 fringe shift, then, implies detection of a "drift" velocity given by:

$$v = N\, c\, \lambda/L = 398 \text{ m/s}$$

where $\lambda = 5.7*10^{-7}$ m is the wavelength of the blue light employed (also note that the length L = 1829 m is often written as 2L because the rectangle is divided into two orthogonal arms and L is then given as the length of just one arm). At that latitude, the terrestrial surface rotates at:

$$v_{Erot} = (2\pi R_{Eeq}/86{,}400 \text{ s}) \cos 42° = 344.7 \text{ m/s}$$

It is most likely not a coincidence that the maximum result registered by the MG experiment matches the maximum speed of the reaction-based flux predicted by Aetherometry at the same latitude:

$$v = (N\, c\, \lambda/L) = 398 \text{ m/s} \approx v_{env} \cos 42° = \{[\sqrt{(v_{MR}^2 + v_{FR}^2)}] \sin \theta\} \cos 42° = 396 \text{ m/s}$$

which is some 53 m/s faster that the rotation of the terrestrial surface. That other maxima were reported in the same range, or that variations down to -0.05 fringe shift were registered (corresponding to a westward counter-rotational flux at 36 m/s), may then have little import:

they do not impugn the maximum positive results for the simple reason that the rotational speed of the atmospheric envelope is bound to vary, not only diurnally (as galactic and solar ambipolar streams will interfere with each other during the day, and not at night), but also locally – as a function of both 1) the vortical velocities (speed and direction) of the streaming atmospheric pressure cells, and 2) the interaction of the reaction field with the slower or lagging rotation of the terrestrial mantle. Evidently, the MG experiment was detecting something other than the speed of terrestrial rotation.

Provocatively, the MG experiment could thus have been cited by W. Reich as proof for his hypothesis of an “orgone atmospheric envelope” that generally rotated slightly faster than the earth’s surface. First enunciated in his June 26, 1944 log entry (Reich, 2004, p. 237), he assumed the envelope rotation was a vestige of the original rotation of the planet:

> *Hypothesis*: the rotation of the orgone envelope is a vestige of the primordial spinning; it is not the Earth that takes the Aether with it, but “as the Aether rotates, it takes the Earth with it”. *Problem*: the rate of this rotation must be *measurable*. Technically difficult. [How right Reich was on this!] (...) *Problem*: which planets have rotating orgone envelopes?

Yet, if every planet that rotated did not have an envelope, then the rotating envelope could not be a mere consequence of “primordial spinning”. Indeed, as we have already seen, aetherometrically, it is not.

Later, Reich (1949) conducted an experiment in which he aimed a searchlight at the earth’s atmosphere on clear nights, vertically, horizontally, and at 45°. He found that the light pencil from the searchlight was shortest when positioned vertically and longest when it was horizontal or tangential to the earth’s surface. He asked why, if light propagates at invariant speed c, the searchlight pencil stops at so short a distance above the earth’s surface. He regarded the abrupt termination of the light pencil near the tropospheric boundary (tropopause) as implying that there is a shallow envelope surrounding the earth, and that light is mostly generated and propagated within this envelope. He inferred that photons are produced locally, due to propagation of an excitation wave and according to the physical characteristics of the local medium. He suggested that the length of the searchlight pencil increases as the angle with the observer’s horizon decreases to 0° due to the increasing depth of the rotating orgone envelope.

Reich also noted the presence of varying, west-to-east moving light nodes along the light pencils on certain clear nights, analogous to the shifting of the striations in a plasma column. It correlated with variations of speed in the wavelike motions observed with the telescope but not with wind displacements, and he regarded this as evidence that the atmospheric envelope rotates slightly faster than the planet and in the same direction. Likewise, Reich anticipated local reversals of the motion of the atmospheric envelope (Reich, 1973, p. 151). These tally with the negative fringe shifts observed in the MG experiment.

Later, Reich subdivided his concept of a rotating orgone energy envelope into two components: a slower-rotating gaseous-atmospheric ring that terminated at the tropopause, and a faster-rotating envelope, the “orgone envelope” proper, that at some undetermined height joined the galactic stream (Reich, 1973, p. 188-189).

The aetherometric concept of a rotating aetherosphere differs from Reich's concept of a rotating orgone envelope in two key features, structural and physicochemical:

1) The structure of the aetherosphere is more complex, comprising the differential rotation of three rings separated by shear zones (the E-layer and the ozonosphere): an outer fast-rotating ring spanning the magnetosphere down to the E-layer, where the rotational speed becomes maximal; an intermediate ring encompassing the mesosphere, where the rotational velocity abruptly decreases; and a lower ring (the atmospheric envelope proper) that spans the stratosphere, the tropopause and the troposphere, where the envelope rotation is generally slightly faster than the rotation of the terrestrial surface.
2) The aetherometric concept of a rotating lower aetherospheric envelope is not a "fuzzy-holistic" one, like that of "orgone energy". Aetherometry has applied the term "orgone" to define a specific energy spectrum of ambipolar radiation, and done so largely to honor Reich's work, because of the physicochemical and biological properties of that spectrum. But Reich himself lent his "orgone energy" properties that were at one time confusedly electromagnetic, gravitational and electrostatic, turning his concept of the orgone into a veritable nonscientific salad. In Aetherometry, the lower aetherospheric envelope is driven ambipolarly, i.e. electrically, and deploys a residual, slower flux of antigravitons responsible for atmospheric rotation and buoyancy.

A number of meteorological phenomena support the concept of a rotating proximal envelope formed by an ambipolar flux and driving antigravitic and latent energy distributions in the troposphere:

- The linear displacement of weather systems and the atmospheric stratification of their velocities are faster, and variably so, than the rotation of the earth's surface, and in the same direction.
- All pressure systems are distorted in the W-E direction to form eastward atmospheric streams.
- The typical "lying-V" shape of hurricane paths, whose vertices always point west and occur when both the angular velocity and the speed of the westward translation of the cyclonic cell reach their minima.
- The W-to-E direction of the jet stream and its high velocity (up to 500 km/h or 0.14 km/s), along with the general slowing down of wind speed with decreasing tropospheric altitude.
- The W-E motion of "atmospheric heat waves".
- The direction of spin or twist, and the preferred W-E fanning-out, of auroras at both poles.

To this, the aetherometric treatment of thermodynamics (AToS, Vol. VI, in prep.) adds that variations of the atmospheric pressure – or the so-called mechanical pressure-volume changes, including those of sound – are shown to be simple byproducts of the varying atmospheric ambipolar flux, of its voltage and its molar energy density.

Lastly, in this context, we should mention a curious observation made by Aspden. As explained in Part 2, in an MM-type experiment conducted at 40° lat., Brillet & Hall (1979) detected a "persistent and spurious" 17 Hz signal (at the second harmonic of table rotation). Aspden (1981, 1982) argued that if such a signal denoted the speed of terrestrial rotation at that latitude (355 m/s), *as detected by a second-order effect*, then the signal should have occurred at 16 Hz, so that:

$$v = \{[(16.25 \text{ Hz}/8.85 \times 10^{13} \text{ Hz})\ c^2] / 0.131\}^{0.5} = 355 \text{ m/s}$$

Instead, the signal seemed to indicate a slightly faster tangential velocity of v = 363 m/s, some 8 km/s faster than terrestrial surface rotation. Yet, the argument appears specious as it concerns a second-order (MM-type) detection "of rotation", even if the surmised result falls within the range of variation registered by the MG experiment.

3.7 The global Sagnac experiment

In light of the preceding, Aetherometry points out that the MG experiment(s) likely cannot be subsumed under the concept of a terrestrial or GPS Sagnac experiment, since the detected effect is neither constant nor of the same magnitude as terrestrial rotation, even when the apparatus is fixed to the terrestrial surface. However, it may well be that every terrestrial or global Sagnac experiment itself may be skewed to some extent by the variable rotation of the atmospheric envelope (an effect that is not observable in any simple Sagnac experiment).

In the global Sagnac experiment, the eastward signal, which travels in the direction of the earth's rotation (and also of the emitter satellite), is delayed with respect to the westward signal, as if the westward beam traverses a shorter distance than the eastward beam. The westward beam appears to travel at c + v and the eastward at c - v, where v is usually understood to be the earth's rotation speed at the surface projection of the emitter/interferometer. All global Sagnac experiments involving satellite transmissions (and multiple satellites) must be corrected for satellite motion and correlated with several terrestrial timing centers. It is only after these corrections that v comes to lie near that of the surface rotation.

Most global Sagnac experiments are carried out with the receivers fixed to the earth's surface (even if performed at height). But even these experiments may reveal the motion of the surface aetherosphere, since the propagation is always made through it. For global Sagnac experiments performed at height, the orbital motion of all the satellites involved must be stable; any deviations attributed to satellite motion are deducted from the final results. The final numbers therefore reflect numerous corrections, which are bound to eliminate small differences that could indicate the presence of a faster-rotating aetherosphere since they assume that any discrepancy must be tuned to the speed of terrestrial rotation. No global Sagnac experiments have been conducted with variable but fixed orbital heights, which would make it possible to observe patterns in the distribution of error, to see whether any variations correlate with orbital altitude. The residual error always represents a drift, for example in every GPS locator. Sagnac experiments should, at the very least, be conducted near-equatorially and with fully controlled atmospheric conditions – something that has not happened to date. Likewise, performance of a global Sagnac experiment at mesospheric altitudes might identify the effect of the layered rotation of the mid-aetherospheric ring.

From an aetherometric perspective, atmospheric photons are emitted from massbound charges that typically share the motion of the rotating earth or are being driven by the local aetherospheric rotation. As with massbound charges emitted from sources fixed to the terrestrial surface, the local inertial frame of reference for the motion of atmospheric massbound charges is the photoinertial frame centered on the earth's nonrotating spin axis.

There is a Sagnac effect, therefore, for the massbound charges emitted from both ground-fixed and atmospheric sources, and this gives rise to the *electromagnetic* Sagnac effect (this was discussed in Part 2 for the Sagnac experiment proper). In other words, massbound charges and the photons they emit share the same +/-v displacement with respect to the nonrotating spin axis, whereas the wave speed c of each photon's internal energy remains unaltered with respect to the photon's or the emitting massbound charge's own inertial frame of reference.

If, for the sake of illustration, photons are treated as traveling fibers (this being the traditional relativistic approach), rather than as local, inertially displaced globules, and if each fiber is taken as spanning the photon wavelength, then a succession of such fibers oriented, say, along the terrestrial equator to form a continuous curved pencil of light fibers, whether emitted from terrestrial or atmospheric sources, will be shorter if directed westward than eastward. The photon pencil moving westward encounters the massbound charges moving eastward that were responsible for its emission, in a time that is shorter than the time taken by the pencil going eastward, as if it is shorter in length, while the pencil going eastward "chases after" the eastward-moving massbound charges, as if the eastward pencil is longer. The apparent changes in light speed therefore only concern the inertial displacement of the light pencils; there are no changes in intrinsic photon energy, and thus no changes in intrinsic photon velocity, angular velocity, and wavelength.

There are MG-like first-order experiments – some under the rubric of the global Sagnac experiment – which appear to detect rotational speeds that are only very slightly faster than that of the earth's surface (nowhere near the maximal results of the MG experiment discussed above). The neutron-interferometry experiment of Staudenmann et al. (1980) reported a frequency of oscillation ~3% higher than predicted, which corresponded to a speed approximately 10 m/s faster than the local surface. In a repetition using a ring-laser fixed to the earth's surface, Bilger et al. (1995) confirmed, with a resolution of 1 part in 10^{20}, that electromagnetic signals propagate faster westward than eastward. Bailey et al. (1977) measured "relativistic time dilation" for positive and negative muons in a circular orbit and found it was some 1.5% greater westward than predicted by the gamma factor of Special Relativity, which translates into some 5 m/s faster than the earth's rotational speed. The rotating electron-beam experiment of Hasselbach & Nicklaus (1993) confirmed that atmospheric massbound charges flow faster westward than eastward, with accuracies on the order of 1%.

In light of the above and the preceding subsection, it is unclear whether first-order interferometry exclusively detects terrestrial rotation. At the very least, it is apparent that first-order optical interferometry must detect something other than terrestrial rotation, whereas "atom interferometry" (with neutrons or muons) seemingly may not (if the differences are deemed nonsignificant). Whether this is because of the supplied relativistic corrections – as is the case with global Sagnac experiments – or because of the mass difference between leptons vs. baryons or muons, remains to be understood.

3.8 Aether drift: substantially linear translation

MM-type experiments have yielded a multiplicity of incongruous and disparate aether-drift velocities at the earth's surface and the results have been interpreted to give vastly different directions of the earth's "absolute" motion (see Table 1 on p. 8). An aether drift is expected to vary according to when and where the experiments are carried out, but this does not by any means explain the reported discrepancies. The calculated aether-drift velocities have generally been far lower than originally expected, and that remains the case even after various proposed systematic errors are taken into account. Invoking "length contraction" is unsatisfactory as it has no independent experimental verification (and cannot have one, since it is a self-fulfilling prophecy), and aether entrainment cannot account for all the relevant experimental facts or even put some order into them. Further tests are required to see whether 180° light reflections could be canceling part of the effect being measured (see below). There is little doubt that experimental artefacts (improperly controlled local atmospheric factors, ground vibrations, undue heating or cooling of the instrument or parts of it, etc.) have played a major uncharted role in aether-drift experiments. Whether there is a genuine signal buried beneath the experimental errors will require further, improved experiments to determine – which, today, are costlier than ever and have very few takers (just imagine the cost of repeating the MG experiment).

In his Mt Wilson experiments, Miller (1933) failed to keep systematic records of the temperatures of the room, walls, and roof of his observation hut, in order to control for both the heating effect of the sun and the cooling effect of nighttime and winds. As a result, he never convincingly demonstrated that the small periodic fringe displacements he observed could not be related to sensible and latent heat lag effects derived from solar ambipolar radiation and its interaction with local weather systems. Miller conducted experiments with powerful radiant heaters, which convinced him that diurnal and seasonal changes of temperature could not account for the observed fringe shifts. However, heaters (on the inside) do not replicate the diurnal effects of solar ambipolar radiation (from the outside), nor those of varying wind cooling and pressure changes.

At one stage, Miller put a flimsy tent over the hut on Mt Wilson to shield the interferometer from direct sunlight. But, as shown by orgone accumulator experiments conducted outdoors under a tent (Correa & Correa, 2001a), ambipolar radiation still passes through, and longer wavelength photons multiply with a more noticeable lag (in fact, a dual lag: tent and hut). The effect of the sun would not vary with civil time, but would depend on epoch of the year and atmospheric conditions. One cannot seriously expect stable heating in a room isolated by thin wooden walls covered with a tent, or within glass-enclosed interferometer arms covered with paper.

On the basis of the aetherometric model, we would *not* expect to detect an aether wind of about 10 km/s at the earth's surface; even at equatorial altitudes of 10 km or more, it would not be more than 0.53 km/s. Further, one would also not expect to detect with optical interferometry the earth's motion around the sun, or the solar system's motion around the galactic center, or its net ("absolute") motion through space. Light anisotropy experiments on the terrestrial surface may, however, detect the rotation of the lower aetherosphere, up to 75 m/s faster than the local terrestrial speed of rotation, if they have the necessary geometry and resolution.

The local speed of aether rotation is highly variable according to the kind of atmospheric cell, interaction with the solar wind, etc. A relative lag or local retardation of parts of the aetherosphere might also be detected. Evidence of this local retardation is the organization of cyclonic systems against the direction of aetherosphere rotation, a fact which becomes obvious in the initial paths of most hurricanes, which are east-west. But data detailed enough to establish such correlations (of fringe shifts with pressure cells) does not yet exist.

Outside the aetherosphere, a much faster aether flux should be detectable. But just as the aether flow within the lower aetherosphere is slower than above it, so the aether flow within the solar system is probably slower than outside it. If the ~30 km/s aether flow that carries earth around the sun is not measurable at the earth's surface (or even 36,000 km above the earth), then the approximately ~250 km/s aether flow that carries the solar system around the galactic center would presumably not be optically detectable within the solar system. But since planetary, solar, galactic, and supergalactic aether flows can to some extent coexist and interpenetrate in the same abstract space, there might be other experimental methods of detecting our galactic velocity, based on time periodicities and direct measurement of ambipolar fields or the speed of propagation of gravitational fields. While the aetherometric analysis of the Silvertooth experiment is an example of the former, the treatment of the Bradley aberration (Correa & Correa, 2007) is an example of the latter.

3.9 Aetherometric analysis of the lepton mCBR and the discovery of the proton rCBR

Mainstream astrophysics regards the mCBR as the faint echo of a mythical Big Bang, which supposedly marked the explosive creation of all matter-energy and even of space and time themselves (the religious overtones are obvious!). The mCBR is allegedly a relic of the light emitted some 379,000 years after the Big Bang, when matter and radiation decoupled and photons began to travel freely through space. Despite relativity, the mCBR is therefore assumed to represent a universal electromagnetic reference frame.

The black body radiation of the mCBR is very smoothly distributed but displays tiny temperature fluctuations (roughly one part in 10,000 or less). It also displays a dipole anisotropy, which is officially interpreted as a Doppler shift produced by the solar system's motion through it; the mCBR is slightly "bluer" (hotter) in the direction of the motion, and slightly "redder" (cooler) in the opposite direction. The discovery of the mCBR anisotropy in the 1970's, and its potential role as a rest frame for the universe, led to talk of a "new aether drift"; this term does not refer to motion with respect to a frame of reference fixed in space, but to motion with respect to the expanding coordinate system of supposedly expanding space (Muller, 1978).

By reference to the mCBR and its anisotropy (with a temperature of 0.0032 deg. K), the solar system is said to be moving (Smoot et al., 1992) at

$$(T_{aniso}/T_{mCBR})\ c = (0.0032 \text{ deg. K}/2.73 \text{ deg. K})\ c = 373 \pm 15 \text{ km/s}$$

More recent determinations with claimed much lower error margins, give a velocity of 369.82 ± 0.11 km/s in the direction of RA = 11.1961 ± 0.0005h, Dec = -6.944 ± 0.007°, an apex located in the Crater constellation, near the boundary with Leo (Planck Collaboration, 2020). This velocity is said to have been confirmed by measuring its aberration and modulation effects on the mCBR temperature anisotropies (Planck Collaboration, 2014).

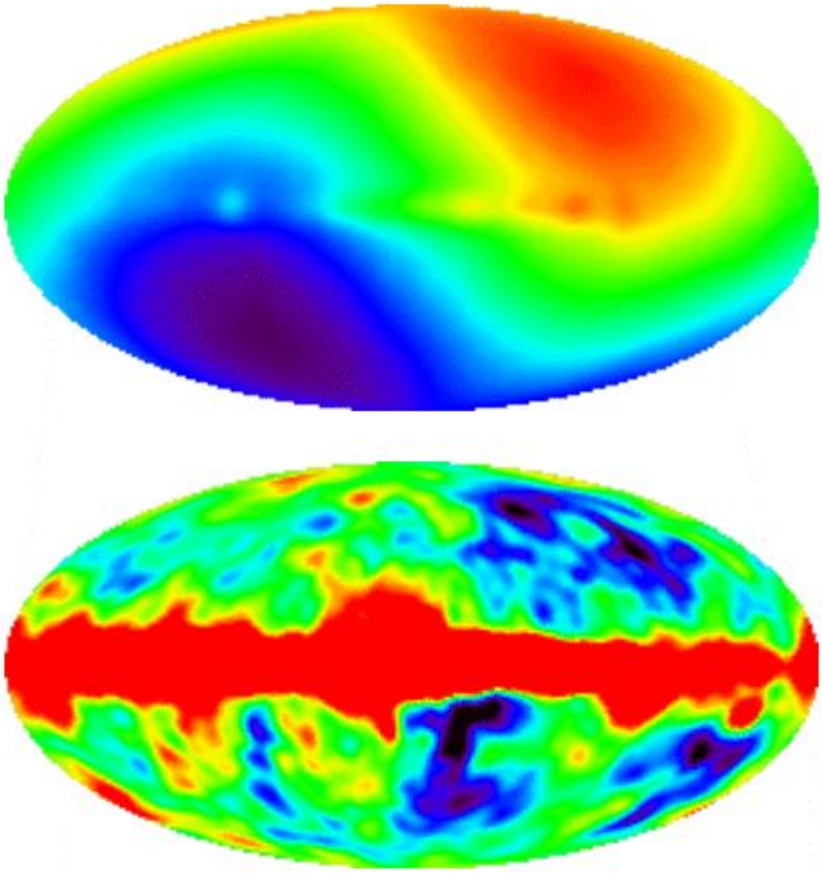

Figure 2 mCBR dipole anisotropy. (NASA)

Aetherometry regards the mCBR not as the relic of a mythical creation event, but as an electromagnetic marker of the ongoing creation and resorption of electrons with minimum kinetic energies throughout space. These electrons create microwave photons when they shed the kinetic energy imparted to them by an underlying cosmological spectrum of electric ambipolar radiation (cosmic background ambipolar radiation, CBAR, or, by deference to Reich, cosmic background orgone radiation, CBOR). The fundamental source of low-energy ambipolar radiation and matter particles (and their massfree gravitational energy) is the cosmic aether lattice flux, consisting of very high-energy ambipolar charges (Correa & Correa, 2008b). The CBAR is responsible for the kinetic energy not just of cosmologically-created leptons, but also of baryons. Accordingly, Aetherometry predicted the existence of radio cosmic background radiations (rCBRs) generated by cosmological protons, hydrogen and helium, and with respect to protons this has already been confirmed by the (now largely forgotten) work of radio astronomy pioneer Grote Reber (1911-2002) (Reber, 1977, 1986, 1995).

According to Aetherometry, if the mCBR dipole anisotropy (see upper part of Fig. 2) really did result mainly from the solar system's motion through it, the velocity would be about 5000 km/s rather than about 370 km/s. This is because aetherometric analysis indicates that the conventional correlation between the temperature scale and quantum frequency is incorrect, and that the temperature of the mCBR is 14.75 times lower than the accepted value (0.185

deg. K instead of 2.7 deg. K) (Correa & Correa, 2001e). This would give the following velocity:

(T_{aniso}/T_{mCBR}) c = (0.0032 deg. K / 0.185 deg. K) c = 5177 km/s

More recent work has fully confirmed the aetherometric temperature scale (AToS, Vol. VI, in prep.), so that, in effect, the accepted derivation of the so-called “absolute” speed of the solar system is an invalid shot in the dark. What the first part of that equation actually does is relate the temperature of the anisotropy to the temperature of the isotropy – and this is the same as relating the temperature of the most basic radio CBR – that of protons – to that of the microwave CBR of leptons. Aetherometry then demonstrates that the correct values for these temperatures would yield a very different speed that depends entirely on the mass difference between leptons and protons:

(T_{rCBR}/T_{mCBR}) c = (102.1×10^{-6} deg. K / 0.185 deg. K) c = (m_p/m_e) c = 162.3 km/s

It is a most unseemly relation.

The Correas have determined the near-isotropic flux speed of the CBAR to be 21.18 km/s, corresponding to W_V = 0.3067 volts). This confers very different speeds on leptons and protons:

$v_e = \sqrt{(W_V W_k)}$ = 232.2 km/s at 0.185 deg. K

$v_p = \sqrt{(W_V W_u)}$ = 5.4 km/s at 102.1 µdeg. K

where W_k is the magnetic wave speed intrinsic to all leptons, and W_u the magnetic wave speed of ordinary protons. The velocity vectors of these speeds will vary according to how cosmological lepton and baryon plasmas interact in any given region of cosmic space. If the interactions were quasi-static, negatron-proton and positron-antiproton couplings will attract, while negatron-antiproton and positron-proton couplings will repel. In either case, the two velocities would be additive, on the order of 237.6 km/s for vectors lying 180° apart. But cosmological leptons and baryons are accelerated by the CBAR such that baryons chase the leptons around, so that the velocities may be subtractive, on the order of 226.8 km/s.

What, then, is the physical significance of the blue and red color-coded maps of the anisotropy of the mCBR? Aside from the fact that the emulations are already fundamentally biased by the misunderstanding of the temperatures involved, the conventional interpretation of the anisotropy holds that the radiation is slightly more intense in a particular direction of space (blueshift) than in the opposite direction (redshift). But what is interpreted as spectral shifts is the result of rCBRs (of protons in particular) presenting different distributions in space. Lower temperature regions (redshifted) are deficient in rCBRs because of lower proton density and, likely of higher relative density of positrons vs. negatrons. Whereas higher temperature regions (blueshifted) are rich in rCBRs because of their higher density of protons and negatrons. The lepton distribution shows a high degree of isotropy, but not so the proton distribution, which is primarily responsible for the slight anisotropy. To extract more information from the anisotropy of the mCBR, one would at least have to generate and superimpose comparable maps for the rCBRs of protons and helions. It follows that the current interpretation of the mCBR as indicative of the “absolute” velocity of the solar system is entirely bogus.

Several consequences follow from this drastic realization. Firstly, as already stated, the mCBR and the various rCBRs cannot serve as evidence of a Big Bang creation event. Secondly, the relative homogeneity and pervasive presence of these CBRs clearly indicate that the conclusion that "light travel time" between opposite distant regions of cosmic space exceeds the age of the universe (the so-called horizon problem) is in deep error, thereby forcing one to toss out the very notion that an age may somehow be calculatable. Thirdly, Big Bang cosmology also predicts the formation of stable magnetic monopoles in the early universe, whereas Aetherometry has proven that magnetism is always dipolar (Correa & Correa, 2011, 2013), and this applies to all particles, whether massbound or massfree.

3.10 The controversial Silvertooth experiment(s)

The Silvertooth experiment reportedly detected an aether wind of 378 km/s, which Silvertooth himself interpreted as representing the solar system's net ("absolute") motion through space towards the Leo constellation, and thus totally in line with the mythical contention of the "new aether drift" school. It matched the velocity and approximate direction derived from the mCBR dipole anisotropy and also several experiments, of doubtful validity (see Part 2), conducted by Marinov (see Table 1 on p. 8).

As noted in section 2, Silvertooth and Aspden took the view that MM-type experiments could not detect an aether drift because any light-speed anisotropy would be canceled by the standing wave resonance effect that results when light waves are kept locked to mirror surfaces oriented at 180° (note that from an aetherometric perspective, this cancelation effect is not due to a change in the velocity of the light waves or associated electromagnetic energy. Rather, two-way light transmission at 180° results in the cancelation of any change in the velocity of the lasing electrons that act as photon emitters), whereas the Silvertooth experiment involved one-way light travel, as did the Sagnac and Michelson-Gale rotational experiments. But so do IS-type experiments, and in these the Doppler shift complies with both the geometric law of velocity composition and with Lorenz invariance. Yet, the former experiments – including Silvertooth's – yield a first-order effect, whereas the latter instead present a second-order effect. How is this possible?

The Correas have suggested that the angular Doppler effect (as they provocatively call the Sagnac effect) is, in a physical sense, the geometric mean of two linear Doppler effects, or the product of the superimposition of two second-order effects required by the law of velocity composition (Correa & Correa, 2008a). If this is what happens in the Sagnac-type experiments, where then does the Silvertooth experiment fit? It is apparent that, according to Aetherometry (see Correa & Correa, 2001e), it cannot be measuring net velocity with respect to the mCBR. Since the Correas have argued that determinations of net velocity based on thermal anisotropy interpretations are wrong and their method inadequate, the general parameter of reference breaks down. Remarkably, determinations of velocities based on redshift interpretation and determinations of peculiar velocity based on anisotropy determination are equally affected.

Besides using *one-way* light transmission, another key feature of the Silvertooth experiment is its use of a novel sensor consisting of a thin photoelectric film that permits relative phase measurements of standing light waves on opposite sides of its surface down to 0.063 microns. The moving sensor detects the electrical phase changes of light waves in two separate, synchronized circuits, by measuring the distance between the nodes in the standing wave pattern; a piezo-electric actuator is used to establish a marker on the light beam. If the sensor had looked for *optical* phase changes (as in MM, Kennedy-Thorndike and Ives-Stilwell experiments), it would not have detected them, because there is no way to electromagnetically measure the effect of an electrical field on the lasing electrons. This is the reason why most one-way light anisotropy experiments detect no significant variation in c.

According to Aetherometry, Silvertooth was wrong, however, to think that he had made a first-order measurement of the earth's net motion with respect to a stationary aether or absolute space. If the experiment detected a real effect, it likely was the effect on the lasing electrons caused by the ambipolar electric field that drives the "density wave" responsible for the formation of the galactic spiral (Correa & Correa, 2009). Mainstream cosmology explains the slow winding of our galaxy in terms of a neutral lagging density wave that compresses matter along the spiral arms. In contrast, Aetherometry proposes that, at any given position, the density wave is faster than the velocity of galactic translation, being a leading wave that accelerates inwardly and not a trailing one that accelerates outwardly. Two distinct energy fluxes are involved: a gravitational one driving overall rotation of the galaxy, and an electric, ambipolar one accelerating the galactic rotation.

Aetherometric analysis shows that the Silvertooth experiment measures precisely (to within 5.7%) the predicted acceleration of the lasing electrons by the ambipolar field that drives the hydrogen-mediated compression wave, once the angle of strike of the ambipolar flux at the position of the solar system is taken into account (Correa & Correa, 2009). The result is fully explained by the second-order velocity differentials of the light-Doppler shifts in the laser channel of the one-way arm of the Silvertooth apparatus. It is therefore consistent with the Ives-Stilwell-type experiments, and with Aetherometry's analysis of the original 1938 Ives-Stilwell experiment (Correa et al., 2008d). The shifted wavelengths do not accord with Silvertooth's formulation – or with a direct, first-order effect – but with the aetherometric determinations of the second-order velocity differentials. The oppositely shifted wavelengths of the electron plasma inside the lasing tube are (Correa & Correa, 2009):

$$\lambda_1 = \lambda_o (v_o/v_1)^2 = \lambda_o [v_o^2/(v_o-\Delta v)^2] = c/(W_k W_{v1}/e) = \lambda_o /[1-(v_{c1}/c)]$$

$$\lambda_2 = \lambda_o (v_o/v_2)^2 = \lambda_o [v_o^2/(v_o+\Delta v)^2] = c/(W_k W_{v2}/e) = \lambda_o /[1+(v_{c2}/c)]$$

where v_o is the velocity of the lasing electrons in the Silvertooth tube; v_1 and v_2, the maximal and minimal velocities of these electrons caused by the detected perturbation; λ_1 and λ_2 denote the wavelength displacements with respect to λ_o; and v_{c1} and v_{c2} are the hidden electron velocity terms that result from the superimposition of two fields, the lasing potential and the external ambipolar field causing the disturbance.

The entire Silvertooth experiment is about demonstrating not a stationary aether – as Silvertooth misguidedly thought – but the effect of the second-order differentials that detect a cosmic-galactic disturbance and which comply with the law of the geometric composition of velocities. Far from proving any absolute velocity, it demonstrates how all the velocities involved are strictly relative, where even the reference c can be omitted. Silvertooth was wrong in thinking that Δv was a direct measure of the net velocity of the solar system with respect to the mCBR, just as Whitney (2006) was wrong in thinking that it was a direct measurement of the velocity of solar galactic translation.

The shifts were originally reported as being observed when the axis of the interferometric arm pointed towards the constellation Leo (located in the northern sky at around RA = 9.5-12h, Dec = 10-20°), which Wesley (1987) later changed to an apex located in the Crater constellation (in the southern sky) at RA = 11±1h and Dec = -20±2°. This would be the direction when, supposedly, the Silvertooth apparatus indicated the greatest speed increment. But the Correas argue that this is not the flow direction of the maximally accelerated lasing electrons. They argue that the actual direction of this flow is RA = 10.3h and Dec ≈ 0° (approximately midway between Silvertooth's and Wesley's declination values, and about 2° from Sextans A), because this is the near antipodal direction to the inward-leading hydrogen compaction wave (with a speed of 365 km/s) at the solar system position in our galaxy.

The mainstream view is that, in its galactic orbit, the solar system – or rather the Local Standard of Rest (i.e. nearby stars as a whole) – is moving at right angles to the galactic center, i.e. towards 90° galactic longitude; it is therefore moving towards RA = 21.2h, Dec = 48.3°, a *galactic apex* that lies close to Deneb, the brightest star in Cygnus. According to Aetherometry, the *compaction apex* points to RA = 21.85h and Dec = 47° and therefore lies close to the direction of the galactic translation of the solar system, with a speed of 256 km/s. In other words, the lasing electron-plasma flows the fastest when opposite the direction of the hydrogen compaction wave (and, *mutatis mutandis*, flows the slowest when pointing in the same direction as the compaction apex) – and some 124° away from the galactic apex of the solar system, so that the Silvertooth interferometer measures the compaction apex indirectly, both 1) by the hidden first-order effect on the velocities of lasing electron plasma (with Δv = 2800 to 3000 km/s for opposite electron-plasma velocities at ~80,000 km/s), and by the second-order effect on the lasing positive column that gives the local velocity of the hydrogen compaction wave (with Δv_{max} = 364.9 to 377.7 km/s).

Thus the Correas claim that the Silvertooth experiment may well have confirmed the aetherometric model of an inward-leading galactic compression wave that is driven by a flux of ambipolar radiation emitted from the local aether lattice. If the compression wave is leading, then it travels in nearly the same direction as the galactic translation, and ahead of it.

3.11 Aether: perpetual motion

Aetherometry aims to explain all five classes of interferometric experiments, and indeed all astrophysical phenomena, in a consistent manner. Most astrophysics remains speculative – even solar physics does to this day – and, inevitably, some of the Correas' proposals also remain speculative and dependent on whether a given type of experiment is reproducible and can be trusted (the Silvertooth experiment being a case in point). But, separate from these more speculative aspects of aetherometric theory, it makes a case for a consistent treatment of all classes of interferometric experiments, and for its determination of their actual physical mechanisms and effects.

For Aetherometry, there is no stationary aether and no aether drag, and the relativistic Lorentz transformations (length contraction, time dilation, mass increase with velocity) are imaginary constructs that lack a valid scientific rationale. The aetherometric analysis of the Ives-Stilwell experiment demonstrates this much for a fact. Further, rotation of any mass (even gaseous) or its orbital translation can be detected optically as first-order effects – as witnessed by the laboratory Sagnac experiment, the planetary Sagnac experiments and, likely, the MG experiment. But the null result of MM-type experiments is a physical reality that should not be sidestepped by mathematical artifice. Efforts to force the residuals to fit the Big Bang interpretation of the mCBR and its anisotropy are purely speculative and always resort to cute but illegitimate mathematics.

Aetherometry makes clear, therefore, that it is high time to abandon obsolete notions such as a stationary aether, an electromagnetic or luminiferous aether, an entrained aether, an “absolute space”, or an abstract geometry of curved “spacetime” devoid of energy, and other such fictions that have damned science rather than advancing it. Experimental and observational evidence shows that an electric massfree aether exists and is in perpetual motion; its motion has both absolute characteristics (its intrinsic or endo-referenced properties) and extrinsic references (its relative or exo-referenced properties). All other forms of energy, including mass-energy and photon energy, can be shown to be constructs and derivatives of aether energy. Space is full of energy only in a manner of speaking. Space and Time are manifestations of energy, and indissolubly interrelated as functions of energy. It is not space that is full of energy, but energy that is full of – and in fact constitutes – Space.

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