

## **Rethinking the Ontological Status of Aether within the Bounds of Two Modern Experiments**

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**Abstract:** In the long history of modern empirical science several hypothetical entities have been postulated and not many of them survived. Some of them were abandoned because they no longer had any relevance to the pursuit of scientific knowledge; others were abandoned because no scientific instrument was devised to detect their existence and manipulate them to some pragmatic ends. The battle over the existence of some unobservable entities may take centuries to resolve; others may take just a few decades. The cases of aether, phlogiston and Higgs particle and or force-field are perfect examples. Entity realists and experimental scientists alike have been embroiled in serious debates over the existence of one entity or another. This paper examines the long case of the aether battle and how the two famous experiments, say, Boyle-Hooke and Michelson-Morley cannot be said to have vanquished the existence of aether. The aspect of novelty I brought into this discourse is where I argue that both experiments were wrongly conducted and as such that, the ontological status of the aether can still be guaranteed precisely because of its important position in the scientific vision of the universe. Quantum science, as it stands, tends to lead us faster into the strong belief in the existence of the aether more than anyone would have ever imagined. Given that this paper is not a pure empirical or experimental research, I used a simple approach of content analysis in driving home my point and sustaining my thesis of continued existence of the aether.

**Key Words:** Aether, Ontological status, Experiment, and unobservable entity

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### **I. INTRODUCTION**

Many battles have been fought, within the domain of scientific experiment over the validity and authenticity of experimental results. The scientific community has always declared that objectivity or some form of neutrality (disinterestedness/unbiasedness) is a hallowed ideal. Over the years, many experimental results have been challenged for various reasons. In our time, social constructivists have clearly argued that experimental results are socially constructed and cannot at any moment be said to be Nature's answers to some theoretical questions posed. Following the Continental tradition of Edmund Husserl (1859-1938) and Gaston Bachelard (1884-1962), and the Anglo-American tradition of Thomas S. Kuhn, Bruno Latour, Harry Collins, and Carina Knorr Cetina, among others, the argument now is that experimental results are ultimately the products of social decision (Emedolu 2014, p.100-125).

The interest here is not to universalize the idea that experimental results are not valid, but to interrogate two key ether experimental results in the modern history of science which the scientific community accepted as having knocked-off the existence of the aether (as a substance). To be sure, these two experimental results challenged the ontological status of the ether as a theoretical or unobservable entity in science. I object to the position of scientific community for some obvious reasons. Ether can never be displaced, precisely because it is the primordial stuff of the universe in its clueless but conceivable singularity. A thousand and one theories may surround it; none of them may be true about it. The basic question is: Does having a plenitude of ether theories automatically suggest that the ether does not exist? To my mind, the death of a theory does not imply the death of any theoretical or unobservable entity. This is an abiding truth which I wish to apply to ether in this paper.

The novelty I wish to bring, especially, into the contemporary debate scenario, is that the experiments are wrongly designed and the instruments used cannot be said to be the appropriate ones. In terms of methodology, this paper is not designed for data analysis based on any experimental result. It is basically a qualitative research that hinges on textual/content and philosophical analysis of the position of the scientific community on aether. However, I am limiting my focus to only two experiments that were said to have disproved the existence of the aether, say, Boyle-Hooke experiment and Michelson-Morley experiment. The reason is that all the experiments performed on or with ether cannot be contained in a single paper.

The paper has been structured to begin with some early clarifications on the nature of aether. Next is the famous Hobbes-Boyle straw experiment that was assumed to have knocked off the ether. This is followed by the celebrated Michelson-Morley experiment. Einstein's denigration of the aether is eventually discussed. The paper is wrapped up with a conclusion.

### **On the Characterization of the Aether**

From the study of the ancient history of philosophy it is learnt that Anaxagoras of Klazomene (*ca.* 500-428 B.C.), son of Hegesiboulos, added a fifth element (*aether*) to the four (earth, water, air and fire) Empedocles of Akragas had earlier proposed. In the primordial revolution of the universe, according to Anaxagoras, the Nous caused the separating off of the air and the aether. As it were: "The dense and the moist and the cold and the dark came together were the earth is now, while the rare and the warm and the dry (and the bright) went out towards the further part of the aether" (Burnet 1930, p.260). This shows that the arrangement of the five fundamental elements of the early Greek *physiologoi* or physicists (philosopher-scientists) could be done in the order density or weight, from top to bottom, and vice versa. In this peculiar order of dignity earth is followed by water, which is followed by air, which is followed by fire, and which in its turn is followed by aether. As it stands, the aether exists within the fringes of the invisible as long as human natural observation is concerned. G.W.F. Hegel, in his *Philosophy of History*, contends that Anaxagoras was truly the first to use the term "aether". He further reveals that, Aristotle found out that Anaxagoras "brought into his explanation merely external causes such as Air, the Ether, Water and the like..." (Hegel 1988, p. 15) and took it up from there.

Be that as it may, I must emphasize that it was really Aristotle who advanced more the theory of *luminiferous* ether in Greek antiquity. Giving Aristotle the credit for a better conceptualization of the *ether* doctrine seems to suggest that Anaxagoras did little or nothing in the actual description of a notion he coined. The interest here though is not so much on the issue of priority of usage as in the concrete scientific explanation Aristotle attached to the term "ether" in the latter days. However, this does not diminish the worth or value of Anaxagoras' scientific speculations. But I wish to point out one important thing that I feel makes Aristotle the greatest genius in the world of science for all times. It lies in the fact that Aristotle, following the example of Anaxagoras, intuited the existence of luminiferous *ether*. Aristotle, indeed, postulated the ether theory to account for reality beyond the material order. For want of a better word, I may call it the purest of air or the rarest gas-like wave/fluid pervading or permeating/filling the entire universe/space – a bridge between "spirit" and "matter," as it were. Aristotle regarded it as the staple stuff of the celestial world. Fundamentally,

The derivation of the word seems to indicate some connection in men's minds with the idea of Fire: the other three "elements," Earth, Water, Air, representing the solid, liquid, and gaseous conditions of ordinary matter respectively. The name Ether suggests a far more subtle or penetrating and ultra-material kind of substance (Lodge, 1909, p.xv).

In the mediaeval period of science ether was a substance for hard cosmological discussions of the origins of the material universe. Hair-splitting arguments over the invisibility of the aether raged on. Scholars quibbled over how many thousands and millions of angels could stand comfortably on the tip of a pin. The aether was conceived as something beyond "sensory perception...finer even than light. It was from these ethereal emanations that matter was eventually precipitated. The ethereal dimension, then, lay and continues to lie between mind... and matter" (Booth, 2008, p.330). Robert Grosseteste describes how the first perceptible light grew from aether as prime matter and became the earliest visible material object to emerge in the cosmos (Emodolu, 2019, p.54). One must remember that the mediaeval scientists did believe that no light ever travels or reaches us independent of any medium ("Lumen superno non descendit indumento"); the ether is that medium. This explains why aether has been qualified with the adjective, "luminiferous". Oliver Lodge confirms this in the following statement: "The oldest and best known function for an ether is the conveyance of light, and hence the name 'luminiferous' was applied to it; though at the present day many more functions are known, and more will almost certainly be discovered" (1909, p.1).

In the modern period of science, Isaac Newton still employs the term for a given medium which fills both the empty and full/occupied space, since "the luminiferous ether must undoubtedly penetrate between the atoms — must exist in the pores so to speak — of every transparent substance, else light could not travel through it" (Lodge, 1909, pp.xv-xvi). Beyond Newton, the aether continued to hold its sway, despite some pockets of attack by few scholars. To be sure, in the 1830s, David Brewster, burst out and "inveighs against the luminiferous aether because it was 'invisible, intangible, imponderable [and] inseparable from all bodies'" (Laudan, 1992, p.221). Lodge expresses this selfsame skepticism as he vociferates: "That the ether; if there be such a thing in space, can pass readily into or through matter is often held proven by tilting a mercury barometer; when the mercury rises to fill the transparent vacuum. Everything points to its universal permeance, if it exists at all" (1909, p.xviii).

Given the fact that the modern or nowadays scientists often possess this empirical attitude towards Nature, they often stick to what is known as the *vera causa* principle, wherein every worthy theoretical entity in science must be able to produce some visible effects and be completely amenable to experimental manipulation.

As it stands, this has been a sure demand, in ancient, medieval and modern empirical science (Emedolu, 2019, p.62). Without this test, an entity could be pigeon-holed or regarded as a mere occult feature or phenomenon in science. As Larry Laudan put it, “The *vera Causa* requirement... forbade attributing properties to unseen objects which were not exhibited broadly (perhaps universally) by objects accessible to inspection” (1992, p.218). Both René Descartes and Karl Popper submitted that, bold conjectures may not be stopped simply because there is currently no experimental instrument or design to directly confirm, corroborate or refute (confute) any theory concerning an unobservable entity.

Towards the end of the 19<sup>th</sup> century, what was considered a plausible and celebrated experiment (Michelson-Morley) was conducted and it kept the scientific community busy for the better part of the 20<sup>th</sup> century on the existence and or non-existence of the aether and its possible properties. The problem of characterizing the ether has remained because scientists have failed to come to an agreement. As Lodge asserts: “The problem of the constitution of the Ether, and of the way in which portions of it are modified to form the atoms or other constituent units of ordinary matter, has not yet been solved” (1909, p.xix). Even James Clerk-Maxwell expresses the same issue when he writes:

Whatever difficulties we may have in forming a consistent idea of the constitution of the ether, there can be no doubt that the interplanetary and interstellar spaces are not empty, but are occupied by a material substance or body, which is certainly the largest, and probably the most uniform body of which we have any knowledge (qtd. Lodge, 1909, p.xx).

Now, it is well-known that Clerk-Maxwell in his article, “Ether”, contained in the ninth edition of the Encyclopaedia Britannica writes: “ETHER or Aether (αἰθήρ probably from αἶθω, “I burn”) [is] a material substance of a more subtle kind than visible bodies, supposed to exist in those parts of space which are apparently empty” (qtd. Lodge, 1909, p.xv). Here, one notices that the ether is not something readily visible to the unaided human sight. In other words, it is something that could be dictated through the deliverance of some sense-extending instrument. Its invisibility does not suggest that matter cannot be said to subsist in it.

The “substantiality” of the aether has very much been questioned. But the crucial question is: How possible is it to build an ether machine or interferometer if one has not first settled, to some degree, the case of the constitution or character of the ether? In relatively recent times, the greatness of Anaxagoras seriously lies in the fact that his *ether* concept has now been re-interpreted as some form of wave or force-field. Some maintain that ether is the electromagnetic wave. But beyond this claim, I argue that the four known universal forces, such as electromagnetic force borne by the photons, the gravitational force borne by what scholars call gravitons, the strong force and the weak force both borne by the nuclear bosons are all manifestations of the aether as a parent wave. But Lodge argues that ether “blows the waves along” (1909, p.46). This implies that, for him, the ether cannot in any way be considered as a wave since it does the job of pushing the waves.

### **Boyle-Hooke Straw Experiment to Cross-Check the Ether Wind**

Descartes, in his wake, somewhat expounded the theory of ether in his Vortex Hypothesis. In this Cartesian Hypothesis, “The ether was supposed to permeate the whole universe, and to be the stationary background to all motions” (Harré 1981, p.117). In spite of Descartes’ defence of the existence of the ether, he remained a died-in-the-wool mechanistic philosopher. Descartes had a corporeal view of light as did Aristotle, Strato, and Grosseteste, among others. For Descartes, the universal vortex of ether served only as a medium of transmission through which light particles swim or pass by. This simply implies that without the existence of the ether, there won’t be any enablement for light to pass from one point to another.

In point of fact, the Cartesian invocation of the ancient and mediaeval plenitude of ether actually triggered a battle, bringing in Robert Boyle, Robert Hooke and Isaac Newton, among others at one side of the battle line. At the other side of the battle line were Thomas Hobbes, the Cartesians, the Aristotelians, Gottfried von Leibniz, and Christiaan Huygens. Years before Newton fired his salvo against Descartes’ vortex or ether hypothesis, declaring the famous quip “*Hypotheses non fingo*”, Boyle and Hooke (who was the then curator of the Royal Society of London) had conducted an experiment, wherein they used the Air-Pump to create a vacuum in the Vacuum Flask and allowed a feather/straw to fall freely. The falling object seemed to meet no resistance and they concluded that the ontological status of the ether has been punctured, and as such, theorization on the ether does not have any scientific validity. The account of the experiment is extensively given by Steven Shapin and Simon Schaffer in their *Leviathan and the Air Pump: Hobbes, Boyle and the Experimental Life* (1985). According to Shapin and Schaffer, Boyle and Hooke made a strong claim to have refuted the theory of the ether wind, using their Torricellian Air Pump experimental demonstration. But then, it is appropriate to listen to the argument marshaled by key philosopher-scientists during this period in defence of the ether.

Thomas Hobbes, though a hardcore mechanistic materialist, first threw a challenge against the validity or reliability of Boyle-Hooke straw experiment. He considered it preposterous for one to argue that ether wind is nullified by the mere use of a feather or straw and a faulty apparatus, namely the Torricellian Air Pump (an advanced model of the Guericke vacuum pump). Moreover, Hobbes generally challenged the autonomy of

experiment by maintaining that every experimental instrument has certain latent theoretical bias. The direct implication of this is that we can never achieve objectivity using experimental instruments, for their deliverances or *resolutions* must always be lopsided. Many recent philosophers of science, such as Ian Hacking and Allan Franklin, have tried to make a distinction between the theory of an instrument and the theory under test. They quite agree that when a theory under test is the same with the background theory of the instrument used in conducting the test or experiment then there is no way a valid result can be achieved. I think it is this scenario that Hobbes was actually referring to.

Nevertheless, Gottfried von Leibniz continued with the argument in rejection of Boyle-Hooke experiment, demonstrating that the glass screen or vacuum flask had thousands of pores or very tiny/invisible holes. The exact words of Leibniz run thus: "...glass has small pores, (through) which the beams of loadstone, and other very tiny fluids may (pass)" (qtd. Emedolu 2009, p.67). To all intents and purposes, Leibniz claims that he inherited this orientation from the Aristotelians and the Cartesians who did not believe there could be any real vacuum; and as he proudly claims: "I am of their opinion". According to Leibniz, in response to Guericke and Torricellius (on their experimental demonstrations of the existence of vacuum), the above two scientific groups (i.e., Aristotelians and Cartesians) "...have said in answer to that experiment of Mr. Guericke (of Magdeburg), as well as to that of Torricellius of Florence (who emptied the air out of a glass-tube by the help of quick silver), that there is no vacuum at all in the tube or in the receiver" (qtd. Emedolu 2009, p.67). The upshot of this brief narrative is, therefore, that Leibniz insists, just like Hobbes did, that such a deficient scientific instrument as deployed by Boyle and Hooke cannot kill the ether theory in one single blow. To be sure, both Guericke and Torricellian Air-Pumps had their limitations which the Aristotelians and the Cartesians clearly pointed out.

Of course, after all these direct grand Inquisitions or acerbic criticisms from such two strong philosophers, Boyle and Hooke soberly admitted that they could not pump out air completely from the Vacuum Flask. By admitting that their instrument was a bit faulty and could not evacuate or pump out air completely Boyle and Hooke actually deserve to be granted pardon for making such a dignifying *mea culpa*. But, pretty clearly, they never offered any adequate response to all the charges leveled against their very unsuccessful scientific experiment. I seem to think that what brought about the silence was that, the very nature of ether was not properly articulated nor perfectly understood within the panoply of scientific discourse, for more than fifty different ideas of the ether were in circulation at that material point in time. Too much argument and counter-argument might have, inevitably, led the entire scientific community into a merry-go-round of much ado about nothing.

Newton's own criticism against the ether is largely based on the insinuation that ether is an occult phenomenon (Cf. Losee 1980). It may not be required in the actual propagation of light because its feature is completely occult, says, Newton. However, the ether may be assigned some other role in the spatial world of motion. For instance, "If there were no such physical standard of rest as the ether if all motion were relative to matter alone – then the contention of Copernicus and Galileo would have had no real meaning" (Lodge 1909, pp.44-45). One may not doubt the explanatory power behind the ether, "Absolute velocity of matter means velocity through the ether – which is stationary" (Lodge 1909, p.44). In other words, Lodge argues that the ether does not move. He continues: "If free or unmodified ether can ever be moved at all, it must be by means of a magnetic field; along the lines of which it has, in several theories, been supposed to circulate. Even this, however, is not real locomotion" (1909, p.164).

This implies that the presence or non-presence of the ether is, after all, very significant in any meaningful investigation of the universe and its motion. Hence, the long-lived ether continued its existence with some level of tacit acceptance within the scientific community until the late 19<sup>th</sup> century when the supposed deadly Michelson-Morley experiment struck and its defenders felt somewhat vanquished. But the question every well-meaning entity realist should ask is this: Was it a case of real defeat or mere abandonment of an entity because it has somewhat lost or outlived its core value, which some other entities have surreptitiously moved in to supply?

### **Michelson-Morley experimental Attempt at Dislodging the Ether**

In the 19<sup>th</sup> century there was this wild belief that the comprehensive theory of the ether received more than a fair share of success, so much so that when the idea of electromagnetic waves was muted, most scholars declared that, "electromagnetic waves did not exist; they were manifestation of ether" (Gribanov 1987, p.28). But be that as it may, a very intense research on the phenomenon of electromagnetism in all its ramifications began. As James Walker notes: "...physicists in the late 1800s were actively studying the electromagnetic radiation given off by a physical system known as a blackbody" (2007, p.1004) and this eventually led to the rise of quantum theory.

Now, in spite of its huge success in the 19<sup>th</sup> Century, the wave theory of light (in the ether medium) did witness a torpedo-shock between 1883 and 1887 when Albert Abraham Michelson (1852-1931) and Edward Williams Morley (1838-1923) – in the now famous Michelson-Morley experiment – tested the speed or velocity

of light in the open air. The title of their paper was “On the Relative Motion of the Earth and the Luminiferous Ether”. The experiment was basically “designed to measure the change in interference pattern produced by two light beams, one travelling parallel to the velocity of the earth relative to the ether, and the other perpendicular to that velocity, when the experimental apparatus was rotated through 90°.” (Franklin, 2004, p.324). The supervening motive was that the ether drag or drift must reveal itself if light were accelerated in two perpendicular directions from a single source. If ether is actually moving in one direction, then the light travelling in that direction will move faster than the one moving in the perpendicular direction. This is to say that no fringeshift was discovered. To be sure, Michelson-Morley experiment recorded a null-result.

But one may likely argue that Michelson-Morley’s interferometer was not up to speed with the kind of instrument that could “detect a fringeshift caused by the motion of the earth relative to the ether”. In other words, the apparatus could be said to be faulty. There were other reasons why the experiment failed or was silent. As Allan Franklin puts it: “Other explanations were later offered for this null results. They include the ether drag hypothesis, that the earth dragged a layer of the ether along with it; the Lorentz-Fitzgerald contraction, that an object shrank in the direction of its motion relative to the ether; and the ballistic theory, that the velocity of light was constant relative to the source of light. Eventually, all of these alternatives were rejected on the basis of experimental evidence” (2004, p.323).

In Rom Harré’s own rendering, the Michelson-Morley experiment achieved null results: in the sense that the velocity of light did not change in the two directions light was pointed to. Hence, Harré, in his verdict on an experiment that produced a silent or null-result, writes: “we can see that the failure to detect a difference in the length of the paths of the light pulses in the two arms of the apparatus deals a fatal blow to the idea of using the ether as a stationary background against which to measure the ‘real’ motion of the earth” (1981, p.122). This does not imply that Michelson and Morley did not notice any fringeshift at all. What happened was that they failed to get the exact result predicted. The marginal result they got led them to the conclusion that “the relative velocity of the earth and the ether is probably less than one sixth of the earth’s orbital velocity and certainly less than one fourth” (qtd. Franklin, 2004, p.324). Further still, James Walker has a very brilliant way of expressing the episode of Michelson-Morley experiment:

...[L]ight was thought to propagate through a hypothetical medium, referred to as the *luminiferous* ether, or ether for short, that permeates all space. Since the Earth rotates about its axis with a speed of roughly 1000mi/h at the equator, orbits the sun with a speed of about 67,000mi/h, it follows that it must move relative to the ether. If this is the case, it should be possible to detect this motion by measuring differences in the speed of light propagating in different directions...Extremely precise experiments were carried out to this end by the American physicists A.A. Michelson (1852-1931) and E.W. Morley (1838-1923) from 1883 to 1887. They were unable to detect any difference in the speed of light. More recent and accurate experiments have come to precisely the same conclusion (2007, p.972).

Given this null-result, the lingering controversy between ether enthusiasts and its enemies seemed to be now put to rest because the Michelson-Morley and other recent experiments are believed to have announced the death of the long-lived *luminiferous* ether which started its journey in the Greek antiquity (with Anaxagoras and Aristotle) and moved unto mediaeval and modern times (with its latest supporters in second-half of the 19<sup>th</sup> Century). In the words of Franklin, “...Michelson-Morley experiment was supposed to have demonstrated the non-existence of the ether ..., (leading) directly to Einstein’s special relativity” (1989, p. 2).

Michelson and Morley were, of course, treated to a Nobel Prize. But I still do not think Michelson-Morley experiment did kill the ether that began its trek or trudge a long time ago. The problem with scientists is that they often ignore the starting point of any theory. They easily relish or treat themselves to the latest refinements or modifications of the theory. These modifications often come with some elements of pruning and addition of strange and complex stereotypes to theoretical entities. To my mind, the concept of ether has been badly represented in its long historical trajectory. For instance, some scholars created the ugly myth that the *luminiferous* ether “has the effect of systematically distorting our measuring instrument” (Dicken 2016, p.24). Pretty clearly, if we get the right or sophisticated instrument, then ether will be made “to sit up and behave.” One cannot be expected to be using a very wrong device and getting right results. I dare say that, it is pretty difficult to dislodge any long-lived theoretical entity such as ether. Ether, in fact, gives us a more brilliant intuitive picture of the universe, even though scientists have found it very difficult to fix the problem of ether stereotype. This is not to say that most of the counter-intuitive findings of science are quite irrational. Truly, they have been very helpful in contemporary scientific investigations.

Light as *brightness* somewhat blends with ether; for Anaxagoras argues that during the early formation of things in our universe, the *dark*, the *dense*, the *moist* and the *cold* “came together where the earth is now, while the *rare* and the *warm* and the *dry* (and the *bright*) went out towards the farther part of the aether” (Burnet 1930, p.260). As such, the ether is often glued to the bright and the radiant. But, then, light or brightness is ether’s next of kin – which explains why it is called *luminiferous* ether. A luminous body reflects light, whereas a black/dark body absorbs radiation or light in the quantum understanding of it. Therefore, the only thing Michelson-Morley experiment somewhat achieved was to substantiate or confirm the second postulate of Albert

Einstein's special relativity theory, which has to do with "constancy of the speed of light". In the view of Einstein, "The speed of light in a vacuum,  $C = 3.00 \times 10^8$  m/s, is the same in all inertial frames of reference, independent of the motion of the source of the receiver" (Walker 2007, p.971).

What I am saying in essence is that light meshes very well with ether. The blend of light and other types of electromagnetic waves with ether makes it appear to Einstein and his allies that "...light can propagate through a vacuum, as can all other types of electromagnetic waves" (Walker 2007, p.841). The electromagnetic waves travel as fast as light, since it has been muted that the photons (energy bundles/packets of light) are the assigned bearers or transporters of the electromagnetic waves. Ultimately, one cannot legitimately declare that the parent ether can be dislodged and its near relatives, say, light, electromagnetic waves and other wave types are allowed to go scot-free. Whether light is perceived as a wave or a particle, the lesson that should be learnt is that the presence of ether does not impede or hinder the swift motion of light. In fact, Lodge affords one important point in this regard when he declares: "Surveying operations are not rendered the least inaccurate by the existence of a universal etherial drift; and they therefore afford no means of detecting it" (1909, p.46).

Nevertheless, in August 1986 the United States Air Force used a state of the arts scientific instrument to dictate the ether field. The results of this perfect experiment were published in the well-established journal, *Nature* (vol.322). Lodge declares a happy fact: "Surely if we are living in an ether stream of this rapidity we ought to be able to detect some evidence of its existence (1909, pp. 48-49). The scientific community of the second and third decades of the 20<sup>th</sup> century never responded to Lodge's comment. Hence, it is necessary to begin to see the connectivity between the substances or sub-elements that actively align with the primordial *luminiferous* ether. But before this can be done, I need to tarry a little while with Albert Einstein's perception of the fate of ether, for he posed as the sworn monstrous enemy of the ether.

### **Einstein's Sidetracking of the Ether amid Genuine call for its Revival in the 20<sup>th</sup> Century**

Harré tells us that Einstein quite independently made good the Michelson-Morley experiment in his Special Theory of Relativity by properly grounding basic physics laws or electro-magnetic laws (most likely those of Maxwell's), and deeply believing "in the ultimate unity of the physical world and the simplicity of its fundamental processes." (1981, p.123). Indeed, the consideration of electro-magnetic laws was what specifically pushed Einstein to move against the orbit of complex ether. For Einstein and the supporters of his theory of relativity, the electromagnetic waves are quite independent of the ether. Frank W. Very, in his 1919 text, *The Luminiferous Ether*, refers to this Einsteinian shift as a new doctrine which clearly "declares that there is no ether, or universal atmosphere consecrated to the propagation of luminous waves, but that light consists of discrete 'quanta' of luminous energy, thrown off from vibrating electrons and originating in their disturbed motion" (1919, p.7).

Niels Bohr (1885-1962) in a brilliant recovery for ether shows, in his *Discussion with Einstein on Epistemological Problems in Atomic Physics*, that Einstein thoroughly understood the usefulness of wave theory. Bohr declares: "Certainly, his (Einstein's) favored use of such picture phrases as 'ghost waves (*Gespensterfelder*) guiding the photons' implied no tendency to mysticism, but illuminated rather a profound humor behind his piercing remarks" (1990, p.339). Humorous or not, Einstein's piercing remarks somewhat polarized him towards the ether scale-end (or frontier). I say this because if the photons, again, are energy quanta or particles of light or bearers of electromagnetic waves as some contemporary scientists claim, then what difference does it make to banish the conception of ether. It is just like throwing ether away through the door and dragging it back through the window.

The same thing applies to more recent thinkers who try to hypothesize that gravitons are the bearers of the gravitational force/wave and that the nuclear bosons are the carriers of the weak and strong forces. Henceforth, photons (bearers of electromagnetic wave), gravitons (bearers of the gravitational wave) and bosons (bearers of weak and strong nuclear forces) are all what I might consider as arcane nomenclature or insuperable substitutes for ether. But the good tidings is that eventually, after all frantic efforts, the Higgs boson or force-field was discovered with the 17-mile long Large Hadrons Collider in the wake of July, 2012; and the magic for gravity waves was done at the Large Interferometer Gravity Observatory in 2016. Be that as it may, I admire the fiery polemics of V.F. Mitkevich in his *Basic Physics Opinion*. D.P. Gribanov interestingly documents it thus:

Mitkevich endeavoured to return physicists to the idea of ether rejected by Einstein. Modern physics, he suggested, could only develop if it returned to study of ether. Acceptance of some universal medium, call it ether, he wrote, was certainly necessary for the development of physical thought, which would otherwise lead to a number of substantial contradictions (1987, p.28).

S.I. Vavilov criticized Mitkevich's call for the revival of ether theory. For Vavilov, it is quite astonishing that Mitkevich did not include any argument against "action at a distance" in his book. Today, all those ferocious arguments against "action at a distance" have disappeared in the face of the quantum principle of entanglement, which encourages non-locality or what Einstein castigates as "spooky action at a distance." The happier fact is that this very quantum principle has led to the fabrication of teleportation machine. Mitkevich is

also criticized for having written as if Newton, Roger Cote, Leibniz, Euler, Einstein, Lorentz and Lomonosov never existed or wrote anything on ether. Yes, they have written volumes, but did they actually open the horizon for more scientific progress or did they shut the door for more brilliant ingressions from ether? Vavilov also claims that Mitkevich is bereft of any idea about "...endless attempts of Fresnel, Arago, Michelson, and others to discover ether" (Gribanov 1987, p.29). Vavilov concludes that Mitkevich's questions and doubts over the abandonment of ether have long been taken care of in physics "with broad theoretical and experimental research". To this, I say no. One can never tell what "sufficient search" in scientific investigation entails.

Say what Vavilov may, I am persuaded to think his manner of speaking bespeaks one who is completely ignorant of the history of science. As Imre Lakatos, Paul Feyerabend, Hilary Putnam and many other philosophers of science know, no theory can be refuted forever. An abandoned theory could always stage a serious comeback at any given time in history. After all, it does not take so much, save making some adjustments in some of the hypotheses, to get a theory retained within the canons of scientific reasoning. This is often referred to as Duhem-Quine Thesis. Asking Mitkevich to brook all those condemnations of ether and maintain perpetual silence is a very wrong advice. As Henri Poincaré once said, a theory might be flawed, but most times something must remain of that theory, namely the entity such a theory talks about. Here, I strongly feel that this is the fate of ether. To be sure, those deadly experimental blows cannot finish off the ether. Instrumental refinement has always been a remedy in saving most scientific entities. We can only await the making of more sensitive scientific instruments that are ether-friendly.

One of the foremost scientists and inventors of the last century, Nicholas Tesla, "patented some seven hundred inventions including fluorescent lights and the Tesla coil that generates an alternate current. Like Newton's most important breakthroughs, this last arose out his (i.e., Tesla's) belief in an etheric dimension between the mental and the physical planes" (Booth, 2008, p.333). Beyond Tesla, most scientists agree that many afore-thought occult phenomena should be pursued scientifically, "believing that it would ultimately be possible to measure and predict occult forces such as etheric currents that seemed only a shade more elusive than electromagnetism, sound waves or x-ray" (Booth, 2008, p.333).

### **Re-Conceptualizing the Aether within the Purview of Quantum Mechanics**

In the past "ether" was specifically used to refer to an occult realm where souls live. When this occult abode becomes pretty hot for certain souls they are forced down to the earthly realm to take human bodies. The ether is a dwelling place for all kinds of spirits, angels and demons. An argument ensued in the mediaeval times as to how many angels can stand on the tip of a pin. If one cups one's hand and scoops air, how many millions of angels will be trapped? I consider all these as occult discussions of the ether. Does ether exist in a different region of the universe or space? In answer to this, Frank W. Very talks about "Bound Ether" as distinct from the regular ether that carries light as he writes:

It is now pertinent to explain my conception of the "bound ether" more fully. In the first place, by 'ether' in the passage quoted from Sir J. J. Thomson, is not to be understood the specially organized entity which conveys light, but a condensation of the universal aura in the immediate vicinity of matter, which is governed by the fourth-power law appropriate to the fundamental magnetic substance ; and it would perhaps be permissible to call it bound aura, rather than bound ether," though if it is desired to look upon the 'atmospheric' sheath of the electron as a sort of attached particle which, when detached, becomes an ether-particle, it is also permissible to do that (Very 1919, p.48).

Regarding the normal ether as the bearer or purveyor of light he insists that it is not "governed or hampered in its progress through interstellar space, but, like the electrons, it is free, corpuscular, and possesses radiant energy which diminishes with the inverse square of the distance as it moves onward with the speed of light, simply by spreading its field of force over a wider area" (Very 1919, p.48). He continues by saying that, "the energy of the ether-particle does not change until it is ready to be reabsorbed, either by matter, or by the universal aura in the reconstitution of matter in its incipient nebular form" (Very 1919, p.48). Now, when authors deny the existence of the ether and still talk in terms of spherical ether-particles, it becomes very clear that they are not anywhere close to intuiting the nature of the ether. Frank Very argues that he has "adopted for the universal interstellar atmosphere the name of 'aura'," which he borrowed from Swedenborg, referring to "purer ether" and so forth. But this same aura is in turn seen by Swedenborg as prior to ether itself (1919, p.7). If ether has particles, according to some speculations, then, the possibility of measuring it is there. Very declares: "While the universal aura, or 'ether of space' as Sir Oliver Lodge calls it, has mass, the case is different with the electrically organized "ether", of which Sir J.J. Thomson in his *Electricity and Matter* has said: 'All mass is mass of the ether, all momentum, momentum of the ether, and all kinetic energy, kinetic energy of the ether'" (1919, p.7).

Given the indispensability of ether, the truth remains, according to Helen Lauer, that, "since some phenomena are best explained by the Newtonian picture of light moving as a sequence of tiny particles", interest in this entity called ether "has since been revived" (2003, p.312). As I have said many times, the ether still survives in the field theories, even though Einstein and Poincaré did not notice it because of their respective

relativistic and conventionalist biases. As a pervading medium, you can refer to the ether as being somewhat manifest in the electromagnetic wave or some other kind of force-field or what you will. All those force-fields and waves are shades of ether, which key characteristics are yet to be settled. Indeed, ether has never been abandoned; it has only been reinterpreted or re-baptized in waves and force-field theories.

In fact, from the humor of Einstein to the ghost waves dancing with the photons, the ether lives on. I still cherish what Hans Reichenbach said, namely that, “experimental demonstration of electric waves by Heinrich Hertz removed the last doubts of the possibility of the ether waves, and the wave theory of light became a certainty, humanly speaking” (1951, p.169). I, therefore, do not see any reason why William F. Magie, a one-time president of the American Physical Society, should pour out his lamentation in the following words: “In my opinion the abandonment of the hypothesis of ether at the present time is a great and serious retrograde step in...physics...” (qtd. van Fraassen 2002, p.68). The ether is a parent wave and cannot be destroyed or abandoned without there being a lacuna or missing link in relativity and quantum physics. A call for the destruction of ether is a call for the destruction of all forms of wave. The tokens or stereotypes of ether are things the scientific community must gradually strive to establish; after all, stating the stereotype of any theoretical entity has never been a one-off thing in science.

Judging from Anaxagoras’s categorization of basic elements from Earth, water, air, fire, and ether, one sees a graduation from what is observable to what is unobservable. The atomic world created by Democritus and advanced in the modern period by Robert Boyle and John Dalton is filled with tiny particles. Moreso, J.J. Thomson’s and quantum creation of the sub-atomic picture of the world has gradually led science into the ethereal domain of dark matter, radiant and dark energy, waves and force-fields. My interpretation of the entire trajectory of the seen world through the unseen world of the real is that electron has been made a gatekeeper that straddles between fire and ether. In point of fact, quantum relativity physics has shown us that at the fringes of the ether waves particles are capable of being formed. Frank Very did examine the relationship of the ether to the electron and to a universal interstellar medium (or aura). The ether is neither an electron nor a universal interstellar medium (precisely known as “aura”). This is a very great insight in any useful rethinking of the ether. At a point, Frank Very agrees that the electron, despite maintaining its identity, produces some form of ether around it but cannot be converted to ether” (1919, p.11). In short, for him, electrons should be taken as little organisms that are constantly “receiving and transmitting energy from an inexhaustible source. The aura is the ‘fundamental substance’. As Sir Oliver Lodge says of it in his searching analysis: ‘It cannot really be ordinary matter, because ordinary matter is definitely differentiated from it, and is presumably composed of it’” (1919, p.40). To my mind, the words, “ether,” “energy,” “aura,” “wave,” and “force-field,” are all dimensions of one and the same thing. As a fundamental immaterial substance, ether remains part and parcel of the material universe. It cannot be said to be far removed from the universe or multi-verse as the case may be; for as the astrophysicist would say, all particles (matter and anti-matter) are packets of energy (to borrow Einstein’s phrase) or frozen ether, so to say (Emedolu 2010, p.3).

## II. CONCLUSION

A radical consideration of the ontological status of the ether cannot be attempted without a critical pruning of the concept of the ether. At least, one can undoubtedly say that ether is one of the few ideas in the history of thought (or science) that have taken too much cobwebs in the long years of tinkering with it. A lot more could be discussed on the ether.

The impression that early mediaeval religious men presented is that whatever is ethereal is spiritual and non-measurable and cannot be a subject of discourse in the physical sciences. Lodge makes a brief clarification on the early modern usage by literary scholars as he writes: “The usual word ‘ethereal’ suggests something unsubstantial, and is so used in poetry; but for the prosaic treatment of Physics it is unsuitable, and etheric has occasionally been used instead” (p.29). In my analysis, I tried to isolate the scientific usage of the concept of *ether* from its occult or magical and literary applications.

I re-examined the two celebrated experiments, say Boyle-Hooke and Michelson-Morley experiment, that were said to have knocked off the existence of the ether. I, incidentally, arrived at the point where I gave a serious consideration to the fact that ether cannot be stopped in its track if we properly consider the import of its pre-Socratic origins in Anaxagoras and its current, but unappreciated, advancement in quantum physics.

## REFERENCES

- [1]. Bohr, N. (1990). Discussion with Einstein on Epistemological Problems in Atomic Physics. In *The Great Ideas*, 2<sup>nd</sup> ed. Vol. 56. Chicago: Encyclopaedia Britannica Inc.
- [2]. Booth, M. (2008). *The Secret History of the World*. New York: The Overlook Press
- [3]. Burnet, J. (1930). *Early Greek Philosophy*, 4<sup>th</sup> ed. London: Adam and Charles Black.
- [4]. Dicken, P. (2016). *A Critical Introduction to Scientific Realism*, London: Bloomsbury.



- [5]. Emedolu, C. C. (2009). "The Onslaught of Antirealism in the Modern Period of Science: A Philosophical Excursus", *KIABARA: Journal of Humanities*. Vol. 15. No.1. Pp. 63-74.
- [6]. Emedolu, C.C. (2010). *Originality*. Vol. II. Port Harcourt: University of Port Harcourt Press.
- [7]. Emedolu, C. C. (2014). "Social Constructivists and Experimental Realism Debate: The Case of Harry Collins and Bruno Latour". *Frontiers of Knowledge in Philosophy: Cutting Edge Issues*. Edited by Martin Asiegbu and J. Chiedozie Chukwuokolo. Enugu: Jones Communications Publishers. Pp. 100-125.
- [8]. Emedolu, C. C. (2019). "Experimentation in the Mediaeval Period of Science: A Brief Historical Excursus". *Ramifications of Philosophic Wisdom*. Edited by Christian C. Emedolu and I. U. Gwunireama. Port Harcourt: University of Port Harcourt Press. Pp.49-62.
- [9]. Franklin, A. (1989). *The Neglect of Experiment*. New York: Cambridge University Press.
- [10]. Franklin, A. (2004). "Doing Much about Nothing". *Archive for History of Exact Sciences*. Vol. 58. Iss. 4. Doi 10.1007/S00407-003-0076-2. Pp. 323-379.
- [11]. Harré, R. (1981). *Great Scientific Experiments*. Oxford: Oxford University Press.
- [12]. Hacking, I. (1983). *Representing and Intervening: Topics in the philosophy of Natural Sciences*. Cambridge: Cambridge University Press.
- [13]. Griбанov, D.P. (1987). *Albert Einstein's Philosophical Views and the Theory of Relativity*. Trans. H. Campbell Creighton. Moscow: Progress Publishers.
- [14]. Laudan, L. (1992). "Waves, Particles, Independent Tests and the Limits of Inductivism". *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association*. Vol. 2. Symposia and Invited Papers. Pp. 212-223.
- [15]. Lauer, H. ed. (2003). "The Standard 'Foundationalist' View of Testing Empirical Hypotheses, and the 'Holist' Challenge to that View". *History and Philosophy of Science for African Undergraduates*. Ibadan: Hope Publications. Pp. 293-320.
- [16]. Lodge, O. (1909). *The Ether of Space*. New York: Harper and Brothers.
- [17]. Losee, J. (1980). *A Historical Introduction to the Philosophy of Science*, 2<sup>nd</sup> ed. London: Oxford University Press.
- [18]. Poincaré, H. (1990). *Science and Hypothesis*. In *The Great Ideas*, 2<sup>nd</sup> ed. Vol. 58. Chicago: Encyclopaedia Britannica Inc.
- [19]. Reichenbach, H. (1951). *The Rise of Scientific Philosophy*. Berkeley: University of California Press.
- [20]. Van Fraassen, B. C. (2002). *The Empirical Stance: Terry Lectures*. New Haven: Yale University Press.
- [21]. Very, F. W. (1919). *The Luminiferous Ether*. Boston: The Four Seas Press.
- [22]. Walker, J. S. (2007). *Physics*, 3<sup>rd</sup> ed. San Francisco: Pearson Educational Inc.

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