

Maxwell's Aether and Similarities with the 4D Stationary Electrostatic field in the Continuum Theory of Gravity

George Kopasakis
Retired Research Engineer - NASA

James Clerk Maxwell held the belief in the existence of the aether. Recently, in early 2026, upon for the first time studying his 1865 paper titled "A Dynamical Theory of the Electromagnetic Field," it was observed that while Maxwell did not exactly define the aether medium responsible for the mediation of electromagnetism, he did possess certain assumptions or ideas regarding its nature. Notably, Maxwell's concepts about the aether exhibited similarities with the aether definition described in the Continuum Theory of Gravity (CTG). These similarities will be explained in this short article. In this regard, it would be appropriate to first provide a brief summary of the CTG as well as mentioning Maxwell and some of the earlier physicist's belief in the aether. Subsequently, some general observations will be made on corresponding mathematical models that described fundamental physical processes. As demonstrated in this article, there is a substantial body of evidence that strongly suggests the existence of an electric aether theory, and more specifically of an electrostatic 4 dimensional stationary aether.

Investigations culminating in the Continuum Theory of Gravity (CTG), as detailed in Refs. 1 and 2, commenced in the mid-1990s, with the objective of comprehending certain phenomena that were otherwise challenging to explain. At the time, the author was unaware of the aether concept during the development of the theory. From these investigations and derivations, a four-dimensional (4D) electrostatic field emerged that permeates the vacuum. This "discovery" prompted a historical research endeavor to ascertain whether such a concept had been contemplated in the past. Through these efforts, the Michelson-Morley (M-M) 1887 experiment came to light, and subsequently it was realized that other physicists also had beliefs in the aether. More significantly, some of these physicists even posited the existence of a 4D aether in both space and time, and even recently, as will be elaborated upon in this article, Maxwell entertained the notion of an electric-type aether.

The aether described in the CTG, as referenced in Refs. 1, 2 and further elaborated in Ref. 3, is a stationary 4D electrostatic field in space and time. The theory describes how gravity manifests as a quantum phenomenon involving the interaction of quanta constituents of mass-energy with an electrostatic aether field at Planck length scales. This interaction is characterized by the velocity of quanta relative to the gradient of a gravitational source field, resulting in a dot product relationship. Consequently, universal constants such as the gravitational constant, permeability, permittivity, and potentially other constants of nature emerge as relations of this field and its interactions. This theory also elucidates fictitious forces and other associated effects. As detailed in the references, the theory posits that this energy field was concentrically collapsing prior to the Big Bang. From heightened gradient stresses at the central region of the collapse, the field shattered at its intrinsic resonance, at Planck frequency, consequently creating fragments of energy. These quanta of energies electrostatically reattached and oscillated with the energy field, thereby creating the conditions for the Big Bang.

In the context of the CTG, the gravitational constant G is expressed as an equation rather than a universal constant. Furthermore, a significantly smaller component of G has been identified in this theory, which is dependent on the velocity of an object relative to the gradient of a gravitational field. The force of gravity is the consequence of the interaction between this 4D aether electrostatic field and inherently charged fundamental mass-energy quanta constituents, as explained in Ref. 1. This interaction elevates the field proportionally to gravitational mass. In this regard, the near field gravitational force is proportional to the gradient of the field, with the maximum intensity

occurring at the surface of a uniform gravitational mass. As the gravitational gradient diminishes from the surface towards the maxima at the center, the gravitational force directs itself towards the positive gradient, ultimately converging towards the center of mass. In this regard, the 4D electrostatic spacetime geometry can be likened to a hill or a bell, while gravity remains a manifestation of an electrostatic force. Given that this 4D aether field is stationary or tightly coupled with mass-energy, it functions as single entity, rendering it unobservable.

Maxwell's theoretical development of Electromagnetism, Ref. 4, doesn't incorporate the aether in his formulations, as he does not directly identify this assumed medium through which electromagnetic waves supposedly propagate. Today, it is widely accepted that the induction equation, also known as the Maxwell-Faraday equation, describes the alternating orthogonal, induced electric and magnetic waves that propagate at the speed of light. However, there is no indication in the equation of the mechanism by which corresponding photons in these waves propagate through the vacuum of space or through some assumed luminiferous aether medium.

Maxwell began his development by assuming the existence of substances whose particles have the property of acting on one another, mediating forces or enabling electromagnetic phenomena, either through repulsion or attraction. In Part II of his development, Maxwell describes the equations governing a system comprising a body connected by two points through which forces are acting. He formulated the equations of reduced momentum, wherein the forces acting on the body are attributed to the momentum of the body induced by the velocities of these connected points, specifically, as self and mutual velocities. Subsequently, he extended this development to describe the electromagnetic equations on an analogous system consisting of two circuits situated in proximity, assuming that, akin to the mechanical analogy, the circuits are interconnected through an aether medium. This assumption was grounded on the realization that induced electromagnetic energy is not confined in the circuits or in the boundary of these circuits, but rather resides in the surrounding medium. The derivations, especially the electromagnetic derivations, present a challenging task in terms of comprehension, as they culminate in the formulation of twenty equations and twenty unknowns. Subsequently, Oliver Heaviside simplified Maxwell's original equations into the four concise equations that are widely employed in contemporary physics.

Although Maxwell's theory of electromagnetism was published in 1865, prior to the (M-M) experiment that revealed no measured disparity in the velocity of light in perpendicular directions, thereby purportedly refuting the existence of aether, later physicists, at least up until the early part of the 20th century, still believed that some aether-type medium is responsible for the propagation of electromagnetic and gravitational waves. The M-M experiment itself did not disprove the existence of a stationary aether that is coupled with mass moving in unison. Consequently, Michelson himself did not exclude the possibility that aether that is completely motionless with respect to matter could exist. In 1895, Poincaré argued that experiments like that of M-M show that it appears to be impossible to detect the absolute motion of matter or the relative motion of matter in relation to the aether. Einstein supported the aether theory as evident from his 1920 U. of Leiden address "According to the general theory of relativity space without ether is unthinkable; for in such space there would not only be no propagation of light, but also no possibility of existence for standards of space and time." Hendrik Lorentz was one of its foremost proponents, by creating a theory in which the relative motion of the Earth and the aether was undetectable. Nikola Tesla also supported the aether theory as evident from his lecture delivered before the Institute of Electrical Engineers (I.E.E.), London, February, 1892, "...and my conviction has grown strong that, to whatever kind of motion light may be due, it is produced by tremendous electrostatic stresses vibrating with extreme rapidity." Later, Einstein and Infeld (1938) employed thought experiments to eliminate the possibility of light propagation through both a stationary and a moving aether by drawing mechanical analogies to sound wave transmission. Nevertheless, in their paper, they acknowledged that the omission of the aether is not a remedy. The issue with such thought experiment lies in the fact that light propagation through such a stationary 4D electrostatic field aether is not precisely analogous to the mechanics of sound waves transmitted through direct force action.

Maxwell's four equations governing electromagnetism, which incorporate Gauss's Law for electricity-magnetism and Faraday's Law of Induction, are considered fundamental. Similarly, for Einstein's field equations that

geometrically describe gravity by relating spacetime curvature to the distribution of matter-energy are also considered fundamental. Even mechanical law of forces utilizing for instance Navier-Stokes equations, or the acoustic equations, etc., are considered fundamental in their respective fields of study. As discussed previously, however, physicists up until the early 19th century considered that deeper; more fundamental laws of nature may exist on which their theories are grounded. In this regard and arguably, what is considered a fundamental law at some higher time scale may not be so from the reference point of a lower time scale. That is, from the reference point of some sufficiently deeper time scale, these same fundamental laws may just be behavioral or empirical in nature. For instance, consider the application of mechanical forces by direct action again as described by Navier-Stokes equations. At the femtosecond or autosecond time scale, the force is not direct, but instead mediated through electrostatic repulsion, as force at a distance rather than direct action. Consequently, and arguably, whether the N-S equations are fundamental depends on the reference time scale, as there exist deeper or more fundamental mechanics that describe the exact action and mediation of forces.

Similarly, Einstein's geometric concept of gravity would be considered fundamental from the perspective that at the macroscopic scales, it adequately explains the behavior of gravity. However, this may not hold true at sufficiently fundamental quantum scales, as it does not. Consequently, at such scales and arguably, Einstein's gravity theory can be considered behavioral in nature. In fact, the concept of gravitons or that of the emptiness of vacuum does not align with the concept of the geometric spacetime of gravity. In Silverberg and Eischen, (2020), Ref. 5, an energy field theory based on fragments of energy was proposed as the foundation of mass. This concept was utilized to solve the Mercury precession and the bending of light independently of General Relativity (GR). This may also suggest that the Einstein geometric spacetime interpretation may not uniquely describe gravity. Consequently, a question arises as to whether the geometric interpretation of gravity precludes gravity from adopting a slightly different or more fundamental form at some deeper time scale. As another example, the standard model, with its nineteen free parameters and six constants, is characterized as a fundamental model of nature that supposedly encompasses all time scales. However, the question arises as to the origin of all these free parameters and constants. Does a fundamental model truly require a multitude of free parameters to describe it, or can this model simply be behavioral in nature? However, the emptiness of the vacuum, regardless of whether virtual particles actually exist, the absence of the aether medium, restricts such questions and consequently, empowers pure mathematics to be employed at the forefront, as the very essence of reality. In the same vain, the absence of the aether allows the entertainment of abstract concepts such as parallel universes and all possible histories, universe simulation, holographic universe, etc.

Through experimental knowledge and through the development of his theory, Maxwell came into the realization that induced electromagnetic energy between two circuits is not stored within the circuits themselves or on their boundaries. Instead, the energy is stored in the surround aether medium. In pg. 487 (73), Maxwell indicates that in the past, he has attempted to describe the particular motion and a particular kind of strain, while in this work he will refrain from doing so and instead use words such as electric momentum and electric elasticity. Clearly, this refers to an assumed electric aether medium or aether with electric characteristics, similar to Tesla's description of this medium. Tesla, however, went a step further by assigning a temporal characteristic to this medium in his description: "...electrostatic stresses vibrating with extreme rapidity." This is quite similar to the stationary 4D electrostatic aether referred to in CTG.

On pg. 493, Maxwell arrives at the conclusion that within this purported medium, electrified or gravitational bodies must possess an intrinsic energy per unit volume greater than $(1/8\pi)R$, where R represents the greatest possible value of the intrinsic gravitational force in any part of the universe. This leads him to determine that every part of the medium possesses enormous intrinsic energy and that the presence of bodies serves to diminish this energy whenever there is a resultant attraction. Since the later portion of the sentence aligns with Einstein's geometric representation of spacetime, it is plausible that Einstein utilized Maxwell's concept of this medium's shape to develop his geometric theory of gravity. Furthermore, Einstein's use of the term spacetime in describing the

geometric theory of gravity suggests that he must have envisioned of a 4D aether with a temporal component. Although, he adapted this term from his teacher, Hermann Minkowski, Einstein's notion of a 4D spacetime fabric diverges from Minkowski's definition of spacetime. While this spacetime shape in Maxwell or Einstein does not coincide with that in CTG, there is agreement, however, with Maxwell in that the aether medium possesses enormous intrinsic energy. In this context, CTG calculated that it would necessitate at minimum a longitudinal pulsating electrostatic potential of approximately 93 trillion volt to overcome this energy and consequently influence the motion of the local spacetime continuum. Diverging slightly, CTG also describes how such motion could potentially circumvent the speed of light by even orders of magnitude, along with a description of a prospective apparatus.

In pg. 497 (91), Maxwell says the following: "At the commencement of this paper we made use of the optical hypothesis of an elastic medium through which the vibrations of light are propagated, in order to show that we have warrantable grounds for seeking, in the same medium, the cause of other phenomena as well as those of light". In this statement, Maxwell once again introduces the concept of an etheric medium through which light itself is assumed to propagate. This is in addition to the medium serving as vehicle for storing electromagnetic or gravitational energy, as discussed in the previous paragraph. The conventional belief holds that light, as an electromagnetic wave, consists of oscillating electric and magnetic fields that sustain each other, enabling light to traverse a vacuum without requiring a physical medium. The Ampère-Maxwell law incorporates the permittivity and permeability of free space as equation parameters, which determines the speed of light as the time constant of the induced electromagnetic waves. These parameters are experimentally determined and, much later, classified as universal constants. However, this raises the questions about the origin of these constants and the associated mechanics. In the absence of an electric aether medium, it even raises the question of how is it that space vacuum, or in other words nothingness, can exhibit parametric electrical characteristics. Consequently, this raises the question about the mechanics by which light propagates in the vacuum of space.

Although there are relative spatial characteristics between the electric and magnetic waves in Maxwell's equations due to the cross product, there is no such feature in relation to light propagation in free space. In other words, nothing in the equations dictates whether light should propagate in straight or curved trajectories or even whether it should behave as a standing wave. Consequently, a strong argument can be made that there are missing physics that describe this aspect of light propagation, and moreover, that such physics cannot be determined without an aether medium. This argument can even be carried further to assert that if an aether medium is necessary, such a medium has to be electric in nature in order to affect light in free space, as light itself, is an electromagnetic wave transmitted by photons. Could it be that Maxwell's equations are not fundamental from the reference point of a deeper quantum scale? It is obvious that earlier day physicists were aware of such questions that led to contemplations of the aether medium, as it was mentioned earlier that many prominent physicists believed in the existence of aether. It is not exactly clear why later this line of thinking was abandoned. In CTG, there are mechanics associated with light, which in summary assumes two charged particles as the components of photon, electrostatically vibrating and propagating through this 4D electrostatic medium of Planck frequency. In this development, permittivity and permeability turn out to be expressions as functions of the luminiferous aether.

In Pgs. 500 (100), Maxwell asserted the following: "If we were to go beyond our experimental knowledge and to assign a definite density to a substance which we should call the electric fluid, and select either vitreous or resinous electricity as the representative of that fluid, then we might have normal vibrations propagated with a velocity depending on this density". In essence, he is referring to an electrostatic medium, as evidence by his use of vitreous and resinous electricity, historically employed to denote positive and negative charges. The latter portion of his statement posits that for such a fluid medium, light vibrations could propagate with a velocity depended on the fluid's density. This aligns with the principles of the CTG, as it identifies the medium as an electrostatic field. Furthermore, in CTG, the density of this fluid is instead referred to as density of spacetime, and its compactness influences the wavelength of the Planck frequency, thereby affecting the speed of light.

As previously mentioned, mechanical forces are electrostatic repulsion forces at deeper fundamental scales. When Maxwell developed his theory of electromagnetism, commencing from formulations of mechanical forces connected through a medium, and extending them into electromagnetism, he was unaware that at certain fundamental scales, even mechanical forces are electrostatic. This is because the atomic model was not comprehended until Rutherford in 1911. Consequently and arguably, all forces in nature can be attributed to electrostatics or electromagnetic interactions. This encompasses gravity, as proposed by CTG, which also aligns with Maxwell's assumptions regarding the aether medium that could potentially be responsible for the transmission of electromagnetic forces. If such a theory is assumed for ultimately responsible for the mediation of all forces in nature, it suggests that the fundamental nature of the physical world is characterized by electrics or, more accurately, electrostatics.

Concluding Remarks

In conclusion, considering Maxwell's ideas about the aether medium, its similarities with the Continuum Theory of Gravity (CTG), and further by considering similar ideas held by Physicists up until the early part of the 19th century, there is strong evidence that indeed points to the existence of the aether, and more specifically the existence of a stationary four-dimensional (4D) electrostatic aether. Moreover, as briefly described in this article with further detail in the accompany references, with such an aether theory, there will be natural relations for universal constants instead of their present characterization of absolutes. Additionally, as pointed out, with such aether theory, there will be distinction between quantum scales in relation to mathematical models of nature and whether such models can be characterized as fundamental, behavioral, or empirical. As summarized in this article and detailed in the accompany references that describe CTG, gravity as well as all natural processes and particles own their existence in this 4D energy field. It is posited that the universe was created from this energy field, as this energy has preceded the universe. This energy field should then outlive the universe to potentially, through its cycling, create a future universe, thereby characterized as everlasting energy.

References:

1. Kopasakis, G. 2017. "A Physical Continuum Theory: Part 1, Gravity," Galilean Electrodynamics Journal, Vol. 28, No 6, Nov./Dec. https://drive.google.com/file/d/1BMoHpyXgDC19BjMAggokcJDgFGvyP_IG/view
2. Kopasakis, G. 2019. "The Continuum Theory: Part 2, Matter, Time, and the Mechanics of Light," Galilean Electrodynamics Journal, Vol. 30, No. 1, Jan./Feb.
3. Kopasakis, G. 2025. "Quantum Gravity, Fictitious Forces as Real Manifestations of Gravity, and Related Effects." <https://quantumgravity.es>
4. Maxwell, C. J. 1865 "A Dynamical Theory of the Electromagnetic Field," Phil. Trans. R. Soc. Lond. 1865 155, 459-512.
5. Silverberg, L. M. and Eischen, J. F. 2020 "On a New Field Theory Formulation and a Space-Time Adjustment that Predict the Same Precession of Mercury and the Same Bending of Light as General Relativity," Physics Essays 33, 4.