

## Maxwell's Original Equations

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### Introduction

Although Maxwell's most important equations had already appeared throughout his seminal paper entitled "*On Physical Lines of Force*" [1], which was written in 1861 in Great Britain, it was not until 1864 that Maxwell created a distinct listing of *eight* equations in a section entitled 'General Equations of the Electromagnetic Field' in his follow up paper entitled "*A Dynamical Theory of the Electromagnetic Field*" [2]. While Maxwell refers to *twenty* equations at the end of this section, there are in fact only eight equations as such. Maxwell arrives at the figure of twenty because he splits six of these equations into their three Cartesian components. Maxwell's eight original equations,

$$\begin{aligned} \mathbf{J}_{\text{total}} &= \mathbf{J}_{\text{conduction}} + \partial\mathbf{D}/\partial t && \text{(A)} \\ \text{curl } \mathbf{A} &= \mu\mathbf{H} && \text{(B)} \\ \text{curl } \mathbf{H} &= \mathbf{J}_{\text{total}} && \text{(C)} \\ \mathbf{E} &= \mu\mathbf{v}\times\mathbf{H} - \partial\mathbf{A}/\partial t - \text{grad}\psi && \text{(D)} \\ \mathbf{D} &= \epsilon\mathbf{E} && \text{(E)} \\ \mathbf{E} &= R\mathbf{J}_{\text{conduction}} && \text{(F)} \\ \text{div } \mathbf{D} &= \rho && \text{(G)} \\ \text{div } \mathbf{J} + \partial\rho/\partial t &= 0 && \text{(H)} \end{aligned}$$

will be discussed in depth in individual sections throughout this paper.

### Displacement Current

1. The first in the list of eight equations appearing in Maxwell's 1865 paper [2] is,

$$\mathbf{J}_{\text{total}} = \mathbf{J}_{\text{conduction}} + \partial\mathbf{D}/\partial t \quad \text{(Total Electric Current)} \quad \text{(A)}$$

It is a statement to the extent that the total electric current is the sum of the conduction current and the '*displacement current*', and it immediately introduces confusion. Maxwell believed that the electromagnetic wave propagation mechanism involves a physical displacement,  $\mathbf{D}$ , in an elastic solid, and he conceived of displacement current,  $\partial\mathbf{D}/\partial t$ , in relation to this

displacement mechanism. Maxwell then added  $\partial\mathbf{D}/\partial t$  to Ampère’s circuital law as an extra term, as at equation (112) in his 1861 paper [1]. Maxwell seems to have misidentified the physical displacement mechanism in electromagnetic radiation with linear polarization in a dielectric, and this misidentification has resulted in the phenomenon being misassociated with electric capacitor circuits ‡. Electromagnetic waves however propagate sideways from an electric current, so we therefore require an alternative explanation for the displacement mechanism that is not confined to the space between the plates of a capacitor, and it is most unlikely that we would ever wish to sum such an alternative form of displacement current together with a conduction current in the same equation. In section 3 below it will be shown that the magnetic vector potential  $\mathbf{A}$  is the displacement current. (*‡The situation became exacerbated in the twentieth century when the aether was dropped from physics altogether. An ‘aether free’ impostor for displacement current was devised in which its divergence is the negative of the divergence of the conduction current. Summing this impostor with the conduction current in Ampère’s Circuital Law is of course a corruption, by virtue of the addition of an extra term to one side of an equation. It is highly illegal to add an extra term to one side of an equation, because in doing so, the equation will cease to be balanced, and will of course cease to be an equation. See section 8 for further discussion on this point.*)

## The Fly-Wheel Equation

2. Maxwell’s second equation appeared as equation (55) in Part II of the 1861 paper, and it exposes the fine-grained rotational nature of the magnetic field. Maxwell identified Faraday’s ‘*electrotonic state*’ with a vector  $\mathbf{A}$  which he called the electromagnetic momentum. The vector  $\mathbf{A}$  relates to the magnetic intensity,  $\mathbf{H}$ , through the curl equation,

$$\text{curl } \mathbf{A} = \mu\mathbf{H} \qquad \text{(Magnetic Force)} \qquad \text{(B)}$$

‡ The vector  $\mathbf{A}$  is the momentum of free electricity per unit volume, and so to all intents and purposes it is the same thing as the vector  $\mathbf{J}$  that is used to denote electric current density. The coefficient of magnetic induction  $\mu$  is closely related to the mass density of the medium for the propagation of light, and it would appear to play the role of ‘*moment of inertia*’ in the magnetic field. According to Maxwell in 1861, the electrotonic state corresponds to “*the impulse which would act on the axle of a wheel in a machine if the actual velocity were suddenly given to the driving wheel, the machine being previously at rest.*” He expands upon this fly-wheel analogy in his 1865 paper, in sections (24) and (25).

(‡The divergence of a curl is always zero, and so equation (B) can be used to derive the equation  $\text{div } \mathbf{H} = 0$ , which is equation (56) in Maxwell's 1861 paper, and which appears as an alternative to equation (B) in modern listings of Maxwell's equations.)

## Ampère's Circuital Law

3. In Part I of his 1861 paper, Maxwell proposed the existence of a sea of molecular vortices which are composed of a fluid-like aether, whereas in Part III, he deals with the elastic solid that these molecular vortices collectively form. Maxwell's third equation is derived hydrodynamically, and it appeared as equation (9) in Part I,

$$\text{curl } \mathbf{H} = \mathbf{J} \qquad \text{(Electric Current)} \qquad \text{(C)}$$

If we treat the vector  $\mathbf{J}$  as being equivalent to the vector  $\mathbf{A}$ , the two curl equations, (B) and (C), together point us to an aethereal sea in which closed solenoidal circuits of magnetic lines of force are interlocked with closed solenoidal circuits of electric current ‡. Vector  $\mathbf{A}$  is therefore the displacement current in the sea of molecular vortices. Part III of Maxwell's 1861 paper deals with the elasticity of the medium for the propagation of light and the physical nature of the electric displacement that is involved in the electromagnetic wave propagation mechanism within this medium. At the beginning of Part III, Maxwell says *"In the first part of this paper I have shown how the forces acting between magnets, electric currents, and matter capable of magnetic induction may be accounted for on the hypothesis of the magnetic field being occupied with innumerable vortices of revolving matter, their axes coinciding with the direction of the magnetic force at every point of the field. The centrifugal force of these vortices produces pressures distributed in such a way that the final effect is a force identical in direction and magnitude with that which we observe."* The magnetic intensity  $\mathbf{H}$  therefore represents an angular momentum or a vorticity.

In his 1865 paper, Maxwell showed that when the electric current term in equation (C) is specifically the displacement current, then this equation can be used in conjunction with equation (B) in order to derive the electromagnetic wave equation [2]. Equation (B) introduces the density of the wave carrying medium, while equation (C) introduces the elasticity factor through the displacement current. Maxwell further says in the same part *"I conceived the rotating matter to be the substance of certain cells, divided from each other by cell-walls composed of particles which are very small compared with the cells, and that it is by*

*the motions of these particles, and their tangential action on the substance in the cells, that the rotation is communicated from one cell to another.*” However, by 1864, Maxwell seems to have ignored this fine-grained rotational mechanism for electric displacement and focused instead on linear polarization in a dielectric. Maxwell seems to have made the serious mistake of blending together the two distinct phenomena of magnetization on the one hand, and linear polarization on the other hand.

(‡When equation (C) is applied on the large scale, electric current is a solenoidal flow of aether in which a conducting wire acts like a pipe. The pressure of the flowing aether causes it to leak tangentially into the surrounding sea of tiny vortices, causing the vortices to angularly accelerate and to align solenoidally around the circuit, hence resulting in a magnetic field.)

## The Lorentz Force

4. Maxwell’s fourth equation originally appeared as equation (77) in Part II of his 1861 paper, and it takes the form,

$$\mathbf{E} = \mu\mathbf{v}\times\mathbf{H} - \partial\mathbf{A}/\partial t - \text{grad}\psi \quad (\text{Electromotive Force}) \quad (\mathbf{D})$$

‡ Maxwell called the vector  $\mathbf{E}$  ‘*electromotive force*’, but it actually corresponds to the modern day ‘*electric field*’, and not to the modern day electromotive force which is in fact a voltage. The first of the three terms on the right hand side,  $\mu\mathbf{v}\times\mathbf{H}$ , is the compound centrifugal force (*Coriolis force*) that acts on an element moving with velocity  $\mathbf{v}$  in a magnetic field. The solenoidal alignment of the tiny vortices causes a differential centrifugal pressure to act on either side of the element when it is moving at right angles to the rotation axes of the vortices, and this causes a deflection in the path of motion. The second term involves the electromagnetic momentum  $\mathbf{A}$ , nowadays referred to as the *magnetic vector potential*, and it comes from the torque producing effect,  $\mathbf{E} = -\partial\mathbf{A}/\partial t$ , which appeared as equation (58) in the 1861 paper. As well as describing electromagnetic induction in a time varying magnetic field,  $\mathbf{E} = -\partial\mathbf{A}/\partial t$  also provides the bridge which links the two curl equations, (B) and (C), in order to derive the electromagnetic wave equation [2]. We can therefore deduce that Maxwell’s displacement current was ideally supposed to be connected with a fine-grained angular displacement in the tiny molecular vortices. The second term,  $-\partial\mathbf{A}/\partial t$ , just like the first term,  $\mu\mathbf{v}\times\mathbf{H}$ , also represents a centrifugal pressure, but in this case the pressure is transmitted by angular acceleration through the sea of tiny vortices in the form of electromagnetic radiation [3]. The third term is just an electrostatic term, where  $\psi$  refers to the electrostatic potential. (‡If we take the curl of equation (D) we end up with  $\text{curl } \mathbf{E} = -d\mathbf{B}/dt$ , which is unfamiliar because

of the total time derivative. If however we ignore the  $\mu\mathbf{v}\times\mathbf{H}$  term in equation (D), since it is not used in the derivation of the electromagnetic wave equation, and then take the curl, we end up with the familiar partial time derivative form,  $\text{curl } \mathbf{E} = -\partial\mathbf{B}/\partial t$ . Heaviside referred to this partial time derivative curl equation as 'Faraday's Law'. Strictly speaking, it is not exactly Faraday's law because it doesn't cover for the convective aspect of electromagnetic induction that is described by the  $\mu\mathbf{v}\times\mathbf{H}$  force. The equation  $\text{curl } \mathbf{E} = -\partial\mathbf{B}/\partial t$  appeared as equation (54) in Maxwell's 1861 paper, and it also appears in modern listings of Maxwell's equations. Interestingly, because it doesn't cover for the  $\mu\mathbf{v}\times\mathbf{H}$  force, modern listings have to be supplemented by Maxwell's equation (D) from the original list. And even more interesting still is the fact that Maxwell's original equation (D) is introduced in modern textbooks, under the misnomer of '**The Lorentz Force**', as being something extra that is lacking in Maxwell's equations, and which is needed as an extra equation to compliment Maxwell's equations, in order to make the set complete, as if it had never been one of Maxwell's equations in the first place! Maxwell in fact derived the so-called Lorentz force when Lorentz was only eight years old. Using the name 'The Lorentz Force' in modern textbooks for equation (D) is somewhat regrettable, in that it gives the false impression that the  $\mu\mathbf{v}\times\mathbf{H}$  expression is something that arises as a consequence of doing a 'Lorentz transformation'. A Lorentz transformation is an unfortunate product of Hendrik Lorentz's misunderstandings regarding the subject of electromagnetism, and these misunderstandings led to even greater misunderstandings when Albert Einstein got onto the job. Neither Lorentz nor Einstein seemed to have been aware of the contents of Maxwell's original papers, while both of them seemed to be under the impression that they were fixing something that wasn't broken in the first place. In doing so, Einstein managed to drop the luminiferous aether out of physics altogether, claiming that he was basing his investigation on what he had read in the so-called 'Maxwell-Hertz equations for empty space'! But whatever these Maxwell-Hertz equations might have been, they certainly can't have been Maxwell's original equations. This is a tragic story of confusion heaped upon more confusion. The aether was a crucial aspect in the development of Maxwell's equations, yet in 1905, Albert Einstein managed to impose Galileo's 'Principle of Equivalence' upon Maxwell's equations while ignoring the aether altogether. The result was the abominable product which is hailed by modern physicists and known as 'The Special Theory of Relativity'. Einstein himself knowing that something wasn't right with his special theory of relativity, attempted to make amends in 1915 with his 'General Theory of Relativity'. But he only made things worse by virtue of spiking Newton's law of gravity with his toxic special theory of relativity. In later years, judging from his Leyden speech in 1920, Einstein realized that the aether was indeed needed after all, but by this time it was too late, because he already had a following.)

## **Elasticity, Dielectric Constant, and Permittivity**

5. Maxwell's fifth equation is the equation of electric elasticity, which first appeared in the preamble of Part III of his 1861 paper, and then again at equation (105) in the same part,



$$\mathbf{D} = \epsilon\mathbf{E}$$

(Electric Elasticity Equation)

(E)

Maxwell believed that his sea of molecular vortices constituted an elastic solid, even though the aether within the individual vortices is fluid-like. The permittivity  $\epsilon$  is related to the elasticity of the solid. (*Maxwell actually used a dielectric constant which is inversely related to the permittivity*) Electric particles move around the edge of the tiny aethereal vortices, and equation (E) is a simple harmonic motion equation for these electric particles which Maxwell used as a device for introducing the elasticity into the mathematical analysis. The physical geometry of the displacement,  $\mathbf{D}$ , is crucial to our understanding of the physical nature of electromagnetic radiation, while the elasticity associated with that displacement mechanism, along with the density of the solid, is necessary in order to link electromagnetic radiation numerically to the speed of light. Knowing that Newton's equation for the speed of a wave in an elastic solid involves the ratio of transverse elasticity to density, Maxwell set out to link this ratio to the dielectric constant and the coefficient of magnetic induction. In Part I of his 1861 paper, Maxwell established an equation for the coefficient of magnetic induction,  $\mu$ , in terms of the density of the sea of molecular vortices, while in Part III he established an equation for the elasticity of his sea of molecular vortices in terms of its dielectric constant. Although Maxwell had no way of putting an absolute numerical value to the density, that didn't matter, because he was only concerning himself with ratios. He showed that the ratio of the dielectric constant to the coefficient of magnetic induction was equivalent to the ratio of electrostatic units of electricity to electromagnetic units of electricity, and the latter ratio had already been determined experimentally in 1855 by Weber and Kohlrausch by discharging a Leyden jar. A Leyden jar is the equivalent to a modern-day capacitor, and the Weber-Kohlrausch experiment produced a numerical result which was closely related to the measured speed of light. Maxwell was therefore able to produce a numerical result in Newton's equation and hence conclude that waves in the luminiferous medium travel at the speed of light, and that hence light must be a transverse undulation in the same medium that is the cause of electric and magnetic phenomena. In his own words he stated, "*we can scarcely avoid the inference that light consists in the transverse undulations of the same medium which is the cause of electric and magnetic phenomena*"

In establishing this fact, Maxwell had inadvertently demonstrated at equation (132) in his 1861 paper, that Newton's equation for the speed of a wave in the luminiferous medium is equivalent to the famous equation  $\mathbf{E} = mc^2$  that is normally attributed to Albert Einstein more than forty years later. This Newtonian equation can alternatively be

written as the well-known equation  $c^2 = 1/\mu\epsilon$ . The latter equation is often wrongly attributed to Maxwell's theoretical analysis, but it should be made quite clear, that on the contrary, it follows from the 1855 experiment of Weber and Kohlrausch. The genius of Maxwell's theoretical work was in exposing the physical significance of the Weber/Kohlrausch result using Newton's equation in relation to a sea of molecular vortices.

## Ohm's Law

6. Maxwell's sixth equation is Ohm's law,

$$\mathbf{E} = \mathbf{R}\mathbf{J}_{\text{conduction}} \qquad \text{(Ohm's Law)} \qquad \text{(F)}$$

where R is the specific resistance referred to unit volume. Ohm's law is an equation which is of interest in electric circuit theory, but it holds no interest value in terms of the connection between the electric current and the magnetic field.

## Gauss's Law

7. Maxwell's seventh equation appeared as equation (115) in his 1861 paper,

$$\text{div } \mathbf{D} = \rho \qquad \text{(Gauss's Law)} \qquad \text{(G)}$$

Gauss's law is an equation of aether hydrodynamics, and the quantity  $\rho$  is the density of *'free electricity'*. Free electricity can only mean the aether. While the aether itself behaves like a fluid, the luminiferous medium in its totality is a solid that is comprised of densely packed aether vortices. The repulsive electromagnetic forces and the inertial forces are based on the centrifugal pressure that exists between neighbouring vortices as they press against each other while striving to dilate, but Gauss's law deals with the flow of aether on the large scale, through the sea of vortices. The large scale flow of aether causes the attractive tensions that arise when unlike electric charges attract, and when two gravitating bodies attract ‡. An important feature of Gauss's law is the fact that it involves the elasticity factor of the luminiferous medium, because the large-scale

aether flow causes linear polarization in this medium. The linear polarization of the molecular vortices induces an aether pressure which acts as an impedance to the large-scale aether flow (*Lenz's law*). This induced pressure, or charge, is the elasticity factor, which in modern textbooks is catered for by the electric permittivity  $\epsilon$ , and in conjunction with the coefficient of magnetic induction, it allows the numerical connection to be made to the speed of light. For this reason, Kirchhoff was able to make a numerical connection between the equations of electromagnetism and the speed of light in a paper which he wrote in 1857 [4].

(‡Maxwell knew that gravitational field lines must involve a lateral pressure as is the case between two repelling like magnetic poles, but he failed to realize that this pressure in the gravitational field is actually the inverse cube law centrifugal repulsive pressure as opposed to the inverse square law gravitational attractive tension.)

## The Equation of Continuity

8. Maxwell's eighth equation, number (113) in his 1861 paper,

$$\text{div } \mathbf{J} + \partial\rho/\partial t = 0 \qquad \text{(Equation of Continuity)} \qquad \text{(H)}$$

is the equation of continuity, which like equation (G) (*Gauss's law*), is another equation of hydrodynamics. This equation is used in modern textbooks in conjunction with one of the greatest scientific deceptions of the twentieth century. It is used in conjunction with Gauss's law for the purpose of deriving a term that has the outward mathematical form of Maxwell's displacement current, but which cannot connect with the curl equations that are used in the derivation of the electromagnetic wave equation. The actual displacement mechanism, as occurs in electromagnetic wave propagation, involves the rotational electromagnetic momentum  $\mathbf{A}$  and the moment of inertia  $\mu$ , and hence the associated displacement current should be using the rotational equation  $\mathbf{E} = -\partial\mathbf{A}/\partial t$  in the electric elasticity equation (E), and not the irrotational equation  $\mathbf{E} = -\text{grad}\psi$ . Electromagnetic radiation is a fine-grained fly-wheel mechanism. The modern textbooks however have been diverting attention to the irrelevant issue of '*conservation of charge*' and using Ampère's Circuital Law in conjunction with a broken electric circuit in which charge accumulates, even though Ampère's Circuital Law applies strictly in connection with unbroken solenoidal currents. Displacement current's irrotational impostor, in a highly illegal move (*see section 1*



above), is then inserted alongside the conduction current in Ampère's Circuital Law. This is then supposed to make everything right, on the grounds that the divergence of the combined result will now equal zero. Modern textbooks then force fit this irrotational displacement current impostor with the rotational curl equations in order to derive the electromagnetic wave equation. It's quite amazing just how many top physicists and mathematicians fail to notice this deception and fail to realize that the curl equations require a displacement current which uses the rotational relationship  $\mathbf{E} = -\partial\mathbf{A}/\partial t$ . It seems that they are all quite content to use the irrotational relationship  $\mathbf{E} = -\text{grad}\psi$ , and to derive the electromagnetic wave equation as if this irrotational electrostatic force were one and the same thing as the time varying electromagnetic force. This sleight of hand is in fact a mathematical conjuring trick that enables the modern textbooks to purport to derive the electromagnetic wave equation without involving Maxwell's sea of molecular vortices, hence furthering the cause of 'aether denial'.

## **Linear Polarization, Charge, and Cable Telegraphy**

9. Maxwell's papers of 1861 and 1865 make no explicit mention of the concept of electric charge. Maxwell talks about '*free electricity*' and '*electrification*'. By free electricity, it would appear that he is talking about a fluid-like aethereal substance that corresponds to the vitreous fluid of Franklin, Watson, and DuFay, and it would appear that when Maxwell is talking about the density of free electricity that he is talking about a quantity which corresponds very closely to the modern concept of electric charge. Charge would therefore appear to be aether pressure and aether tension. Such a hydrodynamical approach to charge enables us to explain how net charge enters an electric circuit when it is switched on, and also why the linear polarization process in a dielectric results in a net charge. These things cannot be explained using the modern idea that charge is a fixed property that is attached to a particle. The hydrodynamical approach to charge also enables us to see the true nature of magnetic charge and the fact that magnetic intensity  $\mathbf{H}$  is a kind of vorticity.

On knowing this, nobody is going to be asking questions like '*why can we not find magnetic monopoles?*' The equation  $\text{div } \mathbf{H} = 0$  describes the solenoidal nature of the lines traced out by the rotation axes of neighbouring vortices, and magnetic charge is simply the tension along the magnetic lines of force. Each vortex is actually a dipolar vortex in which a positron acts as an aether source, and in which an electron acts as

an aether sink. The magnetic tension along the axial direction, which was never explained by Maxwell, is caused by a bi-directional aether flow between the electrons and positrons of neighbouring vortices, which are aligned in a double helix along their mutual rotation axes [5]. There are no magnetic monopoles. There are only electric monopoles, and in a magnetic field, positive electric monopoles and negative electric monopoles exist in equal numbers, leading to overall electric neutrality. It is the double helix alignment of positive and negative electric monopoles that is the secret of magnetic charge in relation to magnetic attraction. The magnitude of the magnetic attractive force will depend on the concentration of magnetic lines of force, and hence it will depend on the magnetic flux density,  $\mathbf{B}$ , which is equal to  $\mu\mathbf{H}$ .

Magnetization is something that is connected with wireless telegraphy. It is a rotational effect associated with the angular acceleration of the molecular vortices. Electromagnetic waves radiate from the side of an electric current. The tiny vortices in the magnetized state are acting like fly-wheels. Linear polarization on the other hand is slightly more complicated, and it involves the dipolar nature of the molecular vortices. It is more analogous to a mechanical spring. It is the subject that we are dealing with in connection with cable telegraphy, and it falls outside the jurisdiction of Maxwell's curl equations even though modern textbooks attempt force fit these curl equations wrongly in the context. An electric current begins as pure pressurized aether flow. It may or may not involve the flow of particles as a secondary effect. Positive particles may be pushed along with the aether flow and negative particles may eat their way in the opposite direction towards the source, but the primary event is the flow of pure pressurized aether. Hence when we first switch an electric circuit on, there will be a net injection of charge into the circuit from the power source. The pressurized aether will flow in a closed circuit which will inflate and expand until it settles inside the conducting wires. Conducting wires act like arteries for aether flow. As the current is initially expanding inside the circuit, there will be a step, or a bore, of pressurized aether flow advancing laterally between the wires. Linear polarization of the luminiferous medium will be occurring at this step, and this will actually induce more charge which will in turn act to oppose the driving current. Hence the current will go wide of this impedance, causing the step to advance in a wave like fashion. This is the principle behind cable telegraphy and capacitor circuits.

## Conclusion

10. The electromagnetic wave propagation mechanism depends upon the existence of a sea of tiny molecular vortices as advocated by James Clerk-Maxwell in 1861. Maxwell's equations were derived using hydrodynamics and elasticity based on the existence of such a physical medium, and these equations therefore cease to have any meaning in physics once that medium is removed. Weber and Kohlrausch first made the connection between electromagnetism and the speed of light in 1855 by discharging a Leyden jar (capacitor) and measuring the ratio of electrostatic to electrodynamic units of electricity [6]. The significance of Maxwell's original papers is that they connect light with an all-pervading elastic solid which enables the electromagnetic induction mechanism to operate throughout all of space. It is generally forgotten that the equation  $c^2 = 1/\mu\epsilon$ , follows from the 1855 Weber-Kohlrausch experiment and not from Maxwell's equations. Maxwell connected this equation with Newton's equation for the speed of a wave in an elastic solid, hence inadvertently showing its equivalence to  $E = mc^2$ , but unless we establish the electric permittivity  $\epsilon$  experimentally using a discharging capacitor, we can have no basis whatsoever to assume the existence of an equation of the form  $c^2 = 1/\mu\epsilon$ . Unfortunately, Maxwell didn't distinguish clearly enough between the rotational magnetization mechanism on the one hand, and the linear polarization mechanism on the other hand, in relation to the physical nature of the displacement that is involved in electromagnetic radiation. Had he done so; he would have realized that the magnetic vector  $\mathbf{A}$  actually is the displacement current.

Nevertheless, Maxwell's original works are pioneering works of enormous value which pointed us in the right direction, and any shortcomings within these works pale into insignificance when compared with the errors that followed in Maxwell's wake. A series of derailments culminated with Einstein taking us into a mad world of relativity where two clocks can both go slower than each other, and where electromagnetic waves can propagate in a pure vacuum without the need for any physical displacement mechanism. Since 1983, the situation has degenerated even further still. The speed of light is now a defined quantity rather than a measured quantity, and the equation  $c^2 = 1/\mu\epsilon$  has become a meaningless conversion formula without enquiry as to its physical origins. Hence the physical elasticity (*electric permittivity*  $\epsilon$ ) that is connected with the electromagnetic wave propagation mechanism has been eaten up by one big mathematical tautology, and to make matters worse, those supporting Einstein's theories of relativity have the audacity to claim that they are a natural consequence of Maxwell's work, when in fact Maxwell and Einstein were not even remotely working along the

same lines. Maxwell is quite clear about the fact that the  $\mu\mathbf{v}\times\mathbf{H}$  force is a centrifugal force (*more precisely a compound centrifugal force (Coriolis force)*), and that the velocity,  $\mathbf{v}$ , is measured relative to the physical medium for the propagation of light. Modern physics is languishing in a totally misguided relativity-based paradigm in which physicists have been brainwashed into believing that neither centrifugal force nor the aether exist [7]. This nonsense needs to end. We need to go back to Maxwell and start again.

## References

[1] Clerk-Maxwell, J., *“On Physical Lines of Force”*, Philosophical Magazine, Volume XXI, Fourth Series, London, (1861)

[http://vacuum-physics.com/Maxwell/maxwell\\_oplf.pdf](http://vacuum-physics.com/Maxwell/maxwell_oplf.pdf)

[2] Clerk-Maxwell, J., *“A Dynamical Theory of the Electromagnetic Field”*, Philos. Trans. Roy. Soc. London **155**, pp 459-512 (1865). Abstract: Proceedings of the Royal Society of London 13, pp. 531--536 (1864). The original eight Maxwell’s equations are found in the link below in Part III entitled ‘*General Equations of the Electromagnetic Field*’ which begins on page 480,

[http://www.zpenergy.com/downloads/Maxwell\\_1864\\_3.pdf](http://www.zpenergy.com/downloads/Maxwell_1864_3.pdf)

Maxwell’s derivation of the electromagnetic wave equation is found in the link below in Part VI entitled ‘*Electromagnetic Theory of Light*’ which begins on page 497,

[http://www.zpenergy.com/downloads/Maxwell\\_1864\\_4.pdf](http://www.zpenergy.com/downloads/Maxwell_1864_4.pdf)

[3] The 1937 Encyclopaedia Britannica article on ‘*Ether in Physics*’ discusses its structure in relation to the cause of the speed of light. It says, **“POSSIBLE STRUCTURE. \_\_ The question arises as to what that velocity can be due to. The most probable surmise or guess at present is that the ether is a perfectly incompressible continuous fluid, in a state of fine-grained vortex motion, circulating with that same enormous speed. For it has been partly, though as yet incompletely, shown that such a vortex fluid would transmit waves of the same general nature as light waves \_i.e., periodic disturbances across the line of propagation\_ and would transmit them at a rate of the order of magnitude as the vortex or circulation speed - - - ”**

[4] Kirchhoff, G.R., *“On the Motion of Electricity in Wires”*, Philosophical Magazine, Volume XIII, Fourth Series, pages 393-412 (1857) [https://www.ifi.unicamp.br/~assis/Weber-Kohlrausch\(2003\).pdf](https://www.ifi.unicamp.br/~assis/Weber-Kohlrausch(2003).pdf) (pages 280-282)

[5] Tombe, F.D., *“The Double Helix Theory of the Magnetic Field”*, (2006)

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[7] Tombe, F.D., *“The Rattleback and the Gyroscopic Force”*, (2010)

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