The Distortion of Maxwell's Equations

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Abstract. **James Clerk-Maxwell is credited with having brought electricity, magnetism, and optical phenomena, together into one unified theory. The details of what exactly he did were however seriously distorted in twentieth century physics textbooks. Maxwell is most famous in connection with a set of equations which bear his name, but these equations have been totally removed from the physical context within which Maxwell was working, and outside of that physical context the full meaning of these equations is lost. Maxwell was working within the context of a sea of tiny aethereal vortices pressing against each other with centrifugal force. The centrifugal force bit was crucial for explaining magnetic repulsion, yet both centrifugal force and aether are stringently denied by modern physicists who nevertheless continue to hail Maxwell for the equations that he derived by using these very concepts which they deny. This irony seems to be explained at least in part because they think that the equations can be re-derived using Einstein's special theory of relativity. Such an erroneous belief stems from the fact that one of the most important of Maxwell's equations has been wrongly credited to Lorentz and referred to as the Lorentz force law and treated as 'supplementary' to Maxwell's equations. Einstein, being ignorant of Maxwell's original equations and the fact that they contained the Lorentz force law, hence wrongly believed that the equations contained no convective term, and so he made the erroneous conclusion that Maxwell's equations mean that the speed of light must be frame independent in contradiction of classical principles of vector addition of velocities. This erroneous conclusion led Einstein to his special theory of relativity in 1905, and it subsequently led to the erroneous belief amongst both relativists and many anti-relativists, that Einstein's special theory of relativity follows naturally from Maxwell's theory, when in fact Maxwell and Einstein were not even remotely working along the same lines.**

The Background Sea of Tiny Aethereal Whirlpools

I. In an article written by Nikola Tesla in 1930 entitled *"Man's Greatest Achievement"* [1], Tesla writes,

"Long ago he (mankind) recognized that all perceptible matter comes from a primary substance, of a tenuity beyond conception and filling all space - the Akasha or luminiferous ether - which is acted upon by the life-giving Prana or creative force, calling into existence, in never ending cycles, all things and phenomena. The primary substance, thrown into infinitesimal whirls of

prodigious velocity, becomes gross matter; the force subsiding, the motion ceases and matter disappears, reverting to the primary substance". (Tesla, 1930)

John Bernoulli the Younger

II. In the eighteenth century, the younger John Bernoulli (1710-1790) worked on the premises that space is densely packed with tiny aethereal whirlpools that are pressing against each other with centrifugal force while striving to dilate. [2] The merits of such a vision lie in the fact that centrifugal force can be used to explain so many of the basic principles behind both inertia and electromagnetism, and indeed it would appear that such an idea still prevailed when Sir Oliver Lodge wrote the article on *"Ether (in physics)"* for the 1937 Encyclopaedia Britannica (fourteenth edition). [3] The article states,

 "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 same order of magnitude as the vortex or circulation speed" (Sir Oliver Lodge, 1937)

The articles then goes on to cite Lord Kelvin, **"The Vortex Theory of Ether,"** *Phil. Mag.* (1887) and *Math. and Phys. Papers*, vol. iv. and passim; also G. F. FitzGerald, *Proc. Roy. Dub. Soc.* (1899), or *Collected Papers*, pp. 154, 238, 472.

James Clerk-Maxwell

III. Maxwell is most famous for having derived a set of electromagnetic equations, and also for showing that light is an electromagnetic wave. He is accepted by the modern physics establishment as one of the all time greatest physicists, and he is even credited with having paved the way for Einstein's theories of relativity. This is however a totally distorted view of the actual situation. The fact is that Maxwell's core ideas in electromagnetism had their origins in a sea of molecular vortices exactly along the lines of what Tesla and Sir Oliver Lodge were referring to above, and which John Bernoulli more than two centuries ago had considered to exist as the medium for the propagation of

light. Modern physics denies the existence of such a medium just as it denies the existence of centrifugal force as a physical reality, even though centrifugal force is the most significant factor behind the electromagnetic wave propagation mechanism within this medium. Maxwell's real achievements are in fact totally alien to modern physics and indeed he was not remotely working along the same lines as Einstein. In the preamble to Part I of his 1861 paper *"On Physical Lines of Force"* [4] Maxwell gives details about who had influenced him, and amongst others, he mentions Lord Kelvin in relation to identifying the rotatory nature of magnetism. John Bernoulli is not mentioned in the preamble, and so it is interesting that Maxwell ended up coming to a similar conclusion as Bernoulli. Maxwell identified the cause of magnetic repulsion in terms of the centrifugal pressure arising in a sea of molecular vortices. He identified the mechanism for the force on a current carrying wire, and also for motionally induced EMF, in terms of differential centrifugal pressure in this sea of molecular vortices. He explained time varying electromagnetic induction on the basis that the tiny vortices in space are acting like fly-wheels.

Maxwell's explanation for time varying electromagnetic induction was essentially the same as John Bernoulli's explanation for the electromagnetic wave propagation mechanism between two aether whirlpools. According to Whittaker [2], Bernoulli's view was that,

"A source of light communicates to its surroundings a disturbance which condenses the nearest whirlpools ; these by their condensation displace the contiguous corpuscles from their equilibrium position ; and these in turn produce condensations in the whirlpools next beyond them- - -" (J. Bernoulli, 18th century)

This is essentially electromagnetic induction acting between electric circuits, where the whirlpools are miniature electric circuits. Maxwell first dealt with the electromagnetic wave propagation mechanism in Part III of his 1861 paper, where he stated in the preamble,

"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" (Maxwell, 1861)

and so it would seem that Maxwell's and Bernoulli's ideas were totally compatible. It would further seem that Maxwell took the matter even further than John Bernoulli by numerically linking the speed of light to the electrostatic and electromagnetic constants. In the year 1856, Weber and Kohlrausch performed an experiment with a Leyden jar and established the ratio between a

quantity of electricity measured statically to the same quantity of electricity measured electrodynamically. This ratio turned out to be numerically related to the speed of light. The literature is unclear as to when exactly Weber, Kohlrausch, or Maxwell became explicitly aware of this apparent numerical coincidence, but the evidence does seem to indicate that it strongly influenced Part III of Maxwell's 1861 paper where Maxwell demonstrated its full physical significance. Maxwell showed that the ratio in question could be used in Newton's equation for the speed of a wave in an elastic solid, hence confirming that light is an elastic wave in a particulate solid. Maxwell essentially demonstrated that Weber and Kohlrausch had in fact unwittingly measured the speed of light using an indirect method.

Maxwell's last word on the luminiferous medium can be read in the article on **"Ether"** which he wrote for the 1878 Encyclopaedia Britannica (ninth edition). He states towards the end of the article,

"Sir W. Thomson has shown that the magnetic influence on light discovered by Faraday depends on the direction of motion of moving particles, and that it indicates a rotational motion in the medium when magnetized. - - - - - - Now, it is manifest that this rotation cannot be that of the medium as a whole about an axis, for the magnetic field may be of any breadth, and there is no evidence of any motion the velocity of which increases with the distance from a single fixed line in the field. If there is any motion of rotation, it must be a rotation of very small portions of the medium each about its own axis, so that the medium must be broken up into a number of molecular vortices. We have as yet no data from which to determine the size or the number of these molecular vortices." (Maxwell, 1878)

Maxwell's Equations

IV. As regards the equations that Maxwell is famous for, his involvement in these equations requires some elaboration. In 1861, he derived equations hydrodynamically within the context of his sea of molecular vortices and some of these equations were already in existence. The one equation which was unequivocally his own was his equation for electromotive force. This equation takes the form,

$$\mathbf{E} = \mu\mathbf{v}\times\mathbf{H} - \partial\mathbf{A}/\partial t - \text{grad}\psi \tag{1}$$

and it is clear that this equation is the same in its essence as the equation which is nowadays known as the *Lorentz force law*. Ironically it is nowadays considered as a necessary supplement to Maxwell's equations, even though it

actually is one of Maxwell's original equations. [5] To make matters worse, modern physicists link Maxwell's equations to Einstein's theories of relativity on the very basis of not realizing that equation **(1)** is one of Maxwell's equations. Einstein's entire basis for postulating the constancy of the speed of light lay with the misinformed view that Maxwell's equations do not contain a convective term. It is in this respect in particular that Maxwell's contribution to electromagnetism has been totally distorted. Maxwell and Einstein were not remotely working along the same lines, while Maxwell was quite clear about the fact that the speed of light is measured relative to an elastic solid (comprised of fluid vortices), and that it is most certainly not frame independent as is believed by relativists.

As regards the set of equations that modern textbooks list under the title of *'Maxwell's Equations'*, these lists contain two curl equations. One of these curl equations is referred to as Faraday's law although it only deals with time varying electromagnetic induction, whereas the original Faraday's law had wider application to the convective kind as well. There was another curl equation in Maxwell's original list of 1864, but it does not appear in modern sets of *'Maxwell's Equations'*. This very important curl equation,

$$\text{curl } \mathbf{A} = \mu \mathbf{H} \tag{2}$$

which relates to the fly-wheel nature of the magnetic field, is played down nowadays in favour of the much less informative equation, div $\mathbf{B} = 0$, which is obtained by taking the divergence of equation **(2)**.

The third curl equation, which appeared in both Maxwell's original listing and in modern listings, is Ampère's circuital law, and Maxwell is most famous for having extended it to include the concept of *displacement current*. The displacement current concept was purely Maxwell's own idea, although Maxwell's concept of it bears no relationship to the term which bears the same name in modern textbooks.

Displacement Current

V. Displacement current was conceived by Maxwell in 1861, and it is often seen as being his crowning achievement because it enabled Maxwell to derive the electromagnetic wave equation. It is often wrongly believed that Maxwell's derivation of the electromagnetic wave equation was the basis of the unity between electromagnetic phenomena and optical phenomena. However, as stated in section **III** above, the unity had already been established in 1856 by Weber and Kohlrausch without involving the concept of displacement current. It was in 1861 when Maxwell established the full physical significance of the

Weber/Kohlrausch ratio by linking this ratio with the elasticity and density of a perfectly elastic solid, and it was then that he first stated his conclusion that light is a wave in the same medium that is the cause of electric and magnetic phenomena, but it wasn't until 1864 that Maxwell derived the electromagnetic wave equation by invoking displacement current. We must therefore remember that it is not displacement current itself that is important, but rather the physical nature of the displacement mechanism and the fact that the elasticity can be linked to the speed of light. Displacement current is simply a vehicle for introducing the luminiferous elasticity. As an interesting aside, in 1857 Kirchhoff used the 1856 Weber constant in his calculations and purportedly established that an electric signal travels along a wire at the speed of light. [6] This he did without using the concept of displacement current. Kirchhoff had in fact unwittingly established the speed of wireless signals and not the speed of an electric signal along a wire. Kirchhoff used what he thought was the mathematical term for the large scale self induced EMF which acts on the conduction current in the wire, but in fact in the context of the propagation of the signal, the term was referring to the microscopic EMF that drives the displacement mechanism in the luminiferous medium, even though Kirchhoff wasn't even remotely considering the existence of the luminiferous medium. It was a classic case of the maths going off the rails and departing from the physics that it was meant to be applying to.

At the beginning of Part III of his 1861 paper, it would seem that Maxwell had in fact grasped the rotatory nature of the displacement mechanism, as had John Bernoulli a century earlier, but as we read on, Maxwell's vortices which had been planar up until then, and which need to be planar in order to explain magnetic lines of force, are suddenly replaced by elastic spheres, and the elastic displacement becomes a tangential stretch instead of an unequivocal angular acceleration. By 1864, Maxwell was already likening displacement current to linear polarization in a dielectric, and in this respect he had got it wrong. He had inadvertently crossed the floor from magnetization into the realms of capacitors and hence confused the issue. Ironically, this did lead Maxwell to realize the dielectric nature of the luminiferous medium, and that was a good thing, but he never seems to have thought to combine the dielectric vision with the molecular vortex vision. This would have directed him to the realization of the double helix structure [7] and hence to the explanation behind the electrostatic tension along the magnetic lines of force, which he had identified but hadn't explained.

Maxwell's equations can certainly apply on the large scale, but we must remember that displacement current is something which only has meaning on the picoscopic scale. Displacement current only has meaning in relation to the electromagnetic wave propagation mechanism and it arises in connection with the angular acceleration of the electric circulations within the tiny molecular vortices which fill all of space. These tiny vortices are in fact quite simply miniature electric circuits, and the angular accelerations in these vortices, which

are often simple harmonic, have no relevance when it comes to large scale applications in electronics, such as in capacitors or transmission lines. In the modern post aether era the situation has become even worse, because displacement current is now derived by sleight of hand in the context of conservation of charge in a complete vacuum. It is justified as a mathematical necessity in electromagnetic radiation without remotely considering how it links to the physical propagation mechanism. This kind of doublethink, along with the wrongful association of displacement current with capacitors has caused modern physics to lose the richness of Maxwell's equations.

Compound Centrifugal Force

VI. A sea of molecular vortices enables the action of compound centrifugal force. This is what occurs when the vortices press harder on one side of an object than on the other. Mathematically compound centrifugal force falls straight out of hydrodynamics as being the inevitable consequence of a linear motion occurring in conjunction with a rotatory motion, but the mathematics alone cannot tell us the physical conditions which will lead to the existence of such a force. Hence many believers in the aether miss the crucial point that it is not a question of establishing what the aether is made of, so much as it's a question realizing that everything is made of the aether, and whatever that might be, it causes inertia and electromagnetic effects by virtue of the fact that it is rendered into a state of tiny whirlpools. Without the tiny whirlpools, all aether theories will fail because they will be unable to account for centrifugal force, and hence for inertia or magnetic repulsion.

Each whirlpool is in fact a tiny electric circuit, and what Maxwell failed to realize was the fact that the electric particles that surround these whirlpools number only two. There is a positron acting as an aether source, and an electron acting as an aether sink. They both circulate around the edge of the whirlpool and when angular acceleration occurs, this is accompanied by an excess outflow from the positron source. [7] The excess outflow, which is directed, spills over into a neighbouring whirlpool, and this mechanism is the basis of both time varying electromagnetic induction, and electromagnetic radiation.

In 1835, the French scientist Gaspard-Gustave Coriolis identified the compound centrifugal force mathematically in connection with water-wheels, but he failed to identify the physical cause of this force, or to realize that in the context it must necessarily be restricted to the transverse direction. As a consequence of Coriolis's association with the compound centrifugal force, such a force is nowadays referred to as a Coriolis force.

Conclusion

VII. The denial of both the aether and centrifugal force in modern physics leaves many phenomena totally unexplainable. A classic example is the rattleback (Celtic stone). A rotating rattleback spontaneously reverses its axis of rotation in the absence of any known external force. The reason is in fact because of differential pressure coming from the tiny vortices in the background luminiferous medium which James Clerk-Maxwell used to derive his famous equations. This force is an axial version of the compound centrifugal force, and the differential in pressure is due to the fact that rattlebacks are asymmetrical in shape. But with neither aether nor centrifugal force being recognized in the textbooks, modern physics doesn't know where to start when attempting to explain this mysterious phenomenon. Mathematically, it is obvious that the force takes on the form of a compound centrifugal force, because it is a force which acts at right angles to the direction of motion. But no amount of mathematics in isolation can explain where this force is coming from. Nevertheless, we see in the literature the occasional utterly hopeless attempt to physically explain the rattleback, based on pages of complicated mathematics, as if the mathematics itself were capable of unearthing a real physical force. Maxwell was most certainly not a stepping stone for Einstein as is often suggested, even by some anti-relativists. Maxwell's most important work has been swept under the carpet and a set of equations with a partial connection to Maxwell have been promoted in his name and used in a manner which is far removed from Maxwell's theory of electromagnetism.

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http://www.rastko.rs/istorija/tesla/oniell-tesla.html

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"All space, according to the younger Bernoulli, is permeated by a fluid aether, containing an immense number of excessively small whirlpools. The elasticity which the aether appears to possess, and in virtue of which it is able to transmit vibrations, is really due to the presence of these whirlpools ; for, owing to centrifugal force, each whirlpool is continually striving to dilate, and so presses against the neighbouring whirlpools. It will be seen that Bernoulli is a thorough Cartesian in spirit ; not only does he reject action at a distance, but he insists that even the elasticity of his aether shall be explicable in terms of matter and motion. This aggregate of small vortices, or " fine-grained turbulent motion," as it came to be called a century and a half later,* is interspersed with solid corpuscles, whose dimensions are small compared with their distances apart. These are pushed about by the whirlpools whenever the aether is disturbed, but never travel far from their original positions. A source of light communicates to its surroundings a disturbance which condenses the nearest whirlpools ; these by their condensation displace the contiguous corpuscles from their equilibrium

position ; and these in turn produce condensations in the whirlpools next beyond them, so that vibrations are propagated in every direction from the luminous point. It is curious that Bernoulli speaks of these vibrations as longitudinal, and actually contrasts them with those of a stretched cord, which, "when it is slightly displaced from its rectilinear form, and then let go, performs transverse vibrations in a direction at right angles to the direction of the cord." When it is remembered that the objection to longitudinal vibrations, on the score of polarization, had already been clearly stated by Newton, and that Bernoulli's aether closely resembles that which Maxwell invented in 1861-2 for the express purpose of securing transversality of vibration, one feels that perhaps no man ever so narrowly missed a great discovery. Bernoulli explained refraction by combining these ideas with those of his father. Within the pores of ponderable bodies the whirlpools are compressed, so the centrifugal force must vary in intensity from one medium to another. Thus a corpuscle situated in the interface between two media is acted on by a greater elastic force from one medium than from the other; and by applying the triangle of forces to find the- conditions of its equilibrium, the law of Snell and Descartes may be obtained. * Cf . Lord Kelvin's vortex-sponge aether, described later in this work."

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