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Longitudinal Magnetic Waves

Frederick David Tombe,
Northern Ireland, United Kingdom,
sirius184@hotmail.com
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***Abstract*. This article deals with the controversial topic of longitudinal waves in the same medium that carries electromagnetic waves. It is often claimed that such longitudinal waves have never been detected, and that they would interfere with the reflection and refraction of light, and that hence the luminiferous medium must be incompressible, as such, ruling out Maxwell's sea of molecular vortices. A counter argument will now be offered.**

Three Kinds of Waves

I. To start with, three kinds of waves will be considered,

(a) Longitudinal waves of the kind that are familiar in ponderable matter, and which are associated with bulk deformation and dissipation of energy.

(b) Transverse waves of the kind that are familiar in ponderable matter, and which are associated with shear deformation and dissipation of energy.

(c) Vortex waves, such as arise in the case of wireless electromagnetic radiation, **[1]**. These are more than likely similar in principle to the kinetic energy waves that pass through the rigid balls in Newton's Cradle, **[2]**. In the case of EM radiation, space is filled with tiny aethereal vortices, **[3]**, **[4]**, whereas in the case of Newton's Cradle, the constituent molecules of the metal balls constitute aether vortices of a more complex structure. These vortex waves operate on the principle of time-varying electromagnetic induction, whereby the aether in a precessing vortex, spills over into its immediate neighbour. Vortex waves are therefore tangential waves, axially deflected by the gyroscopic force with respect to the vortices.

Steady State Magnetic Waves

II. Seldom discussed is the compression or rarefaction of a steady state magnetic field. The deformation of the field pattern is easily visible when two like-pole magnets are pressed together. Whether two compression waves begin at the interface and reverse back towards the two source magnets, or whether a single compression wave begins at one of the source magnets and travels across to the other magnet, depends on whether the two magnetic fields freely collide due to their own momentum, or whether one of the source magnets is forced to move against the interface. The reverse process, leading to rarefaction waves, occurs when the two magnets recoil under their mutual force of repulsion, or if one magnet is forcibly pulled away from the other, despite the mutual repulsion.

Then there is the case of magnetic attraction. No interface is involved since the two magnets sit inside a communal magnetic field in which the field lines join directly between the north pole of one magnet and the south pole of the other magnet. If one magnet is pulled away from the other, relative to the mutual magnetic field, a rarefaction wave will travel across to the other magnet. But if instead, this magnet is pushed towards the other magnet so as to override their mutual force of attraction, then a compression wave will move across to the other magnet. For more details, see **Appendix A** after the reference section.

As well as these rather obvious longitudinal magnetic waves, we also have the question of the much more subtle entrainment wave that spreads out from a magnet to the outer edges of its field when it is linearly accelerated in a situation where the motion is not being resisted by the magnetic field of another magnet. This matter is closely related to the situation inside a long rigid rod that is being dragged lengthwise at its mid-point, along a frictionless surface.

The Problem of the Long Metal Rod

III. When we drag a long metal rod lengthwise at its mid-point, the whole rod appears to move as a single entity. While a compression wave must have moved through the rod in the forward direction, and a rarefaction wave in the backward direction, we know that these waves can't be like any of the waves listed in Section **I** above. There is no dissipation of energy involved, and neither is there any basis for the time-varying electromagnetic induction mechanism to kick in, and we know that the speed of these waves through the rod is much faster than any known deformation wave in ponderable matter, and even faster than the speed that the kinetic energy wave passes through Newton's Cradle.

In the case of wireless EM waves, as stated above, we are looking at precessing vortices causing an aethereal electric current to flow from vortex to vortex, but in the case of steady state magnetic waves, we are looking at something different, yet still in the same vortex sea medium.

It is now suggested, that in the latter case, the principle is based on a different aspect of vortex theory, this being, that if we try to compress a vortex in its equatorial plane, it spins faster, and hence exerts a higher centrifugal pressure on its next neighbour along the line of propagation, [5]. And if we try to stretch a vortex in the axial direction, it spins slower, causing a retarding torque to act on its next neighbour along the axis. But in either case, unlike in the

electro-magnetic wave, there is no net fluid aether exchange (electric current flow) between the vortices. And unlike in the case of ***electro***-magnetic waves, we have no way of establishing what speed they travel at, because in this situation, the speed won't have any direct linkage to the circumferential speed of the vortices. These magnetic waves, as opposed to ***electro***-magnetic waves, involve compression and rarefaction, and hence they constitute longitudinal waves.

It will be assumed that the waves which propagate through a long metal rod from its mid-point, when it is dragged lengthwise at its mid-point, such as to make the rod appear to move as a single item, will operate on the same principle as a longitudinal magnetic wave, but that it will be especially akin to the entrainment wave mentioned at the end of Section **II**, since in such circumstances, the compression or rarefaction will be on a considerably smaller scale.

Conclusion

IV. In the year 1888, Lord Kelvin (Sir William Thomson), who had once supported the idea of a vortex based luminiferous medium, changed his mind on the grounds that a sea of vortices would be compressible, and hence electromagnetic waves would have to involve a longitudinal component that is incompatible with the reflection and refraction of light, **[6]**. What Lord Kelvin didn't consider, however, was the fact that the longitudinal waves would involve a completely separate emission mechanism, and that they would not automatically accompany the electromagnetic waves.

Electro-magnetic waves are based on the time-varying ***electro***-magnetic induction principle, and they are interwoven by a fluid electric current which accounts for their mass and momentum. This electric fluid is *the aether*, and these *'wet waves'* of aether flow through the luminiferous medium, propagated from aether vortex to aether vortex, due to the aether overflow that is caused by the precession of these vortices, **[3]**, **[7]**. Initiated by a tangential emission source that causes the vortices to precess, the gyroscopic force, induced in turn by the precessing vortices, deflects the electric current into the axial direction along the line of propagation. On reaching a receiving antenna, the gyroscopic force then deflects the electric current tangentially into the conducting wire.

The longitudinal waves in the sea of vortices, on the other hand, arise in a completely different context, as in when a magnetic field is being compressed or rarefied. These compression and rarefaction waves are *'dry waves'* involving no net flow of electric fluid. In the magnetic repulsion mode, the electric fluid is hemmed inside the vortices as they press against each other with centrifugal force while striving to dilate, **[5]**, whereas in the magnetic attraction mode, there is a two-way cancelling flow in the axial direction. The speed of these longitudinal waves is unknown, and it may be many orders of magnitude greater than the speed of light. See **Appendix B** after the reference section regarding longitudinal waves in conjunction with the zero-divergence of a magnetic field.

References

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https://www.researchgate.net/publication/335169091_Wireless_Radiation_Beyond_the_Near_Magnetic_Field

[2] Tombe, F.D., ***"Newton's Cradle Disproves Einstein's Theories of Relativity"***, (2014)
https://www.researchgate.net/publication/267569492_Newton's_Cradle_Disproves_Einstein's_Theories_of_Relativity

[3] Lodge, Sir Oliver, ***"Ether (in physics)"***, Encyclopaedia Britannica, Fourteenth Edition, vol. 8, pp. 751-755, (1937)
See pages 6 and 7 in the pdf file in the link below, beginning at the paragraph that starts with, ***Possible Structure.−*** , and note that while the quote suggests that the ether is incompressible, this article suggests otherwise. The quote in question, in relation to the speed of light, reads, ***"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"***
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http://vacuum-physics.com/Maxwell/maxwell_oplf.pdf

[5] Whittaker, E.T., ***"A History of the Theories of Aether and Electricity"***, chapter 4, pp. 100-102, (1910)
"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."

[6] Thomson, Sir William, ***"On the reflexion and refraction of light"***, Philosophical Magazine, vol. XXVI, Fifth Series, pp. 414-425, (1888)
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Appendix A

(General Details Regarding the Deformation of a Steady State Magnetic Field)

When a magnet is rotated, its magnetic field is not entrained with it, but unless it rotates about its magnetic axis, the tiny aether vortices in the luminiferous medium, of which their solenoidal alignment along their mutual rotation axes constitutes the magnetic field, will continually realign such that an identical magnetic field will co-rotate with the magnet. It's only in the case when a magnet undergoes translational motion that the magnetic field is actually entrained with the motion. This is due to the angle at which the vortices in the magnetic field are bonded into the magnet, and it is a very important factor when it comes to explaining the magnetic force that acts between two magnets. Since this force is transmitted through their magnetic fields, the magnets need to be strongly bonded into these fields in order for there to be any grip.

In the case of magnetic repulsion between like-pole magnets, the field lines of the two magnets meet laterally at an interface, and so the repulsion is caused by centrifugal pressure in the mutually aligned equatorial planes of the vortices. The explanation for magnetic attraction between unlike poles is however somewhat different. In the case of magnetic attraction, the vortices are aligned along their mutual rotation axis and the attractive force is due to electrostatic aether tension between the electron sinks and positron sources within the vortices. These electrons and positrons form a double helix pattern along each magnetic line of force, **[8]**, and when a north pole and a south pole magnet move together, whether forced externally, or by their mutual force of attraction, the vortices will spin faster. Therefore, the compression wave will always involve a propagation of faster spin, while the rarefaction wave will always involve a propagation of slower spin.

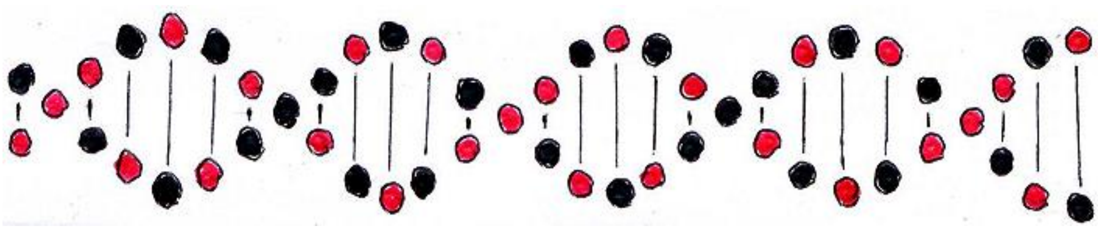

Fig. 1. A single magnetic line of force. The electrons are shown in red, and the positrons are shown in black. The double helix is rotating about its axis with a circumferential speed equal to the speed of light, and the rotation axis represents the magnetic field vector.

In Fig. 1, if we stretch the line of force along its length, providing that it is not in the process of being inflated by a rising source electric current, then the rotation rate of the dipoles will slow down. The same will happen when the lateral pressure reduces, as when two like-magnetic poles are moving apart from each other.

If, however, we compress this magnetic line of force, either along its length or laterally from the sides, providing that it is not in the process of discharging its electric fluid into an electric inductor circuit that has just been switched off, the dipoles will then spin faster.

Appendix B

(Longitudinal Waves in Connection with Zero Divergence)

There is a theory which says that if the divergence of a vector field is zero, that this rules out longitudinal waves. The argument is normally explained within the context of a deformation displacement field in an elastic medium where the divergence is connected directly to the state of compression or to the state of rarefaction of the medium. However, by this line of reasoning, we would have to be physically interpreting the concept of divergence in connection with sinks and sources in hydrodynamics, which of course is not a problem, since elasticity ultimately comes down to aether hydrodynamics at a deeper level. The deeper level involvement of aether hydrodynamics in elasticity theory explains why the speed of light, the dielectric constant, and the electric permittivity, are all so closely related to the speed of the circumferential aether flow around the edge of the tiny vortices that fill all of space, [7], and which due to their mutual alignment along their rotation axes, make up the prevailing magnetic field.

But the problem now at hand is to establish how this very same wave carrying medium also permits the existence of longitudinal steady state magnetic waves, when we know that the divergence of a magnetic field, is without exception, always equal to zero. A clue was given in **Appendix A** above, where we saw that magnetic field lines are comprised of an equal number of sinks and sources, and where it was suggested that steady state magnetic waves are in fact spin-waves, but this in itself does not solve the problem. We need to take a closer look at the precise physical meaning of the divergence of a magnetic field, where cylindrical symmetry applies, because it is different from the physical meaning of divergence in connection with radial fields, such as the electrostatic field, where the field lines terminate on negatively charged particles (sinks), or positively charged particles (sources).

To begin with, the most important fact to realize is that the magnetic field, **B**, is a solenoidal vector field, and that its zero-divergence is not based on any inverse square law of distance. Its zero divergence is based on the Maxwell equation, $\nabla\times\mathbf{A} = \mathbf{B}$, where the vector field, **A**, referred to by Maxwell as the *electromagnetic momentum*, is given no physical meaning in the modern textbooks and is merely referred to as the *magnetic vector* *potential*. This means that the magnetic field, **B**, is an axial vector, and so its zero divergence has got no bearing whatsoever on the issue of compression, rarefaction, or longitudinal wave propagation. The magnitude of the magnetic vector, **B**, is not derived from a net balance of sources and sinks, but rather from a spin factor. Its direction does however run through the middle of a spinning double helix spiral of equal and opposite sources (positrons) and sinks (electrons).

Then there is the very interesting vector field, **A**, itself, which opens up a few more questions. Based on the Maxwell equation, $\nabla\times\mathbf{A} = \mathbf{B}$, mentioned above, the vector **A** is the primary physical essence of a magnetic field, and it would appear to represent the momentum of the circumferential aether flow within the vortices, while the axial magnetic field vector, **B**, merely represents the vorticity. The vector **A** therefore represents a tiny, closed electric circuit, where space is densely packed with such tiny circuits. In the steady state, the radial centrifugal force that is acting outwards in each one of these tiny vortices, is balanced by the centrifugal force that is pressing inwards on them from the immediately neighbouring vortices, such as to hem them in. And since there is no transverse force acting when in the steady state, conservation of angular momentum would suggest that **A** has an inverse dependence on radial distance from the centre of the vortex. Taking the cylindrical symmetry into consideration, this means that we will probably have to accept that, in the steady sate, its divergence is in fact zero, because even in the case of ***electro***-magnetic waves, where the tiny electric current is flying off axially at a tangent, from circuit to circuit, the mathematical analysis treats the divergence of **A** as being zero. But, as in the case of **B**, since this zero-divergence has got nothing to do with sinks or sources, it will present no impediment to the luminiferous medium supporting the longitudinal spin-waves that arise in connection with the compression and rarefaction of a steady state magnetic field.

When ***electro***-magnetic waves are passing through and disturbing the steady state, the vortices precess, and aether overflows tangentially from vortex to vortex, and due to the gyroscopic effect, this tangential flow is deflected perpendicularly into the axial direction. The vector **A** then becomes *Maxwell's displacement current*. Treating the divergence of **A** as zero is known inappropriately as the *Coulomb gauge*. The name is inappropriate because the electrostatic Coulomb force is not explicitly involved in the propagation mechanism.

In the case of the *Lorenz gauge*, on the other hand, where the divergence of **A** is not zero, and the electrostatic Coulomb force is explicitly involved, we are operating in a convective state where energy exchanges between fields in motion, relative to the background electron-positron vortex sea, involve the radial flow of aether (electric fluid) between electron sinks and positron sources.