

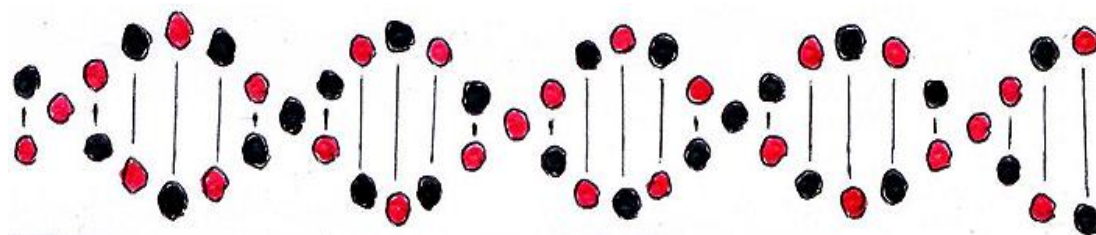
Tesla on the Aether and the Implications

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14th December 2022*

Abstract. Serbian American electrical engineer Nikola Tesla (1856-1943), wrote,

“Long ago he (mankind) recognized that all perceptible matter comes from a primary substance, of a tenuity beyond conception, filling all space, the Ākāśa 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.”

We will now investigate as to what exactly this was supposed to mean.



Perceptible Matter

I. The quote in the abstract is taken from an article entitled, “*Man’s Greatest Achievement*”, which was first written by Nikola Tesla in the year 1907 and finally published more than twenty years later in the Milwaukee Sentinel, [1]. It presents a picture of a fluid-like primary substance known as the *aether*, filling all of space, but which only becomes perceptible as *matter* when it is rendered into tiny whirlpools that are believed to possess extremely high angular speeds. No explanation is given as to how this happens, other than to state that it occurs due to the agency of a life-giving creative force. No distinction is made in principle as between the 118 elements of the periodic table which we associate with *ponderable matter*, and the much smaller molecular vortices that James Clerk Maxwell proposed in the year 1861 to fill all of space in order to account for electromagnetic phenomena, [2].

We are therefore left to consider three different degrees of perception. There is first of all the pure fluid itself, which although considered by men of old to be

imperceptible, is surely that which can manifest itself as electric current, and which we all know can be very perceptible!

Secondly, we have Maxwell's all-pervading sea of tiny molecular vortices that is involved in electromagnetic and optical phenomena. It is proposed that what is now referred to as the *magnetic vector potential* and normally denoted by the vector symbol, \mathbf{A} , is in fact the momentum density of the pure electric fluid (or aether), whether in the irrotational or the curled state. The vector, \mathbf{A} , was known to Maxwell as the *electromagnetic momentum*, and he identified it with Faraday's *electrotonic state*. Each of the tiny aethereal vortices in Maxwell's luminiferous medium will involve a circumferential momentum with an associated vorticity expressed through the curl equation, $\nabla \times \mathbf{A} = \mathbf{B}$, where \mathbf{B} is the vorticity density or the *magnetic flux density*.

And thirdly, we have the 118 elements of the periodic table which we can weigh on the scales, and which comprise what we refer to as *ponderable matter*. The atoms of these elements of ponderable matter, which we can actually touch and feel, are undoubtedly aethereal vortices of a more complex nature, each containing a nucleus which accounts for most of its mass.

It is now proposed that all atoms and molecules contain at least one aether sink and one aether source, whether they be the tiny molecular vortices of Maxwell's luminiferous medium, or the larger complex vortices of ponderable matter. These sinks and sources constitute electrically charged particles and they serve as portals connecting the universe to something external that is beyond conception.

The Double Helix Alignment

II. About a hundred years prior to Maxwell, Johann Bernoulli II, the younger brother of the more famous Dan Bernoulli, had also proposed that space is filled with tiny aethereal whirlpools. Johann Bernoulli II was working in the field of optics, and he proposed that these tiny vortices were pressing against each other with centrifugal force while striving to dilate.

“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.” [3]

In order for this centrifugal force to act, immediately neighbouring vortices would have to be mutually aligned in their equatorial planes, and indeed, exactly such an alignment was fully built into Maxwell's proposal for the

physical structure of the prevailing magnetic field in space. In the preamble to Part I of his 1861 paper, *“On Physical Lines of Force”*, [2], Maxwell proposed a hydrodynamically stable arrangement in which neighbouring vortices are bonded together solenoidally by aethereal tension in the axial direction, and by centrifugal pressure in the aether in the equatorial plane of the vortices. The axial tension acting along the magnetic lines of force explains the attraction between unlike-magnetic poles, while the repulsion between like-magnetic poles is explained by centrifugal pressure acting perpendicularly from the lines of force. In the case of magnetic attraction between unlike-magnetic poles, the field lines join directly between the two poles, whereas in the case of magnetic repulsion, the field lines between the two like-poles bend away from each other and only touch laterally, hence activating the centrifugal repulsion in the equatorial planes of the constituent vortices.

When Maxwell’s solenoidal alignment then takes into consideration the dipolar sink/source nature of the molecular vortices, space takes on a dielectric nature and the prevailing magnetic lines of force take on a double helix structure within the dielectric. The double helix structure makes the attractive tension mechanism between unlike magnetic poles even more understandable, since it is simply based on the electrostatic attraction being channeled, between sink and source, along the double helix, [4], [5]. See Fig. 1 below,

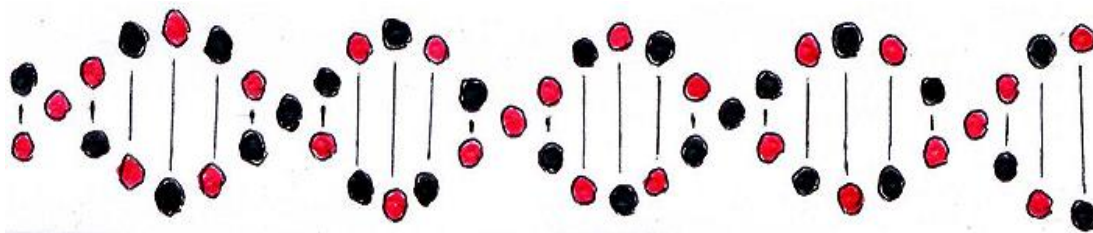


Fig. 1. A single magnetic line of force. The double helix alignment channels an electrostatic tension along the line, and this will pull a north and a south pole magnet together.

Electromagnetic Waves and Displacement Current

III. In the 1937 Encyclopaedia Britannica, the following quote appears in the article entitled, *“Ether (in physics)”*, but it is not clear who was the originator of the idea presented in the quote. The article itself was written by Sir Oliver Lodge, but he doesn’t say that it was his own idea. The quote in question is in relation to the speed of light, and it reads as follows, [6],

“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”

Contrary to what it says however, the pure irrotational fluid will certainly be compressible, but as to whether or not the actual sea of tiny vortices as a whole will be compressible, that is harder to decide. It might be that any external pressure applied to a volume of the vortex sea, rather than reducing the volume, will simply result in the vortices spinning faster, such that the increased centrifugal pressure generated internally, will always exactly cancel with the externally applied pressure.

Consider the vorticity equation mentioned in Section I above,

$$\nabla \times \mathbf{A} = \mathbf{B} \tag{1}$$

and consider it in connection with the sea of tiny vortices, exactly as per the 1937 Britannica article. The magnetic flux density, \mathbf{B} , will represent the axes of rotation of these vortices, while \mathbf{A} will represent the fine-grained circumferential momentum density.

And now we will consider *Ampère’s circuital law* as it applies in this physical context. Ampère’s circuital law, in general, takes the form,

$$\nabla \times \mathbf{B} = \mu \mathbf{J} \tag{2}$$

where μ is the *magnetic permeability* and \mathbf{J} is the source *electric current* of the magnetic field. However, in the context of the sea of tiny vortices, the only electric current present is that associated with the fine-grained aether circulation around the circumference of the vortices, and so we can equate \mathbf{J} with \mathbf{A} .

Replacing \mathbf{J} with \mathbf{A} in equation (2), yields,

$$\nabla \times \mathbf{B} = \mu \mathbf{A} \tag{3}$$

where μ is the density of the circulating aether, and \mathbf{A} , unknown to Maxwell, is the root of *Maxwell’s displacement current*.

Now, during the passage of a wave, the circumferential momentum in a vortex at the locality will oscillate, leading to the simple harmonic relationship,

$$\mathbf{A} = -\varepsilon \partial^2 \mathbf{A} / \partial t^2 \tag{4}$$

where ε is the elasticity factor known as the *electric permittivity*. Taking the curl of equation (1) and substituting equations (3) and (4) into the right-hand-

side, *then providing that we are in the Coulomb gauge*, where the divergence of \mathbf{A} is equal to zero, we obtain,

$$\nabla^2 \mathbf{A} = \mu\epsilon \partial^2 \mathbf{A} / \partial t^2 \quad (5)$$

Equation (5) is the electromagnetic wave equation first derived by Maxwell in his 1873 Treatise, [7], and it matches perfectly with the physical model for such waves described in the quote above from the 1937 Encyclopaedia Britannica.

The Coulomb gauge means that the wave propagation mechanism does not involve any volumetric distortion of the wave carrying medium, and so we are left to conclude that the displacement mechanism must entail fine-grained precession. Hence it doesn't matter what the orientation is of the prevailing background magnetic alignment. A precession wave can propagate either along the magnetic lines of force, perpendicular to them, or at any angle in between.

It's a matter of curiosity that the term *Coulomb gauge* is somewhat ironic, since it means that we are dealing with a physical phenomenon which, being perpendicular to the radial electrostatic Coulomb force, does not therefore involve the Coulomb force itself.

An electromagnetic wave equation in \mathbf{B} can be obtained by taking the curl of equation (5), and since by definition, electric field, \mathbf{E} , is equal to $\partial \mathbf{A} / \partial t$, as observed in the case of time-varying electromagnetic induction, then we can also obtain a wave equation in \mathbf{E} by taking the partial time derivative of equation (5).

Conclusion

IV. The Coulomb gauge is essential in the derivation of the electromagnetic wave equations, as confirmed from the analysis in Section **III** in this article, and this reality can be physically interpreted within the context of one of the molecular vortices that comprises the wave-carrying medium. If we place the polar origin of the analysis at the centre of such a vortex, then the Coulomb gauge tells us that the elastic forces involved in the propagation mechanism are purely transverse to this polar origin. From this we can deduce that electromagnetic waves do not involve any volumetric distortion of the luminiferous medium, and so can therefore only entail the propagation of fine-grained angular acceleration. More details on the mechanism were provided in a quote in Section **III** above from an article in the 1937 Encyclopaedia Britannica, [6], suggesting that when the vortices are induced to angularly accelerate, net pressurized aether flows across the gap to the immediate neighbour along the line of propagation, and then the cycle repeats with respect to that neighbour.

As to how this can possibly happen, it is now suggested that the vortices are dipolar, each containing an aether sink and an aether source that are controlled by a life-giving creative force beyond conception, which Tesla's article refers to as the "**Prana**", [1]. The electromagnetic wave mechanism would therefore involve an in/out flow of aether, into sinks (electrons) and out of sources (positrons). This means that the angular acceleration which each vortex undergoes when an electromagnetic wave is passing through is actually a precession. The vortex tumbles, and as it does so, excess aether emerges from its positron and is swirled across to the electron of the neighbouring vortex, along the line of propagation. The electron draws the excess aether in, and in doing so, the associated vortex tumbles and the cycle repeats. The aether that flows across the gap between the two vortices, in association with the wave, is in fact *Maxwell's displacement current*. More details on the proposed propagation mechanism are provided in the article, "**Wireless Radiation Beyond the Near Magnetic Field**", [8].

References

[1] O'Neill, John J., "**PRODIGAL GENIUS, Biography of Nikola Tesla**", Long Island, New York, 15th July 1944, Fourth Part, paragraph 23, quoting Tesla from his 1907 paper "**Man's Greatest Achievement**" which was published in 1930 in the Milwaukee Sentinel,

"Long ago he (mankind) recognized that all perceptible matter comes from a primary substance, of a tenuity beyond conception, filling all space, the Ākāśa 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."

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[2] Clerk-Maxwell, J., "**On Physical Lines of Force**", Philosophical Magazine, vol. XXI, Fourth Series, London, (1861)

http://vacuum-physics.com/Maxwell/maxwell_oplf.pdf

[3] 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."

[4] Tombe, F.D., “*The Double Helix and the Electron-Positron Aether*” (2017)
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[5] Tombe, F.D., “*The Double Helix Theory of the Magnetic Field*” (2006) Galilean Electrodynamics, vol. 24, Number 2, p.34, (March/April 2013)
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[6] Lodge, Sir Oliver, “*Ether (in physics)*”, Encyclopaedia Britannica, Fourteenth Edition, vol. 8, pp. 751-755, (1937)
“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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(See pages 6 and 7 in the pdf file in the above link, beginning at the paragraph that starts with, *Possible Structure.*—)

[7] Maxwell, J.C., “*A Treatise on Electricity and Magnetism*”, vol. II, Chapter XX, ‘*Plane Waves*’, section 790, equation (19), pp. 389-390, (1873)
https://en.wikisource.org/wiki/A_Treatise_on_Electricity_and_Magnetism/Part_IV/Chapter_XX

[8] Tombe, F.D., “*Wireless Radiation Beyond the Near Magnetic Field*” (2019)
https://www.researchgate.net/publication/335169091_Wireless_Radiation_Beyond_the_Near_Magnetic_Field

Appendix

For the equivalence of the luminiferous medium with the inertial medium, See, “*The Rattleback and the Magnus Force*” at,
https://www.researchgate.net/publication/361277369_The_Rattleback_and_the_Magnus_Force