# The Double Helix and the Electron-Positron Aether

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Abstract. **This article takes a closer look at the bonding and stability mechanisms within the electron-positron dipole sea and how these result in the double helix theory of the magnetic field. The physical connection between the inertial forces and magnetic repulsion will be further investigated.**
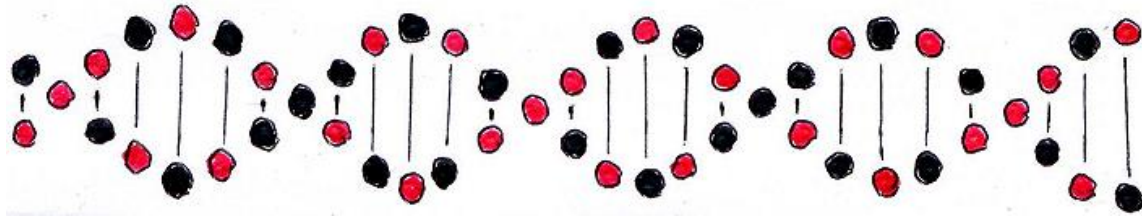
The Inertial Frame of Reference

I. Newton's first law of motion states that a moving body continues in its uniform straight-line path unless acted upon by a force. The term *force* in the context naturally excludes the inertial forces since these are actually a consequence of the motion itself. Newton's first law assumes that the concept of straight line motion is already defined and understood, but in order to define it we need to establish a physical basis that will link it to the inertial forces, because uniform straight line motion involves a centrifugal force to every point in space. This generally unrealized fact is pure geometry, as sure as Pythagoras's theorem. Centrifugal force is angular momentum dependent and it obeys an inverse cube law in distance to the chosen point origin. See section **VIII** below.

    It will be proposed that space is densely packed with electrons and positrons [1], [2], [3], [4], forming an elastic dielectric medium which does not appear to rotate with respect to the average motion of the distant stars, and that this medium will be entrained within the gravitational fields of planetary bodies so as to form local frames of reference that will exist in a system of hierarchies throughout the universe. These local frames of reference will be referred to as *"inertial frames of reference"*, a name first invented in 1885 by German physicist Ludwig Lange. Although this name is totally suitable, it must be remembered that it first came to prominence in conjunction with Einstein's Special Theory of Relativity, [5], on the basis that an inertial frame of reference

is void of gravity. Special relativity is however notorious for its internal contradictions, [6], and so this fact will be disregarded. A frame of reference as a meaningful physical entity in classical mechanics needs to be entrained within a gravitational field in order to have any definition.

The electrons and positrons that make up an inertial frame of reference will constitute what is erroneously believed to be *'the annihilated state'* as is officially taught with respect to electron-positron pair annihilation. The question then arises as to how the electrons and positrons themselves will bond with their neighbours in a manner that is commensurate with the forces of electromagnetic induction. The Coulomb force would act first so as to collapse the electron-positron sea into rotating dipoles in which an electron and a positron undergo a mutual orbit. Ampère's Circuital Law would suggest that these rotating dipoles attract each other, electron to positron, to form toroidal double helix rings. Such rings would then constitute magnetic lines of force. We can then see how the magnetic force of attraction would be explained as an electrostatic attraction acting between electrons and positrons along the double helix. The question then arises as regards the force that will act between neighbouring dipoles in their equatorial planes such as to prevent the magnetic lines of force from collapsing.

Centrifugal Force and Magnetic Repulsion

II. Consider two electron-positron dipoles sitting side by side while rotating in the same plane and in the same direction. When the electron of one dipole passes the positron of the other dipole in the opposite direction at closest approach, the electrostatic field lines will connect directly between the two particles. According to Coulomb's law there should be a force of attraction acting between them, as in the case of any two particles of opposite charge. If, however the electrostatic force field, **E**, is based on tension in an aethereal fluid that is flowing from the positron to the electron, their mutual transverse speed will induce a curl in the velocity field. Above a certain threshold of angular speed, the flow lines between the two dipoles will split and the two separate regions of fluid will now be shearing past each other in opposite directions. The pressure emanating from the sides of the opposing flow lines will then push the two dipoles apart. A centrifugal repulsion will have taken the place of the electrostatic attraction. A magnetic field would therefore appear to be a centrifugal force field, and so it is proposed that particles are sinks or sources in an electric fluid, *the aether*, this being the primary substance from which all matter is made. As a convention, electrons will be considered to be aether sinks while positrons are aether sources.

Electric current cannot be fully understood in the absence of such a primary fluid flow at a deeper level than the flow of charged particles. Electrons would

eat their way upstream in such a fluid while positrons would be pushed in the opposite direction, and if the fluid were inviscid, charged particles would be accelerated by the fluid due to pressure or tension but without taking on the fluid's actual velocity. Electric signals in a conducting wire travel at a speed that is in the same order of magnitude as the speed of light, and this is probably the speed of the electric fluid.

Intrinsic Magnetic Spin Moment

III. The intrinsic magnetic spin moment of an electron and a positron would provide a stabilizing repulsive force in the equatorial plane of rotating electron-positron dipoles which would definitively cause neighbouring dipoles, mutually aligned in their equatorial planes, to repel each other. Unless we consider magnetic field lines to be completely distinct from electrostatic field lines, the obvious conclusion therefore is that the magnetic spin moment of electrons and positrons is nothing other than the curl of the velocity fields of their electrostatic fields, and that the magnetic repulsion arising from magnetic spin moment is in fact caused by centrifugal force.

The Magnetic Field

IV. Part I of Maxwell's 1861 paper ***"On Physical Lines of Force"***, [7], treated the aspects relating to the curl of the velocity field in a sea of tiny aethereal vortices. These aspects are magnetic force and Ampère's Circuital Law. Maxwell didn't mention the idea of a dielectric medium until Part III of the same paper, but in order to amalgamate the concepts it is now proposed that rotating electron-positron dipoles constitute dipolar aether vortices, with the electrons being sinks and the positrons being sources, and that they are powered up to such high speeds that their escape velocity is exceeded and they press against each other with centrifugal force while striving to dilate, hence hemming each other in [8], [9]. The broken flow lines in the equatorial plane will have to terminate upwards and downwards with their neighbours in the axial direction. This recalls the Newton's rotating bucket. In other words, the centripetal force that keeps the electrons and positrons in circular orbit is not caused by the internal electrostatic attraction within each dipole, but rather by the centrifugal force pressing inwards on them by their neighbouring dipoles [10]. The fundamental principle behind centrifugal force is therefore based on the hydrodynamical principle that a flowing fluid cannot move sideways through shear lines. This can even be observed in the case of a toroidal vortex in water. The circulating water doesn't fly off at a tangent. Acknowledging the existence

of the primary electric fluid therefore enhances the picture of the electron-positron dipoles.

As a general rule it is proposed that the flow rate into electrons is greater than the flow rate out of positrons, hence causing a tendency to collapse which can only be prevented by vorticity and hence by centrifugal force. Rotation is the stabilizer of the universe. It is also proposed that curl widens both the sinks and the sources while obstructing the flow of aether between the positron and the electron within a dipole.

When a source or a sink is placed in a magnetic field, it will be induced to rotate like an idler wheel in the opposite direction to that of the surrounding electron-positron dipoles. If the source or sink is then induced to move through the field, at right angles to the magnetic axis, the flow will be broken on one side only, hence causing a centrifugal pressure differential at right angles to the direction of motion. This will cause a deflection expressed by the equation $\mathbf{F} = q\mathbf{v}\times\mathbf{B}$ [11]. The deflection will be in one direction for sinks and in the opposite direction for sources. This is because the flow pattern will curl oppositely in each case, even though the spin will be in the same direction. The breaking of the flow on one side, when translational motion occurs, will be on opposite sides for sinks and sources.

Ampère's Circuital Law

V. When rotating electron-positron dipoles bond together along their rotation axes to form a double helical toroid with nothing in the toroidal hole in the middle, the Coulomb attraction along the double helix would tend to make the helix collapse. If the circumferential speed of each rotating dipole is $\mathbf{v}$, then $\nabla\times\mathbf{v} = \mathbf{H}$ where $\mathbf{H}$ is the vorticity or the magnetic intensity, and hence $\nabla.\mathbf{H} = 0$ meaning that $\mathbf{H}$ is solenoidal. The speed $\mathbf{v}$ represents the flow of the primary aethereal fluid, and this constitutes an electric current. At the hole in the middle of the toroid there will be a concentration of electric fluid and the current density will be $\rho\mathbf{v} = \mathbf{J}$ where ρ is the aether density in the hole. Since $\mathbf{H}$ forms a circle around the inside of the double helix, it follows therefore that $\nabla\times\mathbf{H} = \mathbf{J}$. This is Ampère's Circuital Law and the concentration of electric current through the hole in the toroid prevents the toroid from collapsing into the hole. Unlike in the case of fluid pouring down a sink, a toroid involves only solenoidal flow and so the fluid circulates around indefinitely. The fluid cannot pass sideways through itself in the toroidal hole and so the toroid cannot collapse. The double helix toroid is therefore the fundamental basis for stability and the default alignment in the electron-positron sea.

Ampère's Circuital Law means that when a current or a particle, neutral or otherwise, moves through the electron-positron sea, it causes the electron-positron dipoles to align with their rotation axes forming solenoidal rings

around the direction of motion. It's similar in principle to the creation of smoke rings. Maxwell explains Ampère's Circuital Law at equation (9) in Part I of his 1861 paper [7].

When a current flows through an already existing magnetic field, Ampère's Circuital Law will encounter a resistance and the reaction to this resistance will be a compound centrifugal force of the form $\mathbf{E} = \mathbf{v} \times \mathbf{B}$. The three above equations, $\nabla \times \mathbf{v} = \mathbf{H}$, $\nabla \times \mathbf{H} = \mathbf{J}$, and $\mathbf{E} = \mathbf{v} \times \mathbf{B}$ are all identifiable in Maxwell's original equations, [12], and they relate to the curl of the velocity field in the primary aethereal/electric fluid. $\mathbf{E} = \mathbf{v} \times \mathbf{B}$ arises in both electric motors and motionally induced electromagnetic induction. The equation $\nabla \times \mathbf{v} = \mathbf{H}$ would be more familiar in the form $\nabla \times \mathbf{A} = \mathbf{B}$. The difference between $\mathbf{v}$ and $\mathbf{A}$ is that $\mathbf{v}$ represents the source current at the centre of a magnetic field, whereas $\mathbf{A}$ represents the density of circulating current in the sea of rotating dipoles and is therefore equal to $\mu\mathbf{v}$ where μ is related to the electron-positron sea density and corresponds to magnetic permeability. The vector $\mathbf{B}$ which is equal to $\mu\mathbf{H}$ is the magnetic flux density. The vector $\mathbf{A}$ was known to Maxwell as the electromagnetic momentum and he equated it with Faraday's *electrotonic state*. Part II of Maxwell's 1861 paper dealt with electromagnetic induction. Maxwell began treating the vector $\mathbf{A}$ in Part II beginning at equation (58), but it seems he didn't notice that it corresponds to the displacement current which he proposed in Part III of the same paper in his treatment of the elasticity of the luminiferous medium. The vector $\mathbf{A}$ is nowadays known as the magnetic vector potential, but its physical significance has been lost.

The vector $\mathbf{A}$ is the fine-grained electric current in a magnetic field giving rise to the field's kinetic energy $\frac{1}{2}LI^2$. In the steady state it circulates within the tiny dipoles at the speed of light, but in the dynamic state it becomes electromagnetic radiation and transmits from dipole to dipole at that same speed [13], [14]. In the steady state, the velocity field in a rotating dipole is curled, but the electric field, being exclusively the electrostatic field $\mathbf{E_S}$, is still irrotational because the acceleration is purely radial. When angular acceleration occurs however, $\partial\mathbf{A}/\partial t$ will be non-zero, and the $\mathbf{E}$ field will curl. The newly induced transverse component of the $\mathbf{E}$ field will therefore obey $\mathbf{E_K} = \partial\mathbf{A}/\partial t$, and so we will have $\nabla \times \mathbf{E_K} = \partial\mathbf{B}/\partial t$ which, bar the absence of a negative sign, is the Maxwell-Faraday law for time varying electromagnetic induction, but it also applies when a magnetic field is in the process of being generated in a primary circuit. It's similar in principle to Newton's Second Law of Motion with inductance replacing inertial mass, and the negative sign is introduced by convention to highlight Lenz's Law. Since energy is transferred during electromagnetic induction, this suggests that wireless EM radiation is a wave of fine-grained angular acceleration accompanied by a net vortex flow of electric fluid momentum [14]. Angular acceleration causes aether to overflow from one dipole to its neighbour.

Inertial Centrifugal Force

VI. An objection is often raised that if space is densely packed with electrons and positrons, that this would impact upon inertial motion by creating a dissipative resistance, whereas nothing like this is observed in planetary orbits. On the contrary, it is the very presence of rotating electron-positron dipoles in space which gives rise to the inertial forces that determine the uniform straight-line path. As a body moves through the electron-positron sea, the physical interaction induces a reorientation of the immediately surrounding rotating dipoles such that their rotation axes trace out concentric rings around the path of motion. A centrifugal force therefore presses inwards on the body from all sides, at right angles to its direction of motion. This is identical in principle to how Maxwell explained the formation of a magnetic field around an electric current. As the induced reorientation of the dipoles propagates outwards from the moving body in a wave-like manner, the body will experience a centrifugal force to every point in space. Apart from where the surrounding dipoles contact the moving body directly, each centrifugal force will be indirectly due to the individual rotating electron-positron dipole which exists at the origin in question [15]. The combined effect of every centrifugal force, to every point in space, results in the fact that moving bodies are sitting at the centre of a pressure field that extends into the space beyond, dropping off as per the inverse cube law. This is the circular energy flow mechanism that underlies Newton's first law of motion. The centrifugal pressure field is an extension of the body's kinetic energy and it amounts to a weak magnetic field. See the full analysis in section **VII** below, and as regards the issue of leakage to far field radiation in low energy situations, see section **II**, *'Far Field Radiation'*, in ***"Electromagnetic Radiation in the Near Magnetic Field"*** [16]. It should be emphasized that centrifugal force is measured relative to a point and is hence represented by a position vector as opposed to a displacement vector. It is therefore camouflaged in terrestrial situations where Cartesian coordinates are used in connection with displacement vectors. The physical importance of inertial centrifugal force on the large scale mainly emerges in rotating systems and in radial force fields where it can actively oppose a centripetal force or displace particles in a fluid as in the case of a centrifuge. Centrifugal force can also reverse the angular momentum in a rotating rattleback [17].

The Inertial Path

VII. Consider a body in motion in an inertial frame of reference. We can write the position vector of this body relative to any arbitrarily chosen polar origin as,

$$\mathbf{r} = r\hat{\mathbf{r}} \tag{1}$$

where the unit vector $\hat{\mathbf{r}}$ is in the radial direction and where r is the radial distance. Taking the time derivative and using the product rule, we obtain the velocity,

$$\dot{\mathbf{r}} = \dot{r}\hat{\mathbf{r}} + r\omega\hat{\mathbf{s}} \tag{2}$$

where $\hat{\mathbf{s}}$ is the unit vector in the transverse direction and where ω is the angular speed about the polar origin. Taking the time derivative a second time, we obtain the expression for acceleration in the inertial frame,

$$\ddot{\mathbf{r}} = \ddot{r}\hat{\mathbf{r}} + \dot{r}\omega\hat{\mathbf{s}} + \dot{r}\omega\hat{\mathbf{s}} + r(d\omega/dt)\hat{\mathbf{s}} - r\omega^2\hat{\mathbf{r}} \tag{3}$$

Re-arranging and multiplying across by mass m leads to,

$$m\ddot{\mathbf{r}} = m(\ddot{r} - r\omega^2)\hat{\mathbf{r}} + m(2v_r\omega + rd\omega/dt)\hat{\mathbf{s}} \tag{4}$$
†*see the note at reference [7] regarding Maxwell's equation (77)*

where ω is the angular speed and v_r is the radial speed. The radial component of equation **(4)** contains a centrifugal force, $m\ddot{r}$, and an inertial centripetal force, $-mr\omega^2$, while the transverse component contains a Coriolis force, $mrd\omega/dt$, which equals $2mv_r\omega$ when angular momentum is conserved. In the case of uniform straight-line motion, the total acceleration is zero, but when a constraint is introduced, an imbalance occurs in the inertial symmetry. For example, if the body is tethered to a pivot, the inertial centrifugal force pulls on the constraint, hence inducing a reactive centripetal tension within the material of the constraint. This tension cancels with the inertial centrifugal force and the resultant is a net inertial centripetal force which curves the path of motion.

The inertial centripetal force $-mr\omega^2$ in equation **(4)** with respect to one polar origin, is an inertial centrifugal force with respect to the origin at the same distance along a line through the moving body on the other side of it. From the perspective of the moving body, there is therefore a centrifugal force to every point in space giving rise to a cylindrical vector field in the likeness of the magnetic field that surrounds an electric current. The centrifugal force to any point on a particular cylindrical shell, concentric to the path of motion, will be a resolution of the centrifugal force to a point on the shell, that acts perpendicularly to the path of motion. The perpendicular centrifugal force will drop off with an inverse cube law in distance from the moving body (see equation **(6)**). Since centrifugal force is the radial gradient of kinetic energy ($\partial/\partial r[\frac{1}{2}mr^2\omega^2] = mr\omega^2$), it is now proposed that this cylindrical vector field represents the extension of the body's kinetic energy.

7

The idea that a moving entity could yield up energy to a surrounding medium and have it returned during deceleration is observed in the case of an electromagnetic field. When the power supply to an electric circuit is disconnected, its magnetic field collapses and its stored energy, $\frac{1}{2}LI^2$, flows back into the circuit giving the current a final surge forward. Another rather obvious connection between the inertial forces and magnetism is the fact that the Coriolis force has a similar form to the magnetic force, $\mathbf{F} = q\mathbf{v}\times\mathbf{B}$, if we adopt Maxwell's idea that it is caused by a sea of molecular vortices pressing against each other with centrifugal force while striving to dilate [7], [8], [9], and where the vorticity, $\mathbf{H} = 2\boldsymbol{\omega}$, represents the magnetic intensity, where $\boldsymbol{\omega}$ is the circumferential angular speed of the vortices and where $\mathbf{B} = \mu\mathbf{H}$.

It is therefore proposed that kinetic energy, $\frac{1}{2}mv^2$, is a pressure, and an extended pressure field which drops off with an inverse cube law in distance, and that it is induced by the fine-grained centrifugal force interaction between the immediately surrounding vortices and the molecules of the moving body as they shear past each other. These vortices will be the rotating electron-positron dipoles introduced in section **I**, and they will form double helix vortex rings around the moving body, centred on the line of motion, similar in principle to smoke rings. To the front and rear of the motion, the vortices would therefore have to be continually aligning and de-aligning, and the associated precession of the vortices would be fully compatible with a Coriolis force acting equally and oppositely at the front and the rear of the motion. This process would be identical in principle to Maxwell's explanation for Ampère's Circuital Law. The kinetic energy pressure field, or inertial field, that accompanies a moving body is therefore in principle just a variation on the magnetic field theme. It is a weak magnetic field and a circular energy flow mechanism.

Planetary Orbits

VIII. In planetary orbital theory there is an additional factor to be taken into consideration. Although an inertial frame of reference is defined within the boundaries of a gravitational field, the analysis in section **VII** above only applies when gravity itself is negligible. In the orbital problem however, gravity is highly significance and we are dealing with two inertial frames of reference shearing past each other. These two gravity sinks undermine the inertial centrifugal pressure between the planets. Meanwhile conservation of angular momentum causes the two transverse terms in equation **(4)** to cancel. This is recognized in Kepler's second law, which is the law of equal areas. We can therefore reduce the problem to a scalar equation in the radial distance. Writing the centrifugal term in the form $+r\omega^2$, the radial scalar equation becomes,

$$\ddot{r} = -k/r^2 + r\omega^2 \tag{5}$$

where k is the gravitational constant. Taking l to be the angular momentum constant equal to $r^2\omega$, we can write Leibniz's equation in the form,

$$\ddot{r} = -k/r^2 + l^2/r^3 \tag{6}$$

or specifically for circular orbits,

$$\ddot{r} = -GM/r^2 + v^2/r \tag{7}$$

where G is the universal gravitational constant and M is the mass of the planet being orbited. The inter-play between the gravitational inverse square law attractive force and the centrifugal inverse cube law repulsive force involves two different power laws, and this leads to stable orbits that are elliptical, circular, parabolic, or hyperbolic. The centrifugal force will physically occur at the interface between the two inertial frames of reference. It will arise as a shear interaction between electron-positron dipoles at the interface, and since the gravitational field tails on the outer sides of the two planets will interfere with the inertial centripetal force mechanism, this results in the fact that equations **(5)**, **(6)**, and **(7)** represent the only physical realities in the radial direction. Centrifugal force is therefore exposed as a real force.

There is considerable unease in orthodox physics circles surrounding the centrifugal force terms in equations **(5)**, **(6)**, and **(7)**. While it is obviously a real force which opposes gravity, it is seldom named as such in modern textbooks. And it is certainly not an equal and opposite reaction to gravity because its existence is independent of gravity, and it does not in general have the same magnitude. The cognitive dissonance surrounding centrifugal force is typified in a quote which appeared in a *classical dynamics* textbook written in 1965 by Jerry B. Marion [18]. Regarding the centrifugal force term in planetary orbital analysis, Marion says,

> *This quantity is traditionally called the **centrifugal force**, although it is not a "force" in the ordinary sense of the word. We shall, however, continue to use this unfortunate terminology since it is customary and convenient.* Jerry B. Marion, 1965

So, what is it if it's not a force? Of course it's a force, and it's a centrifugal force. But some textbooks even propose the absurd idea that it is the centripetal term in equation **(4)**, as if a centripetal force could suddenly become a centrifugal force simply by it being taken across to the other side of an equation. The transition from equation **(4)** to equation **(5)** will continue to cause a problem so long as the deeper physical meaning behind the inertial terms is fully understood.

Conclusion

IX. There exists a primary electric fluid, or aether, with momentum field **A** such that $\nabla \times \mathbf{A} = \mathbf{B}$, where **B** is magnetic flux density, implying that space is filled with tiny aethereal vortices. These vortices press against each other with centrifugal force while striving to dilate [19], [20], [21], [22], [23]. Each vortex comprises of an electron sink in the aether, and a positron source. Gauss's law for electrostatics applies to irrotational sinks and sources where $\nabla \times \mathbf{A} = 0$. Centrifugal force and magnetic repulsion are inextricably linked, while magnetic attraction is simply Coulomb's law of electrostatics channelled along a double helix of electrons and positrons.

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† Equation (77) in Maxwell's paper is his electromotive force equation and it exhibits a strong correspondence to equation **(4)** in this article. The transverse terms $2mv_r\omega$ (where vorticity $\mathbf{H} = \mathbf{2\omega}$) and mdv_t/dt (where v_t is the transverse speed equal to $r\omega$) correspond to the compound centrifugal term $\mu\mathbf{v}\times\mathbf{H}$ and the Faraday term $-\partial\mathbf{A}/\partial t$, with m corresponding to μ, and where **A** is the electromagnetic momentum.

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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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"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".
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This quote is in relation to the speed of light,

 "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 article 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.

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