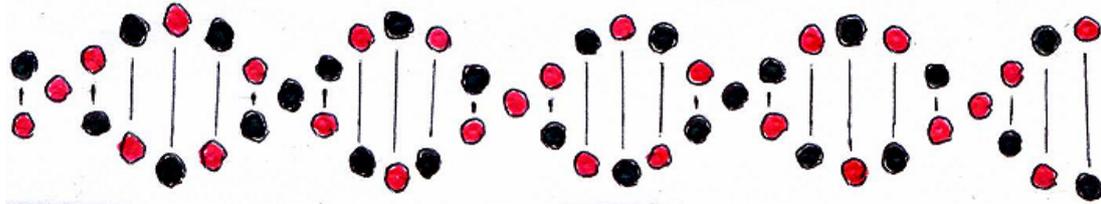# The DNA of Electromagnetic Radiation
(The Rotating Electron-Positron Dipole)

Frederick David Tombe
Belfast, Northern Ireland, United Kingdom,
Formerly a Physics Teacher at
College of Technology Belfast, and
Royal Belfast Academical Institution
sirius184@hotmail.com
30th September 2006, Sumatra, Indonesia
(28th January 2008 Amendment, Philippine Islands)

Abstract. It is proposed that space is a dynamic aethereal medium of unknown substance in which electrons constitute sinks, and in which positrons constitute sources. Negative and positive electric charge is merely a measure of the rate of flow of the aether into the sinks and out of the sources. Standard hydrodynamical theory indicates that this arrangement not only accounts for the irrotational radial flow (inverse square law force) of aether into electrons and out of positrons, but that it also yields three additional components of force. These three additional components are the centrifugal force $\omega^2 r$ associated with radial repulsion, the Coriolis force $v \times H$ associated with gyroscopes and motion in a vortex, and the rotational angular force $\partial A/\partial t$ that is associated with electromagnetic induction and electromagnetic radiation.

It is then explained how electromagnetism is a particular manifestation of these four forces that arises when we have a densely packed sea of rotating electron-positron dipoles. Each dipole will contain an aethereal vortex due to the flow of aether across from the positron to the electron. When the dipoles are aligned along their axial planes, such that their vorticity vectors H (curl A = H) form solenoidal field lines, this will effectively render the entire vicinity

into a rotating frame of reference on the large scale. This will invoke the Coriolis force on moving charged particles and it will lead to both the Lorentz force and to Weber's law of electrodynamics. This renders the rotating electron-positron dipole into the role of being the DNA of electromagnetism. Space is densely packed with these tiny dielectric vortices which are many orders of magnitude smaller than the size of an average atom.

Kepler's Law of Areal Velocity

I. Descartes' Vortex Theory of Gravity contradicted both Newton's Law of Gravity and the Law of Conservation of Energy. The discrepancy between these two theories of gravity can be better understood by considering Kepler's Law of Areal Velocity.

Kepler's Law of Areal Velocity has the effect of eliminating the tangential components of acceleration that would have been implied by Descartes' theory. Consider the expression for acceleration that we obtain when we differentiate the position vector twice with respect to time in an inertial frame of reference,

$$\mathbf{a} = (d^2r/dt^2 - \omega^2 r)_{radial} + (2\mathbf{v}X\boldsymbol{\omega} + rd\omega/dt)_{tangential} \qquad \textbf{(1)}$$

where **a** is particle acceleration, **r** is particle position vector, t is time, **ω** is the angular velocity of the particle, and **v** is the linear velocity of the particle. Kepler's Law of Areal Velocity gets rid of the two tangential components on the right hand side of equation **(1)**. When we solve this one body equivalent of the two body problem with the remaining radial components, the normal procedure is to substitute acceleration **a** on the left hand side of equation **(1)**, with Newton's inverse square law expression for the acceleration due to gravity. The solution to this equation comes out to be an ellipse, a parabola, or a hyperbola, depending on initial conditions.

We will now look at the general situation which occurs if we ignore the restrictive effects of Kepler's Law of Areal Velocity. Let us take a closer look at equation **(1)** which is testimony to the incredible power of vector calculus. By beginning with a position vector **r**, we are acknowledging the concept of a particle having a position in space. We are acknowledging the idea that space exists, and that particles exist. When

we differentiate the position vector with respect to time, we are acknowledging the fact that particles move in space. The result which we obtain at equation **(1)** is most revealing. It enables us to mathematically describe our observation of particles in motion in space.

We can see that the second term of the radial component **ω²r** is the centrifugal force, which is a radial repulsive effect which occurs when two particles have a mutual tangential motion. In part I of Maxwell's 1861 paper 'On Physical Lines of Force' [1], Maxwell inadvertently exposed the close connection between centrifugal force and kinetic energy, through the Bernoulli equation.

We can see that the first term of the tangential component **2vXω** is the Coriolis force, which is an effect that occurs when a particle moves in a vortex.

The mathematical description of motion in space makes absolutely no distinction between electricity and gravity, which leads us to suspect that Newton's law of gravity is in fact a special case of Coulomb's law of Electrostatics. If Newton's law of Gravity and Coulomb's law of Electrostatics are totally unrelated, that would imply that we must have two separate aethers for each theory. This would lead to the ridiculous idea that a positron could be a sink in one aether but yet be source in another aether.

There are a number of limitations to equation **(1)** which need to be mentioned.

(i) Equation **(1)** is derived on the basis of a two dimensional polar coordinate system, which confines us to the study of planar motion. If we were to differentiate the displacement vector within the context of freedom of movement in three dimensions, then it is theoretically possible that we may identify more effects. This has not yet been investigated.
(ii) It is limited further by the assumption that space is rigid. For the more general case of a liquid space (aether) we would need to replace **2ω** with the vorticity vector **H**, since **H** only equals **2ω** in the special case of rigid vortices.

We need to establish how best we can rearrange equation **(1)** such as to keep in line with existing experimental evidence. A better approach would be to substitute the Newton/Coulomb inverse square law term with the first term in the radial component. This makes more sense if we view

the inverse square law term as a radial inflow or outflow term. The correct general acceleration vector should then look like this,

$$\mathbf{g} = (−Q/r^2 + 1/4r\mathbf{H}^2)_{\text{radial}} + (\mathbf{v}\text{X}\mathbf{H} + 1/2r d\mathbf{H}/dt)_{\text{tangential}} \qquad \textbf{(2)}$$

where **g** is the general acceleration, irrespective of whether we are considering gravity or electricity, of any particle due to its motion and position relative to another particle in space. Q is the electric charge which represents the rate of inflow or outflow of aether from a sink or source, and **H** is the vorticity of the aether.

However, even equation **(2)** still has limitations.

(iii) Equation **(2)** only caters for elementary particles, or for the special situation of gravitating bodies in which the units are specially adapted for the fixed value of mass to charge ratio associated with gravitational mass. If we wish to consider the more general situation, we have to introduce mass to charge ratio.

(iv) Another limitation is the fact that equation **(2)** is written out using a coordinate system which is centred on one of the two bodies in the system, and suitable only for the equivalent one body problem. The multi body problem is non-analytical even in the absence of the three additional components.

The Direct Hydrodynamical Approach

II. An alternative to the above method is to begin with,

$$\mathbf{g} = d\mathbf{A}/dt \qquad \textbf{(The Unified Field Theory)} \qquad \textbf{(3)}$$

where **A** is the field velocity of the aether, and where curl **A** = **H**. (see Maxwell's 1861 paper 'On Physical Lines of Force' equation (58) [1]). This expands into

$$\mathbf{g} = \text{grad}\psi + \text{grad}(\mathbf{A.v}) − \mathbf{v}\text{X}\mathbf{H} + \partial\mathbf{A}/\partial t_{\text{(angular acceleration)}} \qquad \textbf{(4)}$$

See **Appendix A** below and see also 'Gravitation and the Gyroscopic Force' at,

Once again we see that the fundamental forces acting between particles include three additional effects in addition to the inverse square law irrotational effect, and it is irrelevant as to whether we are considering the subject of gravity or the subject of electricity. One of these effects, the centrifugal force, has been ignored in recent times in electromagnetism, and disguised in planetary orbital theory. The two other additional effects, **v**X**H** and $\partial\mathbf{A}/\partial t$, have been accepted into the theory of electromagnetism, but the **v**X**H** effect has been ignored in gyroscopic analysis.

Electromagnetism

III. Let us now consider the special case of electromagnetism in which a sea of rotating electron-positron dipoles provides vortices that invoke the Coriolis force. Each rotating electron-positron dipole consists of an electron and a positron undergoing a mutual central force orbit. The axis of rotation of an electron-positron dipole orbit will of course be perpendicular to a line joining the electron to the positron. As the aether emerges from the positron and crosses over to the electron, it will rotate with the orbit and form a swirling vortex.

We will consider all four of the above acceleration effects within the context of a sea of such vortices. These four effects are not necessarily the only effects which occur in such a complex multi-particle system, but they are the only effects which we have so far been able to isolate from mathematics and experiment. By comparing the corresponding terms between equation **(2)** and equation **(4)** we will now look at all four effects individually.

(i) The irrotational inverse square law component is the component that we associate with inflow or outflow of the aether from a sink or source. It is the inverse square law $-Q/r^2$ or $+\text{grad}\psi$ component, and we can safely attribute the inverse square law to the fact that we live in a three dimensional space.

If a row of rotating electron-positron dipoles were to be aligned along their axial planes, electron above positron, in a double helix fashion, then we would expect the Coulomb force acting between the electron of one dipole and the positron of the neighbouring dipole to provide a collapsing axial tension, as is the case in magnetic lines of force. Such a column of

rotating electron-positron dipoles would constitute a helical spring and it would also constitute the physical representation of a magnetic **H** line of force. The inverse square law, radial flow Coulomb force is the root of magnetic attraction. See figure 1 below,
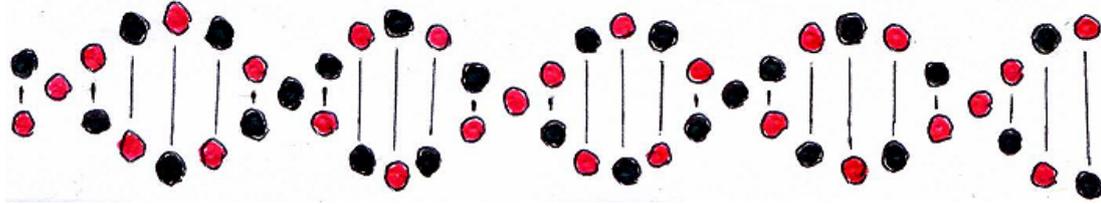

Figure 1. A close-up view of a single magnetic line of force. The electrons are shown in red and the positrons are shown in black. The double helix is rotating about its axis with a prodigious angular speed and the rotation axis represents the magnetic field vector H. The diagram is not to scale as the relative dimensions remain unknown.

(ii) The centrifugal term $\boldsymbol{\omega^2 r}$, which is also irrotational, provides a repulsive force between particles in tangential motion relative to each other. Hence two adjacent rotating electron-positron dipoles, if aligned in their mutual equatorial planes, and rotating in the same direction, should be expected to repel each other. When magnets repel each other, the magnetic **H** field lines coming out of the two magnets spread away from each other. This means that the mutual repulsion is caused by equatorial centrifugal force acting laterally between adjacent field lines in the region between the two magnets.

Modern physics never considers the idea that two adjacent central force orbital systems should repel each other if they are aligned in their equatorial planes. Maxwell brought attention to this concept in part I of his 1861 paper 'On Physical Lines of Force' [1]. This situation does not generally occur in cosmology or in planetary orbital theory, but it does occur often inside atomic and molecular matter. Centrifugal force as a repulsive mechanism has in fact been totally ignored in modern particle physics.

The Law of Conservation of Energy is a result of the centrifugal force acting in tandem with the irrotational inverse square law force of radial inflow/outflow. Kinetic energy is closely related to centrifugal force and potential energy is closely related to the inverse square law force.

(iii) The gyroscopic term **v**X**H** is a Coriolis force and it represents the effects of motion in an aether vortex.

Within the context of a rotating electron-positron dipole, the aether will flow across from the positron to the electron and we will have an aether vortex. This vortex becomes the basis of the Coriolis/gyroscopic **vXH** force. In a sea of such tiny vortices, this Coriolis force acts in conjunction with Archimedes' Principle, diamagnetism and paramagnetism. See "Archimedes' Principle in the Electric Sea" at,

http://www.wbabin.net/science/tombe11.pdf

If two rotating electron-positron dipoles, representing two soft miniature gyroscopes, which are not aligned, come close together, the motion of the electrons and positrons in the vortex of the other dipole will result in the precession of the two dipoles. The **vXH** force will have an aligning effect. Hence the gyroscopic force does become of importance in both the theory of gyroscopes and in the theory of electromagnetism.

The gyroscopic **vXH** force has been totally neglected in gyroscopic theory. See,

http://www.gyroscopes.org/1974lecture.asp

Finally, we should look at whether or not the **vXH** force has any bearing on the law of conservation of energy. When considered in isolation, the solution to the motion of **vXH** is a helix, and as such, kinetic energy remains unchanged by the gyroscopic force. The gyroscopic force does not therefore interfere with the law of conservation of energy. It appears only to be a direction changing force.

(iv) The angular acceleration $\partial \mathbf{A}/\partial t$ is the force associated with electromagnetic induction. It is a tangential force that transfers energy diagonally between adjacent dipoles hence giving it the vital power that is necessary to propagate energy carrying waves. When an electric current accelerates in a wire, the angular $\partial \mathbf{A}/\partial t$ force generates a torque on the electron-positron dipoles in the surrounding electric sea, and expands them into a higher state of vorticity and rotational kinetic energy. In an inductor (LR) circuit, the dipoles (vortices) act like flywheels.

Energy conservation matters in relation to the $\partial \mathbf{A}/\partial t$ term are governed by Lenz's law.

Third Order Effects

IV. If we differentiate equation **(2)** with respect to time, and obtain the third order time derivative of displacement, we end up with a new set of mathematical effects. These third order mathematical effects cannot possibly introduce any new physics, and neither do they correspond directly with the second order effects. Each third order effect is a mixture of some of the second order effects. This means that all four second order mathematical effects are necessarily intertwined with each other and that from a purely physical perspective they do not exist independently. It is hence very hard to analyze the motion of a sea of rotating electron-positron dipoles with absolute accuracy, or certainty. Every movement of every particle relative to every other particle will have some kind of knock on effect on every particle. However, we do get an approximate vision of a sea of soft pliable gyroscopes that undergo distortion and transmit these distortions to their neighbours.

Weber's Law and the Lorentz Force

V. The Coriolis **vXH** force together with the rotational $\partial\mathbf{A}/\partial t$ force, when weighted for inertial mass and magnetic permeability μ, operate in the theory of electromagnetism under the name of the Lorentz Force (Equation (77) in Maxwell's 1861 paper 'On Physical Lines of Force' [1]). This suggests that all the 'would be' vorticity of Descartes' universe has been soaked up by the magnetic field which is acting like a rotationally elastic sponge. The matrix of the magnetic field is a solenoidal arrangement of tiny vortices. This sea of tiny vortices appears to have drawn away all the large scale rotational effects of gravity and devolved them into a separate theory of electromagnetism. This accounts for why Kepler's Laws of Planetary Motion and Newton's Law of Gravity were at variance with Descartes' Vortex Theory of the Universe. The devolution of the tangential Lorentz force into the theory of electromagnetism leaves gravity as a zero curl irrotational theory that obeys the Law of Conservation of Energy. The devolved theory of electromagnetism is a non-zero curl rotational theory that allows for energy transfer under the terms of Lenz's Law. The orbits of the electron-positron dipoles are more complicated than Keplerian orbits because they involve the Lorentz force in addition to the inverse square law force and the centrifugal force. We could call these orbits 'Cartesian Orbits' as they

are the kind of orbits that would have been implied by Descartes' Vortex Theory of the Universe.

In the case of the Lorentz force component $\mathbf{F} = q\mathbf{v}\mathrm{X}\mathbf{B}$, the magnetic induction vector $\mathbf{B}$ will be a vorticity based vector weighted for the density (magnetic permeability μ) of the sea of vortices and also bearing a relationship to distance from the driving belt of the alignment, given by the Biot-Savart law. The driving belt refers to either the bar magnet, the spin source, or the electric current which invokes the $\mathbf{v}\mathrm{X}\mathbf{B}$ force and aligns the electron-positron dipoles solenoidally around itself.

The Lorentz force can be shown to be included in Weber's disputed law of electrodynamics. See this very interesting paper on Weber's law and electric centrifugal force by Professor AKT Assis in Brazil,

http://www.ifi.unicamp.br/~assis/Commun-Theor-Phys-V18-p475-478(1992).pdf

Maxwell's Displacement Current

VI. Maxwell's displacement current first arose in the context of linear polarization of an elastic medium. In part III of his 1861 paper 'On Physical Lines of Force',

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

Maxwell developed an expression for displacement current,

$\mathbf{J} = -\varepsilon \partial \mathbf{E}/\partial t$ **(Displacement Current)**   **(5)**

which he then substituted into Ampère's circuital law,

curl $\mathbf{B} = -\mu\mathbf{J}$ **(Ampère's Circuital Law)**   **(6)**

leading to the equation,

curl $\mathbf{B} = +\mu\varepsilon \partial \mathbf{E}/\partial t$ **(Maxwell/ Ampère)**   **(7)**

where μ represents the density of the vortex sea, and ε represents the inverse of the transverse elasticity of the molecular vortices. The justification of equation **(5)** is generally accepted to lie in the fact that $\mathbf{E}$

arises from Coulomb's law of electrostatics, and that Coulomb's law of electrostatics is compatible with both Gauss's law,

div **E** = ρ/ε   **(Gauss's Law)**   **(8)**

and the equation of continuity of charge,

div **J** = −∂ρ/∂t   **(Equation of Continuity of Charge)**   **(9)**

where **J** refers to electric current density, and where ρ refers to electric charge density. However, Coulomb's law of electrostatics is not the only solution of **E** that satisfies the above criteria. The irrotational Coulomb force has got a perpendicular rotational sister **E** = ∂**A**/∂t. The angular force ∂**A**/∂t also satisfies all of the above criteria regarding Gauss's law and the equation of continuity of electric charge.

Faradays's law of electromagnetic induction can be written in total time derivative format,

curl **E** = −d**B**/dt   **(Faraday's Law)**   **(10)**

when it includes the q**v**X**B** force. We all know that the **E** vector in Faradays's law refers to the angular force ∂**A**/∂t. If we drop the q**v**X**B** term from equation **(10)** we can combine it with equation **(7)** to obtain the electromagnetic wave equation,

∂²**E**/∂x² = 1/c².∂²**E**/∂t²   **(EM Wave Equation)**   **(11)**

The fact that displacement current is assumed to involve the Coulomb force and the fact that it leads us to the electromagnetic wave equation points us to the fact that the luminiferous medium must be comprised of particles that interact under the irrotational Coulomb force. We assume these particles to be much smaller than atoms and molecules, and we assume that they will form a dielectric sea that doesn't partake in the rotational motion of large scale atomic and molecular matter. Electrons and positrons are the obvious candidates.

But the above derivation doesn't actually use the Coulomb force. Instead it uses the rotational ∂**A**/∂t force. Since the rotational ∂**A**/∂t force is so closely related to the Coulomb force, this fact shouldn't change the above conclusion. It actually gives us even more information. It tells us that Maxwell's displacement current should more accurately be referred to as

'Angular Displacement Current'. It tells us that the electrons and the positrons in the luminiferous medium must be paired into mutual orbits.

Electromagnetic radiation is clearly a propagation of rotations. If the propagation is in the equatorial plane of the rotating electron-positron dipoles as would be the case with a changing electric current, then it will be a propagation of angular accelerations. If the propagation is at an angle between the equatorial and the axial plane of the rotating electron-positron dipoles as would be the case when a magnet rotates against its own magnetic axis, then we will have a propagation of precessions. These rotations will be caused by a convective flow of longitudinal centrifugal/Coriolis compressions which will give rise to radiation pressure. See 'The Link between Electric Current and Magnetic Field' at,

http://www.wbabin.net/science/tombe7.pdf

Antagonistic Radial and Solenoidal Field Lines

VII. An electrically charged sphere has the effect of linearly polarizing the surrounding electron-positron dipoles by virtue of the Coulomb force. The polarization of the dipoles will lead to an opposing self restoring internal polarization **E** field. In this situation, the internal polarization **E** field will be radial.

A spinning body, or an electric current, has the effect of invoking the gyroscopic force **v**X**B** to align the electron positron sea into solenoidal magnetic **B** lines of force.

Solenoidal magnetic **B** lines are not compatible with radial **E** lines. Hence, if the universe contains many charged and spinning bodies, it will be criss-crossed with antagonistic interlocking **B** and **E** lines.

The electron-positron sea of vortices readily swivels into line, stretches, and relaxes in response to sources of spin (including electric current circuits), as well as to sinks and sources of charge.

If we have two spheres immersed in the sea of electron-positron dipoles and both are spinning in the same direction, they will repel each other. If we have two negatively charged spheres in the same situation, both charged such as to cause a field strength beyond a certain threshold of magnitude, they will also repel each other. In both cases, the repulsion

will be due to centrifugal repulsion acting laterally between field lines which are spreading away from each other.

Gravity is basically electrostatic attraction between negatively charged bodies that are too weak to invoke the centrifugal repulsion override mechanism in the electron-positron sea. See 'Gravity Reversal and Atomic Bonding' at,

http://www.wbabin.net/science/tombe6.pdf

Gyroscopic Radiation

VIII. The rotating electron-positron dipole is clearly the DNA of electromagnetic radiation. This dipole consists of a non-Keplerian pressurized central force orbit involving an electron and a positron. The dipole contains within it an aethereal vortex of liquid space.

It was explained in 'The Link between Electric Current and Magnetic Field',

http://www.wbabin.net/science/tombe7.pdf

how an angular acceleration in one such dipole can induce the same effect on a neighbour in the equatorial plane. The increased centrifugal/Coriolis force gives rise to an angular back kick on the neighbour and hence induces a torque that causes it to angularly accelerate in sympathy.

The electron-positron dipole is like a tiny satchel of aether. The more aether that is contained within the satchel, then the more energy the dipole will possess. A dipole satchel can be made to increase either its translational kinetic energy or its internal stored energy by being exposed to an accelerated aether flow. If it is exposed to an accelerated aether flow but restrained from following that flow, it will fill up with aether to a higher energy state. This higher energy state could be in the form of linear polarization in a radially convergent inflow field such as gravity, or it could be in the form of magnetization due to a diagonally directed accelerated aether flow $\partial \mathbf{A}/\partial t$.

In the magnetization situation we are effectively dealing with a hydrodynamical balance between the magnetic spin source and the dipoles in the surrounding electric sea. When the magnetic field is

increasing, aether is being transferred from the source into the dipole satchels in the magnetic field. When a magnetic field is collapsing, aether is pouring back out of the dipole satchels and returning to its source. When the magnetic spin source is an electric current, the electrical particles loop their way along the wire in order to gear in with the vortices. They possess slow drift velocities but very high tangential velocities and they swing aether into the surrounding dipoles.

The accelerated flow of aether $\partial \mathbf{A}/\partial t$ will swing diagonally from dipole to dipole at a specific angle and put additional aether into each dipole. This specific angle of flow will invoke the repulsive convective effects that cause the dipoles to spin faster, and become magnetized. Some of the additional aether is absorbed by the dipole and the rest is swung onwards to the next dipole until hydrodynamical equilibrium is reached.

These convective centrifugal and Coriolis effects which cause the back kick on their neighbours will be perpendicular to the accelerated flow $\partial \mathbf{A}/\partial t$. We are hence dealing with an extremely coherent rotational vortex wave that cannot accurately be described as exclusively transverse or longitudinal. The coherence of electromagnetic waves is accounted for by the fact that the accelerated aether flow $\partial \mathbf{A}/\partial t$ between the vortices takes place in a very specific diagonal direction and doesn't spread out in every direction. If it did spread out in every direction, then we would obtain no torque. The diagonally directed aether flow is the key to both the coherence and the energy transfer mechanism.

The vorticity vector $\mathbf{H}$ of the dipoles will be perpendicular to the direction of propagation. In this respect, the wave is transverse and can be polarized. The electric field $\mathbf{E} = \partial \mathbf{A}/\partial t$ associated with the aether that is being swung diagonally between the vortices will be perpendicular to the $\mathbf{H}$ field. This diagonal $\mathbf{E}$ field will invoke a centrifugal/Coriolis repulsion pressure at an angle such as to induce a torque and cause the dipoles to spin faster. In this respect it is a compression wave bearing some of the characteristics of a longitudinal wave.

Normally we associate transverse waves with tension and longitudinal waves with compression. It would appear however that the electromagnetic wave is a gyroscopic compression wave of rotations (including precessions) involving an accelerated flow of aether $\partial \mathbf{A}/\partial t$ swinging diagonally from vortex to vortex.

Electromagnetic Photons

IX. The photon is the name given to a single pulse of electromagnetic radiation. The photon represents the region of the electron-positron sea that is involved in the electromagnetic wave at any moment of time. This region can involve enormous numbers of electron-positron dipoles. The frequency and wavelength of a photon is determined by the emission source, but the physical characteristics of the wave are determined by the nature of the oscillating distortions of the individual electron-positron dipoles. The single rotating electron-positron dipole is the DNA of an electromagnetic wave and it is the DNA of the electromagnetic photon. These dipoles, as in the case of actual DNA, align themselves in a double helix fashion.

When a high frequency photon is emitted from atomic or molecular matter, it bears a relationship between energy and frequency given by the Planck law $E=hf$. Planck's constant h is of course a function of the source of the emission and bears no relationship to the actual wave mechanics of the electromagnetic wave or the electron-positron sea. The quantized nature of photon emissions from matter is entirely a function of the quantized orbitals of the atoms and molecules.

The Speed of Light

X. We might assume that the rationale behind the speed of light c is that it represents the tangential speed of the electrons and positrons of the vortices projected along a diameter in the direction of wave propagation. In this case, the speed c would be the rms (root mean square) of the circumferential speed of the vortices.

It is a fact of planetary orbital theory that in order for a circular orbit to become hyperbolic, a particle needs to receive an additional amount of energy equal to the amount of kinetic energy that it already possesses. Hence if the electron and positron in a vortex possess circumferential speeds of 1.4c, the energy required to split the vortex would be the sum of their existing kinetic energies and it would be equal to $2mc^2$. This would be equal to 1.02MeV which corresponds to the gamma ray energy associated with electron pair annihilation, and the rms value of 1.4c is indeed c.

The equation E = mc², which has been identified by Dr. Menahem Simhony in Jerusalem as being equivalent to Newton's equation for the speed of a wave in a solid, therefore represents the binding energy of the electrons and positrons in the vortex sea, provided that all the binding energy is accounted for purely within each dipole and doesn't involve the forces between the dipoles.

This would be the case in solenoidal vortex bonding where the axial Coulomb force of attraction cancels out with the equatorial centrifugal force of repulsion.

Appendix A

The gradient of a scalar product of two vectors is given by the standard vector identity,

$$\text{grad}(\mathbf{A}.\mathbf{v}) = \mathbf{A}\text{X curl } \mathbf{v} + \mathbf{v}\text{X curl } \mathbf{A}$$

$$+ (\mathbf{A}.\text{grad})\mathbf{v} + (\mathbf{v}.\text{grad})\mathbf{A} \tag{1A}$$

Since $\mathbf{v}$ represents arbitrary particle motion, the first and the third terms on the right hand side of equation **(1A)** will vanish, and from the relationship curl $\mathbf{A} = \mathbf{B}$, we obtain,

$$\text{grad}(\mathbf{A}.\mathbf{v}) = \mathbf{v}\text{X}\mathbf{B} + (\mathbf{v}.\text{grad})\mathbf{A} \tag{2A}$$

Hence,

$$(\mathbf{v}.\text{grad})\mathbf{A} = -\mathbf{v}\text{X}\mathbf{B} + \text{grad}(\mathbf{A}.\mathbf{v}) \tag{3A}$$

Since,

$$d\mathbf{A}/dt = \partial\mathbf{A}/\partial t + (\mathbf{v}.\text{grad})\mathbf{A} \tag{4A}$$

we obtain,

$$d\mathbf{A}/dt = \partial\mathbf{A}/\partial t - \mathbf{v}\text{X}\mathbf{B} + \text{grad}(\mathbf{A}.\mathbf{v}) \tag{5A}$$

showing that a single differentiation of a vector can yield the complete knowledge of magnetic force obtained by all the great masters of the 19th century.

References

[1] Clerk-Maxwell, J., "On Physical Lines of Force", Philosophical Magazine, Volume 21, (1861)
http://vacuum-physics.com/Maxwell/maxwell_oplf.pdf

[2] Clerk-Maxwell, J., "A Dynamical Theory of the Electromagnetic Field", Philos. Trans. Roy. Soc. 155, pp 459-512 (1865). Abstract: Proceedings of the Royal Society of London 13, pp. 531--536 (1864)
http://www.zpenergy.com/downloads/Maxwell_1864_1.pdf
http://www.zpenergy.com/downloads/Maxwell_1864_2.pdf
http://www.zpenergy.com/downloads/Maxwell_1864_3.pdf
http://www.zpenergy.com/downloads/Maxwell_1864_4.pdf
http://www.zpenergy.com/downloads/Maxwell_1864_5.pdf
http://www.zpenergy.com/downloads/Maxwell_1864_6.pdf
http://www.zpenergy.com/downloads/Diagram.pdf