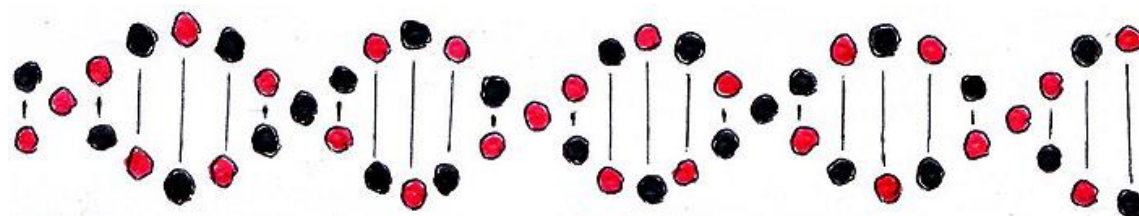


The Positronium Orbit in the Electron-Positron Sea

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Abstract. The purpose is to show that the equation $E = mc^2$ was already implicit in Maxwell's 1861 paper "*On Physical Lines of Force*" and that it doesn't mean that mass is equivalent to energy, but rather it relates to the propagation of electromagnetic radiation through a sea of rotating electron-positron dipoles which pervades all of space.



Electron-Positron Pair Annihilation

I. It is generally believed, that unlike in the case of a Kepler planetary orbit, the positronium orbit involving an electron and a positron, results in the two particles spiralling inwards towards each other, and that when the particles touch, they metamorphose into two gamma photons. This is much like in the case of the Helen Bannerman story in the Dumpy books for children, where a group of tigers chase each other around a tree until they all turn into ghee, which is then used to make pancakes. The energy in the gamma photons is said to have been supplied entirely from the mass of the electron and the positron, which have now both ceased to exist.

Alternative and more realistic explanations have been offered, akin to the manner in which a stage magician makes a rabbit vanish from a hat [1], [2], [3]. The rabbit never actually disappears. It still exists in a latent state close by, as perhaps in a bag hanging under the table. It will here be proposed that the electron and the positron do not metamorphose at all, but rather that the full positronium orbit remains intact in a concentrated and latent state at the locality where it was believed to have metamorphosed, and that it is bonded into an already existing background medium comprised of tiny rotating electron-positron dipoles in a totally stable state. The electron and the positron very much continue to exist, and they are now indistinguishable from their neighbouring electron-positron dipoles in the wider electron-positron sea.

Such an approach is usually rejected quite swiftly on the back of the totally tautological argument that such an electron-positron medium wouldn't be stable because positronium is unstable, and so the electrons and positrons would annihilate each other. In other words, because the textbooks teach that electrons and positrons annihilate each other, then there can be no possible physical explanation for what might really be happening when the positronium orbit appears to decay. Let's then take a closer look at the positronium orbit.

The Positronium Orbit

II. There is no theoretical reason why a positronium orbit involving an electron and a positron should be any different than a Keplerian orbit. The electrostatic force of attraction between the two particles obeys an inverse square law just like in the case of gravity, and so the dynamics should be identical. The full trajectory should form an eccentric ellipse, and when the electron and the positron reach closest approach, there should be a recoil due to centrifugal force, as like in the case of a comet at perihelion. There is however a slight difference in the physical manner in which the centrifugal force is manifested in the positronium orbit. In a Keplerian orbit, the centrifugal force is sourced at the interface between the two gravitational fields and is due to the shear interaction between the two fields [4]. This cannot be so however in the case of the positronium orbit. Where gravitational attraction is monopolar such that the field lines between the two gravitating bodies spread outwards from each other and meet laterally, enabling the centrifugal force to engage, the attractive force in electrostatics, on the other hand, is dipolar and so the field lines connect directly between the two charged particles. In this case though, the magnetic fields that are generated by the two moving charged particles will be the source of the centrifugal force. See the article *“Straight Line Motion”*, [5], which explains how a magnetic field is in fact a centrifugal force field. The two magnetic fields will repel each other since the electron and the positron will be moving in opposite transverse directions*, and their mutual motion will become increasingly transverse as they approach each other. *See **Appendix I**.

As the two charged particles get faster, their surrounding magnetic fields will expand, and the mutual repulsion between the two particles will continue to increase. At some point, the centrifugal/magnetic force of repulsion should exceed the electrostatic force of attraction and so we would be expecting a reversal threshold to be reached. However, before this gets to happen, some kind of abrupt fusion event occurs which can be explained if space is already densely packed with tiny electron-positron orbitals [2], [3]. This background dielectric sea serves as the physical medium for the propagation of light. The wider stability of this dielectric sea, in three dimensions, is explained in *“The Double Helix Theory of the Magnetic Field”* [2].

When the electron and the positron of the decaying positronium atom come side by side, with nothing in between them, they bond into this background dielectric sea and become indistinguishable from the constituent components. This event happens in like manner to when an escaped vapour particle fuses back into the main body of the liquid, releasing a latent heat of fusion. The capture occurs when the centrifugal pressure in the positronium orbit, that would be striving to push the two particles apart, is neutralized by the corresponding centrifugal pressure pushing inwards on it from the surrounding bound state electron-positron orbitals that comprise this all-pervading background medium. The decaying positronium orbit will now be hemmed in, and it will be in a state of stable equilibrium, neither inclined to collapse because of its own tendency to expand, nor allowed to expand due to the inward pressure emanating from the surrounding dipoles.

As regards the two radiating magnetic fields that surrounded the electron and the positron as they accelerated together, they will lose their source to the background medium during the abrupt fusion event, by which time the cumulated magnetic energy (centrifugal potential energy) will be very high, and the two fields will radiate away in opposite directions as gamma photons. The manner in which a decaying positronium orbit could suddenly become hemmed in by other surrounding electron-positron orbitals in the vicinity is easier to comprehend by considering the situation in reverse. This will be explained in detail in the following sections.

The Speed of Light and $E = mc^2$

III. In Part III of Maxwell's 1861 paper "*On Physical Lines of Force*" [6], he introduces *elastic displacement* (and later displacement current) within the context of a dielectric solid that pervades all of space. Maxwell applies elasticity theory in order to link the dielectric constant with the transverse elasticity of this solid medium. He is able to utilize the result of an experiment performed in 1855 by German physicists Wilhelm Eduard Weber and Rudolf Kohlrausch [7] in order to equate the speed of light with the ratio of the dielectric constant to the magnetic permeability, and hence also with the ratio of the transverse elasticity to density in this luminiferous medium. Since the latter ratio forms one side of Newton's equation for the speed of a wave in an elastic solid, Maxwell is able to conclude that light is a transverse wave in an elastic solid that is also the cause of electric and magnetic phenomena. Hooke's law appears at equation (105) in Maxwell's 1861 paper in the form,

$$R = -4\pi k^2 h \tag{1}$$

where R is electromotive force, k is a coefficient depending on the nature of the dielectric, and h is displacement. Maxwell doesn't actually use the letter k in his paper, but it has been chosen here in order to avoid confusion with the normal symbol for energy which will appear later in the analysis.

The purpose now will be to show how equation (1) can be related to Newton's equation,

$$V^2 = \sigma/\rho \quad (2)$$

where V is the speed of a wave in an elastic solid, σ is the coefficient transverse elasticity, and ρ is the density. Maxwell didn't actually use the symbol σ for transverse elasticity in this equation (equation (132) in his paper), but it will be used here to avoid confusion with the usual symbol for mass which appears later in the analysis. Maxwell equated the transverse elasticity σ to k through equation (108) in his paper as per,

$$k^2 = \pi\sigma \quad (3)$$

and he equated density ρ to magnetic permeability μ (which he called the coefficient of magnetic induction) through equation (133) in his paper as per,

$$\mu = \pi\rho \quad (4)$$

Hence combining equations (2), (3), and (4), we obtain,

$$V^2 = k^2/\mu \quad (5)$$

which is equation (135) in Maxwell's paper and equivalent to $\mathbf{E} = mc^2$, as will be demonstrated in the next section. Maxwell didn't know the actual density of his elastic solid but he was only concerned with the ratio k^2/μ , and by comparison with the results of the 1855 experiment of Weber and Kohlrausch in which the ratio of electrostatic units of charge to electrodynamic units of charge had been established by the discharging of a Leyden jar (a capacitor) [7], he was then able to establish that the dielectric coefficient k equated with the speed of light (equation 131 in Maxwell's paper) as measured optically by Fizeau.

The objective now will be to show how equation (5) can be derived from the sea of tiny aethereal vortices described in Part I of Maxwell's 1861 paper. In this part, in order to explain the magnetic field and magnetic repulsion, Maxwell utilizes the concept of tiny aethereal molecular vortices that press against each other with centrifugal force while striving to dilate [8].

The Fine-Grained Vortex Nature of the Elastic Solid

IV. It is now further proposed that Maxwell's molecular vortices will be dipolar, having both a sink (electron) and a source (positron) in mutual orbit around the edge of the vortex [2], [9], [10], and since Maxwell has all immediately neighbouring vortices spinning in the same direction, the effective speed for the purposes of centrifugal potential energy will be the mutual transverse speed, which will be twice the circumferential speed. Centrifugal potential energy is the same thing as transverse or rotational kinetic energy, and summed over the two particles of each dipolar vortex this will be equal to $m(2V)^2$, or $4mV^2$, where $2m$ is the combined mass of the two particles, and where V is their circumferential speed. Mass is considered to be a measure of the amount of aether. The centrifugal potential energy will be equal to the maximum linear kinetic energy as resolved along a diameter in relation to the projected simple harmonic motion. This in turn will be equal to the maximum potential energy that we obtain from Hooke's law. Since we are dealing with shared elasticity over the two particles within each dipole, this maximum potential energy will be $2\pi k^2 h^2$. Therefore,

$$4mV^2 = 2\pi k^2 h^2 \quad (6)$$

and hence,

$$2mV^2 = \pi k^2 h^2 \quad (7)$$

The centrifugal potential energy, $4mV^2$, is the resultant of an outward centrifugal force and an equal and opposite inward centrifugal force generated by the neighbouring dipoles. As such, if we double the outward centrifugal potential energy, we will split the dipole. The input energy needed to split an electron-positron dipole is therefore $2mV^2$. We also know from the 1932 Carl D. Anderson experiment that this energy is the 1.02 MeV associated with gamma radiation, and that it corresponds exactly to $2mc^2$, where c is the speed of light [1]. Hence it follows that the circumferential speed of the electrons and positrons in the dipoles that make up of this elastic solid is equal to the speed of light [11], [12], and that,

$$c^2 = k^2/\mu \quad (8)$$

where μ is the areal density, $2m/\pi h^2$, of an electron-positron dipole. Equation (8) is equivalent to equation (135) in Maxwell's 1861 paper and it is more familiar nowadays in the form,

$$c^2 = 1/\mu\varepsilon \quad (9)$$

where ϵ is the electric permittivity and where μ is the magnetic permeability. By multiplying the top and bottom lines of equation (9) by area, we end up with,

$$\mathbf{E} = mc^2 \tag{10}$$

where \mathbf{E} is the centrifugal potential energy. It is the compressed orbit syndrome that gets rid of the factor of one half that appears in the standard formula for kinetic energy.

Maxwell never knew the size of his molecular vortices, but it would be reasonable to assume that they are small enough to flow through the interstitial spaces between the atoms and molecules of ponderable matter as like water flows through a basket. A credible guess might put them on the scale of the Compton wavelength for an electron, since gamma radiation of this wavelength can split an electron-positron dipole apart. This would be in the picometre range making them about one thousandth the size of the average atom, with the vortex sea being about thirty-two times denser than lead.

Conclusion

V. Contrary to popular belief, a positronium atom doesn't decay. The deeply ingrained belief that it decays, and that the constituent electron and positron annihilate each other, is based purely on the fact that the actual details of what does happen at the crucial moment are unknown. When the gamma radiation is released, the electron and the positron continue to exist in a stable and bound state, propped up by centrifugal potential energy (centrifugal pressure) quantified by the equation $\mathbf{E} = mc^2$. Space is already densely packed with rotating electron-positron dipoles pressing against each other with centrifugal force while striving to dilate. The circumferential speeds equal the speed of light and this dielectric sea serves as the medium for the propagation of light. A positronium atom is merely a liberated component which falls back naturally into its bound state in this all-pervading medium.

Appendix I

(Electric Current and Magnetic Field)

*It might be argued that two particles of opposite charge circling in the same direction would result in a cancelled electric current, and so therefore there would be no magnetic field. This argument might hold if electric current were primarily due to the motion of charged particles. However, the direction of an electric current is actually governed by the direction of the driving electric field, which in the case of a positronium atom is the electrostatic field which

pulls the electron and the positron together. In this case, the electric current is fundamentally the aether that flows in the single direction from the positron to the electron while the two particles move together in opposite directions. This aethereal current of electric fluid is described by its momentum, \mathbf{A} , known variously as the *electrotonic state*, the *electromagnetic momentum*, the *magnetic vector potential*, or *Maxwell's displacement current*. See section **V** in "***The Double Helix and the Electron-Positron Aether***" [9]. As the dipole rotates, the aethereal current spirals into the electron and out of the positron, and it is this vortex and this anti-vortex which determine the two magnetic fields, both of which have the same vorticity, $\nabla \times \mathbf{A} = \mu \mathbf{H}$, and hence they repel each other. Within the positronium orbit, the electron and the positron are moving in opposite directions, both radially and transversely, within a single aethereal current, just as particles of opposite charge move in opposite directions within a single uni-directional electric current that is flowing through an electrolyte.

When the positronium atom collapses into the bound state, the mutual transverse speed between the two particles will be so high that the aethereal current flow between them will break. The two branches will then each spiral, both upwards and downwards, to the neighbouring dipoles in the axial direction, while the dipole takes its place within the double helix alignment of the wider background magnetic field. See section **IV** in "***The Double Helix and the Electron-Positron Aether***" [9].

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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.”

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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*”

[12] O’Neill, John J., *PRODIGAL GENIUS, Biography of Nikola Tesla*, Long Island, New York, 15th July 1944

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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”.