Thickness of Present and Dimensional Cleavage

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Abstract

The present has a time thickness. The thickness of present defines the time interval required for the realization of the Pauli exclusion principle. Thickness of present varies with the wavelength of particles. It can be calculated using the thickness of present factor, which is the reciprocal of the speed of light.

The square of the thickness of present factor equals the product of the constants relating to each of the three dimensional orders 1D, 2D and 3D. Each of these constants refers to a specific type of field: magnetic, electric and gravitational.

Dimensional cleavage is an angle that changes with the relative velocities of two referential frames. It varies between 0 and $\pi/2$. Like Lorentz transformations, the angle of dimensional cleavage underscores the phenomenon of relativistic effects on masses, lengths and clocks.

A dimensional cleavage of $\pi/2$ occurs between two contiguous dimensional orders. This type of cleavage occurs on the front of present, inducing the future in which the quantum probability wave is spread out.

Introduction

Despite the enormous upheavals brought about in physics by relativity and the quantum theory, the notion of an entwinement of space and time has remained unchanged.

Minkowski space is the stage for relativistic transformations between referential frames. Lorentz transformations allow these differences to be calculated, but they don't help explain how these phenomena occur at interfaces between referential frames.

There remain significant gaps in theory when it comes to explaining the astounding phenomena uncovered by quantum physics (wave-particle duality, discrete quantification, decoherence, antimatter, black holes, big bang, dark matter, etc.). A quick review of relevant physical concepts is therefore essential.

This article presents a geometrical theory of time, space and charges. In the following exposition, time is wittingly excluded from dimensions because it is considered to be of a different nature than spatial dimensions. I will demonstrate that relativity is an illusion due to a dimensional cleavage between two referential frames moving relative to one another.

Photons

A photon travels through free space at a constant velocity c known as the speed of light. This velocity can be inferred from Maxwell's equations [1] and expressed as follows:

$$c = 1/\sqrt{(\mu_0 \varepsilon_0)} \qquad (1)$$

where μ_0 and ε_0 are the magnetic permeability and the electric permittivity of empty space, respectively.

Electrons

Classically, an electron is viewed as an infinite, spherical and uniform electric field which may be taken as a constant point electric charge determined by Maxwell's equation for Gauss' theorem:

$$\varepsilon_0 \S\ E\ dS = q \qquad (2)$$

This equation describes the integration of an electric field E on a Gaussian surface S surrounding a point source with a charge q. All electrons bear the same charge. An electron has a magnetic spin dipole moment that is perpendicular to its electric field. All electrons are identical [2]. Electrons are the lightest persistent particles that obey the Pauli exclusion principle.

Although electromagnetic phenomena are now well understood, the nature of electric charges has not yet been elucidated [3]. The problem of electron structure, if any, remains unsolved [4]. Why do two identically-charged particles repel each other, and why do they have opposing electric fields?

To gain insight into the phenomenon of attraction and repulsion, one must first review the principles underlying the notion of space. By definition, the universe contains all things. If something is excluded, then our definition of the universe is incomplete [5]. From this principle, it follows that:

Space must be created. (A1)

Assumption A1 implies that a space creation process is required for the universe to be produced as it appears to us, in three dimensions.

The electron is viewed as a circular eccentric electric field spread out over a surface normal to its magnetic moment (figure 1). The magnetic field is taken not as a flux, but as a 1D axis having the same properties as a flux in a 2D referential frame.

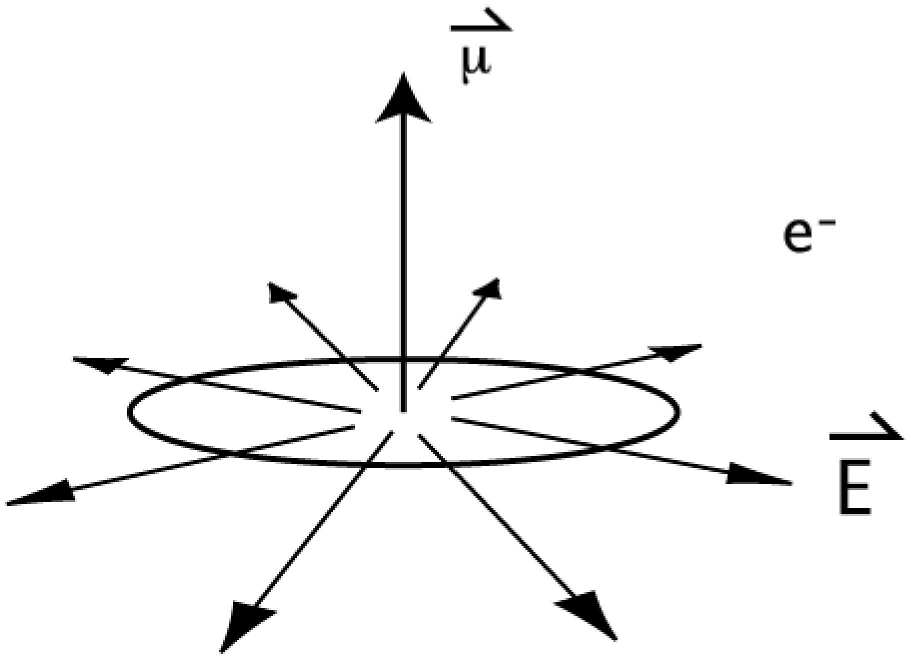

Figure 1. The structure of an electron.

When two electrons come into interaction, they repel one another in accordance with Coulomb's law. This electric repulsive force could evidently constitute a space production mechanism.

Time Arrow and Antiparticles

Symmetry is an increasingly important notion in modern physics. Low entropy is ascribed to high symmetry, and increasing entropy is taken to direct the time arrow toward the future. Yet the very ability to persist necessarily goes hand in hand with the Pauli exclusion principle, which is fundamental in setting the direction of the future. The electron being the lightest persistent particle that obeys the Pauli exclusion principle, it is the most primitive carrier of a preferred time direction on a scale of increasing particle weight.

Since few antiparticles are observed in the universe, a second assumption must be made (which will be discussed below):

> *An antiparticle lies a certain time interval away in the past of its corresponding particle.* (A2)

Time has a direction. In the past, events are perfectly determined, whereas the future is ruled by uncertainty. In 1D or 2D universes, physical phenomena are simple, and the direction of time is therefore easy to establish.

For an electron at rest, for example, the arrow of time naturally points in the same direction as the magnetic dipole moment, which is normal to electric surface E_2 (figure 2).

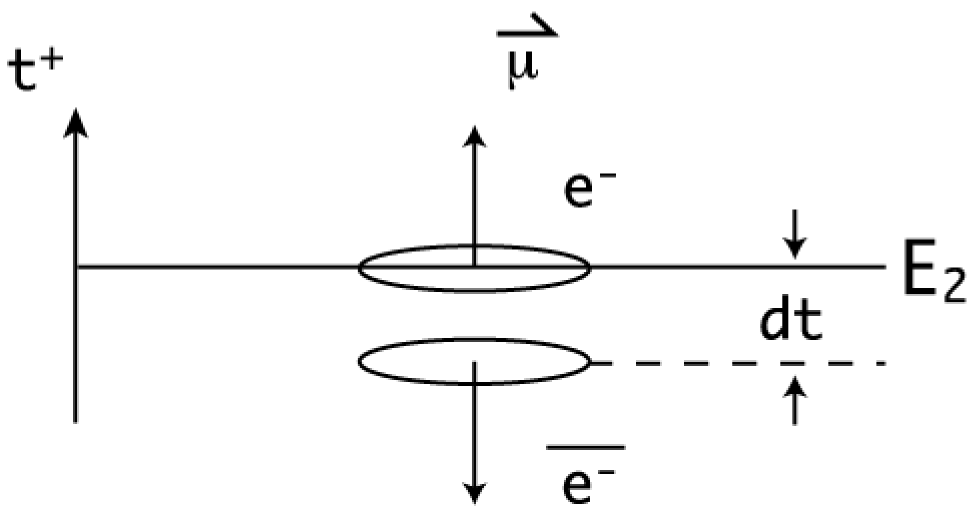

Figure 2. The direction of time t+ is perpendicular to electric surface E_2, pointing in the same direction as the magnetic moment μ. A positron (the antiparticle of an electron) resides in the past of its electron, separated from it by a time interval $dt > 0$.

It follows from [A2] and the above that a positron lies under surface E_2, a time interval dt away in the past of its electron.

When an electron is set in motion, the axis of its electric surface tilts with its magnetic dipole moment μ, which then projects a positive time vector along E_2 in the direction of the motion. The creation of 2D space as a result of two electrons moving away from each other is due to an increase in the internal surface of both electrons. The inclination of the electron's magnetic moment also induces a time vector projecting along E_2 (figure 3).

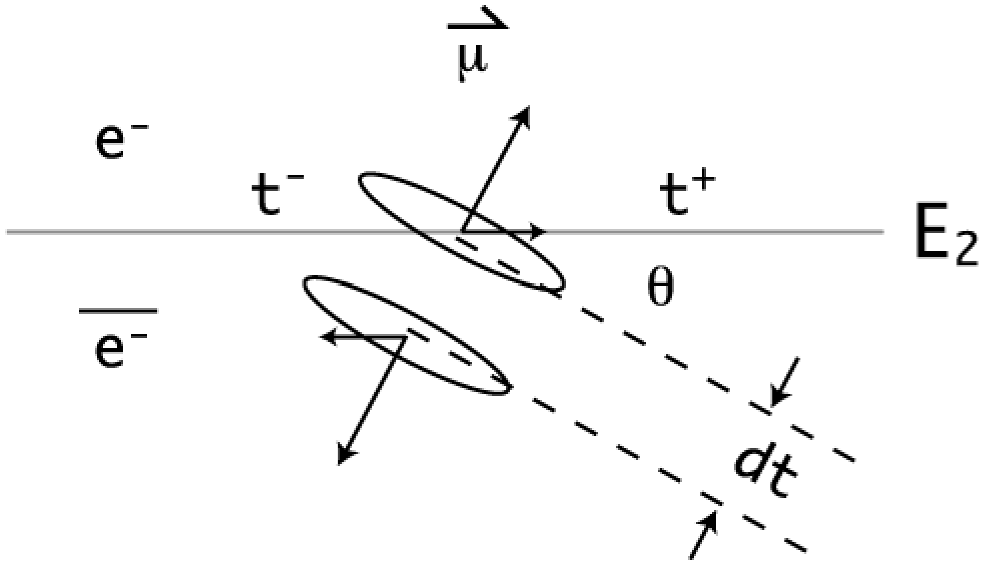

Figure 3. A moving electron projects a time vector t+ along electric surface E_2 in the direction of the motion, while the corresponding positron projects a negative time vector t- in the opposite direction.

Protons

It is probable that in certain parts of electric surface E_2, overcrowding prevents the surface growth of electrons, which then lack the space they need to move away from one another. In these disturbance areas, electrons tilt markedly down toward E_2 because they are unable to distance themselves. This pronounced inclination of electrons makes it likelier for their antiparticles to come into contact with one another (figure 4).

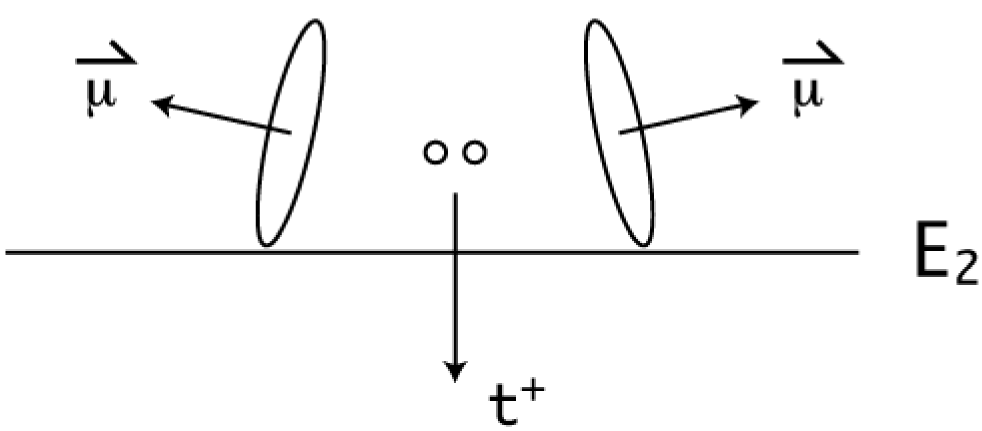

Figure 4. Interacting positrons brought into contact by the repulsive stress of electrons. An orthogonal dimensional cleavage is also brought to light by the induction of a perpendicular future upon creation of a new dimensional order (in this case, 3D).

Three positrons may then come into contact under high energy and react to form a quark trio, their electrons turning into antiquarks. This new proton is ejected from surface E_2 into 3D space, immediately drawing an electron into its orbit. The geometric arrangement of electrons tilting down toward the electric surface is conducive to the formation of a 3D structure, namely a proton. Also created is a new 2D space in 3D corresponding to the electron's orbital around the nucleus of this new hydrogen atom (figure 5).

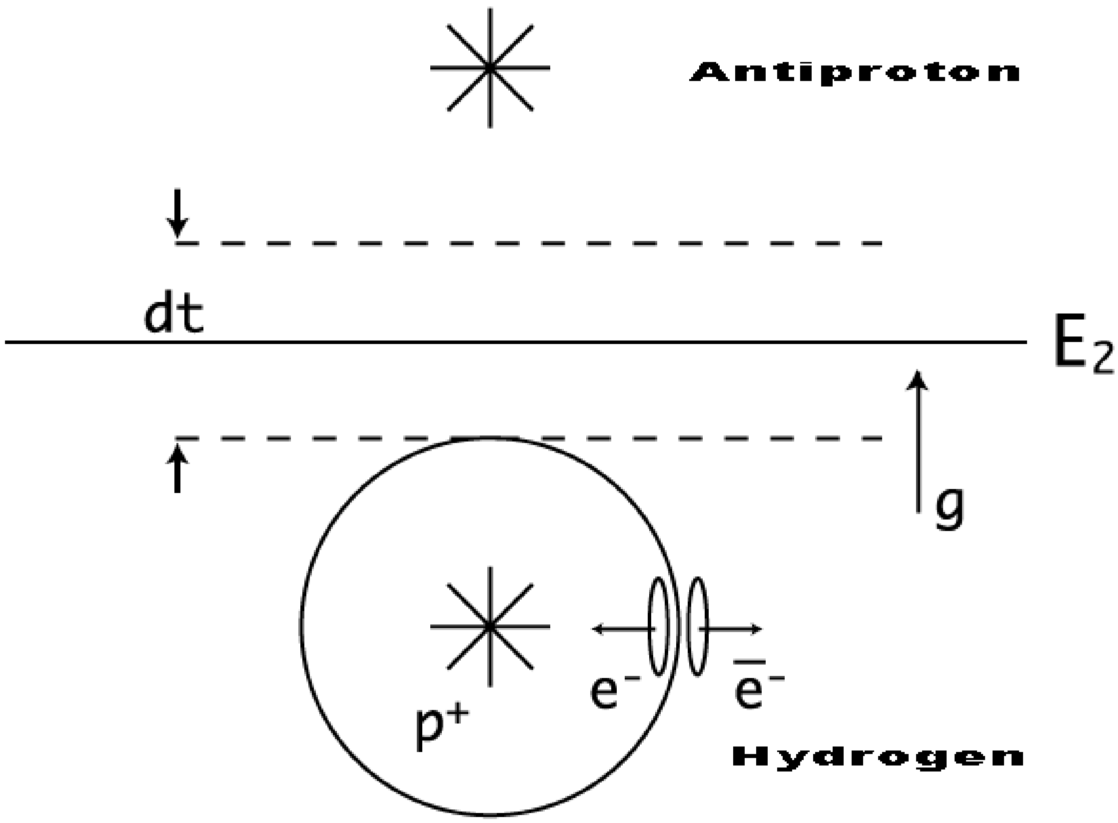

Figure 5. A hydrogen atom produced by the reaction illustrated in figure 4. The antiquarks lie on the other side of surface E_2. The creation of a 3D structure has liberated the electric tension due to electron repulsion. Three positrons have become quarks, three electrons have become antiquarks, and one electron and its positron have escaped surface E_2 and entered orbit around the new proton.

The possible existence of an interaction between quark and electron has long been considered: according to Gell-Mann, a majority of theorists believe the nature of quarks is close to that of electrons [6]. As part of GUT, Hawking mentions the possibility of an electron being produced as a result of the annihilation of a quark by its antiquark [7] in a reverse reaction to the proton-forming process described above.

At any rate, the formation of a proton provides the 2D space needed for electron persistence in the form of an orbital. From the point of view of the electric surface, the proton appears as the opposite of an electron, in other words as an empty space that attracts electrons with the same intensity of charge as the electron itself. It may then be argued that the electric force observed between opposing charges results from an attraction between structures of different dimensional orders (2D and 3D for the electron-proton couple), whereas electric repulsion occurs between structures of the same dimensional order (2D for the electron-electron couple, and 3D for the proton-proton couple).

From the point of view of the proton, electric surface E_2 appears as an envelope or, ideally, a surrounding sphere. In 2D, the antiproton (or antiquarks) and the proton lie on either side of surface E_2 (figure 5); in 3D, on the other hand, the antiproton (or antiquarks) lies in an indeterminate location next to the proton, separated from it by a time interval dt wherein lies the electron's orbital.

When 3D space is formed, gravity appears [8], along with the weak and strong interactions that maintain the atom's nucleus. Gravitational force results from an opposition between virtual (or empty) space and its occupation by persistent 3D structures. This force is very weak, however, when compared with that which is opposed to the presence of electrons in 2D space and is observed as mutual electron repulsion.

In principle, gravitational acceleration g originates from the proton's centre of mass and points toward surface E_2 (figure 5). When this surface becomes a spherical interface surrounding the proton, however, gravity naturally points from the centre outward, in no predetermined direction.

Thickness of Present

As previously discussed, a geometric arrangement in which positrons and electrons are separated by a time interval dt is conducive to the creation of new 3D space as a result of positrons being converted into quarks, and electrons into antiquarks.

According to Mazur, the importance of the particle-antiparticle duality and the notion of determinacy over time are not only related, but necessary to one another [9]. Mazur ascribes the direction of the time arrow to weak interactions. The electron, which is the smallest persistent particle in terms of mass, is in itself the result of a primordial expression of a preferred time direction toward the future.

It follows from assumption (A2) that time is aligned with an electron's magnetic dipole moment μ. The positron lies a time interval dt away from the electron at rest, under electric surface E_2. This time interval dt, representing the base from which an electron leaps toward the future, is what I call *thickness of present*.

In 2D, the inclination angle θ of an electron's magnetic dipole moment is what I call the *angle of dimensional cleavage*; it projects a velocity vector along surface E_2 in the direction of the electron's motion (figure 3).

Imagine a circle with a radius equal to the speed of light c centered on the intersecting point of two orthogonal axes representing two referential frames moving relative to one another; θ is the angle of dimensional cleavage between the two referential frames, and v is the velocity of the particle in the referential frame on the y-axis as perceived from the referential frame on the x-axis (figure 6).

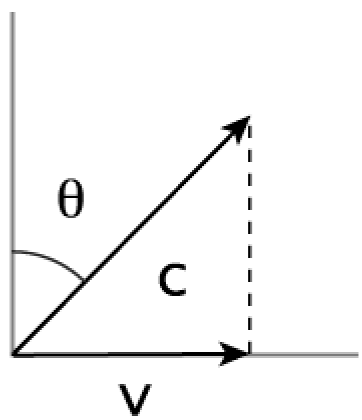

Figure 6. The velocity v of a particle as perceived from a second referential frame in relation to the speed of light and the angle of dimensional cleavage θ between the two frames.

Perceived velocity v can be expressed in relation to angle θ:

$$v = c\,(\sin\theta) \qquad (3)$$

Thus:

$$v/c = (\sin\theta) \qquad (4)$$

Therefore, dimensional cleavage θ is a function of velocity v divided by the speed of light:

$$\theta = \arcsin\,(v/c) \qquad (5)$$

Deriving angle θ with respect to velocity v gives:

$$d\theta/dv = d(\arcsin\,(v/c))/dv = 1/\sqrt{(1 - v^2/c^2)} \qquad (6)$$

The right-hand side expression of equation (6) coincides with the mass and length conversion factor for relativistic velocities in Lorentz transformations [4]. Applying this derivative to a mass m_0, for instance, gives:

$$m = m_0 \, d\theta/dv \qquad (7)$$

Dimensional cleavage produces a relativistic effect on mass m_0, which is perceived as m from a referential frame that is moving relative that of m_0.

Relativistic phenomena can be viewed as refraction effects due to the angle of dimensional cleavage between two referential frames. These effects occur on a common interface that is located halfway between the frames and whose thickness is also related to the thickness of present factor.

The thickness of present factor is the reciprocal of the speed of light:

$$e_p = 1/c \qquad (8)$$

It is estimated at:

$$e_p = 3.3356 * 10^{-9} \text{ (s/m)} \qquad (9)$$

Its square is:

$$e_p^2 = 1/c^2 \qquad (10)$$

Replacing c^2 in equation (10) by the right-hand side expression of equation (1) gives:

$$e_p^2 = \mu_0 \varepsilon_0 \qquad (11)$$

Since electric permittivity ε_0 relates to gravitation-free electric permittivity ε_1 and gravitational freedom x_0 as exposed in [8]:

$$\varepsilon_0 = \varepsilon_1 x_0 \qquad (12)$$

ε_0 can be replaced in equation (11) by the right-hand side expression of equation (12), which gives the fundamental relation between the field types relating to dimensional orders 1D, 2D and 3D:

$$e_p^2 = \mu_0 \varepsilon_1 x_0 \qquad (13)$$

Multiplying the thickness of present factor e_p by the wavelength of a particle gives a specific thickness of present value for that particle.

When the concept of speed of light c is replaced by that of thickness of present e_p, maximum velocity becomes a physical limit inherent of bodies resisting to non-being by the very constraint of persistence. The physical limit e_p is that of maximum cleavage ($\theta = \pi/2$).

Orthogonal Cleavage of Future

In addition to affecting how masses and lengths are perceived, dimensional cleavage plays an important role in the deployment of space from 1D to 3D.

This can be seen in the way the future is induced, a process wherein dimensional cleavage occurs orthogonally: $\theta = \pi/2$.

For an isolated magnetic field B considered as a 1D structure, time is perpendicular to the axis of B, and its direction is indeterminate (figure 7).

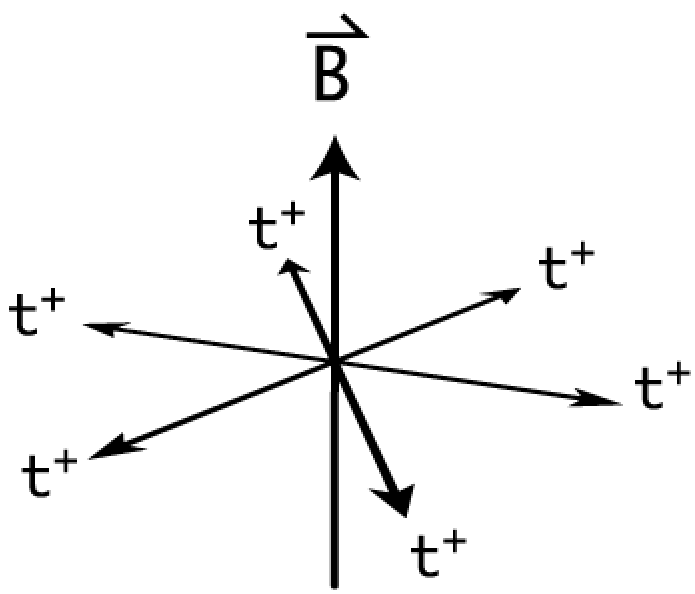

Figure 7. For a magnetic field B, the direction of time is indeterminate but restricted to a surface that is perpendicular to the axis of B.

For a photon, time is perfectly aligned with the velocity vector, which is perpendicular to the two constituent fields E and B (figure 8). However, since photons travel at the speed of light, for them, time ceases to pass [10].

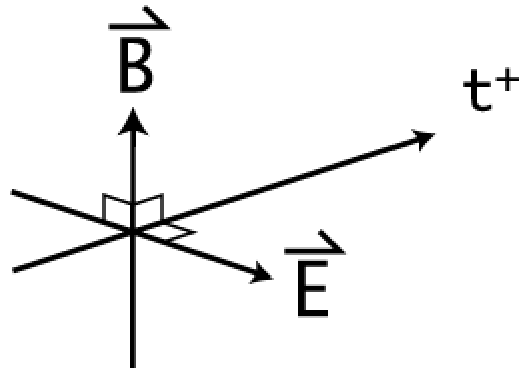

Figure 8. The future of a photon is determinate and perpendicular to the two constituent fields E and B.

For an electron at rest, the arrow of time points in the same direction as the magnetic dipole moment μ (figure 9).

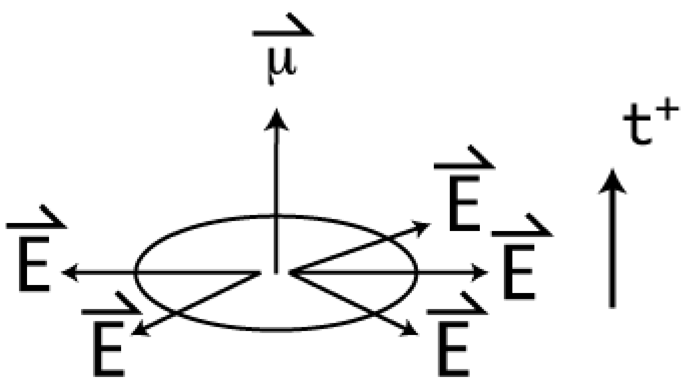

Figure 9. For an electron at rest, the direction of time is perpendicular to the electric surface.

For a moving electron, the time vector tilts down with the magnetic dipole moment μ closer to the direction of the motion (figure 3). When a proton is formed, dimensional cleavage is nearly or perfectly orthogonal, resulting in the ejection of quarks and antiquarks from the electric surface. This suggests that the direction of the future is perpendicular to the electrons' surface of origin (figure 4).

Finally, a proton in 3D has an eccentric, field-shaped future, whereas its environment displays a concentric future (figure 10).

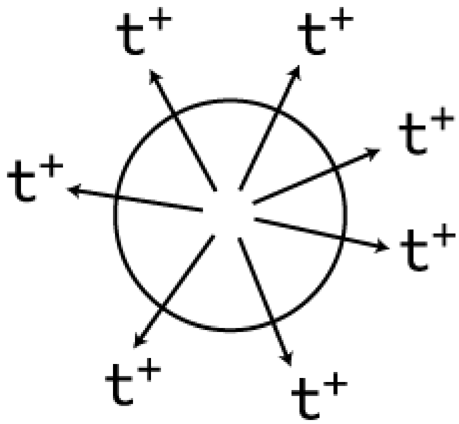

Figure 10. In 3D, particles such as hydrogen atoms have an indeterminate and eccentric future, whereas their environments have a concentric future.

An analysis of the orthogonal "direction adaptation nature" of Coulomb and gravitational forces performed by Cui [11] shows that these forces always act perpendicularly to the four velocity vectors of particles in 4D spacetime rather than along a line drawn between interacting particles. According to Cui, the direction adaptation nature of these two types of forces might have something to do with the quantum aspect of the phenomenon. Though Cui's argument is not directly related to my model, his intuition concerning the role of orthogonal angles in physics is worth pointing out as an analogy in the present context.

Uncertainty of Future

The uncertainty of future is necessarily connected to the rules governing the quantum probability waves of particles. The immediate future of an electron presents an uncertainty (a cone defined by solid angle Φ) relating to magnetic dipole moment μ whose diameter where it intersects the tangent plane to velocity v, projected on E_2, defines the front of present (figure 11).

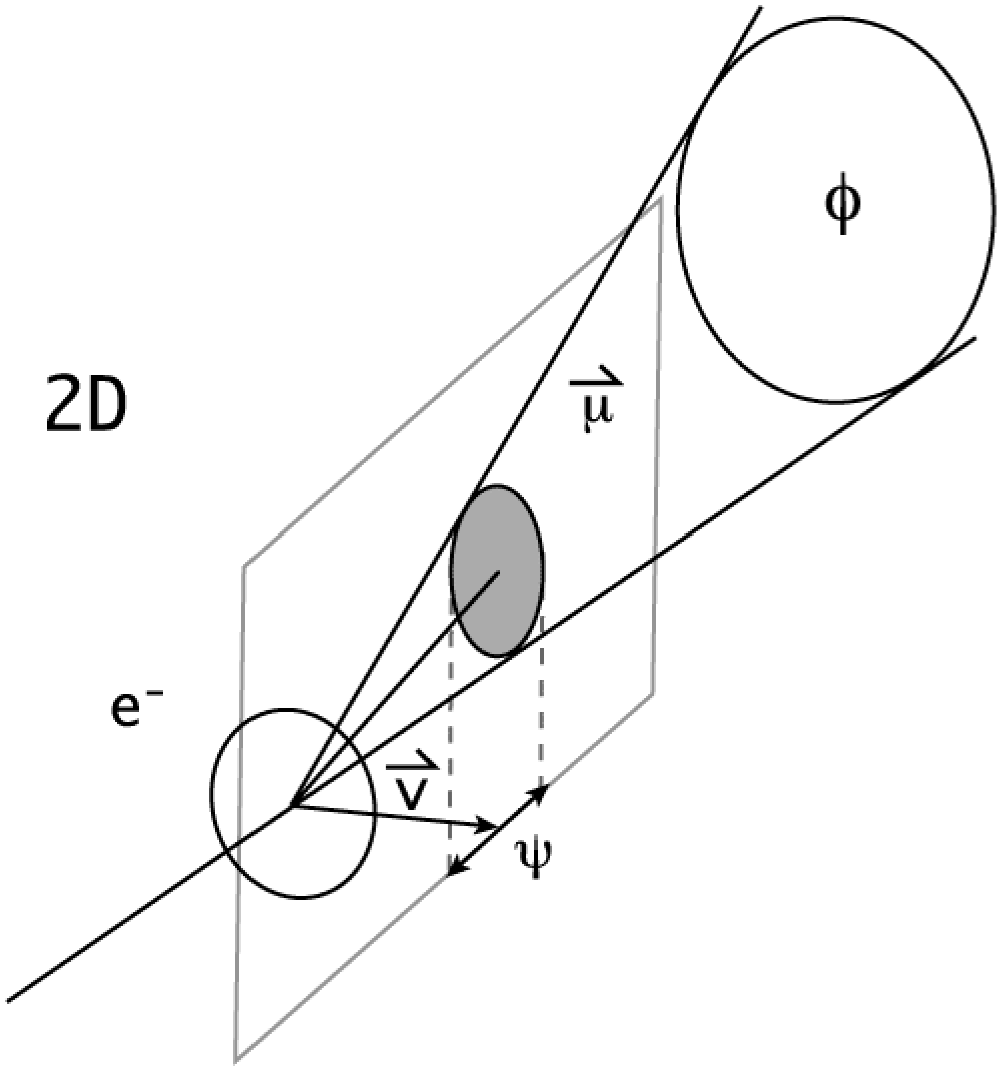

Figure 11. The cone and uncertainty line Ψ associated with the future of a moving electron. The intersection of the cone with the plane perpendicular to the front of present on surface E_2 projects a line of uncertainty that is perpendicular to the motion.

The quantum probability wave forms an uncertainty line Ψ in 2D and an uncertainty surface Ψ in 3D (figure 12), both velocity-dependent and lying on the front of present, perpendicularly to the time axis.

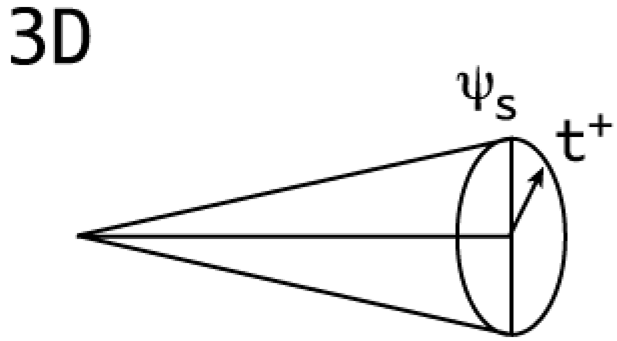

Figure 12. The surface of uncertainty Ψ lies perpendicularly to the motion of a particle in 3D.

Interfaces and Wave Function Reduction

The uncertainty lines Ψ_1 in 2D become uncertainty surfaces Ψ_s in 3D, forming interfaces where the futures of objects meet and the coherence of spacetime can be adjusted. Wave function reduction, far from representing some sort of interference between the observer's conscience and a physical phenomenon, simply requires that two fronts of future meet in such a way as to become the cause of other subsequent phenomena.

Decoherence is natural in 3D if the future of a quantum object does not meet the future of another object to produce a cause. When an electron goes through two slits at once, an interference pattern is produced in the surface Ψ of probabilistic future. The very observation of the quantum state of a particle induces the future of the observer, which reacts with that of the particle to reduce the wave functions of the particle and the observer simultaneously at the interface. This reaction of mutual wave function reduction allows the coherence of spacetime to be adjusted through an interface that forms a perpendicular surface Ψ common to the observer and the observed.

Maintenance of Present

The process of maintenance of present can be viewed as a vibration: an instance of an antiparticle annihilates an instance of the present of the corresponding particle as a new instance of the particle appears with a new instance of its antiparticle.

Without some sort of continuous dissolution and creation process, or "rebound effect", physical events would accumulate in limited persistence spaces.

Discussion

Doubts could be raised about the validity of the electron structure presented in this article, since the electron's magnetic dipole moment cannot be formally determined on the z axis based on observations. It should be stressed that regular observations are made from a 3D point of view. A 2D phenomenon, however, will necessarily bear uncertainties in 3D, a higher dimensional order than that in which 2D structures are defined.

The time location of the past and thus of a proton's antiquarks outside the nucleus of the atom (figure 5) is a geometric configuration that is conducive to the maintenance of the orbital of the hydrogen atom's electron, due to the repulsion between the charges of the quarks and the positron and those of the antiquarks and the electron. It wouldn't be surprising if the proton's thickness of present coincided with the electron's – thus ensuring the stability of the atom in 3D – and helped determine the energy levels of the various electron orbitals in more complex atoms.

The interactions between positrons, electrons, quarks and antiquarks can be analysed easily with this model. However, I save this work – as well as a study of the formation and structure of neutrons – for later publications.

Assuming the antiparticle lies in the past of its particle, the effect of the antiparticle's mass on the particle must be examined. According to quantum theory, the mass of an antiparticle is equivalent to that of the corresponding particle. In order for the antiparticle to remain invisible to the particle (to my knowledge, no gravitational effect revealing the presence of an antiparticle near a particle has ever been recorded), its gravitational wave would never have to be able to reach the present of the particle. The fact that the thickness of present is the reciprocal of the speed of light, which Einstein assumed to coincide with the velocity of gravitational waves, certainly has something to do with it, but the paradox remains.

My description of protons as being formed through the mutual repulsion of electrons provides an interesting lead in the search for an explanation to Feynman's ratios of gravitational attraction to electric repulsion, and proton diameter to universe diameter, both of which have an order of magnitude of $\sim 10^{-42}$ [12].

This proton formation mechanism could be responsible for the unexplained jets of matter observed at the centre of disk-shaped celestial structures; apparently, the impressive focusing of these jets can only be explained by the presence of intense magnetic fields [13]. The centre of a rotating 2D charged surface is the most likely place for a high concentration of electrons to be found.

Unlike the speed of light, which is the highest speed at which information can travel through space, the thickness of present not only serves as a foundation for the persistence of fermions, making them obey the Pauli exclusion principle, but also acts as a local resistance to or friction against the spread of information through space.

The present model explains and reconciles certain contradictory aspects of the general relativity and quantum mechanics theories. General relativity is entirely based on a continuous universe in 3+1D, while quantum mechanics rest on discrete mathematics relating to 2D binary phenomena that strictly exclude gravity, which is confined to a 3D geometry [8]. I eliminate this discrepancy by introducing the notion of cleavage between dimensional orders 1, 2 and 3 and referring to my concept of gravitational freedom of empty space [8], which provides new insight into both the separation and connectedness of the different dimensional orders.

Having established that the electron has a 2D structure and that gravitation only acts in 3D, I must ascribe a meaning to the electron's rest mass. This mass can simply be taken as a vibration of surface E_2 in 3D, which would explain the considerable mass difference between protons and electrons ($m_p = 1836\ m_e$).

Interface reactions between futures are consistent with Smolin's conception of the universe as a network of evolving relationships [5]. Smolin's analysis of Penrose spin networks should help understand how spacetime coherence is maintained through the interaction of magnetic fields on the front of present where the wave function is spread out.

These discoveries open a whole new field of thought with regard to the role of interfaces between referential frames. This issue must be related to the Beckenstein concept of surfaces, entropy and the Planck constant. The occurrence of wave function reduction on 2D surfaces in 3D and the resolution of spacetime coherence governed by this process constitute substantial clues as to what underlies the illusion to which three-dimensional nature has confined us.

At present, the general trend is to consider space and time at the microscopic level as discrete phenomena [5]. In my theory, time acts discretely through the thickness of present and the instantiation of particles obeying the Pauli exclusion principle, a process wherein resulting space is fragmented into quanta.

Conclusion

This article presents a geometric theory of time, space and charges.

I suggested that space does not exist a priori and assumed that the fundamental principle underlying electric repulsive forces is the provision of the space required for electron persistence. I then postulated that this 2D space is produced by the mutual repulsion of electrons.

I established relevant conditions and proposed a proton formation process wherein three-dimensional space is produced.

By assuming that antiparticles lie in the past of their corresponding particles, I derived a mechanism for the deployment of new spatial dimensions involving, in each instance, an orthogonal induction of time on the front of present.

I assumed and then demonstrated that it is relevant for the present to possess a time thickness that is related to the wavelength of particles. I established that the thickness of present factor is the reciprocal of the speed of light.

I established the fundamental relation defining the thickness of present factor: $e_p{}^2 = \mu_0\varepsilon_1 x_0$. This equation describes a model of the universe based on three dimensional orders, each of which is characterised by a constant related respectively to magnetic, electric and gravitational fields. There should be a fourth dimensional order, of order zero, which is time but in the form of frequency. This prime dimensional order can only be perceived through other dimensional orders.

Finally, I linked quantum probabilities with the uncertainty of future using a line or surface – depending on the dimensional order in which a given phenomenon occurs – extending on the front of present perpendicularly to the arrow of time.

I identified an angular phenomenon, dimensional cleavage, to which I ascribed relativistic effects on the perception of masses and lengths from different referential frames in motion relative to one another.

I discussed interface wave function reduction phenomena.

I associated dimensional cleavage with an orthogonal induction of future inherent in the deployment of dimensional orders.

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