The Atomic Vortex Hypothesis, a Forgotten Path to Unification

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September, 2013

Introduction

The rise of positivism in science during the early 20th century led to the abandonment of the then prevailing mechanistic approach to theoretical physics (realism). Max Planck's discovery in 1900 that the emission of thermal radiation only occurs in discrete quantities related to a definable constant, the development of the Special and General Theory of Relativity, and the subsequent historical evolution of quantum mechanics resulted in reinforcing a conviction that a classic mechanistic model could have no place as a foundation for physical theory. By the end of the 20th century it was clear that not only were the current conceived models of quantum mechanics and relativity fundamentally incongruent, but astrophysical observations required postulating exotic entities (such as dark matter and dark energy) solely to keep the models compatible with the observations. Evidence is building (if not already overwhelming) that current physics theories are lacking something fundamental, without which unification will never be possible. Any unification theory must, by definition, seamlessly integrate all known branches and elements of physics. Hopefully it will also both quantify and resolve known paradoxes and anomalies; while providing insight to new relationships and connections. To achieve this at a foundational level, the process should give rise to all observed physical processes and behavior. Herein we will explore the possibility that a granular, discrete-entity media consisting of vortices can provide just such a basis.

Basic Concepts

We will start by postulating a single vector entity (a single quantum entity) which:

- Has a defined momentum (**p**),
- occupies space of volume (s),
- and obeys Newton basic laws of motion

These quanta therefore can move through four dimensional space (x,y,z,t) with any velocity (**v**), and have a mass (m_p) equivalent to (**p**/**v**). We will further postulate that these quanta form toroidal, fluid structures (vortex rings) as indicated by Maxwell's electrodynamics. Starting with these two postulates, we shall attempt to describe and derive the key properties of such a media and compare the results with known physical properties. It is very important to note that the vortices in a fluid act as pseudo particles interacting with each other in a distinctly peculiar manner. Vortices can have two coupled circulations: (poloidal and toroidal). They can sustain oscillations in both, but only in integer values of circumference ($2\pi r$) at a radius [*r*]. Vortices can come in all sizes but have a minimum limit, which is determined by the constitute quanta size and spacing.

Lord Kevin at one point posited that the entire universe is likely to be what would be called today a Bose-Einstein condensate which he termed a vortex sponge (possible super-solid). Maxwell used this model to define and quantify the distinct mathematical properties of electromagnetism, and we also use it as our main basis, treating these (smallest) vortices as particle-like entities each having distinct linear and rotational momenta. There are therefore two distinct levels to this model with each playing a crucial role. The first consists of the basic media quanta, and the second that fluid's vortices. The lower base level is assumed to be an (if not ideal, nearly so) in-viscous (superfluid) system obeying the defined rules of basic kinetic theory. Throughout this work we use the standard international (SI) - MKSC unit system when presenting physical relationships.

Action and Energy

A direct approach for defining such a system's total energy is in terms of vortex interactions. In any kinetic system, these interactions (collisions), are directly proportional to an average spacing (**L**) (the mean free path

[MFP], their average momentum (**p**). These two quantities directly define the lagrangian action parameter (**h**) of the system. This becomes:

$$h = 2p\int_0^L \delta L = 2m_p v\int_0^L \delta L = 2PL = 2m_p VL \qquad \text{(Eq. 1)}$$

This action parameter h may be directly integrated (by the rate of interactions (i)) to define the total energy involved:

$$E = \int_0^i nh\ \delta i = nh\int_0^i \delta i = nhi \qquad \text{(Eq. 2)}$$

Since this rate can be either c/L (*c = mean speed*) for random interactions or frequency ν for wave actions, and nhi = n*pv*, the total system energy can be defined as

$$E = nmv^2 = Mv^2 \qquad \text{(Eq. 3)}$$

or

$$E = h\nu. \qquad \text{(Eq. 4)}$$

If velocity *v* becomes *c* we find that we have defined both the relativistic and quantum forms of the energy equation.

Permittivity and Permeability [13],[14]

In classic kinetic theory, longitudinal wave (Ψ) speed is defined as;

$$c_\Psi = \sqrt{\frac{\sigma}{\rho}} \qquad \text{(Eq. 5)}$$

and transverse waves (S_z, S_y) as:

$$c_T = \sqrt{\frac{\sigma}{3\rho}} \qquad \text{(Eq. 6)}$$

Where σ is the modulus and ρ is the mass density

Note: It is recognized that under classical kinetic theory, transverse waves are not carried in irrotational fluids. However, Lord Kelvin demonstrated that transverse waves do exist in a fluid predominantly consisting of vortex rings, a state which is due to the gyroscopic action of the fluid circulation he defined as a vortex sponge. The reason for this, around the large and small axis of the vortices

The transverse wave equation was first introduced by J. C. Maxwell in his 1861 paper *On Physical Lines of Force* correlating the speed of light to the modulus σ and density: ρ of the medium. We note that the modulus is simply an expression of the energy density of the medium. i.e:

$$\sigma = nP\int_0^v \partial v \to nPc \to nmc^2 \qquad \text{(Eq. 7)}$$

Where n is the numeric density (*in entities per unit volume*), **p** the mean momentum of each entity, and **c** their mean speed

Thus, when divided by mass density:

$$\rho = nm \qquad \text{(Eq. 8)}$$

We get back the square of mean speed of the entity population. The inverse of modulus is defined as the *coefficient of compressibility* (μ). In terms of transverse waves

$$\mu = \frac{3}{\sigma} \qquad \text{(Eq. 9)}$$

and

$$c = \sqrt{\frac{1}{\mu\rho}} \qquad \text{(Eq. 10)}$$

This form of the equation is the one found in modern textbooks. Where light speed is expressed in terms of Permeability **μ** (compressibility) and Permittivity (€) (density ρ).

Divergence and the Origin of Charge

In any compressible media there exist cyclic fluctuations in the physical contents of every point. The scalar magnitude of the point momentum variance is Divergence and is defined as:

$$\mathrm{Div}P = \lim_{s\to(\frac{L}{3})^3} \frac{P\int \partial A}{\partial s} = q \qquad \text{(Eq. 11)}$$

If this divergence is zero the field is incompressible. However incompressibility requires that there be no spacing (L) no wave based phenomena can occur. For compressible fields this term can be simply defined as:

$$q = \frac{2P}{L} \qquad \text{(Eq. 12)}$$

With this definition divergence has dimensions of mass per unit time. In the model we relate this fundamental field property to electrical charge. The textbook dimensions of charge (*in terms of mass/length/time*) remains undefined and is assigned arbitrary names (*Coulombs in SI, ESU in cgs, … etc.*) in different unit systems. In this model this is not the case and for the SI unit system it is defined as one (1) Coulomb equals 1 *kg/sec*. The benefit of this definition is demonstrated below.

Ring Vortices and Torroidal Geometry [12]

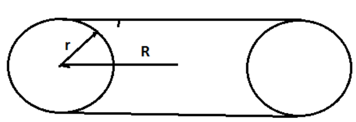

Figure 1

The volume (s) of a torus is defined as:

$$s = 2\pi^2 R r^2 \qquad \text{(Eq. 13)}$$

and it area as:

$$A = 4\pi^2 R r \qquad \text{(Eq. 14)}$$

If R = 2r and L= r the area of a ring vortex:

$$A_T = 4\pi^2(2\,\mathrm{rr}) = 8\pi^2 r^2 = 8\pi^2 L^2 \qquad \text{(Eq. 15)}$$

Where the $8\pi^2$ is the geometric eigenvalue for this specific geometry form. Couple this to the eigenvalue $\sqrt{3}$ for the difference between longitudinal and transverse wave speeds we has a distinctive dimensionless geometric factor (α) of:

$$\alpha = \frac{1}{\sqrt{38\pi^2}} = 7.3121E-03 \qquad \text{(Eq. 16)}$$

This new definition of **α** satisfies Richard Feynman prediction, namely **α** is simply a geometric factor that is based upon distinguishing characteristics of an underlying physical structure. Starting with the accepted textbook definition of α as:

$$\alpha = \frac{q^2}{2\rho h c} \qquad \text{(Eq. 17)}$$

and solving for charge (q):

$$q = \sqrt{2\alpha\rho h c} \qquad \text{(Eq. 18)}$$

then substituting in the new definition of α we get:

$$q = \frac{1}{2\pi}\sqrt{h\sqrt{\frac{\rho}{3\mu}}} \qquad \text{(Eq. 19)}$$

This is accomplished by replacing light speed **c** with its definition, $\sqrt{1/\rho\mu}$. Note that when using $\mu_o\ \varepsilon_o$ (ρ) the result increases the value of charge by 1.00116. This is exactly the amount necessary to eliminate the observed anomalous electron Magnetic Moment. Therefore this definitions of **α** and **q** removes the heretofore anomalous difference between measurement and calculation. The new definition of charge also demonstrates its fundamental quantum nature as an un-damped harmonic oscillator. The equation indicates variability in the local value of q which depends on the local values μ and ρ. This provides a simple basis for both galvanic and thermo-electric potential.

Temperature and Thermal Physics

The model also provides a means of connecting Boltzmann's Constant (k) to Field Action **h**, Divergence **q**, and propagation speed **c**:

$$k = \frac{h}{qc} = \frac{h\sqrt{\rho\mu}}{q} \qquad \text{(Eq. 20)}$$

(N*ote the replacement of light speed c with its [x,y,z,t] point definition of* $\sqrt{1/\rho\mu}$. *This more accurately reflects the local value of light speed in bulk physical substances like air, water, …etc.*)

Therefore temperature becomes a measure of the excitation of (or acceleration on) a charge **q**, i.e. while force (F) is

$$F = qE = q(v \times B) \quad \text{(Eq. 21)}$$

Temperature (T) is

$$T = qa = q\upsilon E = q\upsilon(\text{v} \times B) \quad \text{(Eq. 22)}$$

Where acceleration **a** can take several forms. For an ideal 'Black Body' temperature can be related to a characteristic emission frequency **ν** as:

$$T = \frac{qcv}{3} = \frac{qv}{3\sqrt{\rho\mu}} \quad \text{(Eq. 23)}$$

Therefore the black body frequency (ν) is:

$$v = \frac{3T}{qc} = \frac{3T\sqrt{\rho\mu}}{q} \quad \text{(Eq. 24)}$$

It appears from the above that temperature is the measure and manifestation of cyclic variations in the value of charge. Another interesting observation is that in this model which is founded upon Maxwell's, charge itself is a basic oscillation of momentum at each and every point in the field and with units of kg/sec we finally realize that the charge to mass ratio is simply the oscillation's frequency ν. Thus with this definition:

$$\upsilon = \frac{q}{m} \quad \text{(Eq. 25)}$$

and using the published rest mass of an electron, then with:

$$h\nu = 3kT \quad \text{(Eq. 26)}$$

we get:

$$T = \frac{hq}{3km} = \frac{q^2c}{3m_e} = 2.8\ °K \quad \text{(Eq. 27)}$$

This suggests a link between the oscillation frequency of the electron and the observed CMB (Cosmic Microwave Background) .

Likewise the power density (Q - *Watts/m²*) based on this frequency (υ) is:

$$Q = \frac{h}{2c^2}\upsilon^4 = 3.22\text{E-06} \quad \text{(Eq. 28)}$$

Note: this equation is a direct replacement of Stephan-Boltzmann's equation and uses the black body frequency. We no longer need the undefined Stephan-Boltzmann's constant.

Moving Sources and the Basis of Lorentz-Poincare` Relativity [4] [9] [10]

An important aspect of this model concerns the effect of steady motion of a medium on the field distribution from any emissive sources located within it. In the absence of motion the propagating field will be spherically symmetrical.. However, motion changes this profile. The field distribution of a stationary source in a moving medium when measured in the source's coordinate system is the same as that of a moving source in a stationary medium. The field from a source located at the origin of the stationary coordinate system (*x,y,z,t*) in which the medium moves with a constant velocity (**v**) in the direction of the x axis is shown in figure 2 below.

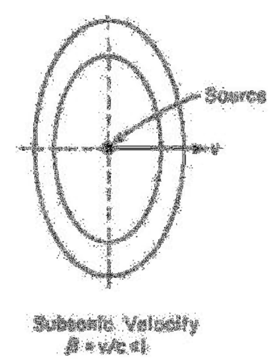

Figure 2: *Equal intensity contours for a source in motion as measured in the coordinate system attached to the source.*

The surfaces of constant phase are spheres. This can be easily seen by calculating the time it takes for a pulse to reach x, y, z. The surfaces of constant pressure, on the other hand; are ellipsoids $\mathbf{z^2/(I - \beta^2) + y^2 + z^2}$ = constant = r^2, as pictured in Fig. 2 above. It is important to notice that as Fig. 2 illustrates the field is axially symmetrical and the intensity is retarded in the direction of motion. Physically this can be explained as follows. In the direction of motion the space occupied by a pulse of energy "stretches" out, and its energy density is correspondingly decreased. In the opposite direction the wave has to effectively travel further to reach the point of observation, and the spherical divergence is correspondingly larger.

This behavior is the same for all granular media and the resulting field profile can be fully defined as:

$$r = r_o\sqrt{1 - (\frac{v\,(\cos\theta)}{c})^2} \qquad \text{(Eq. 29)}$$

Where θ is the angle measured relative to the direction of motion…

This leads directly to the behavior described by Lorentz and Poincare` in their 1904 papers. Since all fields are equally affected including those that constitute the structure of material objects this change in length cannot be directly measurable just like an ellipse can appear to be a perfect circle on a computer screen where the aspect ratio matches the inverse of the distortion ratio. However, if the propagation speed is invariant irrespective of motion travel lengths and times must increase in moving systems.

The Light Clock and Time Dilation

Consider a clock consisting of a laser emitter, mirror and a detector mounted at the emitter. It works by firing a pulse of light across a fixed distance (d) reflecting off the mirror and returning to the detector. Each time the detector circuit senses the returning pulse a 'tick' is recorded and another pulse fired. Assuming light propagates c and independent of any speed of the emitter/detector then, when motionless, the time it takes to traverse the circuit is simply 2d/c. Now set the clock system in motion with speed (v) in the direction of the mirror. The mirror recedes from the incoming pulse at v and with c unchanged it approaches the mirror at a net speed of (c – v) . Upon hitting the mirror and reversing the same pulse approaches the detector and a net speed of (c + v). If the distance d remains unchanged the total round trip distance is $2d/(1 – \beta^2)$ and the transit time $2d/c(1 – \beta^2)$. With material systems consisting of atomic elements held together by electrostatic fields motion reduces the field spacing by $\sqrt{(1 - \beta^2)}$. Therefore the travel distance becomes $2d/\sqrt{(1 – \beta^2)}$ therefore the round trip time reduces to $2d/c\sqrt{(1 – \beta^2)}$. Since this effect results in the total travel distance from all angles being equal and with speed being defined as distance divided by time (d/t) we find that the computed value of light becomes a constant value. However, the consequences of having to physically traverse longer distances within moving systems MUST result in longer round trip transit times. The simple fact is, $d' > d_o$ thus $t' > t_o$. If this fact is not properly understood and accounted for the result variances in the tick rate of the same clock at different speeds gives the illusion of a dilation or slowing of time in moving systems. In fact the *net* transit speed of light is $c\sqrt{1-\beta^2}$., not c

Other Speed Induced Effects

As noted earlier there is a close correlation between the current published value of α (the fine structure constant) at 7.29735E-03 and the geometry factor $1/(8\pi^2\sqrt{3})$ at 7.31223E-03, which is difference by 0.2%. So now let's look at this in terms of the divergence in moving systems. As noted earlier divergence is the scalar magnitude of the cyclic variance of the momentum content at any point in a granular medium. In the presence of a net directional current this variance is reduced by (1 – β). Thus divergence (charge) in moving systems[15] becomes:

$$q = q_o(1 - \beta) \qquad \text{(Eq. 30)}$$

and given that our measured net speed with respect to the observed CMB is ~348 ±15 Km/sec we find that β becomes ~0.00116 making charge at this speed (1.604E-19)(0.9988) = 1.602E-19.. Since the textbook definition of α is:

$$\alpha = \frac{q^2}{2\rho hc} \quad \text{(Eq. 31)}$$

Using q instead of q_o in this equation results in an decrease of α by $1/(1 + \beta)^2$ or 0.997685. Thus 7.31223E-03(0.997685) = 7.2953E-03 which has a difference from 7.297685E-03 of ~0.03%. This is well within the ±15 Km/sec seasonal variance. Moreover, as mentioned earlier this magnitude of (1+β) is ***exactly*** the value of the observed anomalous magnetic moment of the electron which is given as 1.00115965.

Doppler, Frequency Shifts and the Hyperfine Structure Constant (g) [11]

One might expect that when in motion fluid structures that have harmonic oscillations (like ring vortices) would undergo current induced stresses which would result in variations in the measurement its base frequency. The magnitude of which should be based on the Doppler shift of (1 ± β). The total spread (g) would therefore simply be:

$$g = 2(1+\beta) = 2.0023 \quad \text{(Eq. 32)}$$

which precisely corresponds to the observed quantum hyperfine structure.

Stress, Strain & Gradients

If the energy density (ξ) varies within a medium there exists a gradient. This gradient in turn induces a stress (flow in fluids). This in turn results in strain. Since

$$\frac{\partial \xi}{\partial x} = \frac{\partial \rho}{\partial x} c^2 + \rho c \frac{\partial c}{\partial x} \quad \text{(Eq. 33)}$$

We see that any change in density **ϱ** or mean speed **c** induces a gradient in the media. So, we can describe the behavior of anything within a region of the media by its resulting stress-energy tensor $KT_{\mu\upsilon}$. How the media respond is defined by:

$$R_{\mu\upsilon} - \frac{1}{2} R g_{\mu\upsilon} = KT_{\mu\upsilon} \quad \text{(Eq. 34)}$$

Which, of course, is the hydrodynamic equation used to define the general theory of Relativity [2] [3] [4]. In simple words, the stress-energy state as defined by the stress-energy tensor on the right side of the equation defines and describes (a.k.a. equates to) the current state of the region as a whole (a mapping of the momentum-energy of the region). This therefore also determines the behavior of anything within the region.. However, any movement of the stressors changes the stress-energy state and, in turn, alters the Stress-Energy Tensor. This means that the above equation is, and can only be valid for any given instant, a snapshot of the system at any given moment only.

Granularity, Uncertainty & Quantum Theory

Fundamentally all known media and the one proposed herein consist of discrete quanta (individuals entities) separated in space. This means that as volume scales decrease well-defined properties (such as pressure, density, and other field effects) become either ill defined or non-existent. This well-known fact limits the length scales at which these properties and the mathematics of Continuum Mechanics (CM) are useful or valid. This is defined by the Knudsen number. This number is the ratio of the quanta's interaction mean free path (MFP) (L) and the length scale (x) under evaluation. When L/x is greater or equal to one basic kinetic theory holds but not continuum mechanics and when much less than unity the statistical property of continuum mechanics works well. In the the model proposed which is based on the atomic vortex hypothesis (Maxwell's 1860-61 model) there are no such things as point or even well defined '*particles*'. There are instead vortices which in Maxwell's time was called a vortex sponge. Today this concept correlates to the quantum concept of a Bose-Einstein Condensate. And while vortices can have dual oscillations on both their poloidal and torroidal axes the oscillations frequencies are limited whole number values of 2πr and 2πR respectively. In other words if a Bose-Einstein Condensate consists of a vortex lattice it is inherently quantized and linked to frequencies of $2\pi r$. Since 2π is an inherent geometric factor it should not be a surprise that 2π is so prominent in quantum theory as to have spawn its own term $\hbar$.

Div, Grsd, Curl and the Fundamental Forces

In this model any field gradient (Grad) results in a perturbative force. Likewise the point divergence (Div) in the quantity we call Charge. Finally the net circulation (Curl) at any point defined magnetic potential.

Electric and magnetic effects are both well-defined and almost completely quantified by Maxwell's 1860-61 work *On Physical Lines of Force*. It is interesting that in this model (an extension of his) the electric *potential* (**E**) has units of velocity (*m/sec*) and the magnetic *potential* (**B**) is a dimensionless. This along with Maxwell's original work could help shed light resolving the actual physical mechanisms involved in. the creation of the both forces. Inspection strongly suggests that both the electric and magnetic forces are Bernoulli flow induced effects. In this view opposing currents reduce net flow velocity between the vortices increasing pressure and creating an apparent repulsive force. Complimentary currents increase net velocity resulting in an apparent attraction.

Gravity as the Gradient of Electric Field

If the electric potential (**E**) is a net speed its gradient will be an acceleration.:

$$\nabla E = \frac{E_{r1}^2 - E_{r2}^2}{r1 - r2} \qquad \text{(Eq. 35)}$$

Since this potential is squared the sign of **E** does not matter and the gradient vector is always directed towards the point of highest intensity. This provides a natural explanation for the singular attractive nature of the gravitational force. Then let:

$$\frac{\rho(\alpha c)^2}{2\pi} or \frac{\alpha^2}{2\pi\mu} \qquad \text{(Eq. 36)}$$

be the resulting momentum flux gradient per unit area (Φ). Now, let (μ_g) be a fundamental interaction coefficient of *3.146E-06 m^2/kg*. Thus:

$$\nabla E = \Phi\mu_g = \varphi = 2.12\text{E} - 05\ \frac{m}{sec^2} \qquad \text{(Eq. 37)}$$

we will, at this point declare this a new physical constant. The acceleration resulting from the interaction between two such gradients is,

$$a = \frac{4\pi\Phi\mu_g^2 m}{4\pi r^2} = \frac{\varphi m\mu_g}{r^2} = \frac{Gm}{r^2} \qquad \text{(Eq. 38)}$$

Where G becomes

$$\text{G} = \Phi\mu_g^2 = \varphi\mu_g = 6.673\text{E} - 11\ \frac{\text{m}^3}{\text{kg}-\text{sec}^2} \qquad \text{(Eq. 39)}$$

therefore

$$G = \frac{(\alpha\mu_g)^2}{2\pi\mu} \qquad \text{(Eq. 40)}$$

Note that the $\boldsymbol{\mu_g}$ term is traditionally identified with a mass attenuation coefficient. When multiplied by density it yields a linear attenuation coefficient. With a density ρ of 8.8E-12 kg/m^3 this becomes:

$$\mu_g\rho = 2.785E - 17\ \text{m}^{-1} \qquad \text{(Eq. 41)}$$

and its inverse is called the *gradient mean free path*. This is not at all related to L (*the medium's interaction MFP*).

Finally, the overall force generated between two bulk masses (M & m) becomes:

$$F = \frac{\Phi(M\mu_g)(m\mu_g)}{r^2} = \frac{GMm}{r^2} \qquad \text{(Eq. 42)}$$

Where the total mass is simply:

$$m = \sum_{i=1}^{n} \mathcal{M}_i \qquad \text{(Eq. 43)}$$

And $\mathcal{M}$ is the mass of any electromagnetic entity (*be it a proton, electron, neutron, photon … etc.*). Note that G contains μ_g^2 and is therefore limited to situations involving the interaction of two bodies. However, φ only contains μ_g

and can be used when evaluating situations involving a single entity. For example φ can be interpreted as a resistance to relative motion. The magnitude of this resistance (a_d) is defined as:

$$a_d = \varphi \frac{v}{c} \quad \text{(Eq. 44)}$$

Where v is the net relative velocity of an entity in the field. Consider the Pioneer spacecraft moving at ~12.5 kps. Its deceleration in this model is therefore predicted to be *8.4E-10 m/sec²*. Within experimental error this value matches the actual observed deceleration of both spacecraft.

Field Limits

Within this model all long range forces (*electric (Div), gravitational (Grad), magnetic (Curl)*) arise from well-defined continuum mechanical processes. At the length scales less than or equal to a Knudsen value ≥ 1 none of these processes apply since, at this level, the fields from which they arise no longer exist. While this occurs at a length scale much smaller than vortex interaction length (L) the very fact that field effects do not have infinite scale ranges resolves one of the greatest issues in physics today, namely gravitational field (i.e. the E field gradient) simply vanishes at these quantum levels.

Near Field Effects and Nuclear Forces

It is beyond the scope of this paper to attempt to describe the structure and nature of matter. However given the premise of the model one would expect it to be similar to Lord Kelvin's concept of knotted vortices. Close range vortices interactions consisting of intertwined flow & vibration could and should give rise to extreme near field effects. Quasi-stable knots could be separated by local field perturbations exceeding the threshold value. It would be solely probabilistic as to when this occur. The weaker the binding the quicker it occurs. This would account for the weak nuclear force. However, if the knotted structure's near-field interactions create binding forces that exceed the strength of all possible natural field fluctuations the structure remain stable and would account for the strong nuclear force.

The Strong and Weak Nuclear Forces

To address the weak and strong nuclear forces, one need a model of what matter is. Postulating matter is a (quasi)stable structure of the medium (which is consistent with Lorentz' or Penrose's model), then there is a basis for extending the model into the region of particle dynamics.

What we call particles (protons, electrons, muons, etc) are, in this model, quasi-stable momentum structures of the fluid. Some (the proton, antiproton, electron and positron) correspond to the lowest-energy states available. Others (muons, pions, etc) are similar but more complex structures that are only quasi-stable. These structures exist within a fluid medium whose quanta have a Maxwellian speed distribution. The structures therefore are interacting with the individual quanta which have a wide range of speeds. Every so often a the structure will be 'hit' by quanta with sufficiently speed to 'knock' the matter structure far enough out of alignment to allow it to collapse into a lower energy state (or states). A beta decay would be the simplest of these transitions. Therefore radioactive decay would be a direct result of the fluid's Maxwellian distribution.

Slowing of Decay with Speed

As a structure moves faster through the medium, the probability that it will encounter a suitably fractionally 'faster' than the average quanta decreases. Therefore the probability of encountering sufficiently high speed quanta drops and is directly proportional to:

$$\sqrt{1-\beta^2} \quad \text{(Eq. 45)}$$

The Constants of Nature

We demonstrate below that all of the major constants of nature can be derived from the vortex momenta quanta (P) and interaction length (L). Given the earlier definitions,

$$h = 2PL \quad \text{(Eq. 46)}$$

and

$$q = \frac{2P}{L} \quad \text{(Eq. 47)}$$

We can derive P and L as::

$$P = \frac{\sqrt{hq_o}}{2} = 5.1546E - 27 \quad \text{(Eq. 48)}$$

and

$$L = \sqrt{\frac{h}{q_o}} = 6.427E - 08 \quad \text{(Eq. 49)}$$

Combined with c, α, and s all other constants can be defined. For example,

Permeability…

$$\mu_o = \frac{\alpha L^3}{Pc} = 1.256\text{E-}06 \quad \text{(Eq. 50)}$$

Permittivity…

$$\rho = \frac{P}{\alpha c L^3} = \epsilon_o = 8.857\text{E-}12 \quad \text{(Eq. 51)}$$

Boltzmann's Constant

$$k = \frac{[L(1+\beta)]^2}{c} = 1.381\text{E-}23 \quad \text{(Eq. 52)}$$

Rydberg's Constant

$$R = \frac{1}{\sqrt{2}L(1+\beta)} = 1.0989\text{E+}07 \quad \text{(Eq. 53)}$$

Gravitational Constant

$$G = \frac{\alpha P c \mu_g^2}{2\pi[L(1+\beta)]^3} = 6.673\text{E-}11 \quad \text{(Eq. 54)}$$

Hydrogen stable electron energy states (U_n)

$$U_n = \frac{\sqrt{2}Pc}{n^2} \quad \text{(Eq. 55)}$$

Conclusion

In this paper we have attempted to show that by using the 19th Century's atomic vortex postulate it is possible to construct a single simple model that encompasses all known physical processes. We have covered all major branches of physics including kinetic, fluid, gravitation, relativity, electromagnetism, thermal, and quantum theory. It has being demonstrated that anomalous observations such as Pioneer's drag and the electron's magnetic can be directly accounted for by the model. Moreover we have identified new physical effects accounting for the quantum hyperfine structure, galvanic potential, the observed Pioneer drag, and the anomalous electron magnetic moment. We have also discovered new physical relationships such as how Boltzmann's constant is defined by Planck's action, charge, and light speed. This model removes all arbitrarily defined units providing both Temperature (°K) and charge (q) with fundamental dimensions of mass, length, and time. However the model is incomplete, as the details of vortex atomic structures remain undefined. What is very clear however that it cannot be point particles or even classic particles forming the basis of any atomic description in this model. I think it is clear, in light of evidence provided herein the Helmholtz, Maxwell, Kelvin atomic vortex hypothesis requires serious reconsideration as a candidate model for unification of physical theories.

Nomenclature

Below is a list of physical properties and their dimensional identities in the vortex model

m – Mass (kg)
p – momenta quanta (kg-m/sec)
L – Interaction Length (m)
s – Volume (m^3)
A – Area (m^2)
v – Velocity or speed (m/sec)
c – Wave propagation speed (m/sec)
h – Media Action parameter (kg-m^2/sec)
E – Energy (kg-m^2/sec^2)
σ - Modulus (kg/m-sec^2)
ρ - Density (kg/m^3)
μ **-** σ = Permeability
€ - ρ = Permittivity
q – Elemental charge, Coulomb (kg/sec)
α – Fine Structure, dimensionless
k – Boltzmann's Constant (m-sec)

F – Force (kg-m/sec^2)
T – Temperature $°K$ (kg-m/sec^3)
γ – Frequency (1/sec)
β - v/c dimensionless
Φ – Gravitational Flux (kg/m-sec^2)
μ_g–Gravitational attenuation coefficient (m^2/kg)
a – Acceleration (m/sec^2)

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