

The Foundations of Physics

(A Qualitative Summary)

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November 26, 2011

Whenever a true theory appears, it will be its own evidence. Its test is that it will explain all phenomena
Ralph Waldo Emerson

Abstract:

The reasons for the failure of 20th century theoretical physics are explored from the standpoint of fundamental mathematical and geometric principles. These same principles are then applied towards the establishment of a complete generalization of mechanics and electrodynamics, which will serve as solid foundation for all future advancements in their development and application. There is no appreciable difference between this paper and others written 10 years ago. The formulas are the same as those of classical mechanics and electrodynamics. As such, it can be ignored, but not refuted. This is a qualitative summary. A complete mathematical description is available.

1. Introduction:

In my early years of study, I was impressed with the publications of leading physicists who claimed that the principle motivation behind their efforts was the search for truth. After many fruitless attempts to have my own “eminently” truthful paper published a quarter century ago¹, I was forced to consider that their purpose might have less to do with exalted goals and more to do with elevating the perception of their own works. My experience in this regard suggested that nothing defines the search for truth more than the resistance to it.

One early response to my paper was by a Professor of Physics and Chancellor Emeritus of a leading university; a title whose grandeur alone would reduce one to a snivelling acquiescence. He wrote, “*Einstein's theory of relativity is not derivable a priori from simple logic.*” This statement was followed by, “*I urge you to rethink the matter from Einstein's point of view*”. Here we have centuries of hard-won objectivity replaced by the subjectivity of individual perception, and that perception, apparently, dependent on a logic too complicated to express.

The combination of a subjective philosophy and complexity provides theories that are independent of any basic principles. This leads to the unrestricted propagation of metaphysical concepts, which are then accumulated into vast mathematical edifices with no grounding in theory, experiment, or logic. One such, is the current assumption of a probabilistic basis for all physical laws, with no consideration for the obvious fact that it precludes the existence of any physical laws²! In Newton's gravitational theory, we know that any object can be treated as though its mass were concentrated at an infinitesimal central point, but it would be ridiculous to think that anyone actually...

Ten billion dollars was spent to find the Higgs boson which was not found. This will soon be declared a major success for theoretical physics since it eliminates the possibility that the Higgs boson will be found. Unfortunately, that claim has already been made! In a joint communique from Imperial College and SMU, we have; “*In fact, proving the Higgs particle does not exist would be scientifically every bit as valuable as proving it does.*”³ We can look forward to many more valuable revelations. For example, dark matter, which cannot be seen or otherwise detected will not be seen or detected. Black holes will be filled and string theory will unravel.

The search for the Higgs boson is a catastrophic failure that brings into question the entire process that engendered it. A billion a year in operating expenses makes it the biggest boondoggle since the tower of Babel.

Foundations

In the following, we clearly define a set of primitive concepts, and show how they apply in the formulation of the laws governing physical phenomena. We will also identify A few significant errors in principle that changed the course of theoretical physics for the last hundred years. Finally, we discover the only candidate that can lay claim to the “god particle”.

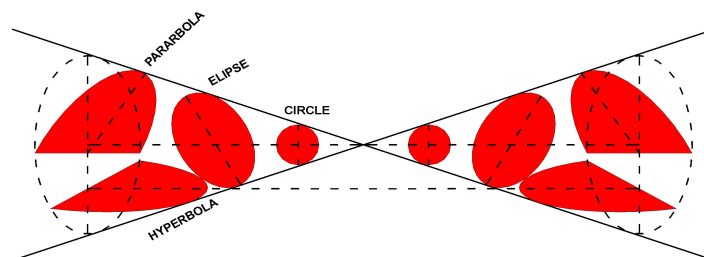


Fig. 1

a. Geometry: Only the basic entities of Euclidean geometry; point, line and plane are used. All congruent distances are considered invariant although the distances themselves are meaningless in an essentially qualitative discipline. If we allow for a fundamental duality, then all other geometries may be viewed as variants or intermediate positions. The claim is that forms of all dimensions devolve to or emanate from Euclidean primitives, and that all geometries exist as different states. We now add two attributes: Symmetry, which is the geometric equivalent of the conservation laws. Rotation as its prototypical motion.

b. Mathematics/Logic: The currently accepted principles underlying mathematics are static and do not in any way imply quantity. In their place, I have proposed the principals of duality, (each 1 presumes a minus 1) multiplicity (there is more than one) and progression⁴. The progress is linear; a simple addition or subtraction. Implicit in the latter, we find, "no logical statement can exceed its initial premise". This is the fundamental test for logical consistency and specifically identifies the **premise to be equal to all that emanates from it**. The two attributes of mathematics are equality, which is the mathematical equivalent of conservation and linear displacement.

In applying the concept of progression/regression to theoretical physics, it is seen as the method whereby a broad range of phenomena is reduced to, and dependent on a simple set of laws. The logic employed is that of **deductive reasoning** and the process is ontological. It follows that the greatest understanding is the establishment of the simplest set of laws that encompass the broadest range of phenomena. Conversely, progression has the ability to extrapolate from any given level of complexity to ever-higher degrees. **Inductive reasoning** is employed and its purpose is teleological.

Regarding both physical directions, it is quite possible to express understanding with statements such as "the universe is infinite", which has zero content, or have an encyclopedic knowledge of its makeup, but no understanding. One is useless without the other. Understanding is the ability to relate to a basic cause. Knowledge is the ability to apply content to some effect. Consider that the meaning of Maxwell's equations is still being debated while one can immediately grasp those of Faraday.

3. Special Relativity

This demonstration will show that while a purely mathematical explanation may produce a desired result, that result can be physically and geometrically impossible. We will use simple geometry and designate physical properties⁵⁶. All diagrams are from a fixed observer's point of view. We will assume as per special relativity, that the speed of light is a universal constant. Normalizing the speed of light, we have $c = 1$, for time $t = 1$, giving the distance $ct = 1$. A displacement of, $vt = .5$ is introduced.

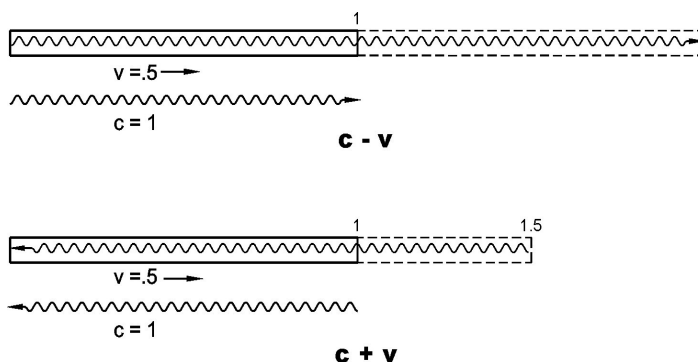


Fig. 2

Travelling in the same direction as a beam of light and maintaining a constant c , time must dilate by a factor of 2 or space must be reduced by $1/2$. On the return trip, time must contract by $2/3$ or space must expand by 1.5 . Time and distances must either contract or expand depending on the direction of light travel.

However, special relativity does not overtly deal with the opposite directions independently. Both time and space are reduced consecutively, through multiplying them by the root of the squared speeds,

$$[(c^2 - v^2/c^2)]^{1/2} = \beta \tag{1}$$

Time and distance for a two-way light path is then calculated.

There are four problems with this approach:

- a. Uniform changes in time and space are not compounded. The ratio of a reduced time and an equally reduced space is constant. The change is redundant.
- b. Time and space must expand or contract depending on the direction of light speed.
- c. The formula requires simultaneous emission of light from or to opposite directions, but the measurement is based on consecutive trips.

d. A second-order equation is a geometric plane incorporating the **Y** axis. The solution to the relativistic equation can only be on that axis.

Inductive reasoning may be pursued independent of any deductive process and the reverse is also true. Special relativity can only be accepted by ignoring fundamental logic.

Electromagnetism

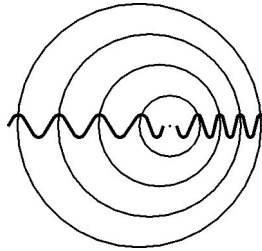


Fig. 3

We can give the above demonstration a proper physical and geometrical interpretation by observing that in Fig. 3, $t(c - v)$ and $t(c + v)$ represent the Doppler effect on the wavelengths of light⁷⁸ emitted by a moving object on the **X** axis. Note that they propagate simultaneously as required by formula (1).

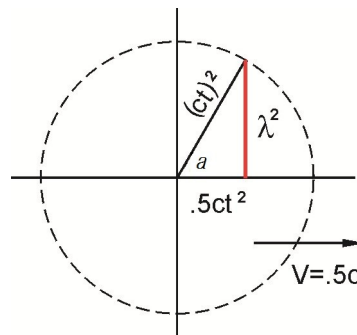


Fig 4

It follows that the “relativistic” equation,

$$\beta ct = \lambda \tag{2}$$

represents the wavelength perpendicular to the direction of motion. If we freeze the action at $t = 1$, after a pulse of light has been emitted at origin, we find:

The wavefront is uniformly distributed in a circle of radius ct . The object is positioned at $.5ct$, so that $(ct)^2 - (.5ct)^2 = \lambda^2$ as Pythagoras will attest. That is, a beam of light emitted vertically at O , in the moving frame will appear rotated by an angle in the “fixed” which is the classical (and simplest) explanation for stellar aberration, requiring only that the beam be discontinuous (photons).

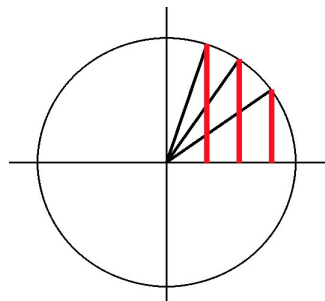


Fig. 5

We have established a standard wavelength of **1 hertz**, so the reduced wavelength λ represents an incremental increase in frequency, and therefore, “energy” relative to the fixed observer. Finally, we can dispense with some mathematical baggage by realizing that β is the trigonometric identity, $1 - \cos^2 a$ so that λ is the **sine** of a , the interior angle (Fig. 4)

Various displacements along the **X** axis give different values of the **1/2** chord λ , but the radius length **ct** does not change; it rotates. Accordingly, any object moving at any velocity at any given time will identify the speed of light as a universally invariant, an attribute that the entire structure of special relativity was designed to accommodate. The reason for its invariance is simply that light travels at **c** in empty space in all frames of reference.

a. Absorption:

We have established that the relativistic equations apply to electromagnetic interactions. If we assume Fig. 4 represents the typical sizes associated with an electron in uniform motion at **v**, then the e/m field exhibits a Doppler displacement relative to a fixed observer. As special relativity and the Compton effect confirm the early experiments by Bucherer et al., that moving electrons exhibit increased inertial effects, we identify them to be due to that same field displacement. Further, it will be shown that λ is, the total energy vector, on the **Y** axis of Fig. 4.

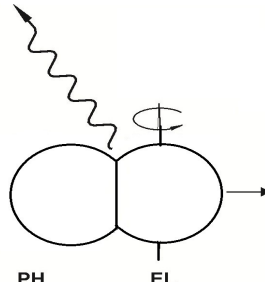


Fig. 6

In the Compton collision, a photon interacts with a free electron causing it to accelerate. The interaction is totally inelastic with respect to the fields, and the energy transferred is according to the conservation laws. That which escapes, is the coupling energy; evidently a loss of kinetic and an equivalent increase in potential for the system.

$$\mathfrak{J} = \epsilon_1 / \epsilon_1 + \epsilon_2 \tag{3}$$

where ϵ_1 is the energy of the photon, ϵ_2 is the electron at rest and $c = 1$, throughout.

If we subtract emitted energy from initial energy, $(\epsilon_1 - \mathfrak{J})$ the result must be the total field energy $(\epsilon'_2 v_i^2 / 2)$ of the system, where the primed value represents the increase in inertia. The relativistic formula is of course, the same:

$$(\epsilon'_2 - \epsilon_2) = \epsilon'_2 v_i^2 / 2 \text{ (where charges } \epsilon'_2, \epsilon_2 \text{ replace } m, m_0 \text{) and, Kinetic - Potential = Total.} \tag{4}$$

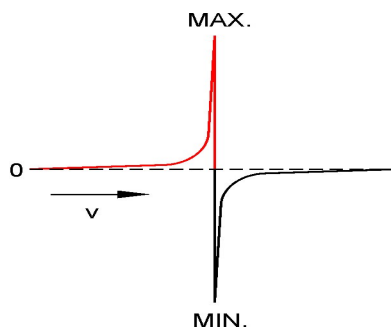


Fig. 7

The relativistic equations are based on a limiting speed of **c** for the electron, but it is evident that the “limit” can be at any lesser (or greater) speed, giving the maximum inertial effect at the point where the applied force is expended, resulting in uniform motion. Since the inertia of the field has increased, there must be an equivalent loss in kinetic energy, according to the conservation laws. As indicated in Fig. 7, the inertial effect is associated with the **Y** axis, which identifies it to be magnetic, and the right term has the dimensions of the classical induced **magnetic** field. Yet we see by equation (4), it represents **total** field energy. The vector aspect indicates spin. The **kinetic energy exceeds that of its rest energy**, giving a positive result. This can only be interpreted as the field exerting an inertial effect on the particle travelling in one direction, and the loss of inertia of the particle due to the motion, increasing the kinetic energy of the field in the opposite direction. The loss of particle inertia causes the field kinetic to exceed its equilibrium position with its inertial, which retards the kinetic energy of the particle by an equivalent amount.

This suggests a simplification, if only for general descriptive purposes. For example, magnetic and conservative relate to the inertial aspect of field, while electric and gravitational, to its kinetic. Potential then applies to both, in terms of the amount of

push and pull available. In the following, we will use the identities, field and particle, and their actions, inertial and kinetic.

b. Emission:

Maxwell's equations suggest that an accelerating charge emits radiation, but this is based on the assumption that space is universally invariant. The Compton effect shows no sign of emission, other than that of coupling. There **is** no emission unless there is a cessation of motion (braking). As we know, both emission and absorption are quantized, but depend on frequency.

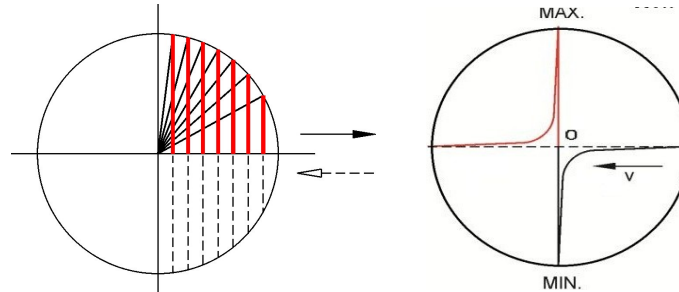


Fig. 8 and 9

If we increase the particle speed in Fig. 8 we find that field inertia increases and field speed reduces. Beyond the speed of light, inertia becomes negative, and there appears to be no limit to the speed of the electron. For an observer on the **X** axis, the wavelength is reversed and the object will appear to be travelling in the opposite direction. The maximum field speed must be at the zero point, which must also signify maximum particle inertia is also at the zero point. Field must be based on the inverse cosine of the angle, where the inertial increase was based on the inverse sine,

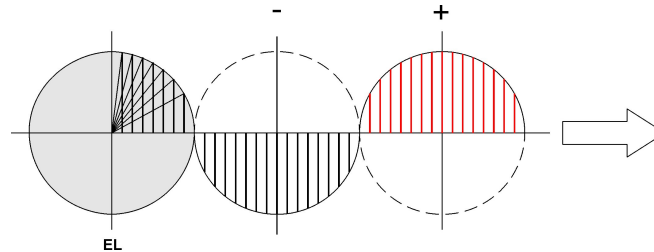


Fig. 10

I have shown in a previous paper⁹ that the electric and magnetic energies available for emission are equal and invariant, just as their angular momentum equalled the invariant \hbar . If a periodic acceleration-deceleration takes place, we can assume the zero point to be the sequential point of emission of radiation at the positive and negative poles, resulting in the propagation of a wave (the diagram disregards the electric component which is precisely equal and normal to the direction of travel). It is quite evident that the inertial component equals the kinetic at this point, **which establishes the limitation on light speed**. It also specifically identifies the existence of inertial mass as a component of light. Since any decay process, neutrinos are emitted which propagate at light speed, it is equally true that light is a component of mass!

The frequency and wavelength must be proportional to the vector λ at any given time, but the energy is external (kinetic)-internal (potential); obviously two fields. The latter configuration on emission **replicates that of an accelerating electron but in a process reversal**. This allows detailed evaluation of radiation and particle energies at every point. As the electron accelerates, the fields simultaneously exert an inertial effect as counterbalance, as determined above. That is to say, the fields exhibit the precise opposite of mechanical action, and the transfer of energy is conducted through positive and negative energy vectors. At full transfer, both revert to uniform motion.

At this point, we must attempt a partial summary:

- a. A particle accelerates, approaches the energy limit of a photon (from impact), is stopped and emits a quantum
- b. The photon (+ or -) is the quantum of energy¹⁰.
- c. The energy is then totally reversed, becoming negative, signifying the loss of energy.
- d. The reverse process reaches the equilibrium position and emits a negative photon, signifying the **loss of the gain** in positive energy.
- e. The two photons exit consecutively as a wavelength; their separation is the vibratory frequency.
- f. The internal and external energies are at equilibrium. The transfer is kinetic ↔ potential.
- g. The total energy is a combination of positive and negative energies (kinetic minus potential).
- h. Any acceleration-deceleration effects a quantum emission (no partial emission since the total electron moves).
- i. The magnetic field is the result of two monopoles. Their energy is emitted consecutively.
- j. Monopoles are connected as natural opposites.
- k. The monopole is the smallest manifestation of matter.

I. The energy vector can rotate. Polarity

The separation, or wavelength, is also dependent on the relative velocities of object and observer. The wavelength can be modified in a simple way by the presence of one polarity over another, such as with a magnet or matter or any appropriate unipolar condensate.

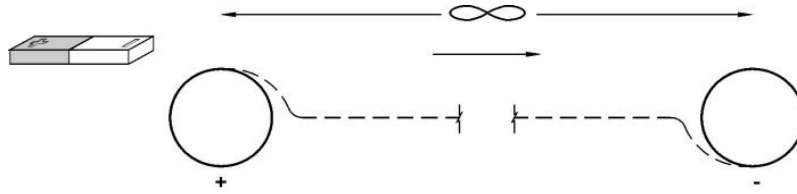


Fig. 11

Quantum entanglement is a natural phenomenon. It is the connection between the two fundamental opposing forces, and not some new and amazing property of matter or field. It can also be erroneously applied to all phenomena since motion viewed by each observer is chiral relative to himself. It is called Galilean relativity and its pseudo-reaction is instantaneous relative to any action by the observer! The assumption of Heisenberg's uncertainty principle (probabilism) is necessary to give it a mystical quality, such as in the momentum or position of a sub-atomic particle.

Mechanics

If we look back through the fog of mathematical sophistry to the elegant simplicity of Newtonian mechanics, we find only the need for the analysis and generalization of the active-reactive law for completion. There is no necessity to repeat the formulas of mechanics. It is only necessary to show that the total energies for electromagnetism and mechanics are the same, the linear velocities for field and mass are reversed, and their product is the velocity associated with total energy (see Appendix 1¹¹).

a. Particles

It should not be assumed that matter is created or destroyed. The photon is invariant and has dual character. If the "god particle" infers the most primitive manifestation of matter, then it is the photon and anti-photon. The **presumed** creation of matter infers its dissolution. In both instances, the total energy is involved. For the electron, these may be represented as,

$$e^2/m_0(1-v_i^2/2c^2) \text{ and } m_0e^2(1-v_i^2/2c^2) \tag{6}$$

The latter assumes deceleration. Of course, **neither is totally assimilated**. Another way of perceiving it, is that the inertial energy field equals the kinetic, or the electric equals the magnetic. Neither creation or dissolution will manifest unless the appropriate limit (quantum) is achieved. All intermediate steps will decay.

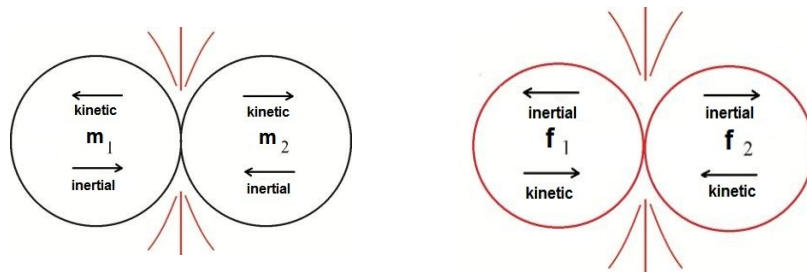


Fig. 12 and 13

Obviously, masses and fields are combined but shown here as separate for demonstration purposes. In any elastic collision, **m₁** will exert force on **m₂** causing acceleration and will deplete its own momentum (decelerate) through the inertial effect from **m₂**. There will be a loss of inertia in **m₂** and an equivalent gain in **m₁**. Precisely the same effects are exhibited by the fields, but in reverse: The field inertia will decrease in **f₁** and increase in **f₂**. The momentum will increase in **f₁** and decrease in **f₂**. The reason for the latter is that the field **f₂** of an electron in motion exhibits the Doppler effect while **f₁** is at rest with the fixed observer. For the particle in uniform motion, field and particle are in equilibrium and there is no displacement. For the particle, the reduced mass would require an increase in kinetic and a reduction in inertial energy.

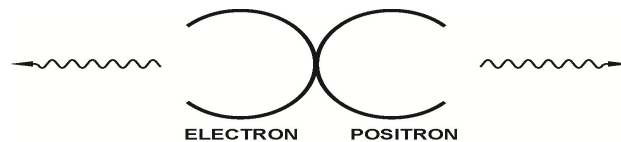


Fig. 14

Experiment confirms that separation of a positron and electron cannot subsist in nature, unless artificial means are used. The

reason for this is the masses and fields are equally balanced and reversed causing attraction and annihilation.

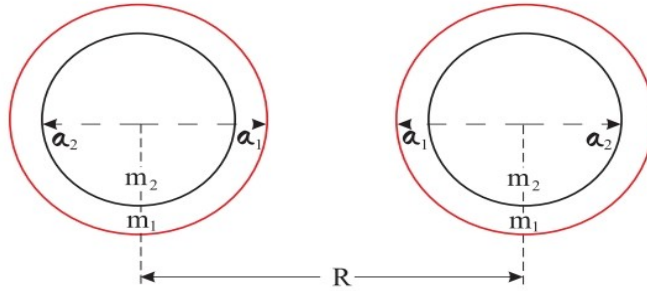


Fig. 15

Stability **requires a field/mass imbalance**, and in the case of neutral masses of equal size, there is no active-reactive force other than collision. This is confirmed by experiment¹². Note that in any interaction such as collision or orbit, $Qm_1m_2 = Qm_2m_1$, Where Q represents the micro or macro “gravitational” constant. This seriously challenges the concept of equal “charge” for the electron and proton **unless the field magnitudes are in fact reversed**. This suggests a prototypical field-mass magnitude (and its inverse). From this standpoint, anti-gravity becomes a pathetically simple concept.

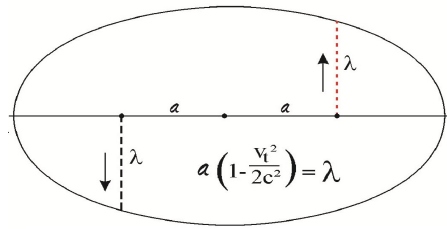


Fig. 16

Duality is evident in in orbits, where the energies are seen in the foci and semi-parameters of an ellipse. The foci are the displacement of field and particle. And each orbit is double. This is the basis for my claim that all geometries exist simultaneously, as inversions and reversals.

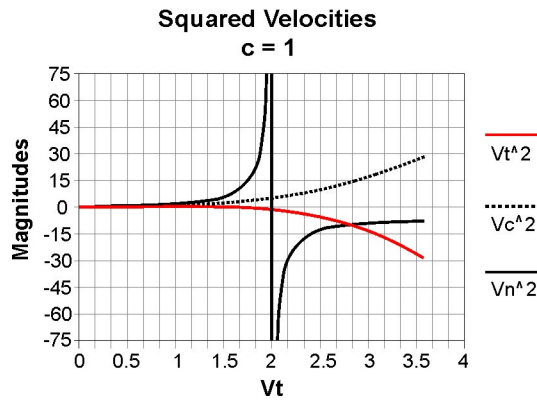


Fig. 17

At the appropriate speed, the induced magnetic field equals the electric (inertial equals kinetic) and the electron is converted to the wave-photon duality which is the process allowing “electron tunnelling” through the Coulomb barrier to the nucleus. Interaction with nucleons initiates the proper transformation of the nucleon with the ejection of a positron or electron, or in cases where tunnelling does not take place, the creation of a pair. We can create positive-negative stability by realizing that “electron tunnelling” through the “Coulomb barrier” inverts fields and at the appropriated distance will result in the creation of an electron and a proton, with recoil sufficient to eject the electron (“reduced mass”) into orbit, counterbalanced by the momentum of the proton. This process is distinct from neutron-proton conversion through the medium of gamma radiation and ejection of an electron or positron..

b. Fields:

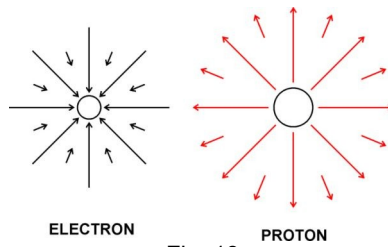
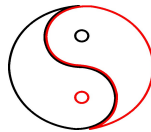


Fig. 18

The simple fact that light radiates in all directions confirms the presence of a field. There are no independent electric charges and no fields without the presence of matter. It should be abundantly clear from the foregoing, that charges and therefore fields, and therefore masses, are subject to inversion. The transfer is effected through the energy vectors. In the case of the electron (planet), there is polarization of that which constitutes the substantive portion of the field, resulting in an attraction (absence). The proton (sun), which is the inverse of the electron (planet), radiates (presence). Motion due to the magnetic field is perpendicular to the electric resulting in an orbit. Since $Gm_s \approx s^3/t^2$ and $Im_p \approx s^3/t^2$, (where G and I are gravitational constants) we can dispense with all euphemisms and concern ourselves with only mass, space and time.

A null field is "empty space". Note that it is achieved at the point equidistant from the maximum vector values of total energy, and is the point where radiation can occur. The fundamental particle is a component of field and composite, which is why light will traverse both.



At no time do the maxima reach infinity.

For example, the Compton effect allows emission at 90° with a measurable angle for the electron's motion. This is indeterminate in Newtonian mechanics. At the zero point between maxima and minima, beyond the confines of each hierarchical limit, empty space is represented as dimensionless (infinite) and "apparently" giving no impedance to uniform motion. Since there is no negative zero point, we can be sure that the space exhibits the same dual character as matter, and is substantive. This is Dirac's sea, but the particle is the photon and it comes in two orientations.

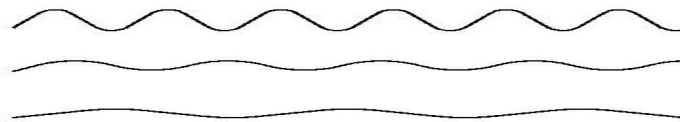


Fig. 19

According to the above, waves, regardless of wavelength, contain the invariant photon and cannot exceed the field tolerance c . However, the distance between photons approaches a straight line at maximum extension. It is here that the speed can exceed this limit. A straight line carries no energy. It is proposed that where the electric field has no impedance, it propagates at infinite speed. The speeds are coincident as the Pappas-Obolensky¹³ experiment shows, and the speed diagram confirms. Furthermore, the speeds are simultaneous. The speed of a photon or neutrino, (a conglomeration of photons) cannot exceed c , nor can it be less in empty space because of the inertial balance with the kinetic. The field is quantized. The most primitive particle is the +/- photon pair, which interacts with that field by the consecutive opposition of positive and negative polarity, similar to the operation of an electric motor. It travels vast distances with no loss of energy. It is also the reason why light can travel through mass. Since a field is a significant component of mass, decay of any sub-particle emits a conglomerate of photon-pairs (neutrinos) that travel at the speed of light.

Any acceleration is a disturbance of the field(s). In deceleration, radiation must be emitted to re-establish a balance. An increase in kinetic energy must be compensated by a decrease in potential and the reverse.

Since field-type inertia is removed from the zero point of mass, red-shifting will occur as distance increases, and speed decreases! Look no further for galactic red-shifting.

By logical extension we have shown that: Superconductivity is achieved with the total cessation of motion; the highest density of "matter" or greatest impedance, and superluminal speeds are achieved with zero impedance¹⁴. This is an abrupt, either-or transition. This theory is borne out by the need for temperatures close to absolute zero or in the case of higher temperatures, the use of amorphous materials to curtail motion, and in the latter, the total absence of matter.

Summary

1. The laws of physics and their manifestations are deterministic
2. They conform to mathematics and geometry (quantitative-qualitative)
3. There are only two mechanical or electromagnetic forces: One pulls, the other pushes

4. There is only one law: Active-reactive
5. The most primitive form of matter is the photon pair (god particle)
6. Transfer from one state to the other (particle- field) is effected through the the total energy vectors previously identified.
7. Inversion take place when finite limits are reached.
8. All gradation is unstable. Only stability is at limits.
9. The e/m field is the total particle-field in reverse, and inverse.

By starting with simple concepts that have been proven to conform to reality and applying them in a simple manner, a generalization of all of theoretical physics is achieved. Only the basic formulas of mechanics and electrodynamics are used, showing that simple algebra and geometry is sufficient for their description. However, the fundamental duality is an indication of the complexity to come. Broad generalizations were used in this attempt to describe all of physics, and much has been purposely omitted. There is a progressive inversion process in magnitudes that encompasses all of existence, from photon to electron, to proton and onward. In the microcosmic inversion to the macro, the laws are the same. The inversion are a complete either-or.

Note in the foregoing that as mechanical momentum decreases, electro-dynamical increases, so that at the periphery of all solar systems, galaxies and to the edges of the universe itself, "central" observation will confirm that radiation will appear re-shifted.

The poof is in the detail. If there is some corporation who would be interested in developing that which **does** exist, I believe the concepts described will provide significant opportunity for patentable devices. The meanings and calculation of time, space, mass, field, gravity, anti-gravity are all available to the discerning shopper. On the other hand, you may wish to continue major funding for the discovery of things which do **not** exist.

Finally, if the mechanism is not understood for the abrupt transitions to opposites, or statistical evaluations are necessary, the apparent laws may appear probabilistic. Strings abound, and 10 dimensions are conceivable. This paper is not a condemnation of the current metaphysical approach to physics, but of its methodology. All things are true, but only partially. It is in the inclusion of opposites that truth is found.

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Nov. 19, 2011

Appendix 1

Newtonian physics assigned only one relative motion for momentum and energy. In the case of energies associated with orbit, an expression for the total is derived (circular):

$$m_p m_s V^2 / 2(m_p + m_s) - m_p m_s G / r = -m_p m_s G / 2r \quad (K - P = T) \quad (1)$$

where V = sum of speeds of the sun and planet relative to center of mass, m_s , m_p , = masses of the sun and planet respectively.

from which, according to convention, the "proper" sum of velocities is derived.

$$V^2 = G(m_s + m_p) / r \quad (2)$$

However, we see that equation (2) is incorrect. The velocities have been initially defined and their sum **cannot be changed**. Because of the inverse proportionality of speeds with masses, (2) may be expressed:

$$v_p^2 (m_s + m_p)^2 / 2m_s^2 \neq v_p^2 (m_s + m_p) / m_s \quad (3)$$

Macrocosmic velocities do not show appreciable differences. If we replace the masses and velocities of Newton's equation with those of the first Bohr orbit of hydrogen, we will find the resulting speed to be precisely that of the total energy, v_r . That is to say, the formulas are the same!

Velocities:

In special relativity theory, there is an uncritical acceptance of a velocity associated with momentum and a speed attributed to kinetic energy, with their relationship expressed by:

$$m^2 v_m^2 c^2 = m^2 v_k^4 / 4 + m m_o v_k^2 c^2 \quad (4)$$

where v_m and v_k are the respective motions

The Newtonian velocity is disregarded. However, a classical one-dimensional elastic collision between an electron and a mass-equivalent photon $m_x = m_o$, (or for that matter, two electrons,) would result in a Newtonian velocity of v_n :

$$2m_x c / (m_o + m_x) = v_n = c \quad (5)$$

A similar configuration in a Compton collision gives, $\mathbf{c}\mathbf{v}_m = \mathbf{v}_t^2$. If the mass ratio is modified and/or a two-dimensional collision is introduced,

$$2m_x c v_m \cos \varphi / (m_x + m_o) = v_n v_m = v_t^2 \quad (6)$$

where φ is the recoil angle of the electron. Subsequently, we can derive,

$$v_m / v_n = (1 - v_t^2 / 4c^2) \quad (7)$$

In equation (6), v_n has the component, $2m_x / (m_x + m_o)$, which signifies the final Newtonian velocity in a collision. This is coupled with v_n to equal v_t^2 . Inverse relationships are also evident:

$$m + m_o / 2m = v_t^2 / v_n^2 \text{ and } 2m / (m + m_o) = v_t^2 / v_m^2 \quad (8)$$

and so on:

Equation (7) applies to Dirac's relativistic treatment of the energy levels of the hydrogen atom and provides an ontological basis for fine structure splitting of spectral lines. The velocity v_n is implicit. Furthermore, the velocity associated with total energy is explicitly defined in the combined linear velocities as square of the velocity v_t^2 ; the spin vector. In this context, v_n is defined as the velocity associated with inertia, in direct opposition to v_m , as obviated by the absence of any angles in the relativistic equations of motion. In fact, one is the inertia of the other. In an elastic collision, the forces would be precisely equal, and the same would apply to inelastic collisions when internal energies are taken into consideration (conservation laws). The principle of "equivalence" is dependent on this interpretation. Action and re-action are only simultaneous in elastic collisions. Equilibrium may take a considerable time to achieve depending on the material.

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