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Preface

This is the presentation of a field-free, particle based theory of mass and photon interaction, the same as envisioned by Wheeler and Feynman in the 1940's. The difference in their view was that the elementary particles were massive whereas the particles at the core of this development are photons. By making assumptions about the character and properties of photons' interaction, the separate fields identified as electric, gravitation, and strong can be duplicated without any reference to "charge". The basic concept is that the probability density of moving Feynman photons from one mass particle changes the direction and velocity of Feynman photons from another. This change in the index of refraction thus moves the direction and velocity of the particles and styles the theory as: Mechanics. The purpose of this book is not as an advocacy of the presented theory, but to preserve the development findings as they came about, and as a guide for someone later. The author is getting old and does not have the acuity of earlier years, and thus the first paper in this book is the last. Readers will find the older papers have both mathematical and conceptual errors, later discovered to be wrong. Those papers should have, but have not, been revised, and as the project has further developed, the results have shown the developed concept to be "too right, to be wrong".

DT Froedge October 11, 2023 v

Curriculum Vitae

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Introduction:

Δc Mechanics

Δc Mechanics is an alternate approach to the physical interaction between mass and photons by way of the Feynman action path probabilities, offering a new approach to mechanical dynamics and particle structure. [1-10]. It is based on the Feynman view of QED that photons going from one point to another follow all paths and there is a probability that the particles actually exist on those paths. Additionally photon densities moving in one direction retard opposite moving photons and thus create a change in c, , as a result of their presence.

In the 1940's, John Wheeler and Richard Feynman developed a vision of a field-free particle based theory of physics. The Wheeler-Feynman absorber theory developed from this with the view that physical interactions between a source and an absorber were particle based. This field-free idea came from Feynman, with Wheeler as the primary developer. The theory was based on Feynman's ideas and Wheeler's insight and experience. Feynman's dissertation was based on the theory but it had problems and was eventually abandoned.

Feynman continued the pursuit however, and while attempting to put the theory into a quantum basis, developed the idea of summing probability weighted quantum paths. Wheeler titled this idea as the "sum over all history" method of quantum electrodynamics, and for the work Feynman received the Nobel Prize.

Δc Mechanics starts with Feynman's action paths and continues a particle based theory. It extends Feynman's presumption in that there is an actual probability of the Feynman path photons being on these paths. This is evidenced by measurements of the Anomalous Magnetic Moment and the Aharonov-Bohm effect. It is presumed ixthat photons taking the action path not only have delays, but the probability density of these photons being there affects the speed of light and the motions of other particles.

Δc Mechanics is not based on electron and positron as the primary particles as Wheeler had envisioned, but based on photons and photon-photon interactions. Electrons are in fact a composition of two photons bound together by their own self interaction, and it is presumed that all

Ground States

Once the value of the fine structure constant is found [6], then the atomic levels are just n values of the Rydberg energy.

$$R_{\infty} = \frac{1}{2}\left[\frac{\left(\sqrt{2}\,\lambda_{R_c} v_e\right)}{n\lambda_e g_A^2}\right]^2 m_e c_0^2 \quad = \quad \frac{1}{2}\frac{\alpha^2}{n^2} m_e c_0^2 \quad \rightarrow 13.6\text{ev}/n^2 \qquad (3)$$

The ground state of the atomic energy level at n = 1 is:

$$E_s = \frac{1}{2}\left[\frac{\left(\sqrt{2}\,\lambda_{R_c} v_e\right)}{\lambda_e}\right]^2 = \frac{1}{2}\left(\frac{\Re_0}{\lambda_e}\right)^2 \qquad (4)$$

It is also the ground state energy for nuclear particles. The energy level is slightly lower than the Rydberg levels Eq.(3), by a factor of g_A^2

The integral of the potential energy from a point r to ∞ is the escape energy, which will apply for both atomic and nuclear particles. The escape energy for both atomic and nuclear particles is then

$$\varepsilon = \int_r^{\infty} \frac{1}{2}\left(\frac{\Re_0}{r}\right)^2 = \frac{1}{2}\left(\frac{\Re_0}{r}\right) \qquad (5)$$

The separation between positive and deficit kinetic energy is the ground state kinetic mass for atomic as well as nuclear particles at n = 1 is:

$$\varepsilon_0 = \frac{1}{2}\left(\frac{\Re_0}{D_e}\right) \qquad (6)$$

The electron is the ground state particle of the atomic interaction thus the ratio of the atomic levels to the electron is an integral constant α^2 / n^2. It was a serendipitous finding that the ratio of nuclear particle masses to the electron mass had similar values of the kinetic mass and the binding mass that were exactly equal to states of other nuclear particles.

Order of Developments of Δc Mechanics

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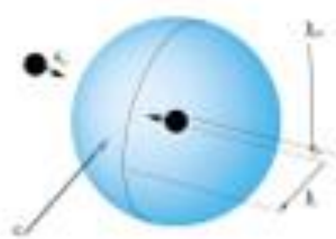
After a review of Feynman's sum over all action paths of photons moving from one point to another, and presuming that there was actually the probability of the photon being there, consideration was given to the possibility that an interloping photon would be altered by the probability.

Presuming the photon is a rotating Planck particle inside the Compton radius of the concept developed that a Planck size particle passing thru the Compton radius of another photon has a probability of intersection and thus collectively probability of a slowdown of a probability and a change in c.



$$\frac{\Delta c}{c_0} = \frac{\sigma_{pL}}{\sigma_c} = \frac{\lambda_{pL}}{\lambda_c}$$

The first consideration was gravitation, and Schapiro's value of the change in c from a gravitational mass, [2], [3], the relation between delta c and mass could be developed.

$$\frac{\Delta c}{c_0} = \frac{2Gm}{r} \qquad \Delta c = c_0 - c \qquad (1)$$

From this then the probability density of Feynman photons as a function of the radius could be originated. **Δc / Δd**.

An increase in the oncoming density of photons, decrease the velocity of light thus the density of photons necessary to establish the current velocity of light can be calculated. By using current estimates of the number of protons in the universe and calculating the density of the Feynman photons, it turns out to match the current velocity. This density can be viewed as the vacuum polarization or background density for Feynman photons in the universe that sets the velocity of light. In any direction a photon moves it encounters an oncoming flow probability density of about 10^39 photons/cm/sec.[8]

Gravitation is a spherically symmetric distribution of Feynman photons emanating from the internal path actions of mass particles in nuclei that are not spin aligned. There is no spin stabilization and thus the paths as well as the photon probability paths are random.

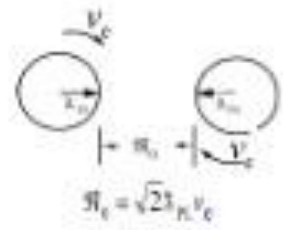
Charge Effects

The next consideration was the prospect of two photons revolving together encountering the probability density of the other. As they rotate, they are spin stabilized thus he probability density moves in one direction that lies in a plane.

Each time they revolve increases the oncoming photon density at a point, thus slowing down probability density of photons moving opposite. Slowing down is equivalent to increasing the index of refraction in the proximity of the other particle and thus bending the trajectory and pulling the particles together. At the right frequency of rotation for the Planck particles the photons can bind and create the electron at the radius, $\mathfrak{R}_0$.[8]

$$\mathfrak{R}_0 = \sqrt{2} D_{PL} \nu_e \tag{2}$$

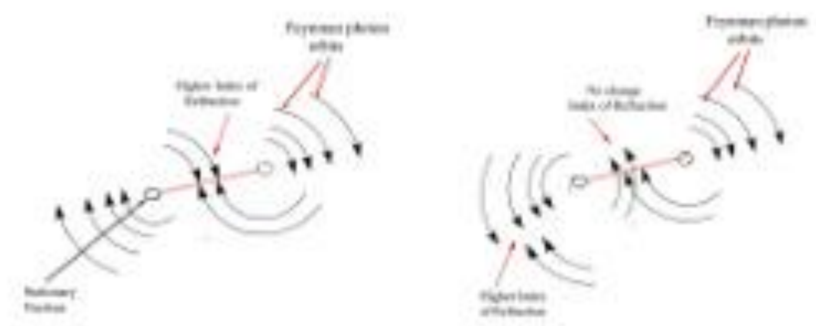
$\mathfrak{R}_0$ is the Electron Creation Radius, and is the binding radius of two Planck photons that forms the electron, D_{PL} is the Planck particle radius, and ν_e is a unitless number equal to the Compton frequency of the electron. $\nu_e = h / m_e c_0^2$. $\mathfrak{R}_0$ is the radius at which the repeating encounter density experienced by rotating photons matches the background encounter density of Feynman photons in the universe, ν_e^2.



Electron Creation Radius

Photons have polarization, with right and left handed versions, thus photons with an opposite polarization can also bind creating the positron. The frequency of the electron is about 10^20 cycles per second and the encounter probability density is the product of the frequencies ~ 10^40 which approximately matches the background density of ambient photons, and bends the photon into a circle, $\Re_g$.[??]

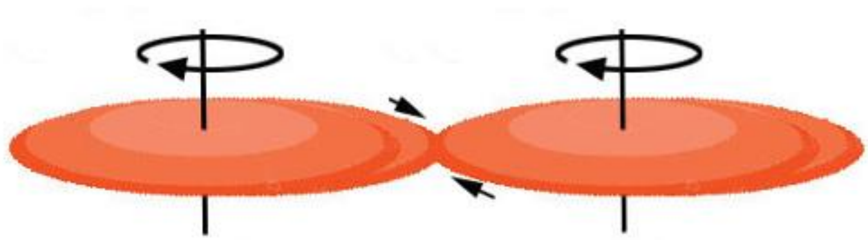
Gravitation is generated by a random direction of the ambient photon emanating from a mass, but electrons are generated by a pair of spin aligned particles. Electric effects are generated by planar rotating photons and the interacting particles lie in a plane.



Attraction Repulsion

Fig.4 Attraction and repulsion by photon density

Electrons with opposite spin alignment engage in a planar motion and can create both attractive and repulsive forces that have the effect of charge. The concept of charge is discovered not to be a substance distributed in a mass, but the directional interaction of the spin aligned opposite polarized Feynman photon probability density. Photons moving in the same direction have no effect on each other whereas photons moving opposite directions decrease their mutual velocity[??]



Interacting Electron Positron
Rotation Disks

Fig. 5

The ratio of the planar photon interaction of the ½ spin electron-positron and the random spherical photon interaction of gravitation is about ν_e^2,or 10ˆ40 orders of magnitude.

Fine Structure Constant

The anomalous g factor $g_A = (g/2-1)$, increases the radius of the electron due to the Feynman path integrals that delays the electrons orbit, and has been has been incorporated into the to the value of the fine structure constant, note the difference in Eq.(??), and Eq.(??), (See Appendix II)

Ground States

Once the value of the fine structure constant is found [6], then the atomic levels are just n values of the Rydberg energy.

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A series of these relations were found and developed in " Nuclear Particle Structure in **Δc** Mechanics". Included below are some examples.

Tau Quark Identity

$$\frac{1}{2}\left(\frac{D_\tau}{D_e}\frac{D_\tau}{D_e}\right)=\frac{1}{2}\left(\frac{2^3 D_p}{D_e}\right)\left(\frac{2^3 D_p}{D_e}\right)\left(\frac{2^3 D_p}{D_e}\right)$$

Binding 2 Tauons = Binding 3 Quarks

The state energy level of two bound tauons is equal to the state energy level of the three bound quarks

The mass of the quarks are referenced here to the proton, however the bound quarks have a different fine structure component of mass.

Another Identify that has been found is the relation between the Tauon and the Z boson.

$$\frac{\frac{1}{2}\left(\frac{D_\tau}{D_e}\right)^2}{\frac{1}{2}\left(\frac{\Re_9}{D_e}\right)^2}=\frac{\left(\frac{D_Z}{D_e}\right)}{\frac{1}{2}\left(\frac{\Re_9}{D_e}\right)} \qquad m_Z=\frac{176871.72\ \text{electrons}}{90.3833\text{Gev}}$$

This relation shows the state value of two bound tauons referenced to the ground state. $\mathbf{E_0}$, is equal to the kinetic mass of the Z boson referenced to the kinetic mass ground state $\mathfrak{E}_0$.