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THE HYPERGEOMETRICAL UNIVERSE: COSMOGENESIS, COSMOLOGY AND
STANDARD MODEL

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Abstract. This paper presents a simple and purely geometrical Grand Unification Theory. Quantum
Gravity, Electrostatic and Magnetic interactions are shown in a unified framework. Newton’s
Gravitational Law, Gauss’ Electrostatics Law and Biot-Savart’s Electro-Magnetism Law are derived from
first principles. Gravitational Lensing, Mercury Perihelion Precession are replicated within the theory.
Unification symmetry is defined for all the existing forces. This alternative model does not require Strong
and Electroweak forces. A 4D Shock-Wave Hyperspherical topology is proposed for the Universe which
together with a Quantum Lagrangian Principle and a Dilator based model for matter result in a
quantized stepwise expansion for the whole Universe along a radial direction within a 4D spatial
manifold. The Hypergeometrical Standard Model for matter, Universe Topology, Simple Cosmogenesis
and a new Law of Gravitation are presented. A New de Broglie Force is proposed.
INTRODUCTION

Grand Unification Theories are the subject of intense research. Among current theories, Superstring, M-Theory, Kaluza-Klein based 5D Gauge Theories have shown diverse degrees of success. All theories try to keep the current conceptual framework of science. Kaluza-Klein melded both Electromagnetism and Einstein Gravitational equations in a 5D metric.

Here is presented a theory that departs radically from other theories and tries to bridge the conceptual gap as opposed to explore the formalism gap. Most research is concerned on how to express some view of Nature in a mathematically elegant formalism while keeping what we already know. It has been said that for a theory to be correct, it has to be beautiful.

This work concentrates on what to say, the conceptual framework of Nature instead. All the common constructs: mass, charge, color, hypercharge are dropped in favor of just dilator positions and dilaton fields, which are local metric modulators and traveling modulations, respectively. There is no need for the concepts of charge or mass. Mass is modeled as quantity proportional to the 4D metric displacement volume at precise phases of de-Broglie cycles. Charge sign is modeled by dilator phase (sign) on those specific phases. The mapping is needed to demonstrate that the geometrical framework replicates current scientific knowledge.

The logical framework is presented on the Hypergeometrical Universe Topology section. A simple Cosmogenesis model is presented on the Cosmogenesis section.

On the Cosmological Coherence section, the consequences of the topology of the Hypergeometrical Universe and the homogeneity proposed in the Fundamental Dilator based model for matter is shown to result in a cosmological coherence, that is, the whole 3D universe expands radially at light speed and in de-Broglie (Compton) steps.

When cosmological coherence is mentioned it is within the framework of absolute time and absolute 4D space ($RXYZ$ or $\Phi XYZ$). There is no sense in speaking of synchronous motion within frameworks containing proper time $\tau$. All force derivations are done considering a framework at rest with respect to the Fabric of Space.

A new Quantum Lagrangian Principle (QLP) is created to describe the interaction of dilators and dilatons. Quantum gravity, electrostatics and magnetism laws are derived subsequently as the result of simple constructive interference of five-dimensional spacetime wave overlaid on an expanding hyperspherical universe. In the electrostatics and magnetism derivation, a 4D-mass of a HydrogenMass a.m.u. electron or fat electron is used. This means that the dilatons being 5D spacetime waves driven by coherent metric modulations are coherently produced by all phases of the dilator coherence. The 4D-Mass is the result of the mapping of the coherence model for matter and 4DMode-factors for the phases contained in it.

Hypergeometrical Standard Model Section contains a brief description of the Hypergeometrical Standard Model. It shows that hyperons and the elements are modeled as longer coherences of tumbling 4D deformations. Nuclear energy is proposed to be stored on sub-coherence local twisting of the fabric of space.
A grand unification theory is a far-reaching theory and touches many areas of knowledge. Arguments supporting this kind of theory have by definition to be equally scattered. Many arguments will be presented with little discussion when they are immediate conclusions of the topology or simple logic.

**HYPERGEOMETRICAL UNIVERSE TOPOLOGY**

The picture shown in Figure 1 represents cross sections of the proposed hyperspherical light speed expanding universe.

![Figure 1](image)

Figure 1. These are the cross-sections Xτ and XR for the expanding universe. The universe direction along X is represented by the green band. X (or Y or Z) is displayed along the perimeter of the circle. The circle radius is equal to the age of the universe times the speed of light. Also shown in the diagram is Φ (cosmological time), proper time τ, radial direction R, proper radial projection r, the Cosmological Angle α between two reference frames XYZτ and X’Y’Z’τ’, the local torsion angles αt and αR. By choosing a local metric for xyt Minkowskian and having a Lorentz transformation to relate XYZτ and X’Y’Z’τ’ reference frames, one can assure that the theory obeys Strict Relativity.

The universe is hypothesized to be created by a four-dimensional explosion, a Big Bang in a Four Dimensional Spatial Manifold. The evolution of such Big Bang is a lightspeed expanding three-dimensional hypersurface on quantized de-Broglie steps. The steps have length equal to the Compton wavelength associated with the gravitational fundamental dilator (the atomic mass of a hydrogen atom). It will be shown that:

<table>
<thead>
<tr>
<th>Dilator</th>
<th>4D-Mass(a.m.u.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravitational Fundamental Dilator (GFD)</td>
<td>HydrogenMass x 2</td>
</tr>
<tr>
<td>Electronic Fundamental Dilator (EFD)</td>
<td>HydrogenMass</td>
</tr>
</tbody>
</table>

**DEFINITIONS AND SIMPLE TOPOLOGY-BASED CONCLUSIONS**

a) Cosmological time Φ represents an absolute time frame, as envisioned by Newton and Mach - it is a fifth dimension in the Hypergeometrical Universe Model. It times the expansion of the Universe.
b) Proper time $\tau$, $\tau'$ are projections of the Cosmological Time $\Phi$ on the respective reference frames.

c) Fabric of Space (FS) is the Lightspeed traveling locus where our 3D Universe exists. This is a 3D hypersurface of a shockwave within a 4D spatial manifold. Anything at rest with respect to the Fabric of Space would just travel radially at the speed of light. At the Big Bang all dilators would be initially traveling at the speed of light not only radially but also tangentially in all directions. When the Universe is a point, there is no difference between tangential and radial directions. As the Universe aged, dilators would, on average, reach equilibrium and a low velocity with respect to FS.

d) The radial direction is a preferential direction in 4D space. It is the radial expansion direction. This direction doubles as a direction on 4D Space and a projection of the cosmological time, since they are related by the expansion speed (light speed).

e) The 3D Universe has a radius of curvature equal to the age of the $\beta$.

f) Universe time the speed of light. This radius is independent of mass distribution. This is not the same as stating that General Relativity theory cannot reproduce Gravitation effects by mass induced curvature of spacetime (XYZ$\tau$). Later, the Gravitational Constant $G$ will be derived as inversely proportional to the 4D radius of the Universe, thus being stronger in the earlier Universe. This should affect the mass of stellar candles such that earlier (far away) stellar candles would have smaller mass and thus smaller energy release, thus misleading intensity based distance measurements.

g) The Universe is finite but cannot be traversed since it is expanding at the speed of light. Simple geometry can provide the volume of the Universe.

h) One can only see the Universe up to cosmological angle $\alpha=45^\circ$.

i) Any observer is always at the center of their Universe.

j) The 4D Big Bang occurred on each and every point of the 3D Universe.

k) Since one can only see the past, cosmological angle $\alpha=45^\circ$ corresponds to the Big Bang or thereabouts.

l) Black-Body shifted radiation is hypothesized to be the Microwave Cosmic Background [1]. A geometric mechanism for Doppler shifting will be presented later.

m) The moving frame aspect of this model requires the actual speed of light to be $\sqrt{2}c$ since all measurements of the observed speed of light $c$ can only be done at distances small in comparison to the 4D radius of the Universe.

n) $\alpha_t$ and $\alpha_R$ represent both a direction of propagation and a deformation of the local fabric of space. Since these angles point to direction of propagation it is clear that a local deformation of the fabric of space maps directly to a state of motion. Motion is the result of the relaxation process of the local FS (Hypergeometrical Universe interpretation of Newton's first law) as the FS expands.

o) XYZR is modeled as a Cartesian space
p) XYZ\[\phi\] is modeled as a hyperbolic space and thus consistent with Strict Relativity [2,3] if one considers that the Lorentz transformation is a rotation on an imaginary angle equal to atan(v/c).

**UNIVERSE EXPANSION AND THE HUBBLE CONSTANT**

Edwin Hubble discovered that Stars and Galaxies are receding from us at speeds that increase linearly with distance. Below is Hubble Law governing the velocity \(V\) for objects at distance \(L\):

\[
V = H_0 \times L
\]  

(1)

From the proposed topology shown in Figure 1 one can easily ascertain the Hypergeometrical Universe model for the Hubble Constant:

\[
H_0 = \frac{c}{R_0}
\]  

(2)

where \(c\) is the speed of light and \(R_0\) is the 4D Radius of the Universe (age of the Universe time the speed of light).

Peering into the past takes place through the 4D spatial manifold and always through a 45° perspective. The 45° is due to the light speed expansion of the Universe. Light is modeled, in this theory, as a modulation of the dilaton field (seem as a carrier wave) by the varying position of the generating dilator during light emission (oscillating dipole).

Doppler Red-shifting can also be easily understood from the picture using simple geometry. It is clear that a trigonometric correction has to be done to the current calculations!

![Figure 2](image)

Figure 2. This picture shows how one would see the past in the Hypergeometrical Universe Model.

If you consider any other point in the early epoch, the light would had arrived too early of too late. For short distance one can calibrate the Hubble constant using parallax. Longer distances are calculated using Stellar Candles (type 1A Supernovae explosions). Later, it will be shown that \(G\) (gravitational constant) is inversely proportional to \(R_0\), so if the current Universe age is 15 Billion years, \(G\) for the 7.5 Billion years epoch is twice the current \(G\). Supernovae masses at that epoch should be half
current ones, thus the distance will be mistaken by a factor of $\sqrt{2}$ or the observations will be thought to be of $7.5\sqrt{2}$ Billion light years away. This is one of the reasons why this theory eliminates the need for Inflation Theory to explain cosmological observations. The other reason is that the spot A at the edge of the Universe was seen in a Universe that was much smaller than today’s Universe. Its distance on today’s Universe will lie approximately at the same distance as measured indicating it is and was 14.5 billion light-years away if its light came from 14.5 billion years ago.

Using $H_0=67.8 \text{ km/s/mpc}$:

$$R_0 = \frac{c}{H_0}$$

$$\text{AgeOfTheUniverse} = \frac{3,261,633.44 \times 299792.458}{67.8} = 14.42 \times 10^9$$

$$\text{AgeOfTheUniverse} = 14.42 \text{ Billion years}$$

Not surprisingly, the expected acceleration for objects at distance L for the 3D Universe is:

$$\text{acceleration}(L) = \frac{c^2 L}{R_0^2}$$

$$\text{acceleration}(R_0) = \frac{c^2}{R_0}$$

(5)
SIMPLE COSMOGENESIS

Below is the pictorial display of equilibrium at the incipient Universe (prior to irreversible dimensional phase transition) and the Big Bang irreversible transition.

**Figure 3.** This picture displays the mapping of the different phases of the Universe coming into existence to Mathematical Constructs. Top-left displays the Zero-Dimensional Universe (just numbers, adding always to zero), following by the Unidimensional Space (just equal size opposing vectors along a line) and eventually to our 5D Spacetime Universe. Entropy of a 5D Universe allowed for partial recombination of the initial macroscopic fluctuation, represented by the two states (N,N,N,N,) and (-N,-N,-N,-N). This macroscopic state could have a dipolar (like the electronic orbital 2p) or hyperspherically symmetric (like a 2s electronic orbital). We believe that the likely topology is of a 2s hyperspherical orbital with metric compression in the center and stretch on the outer layer. The decaying of this state, followed by recombination of the inner core would generate gamma rays that would propel the outer layer. The Quantum Lagrangian Principle describing interacting precludes this “explosion” to be like anything we are familiar with. Quantum Lagrangian Principle together with retarded potential interaction (interaction along 45° angle) impose equipartition of energy between Radial and Tangential degrees of freedom. In a four-dimensional non-compact spatial manifold that translates into the instantaneous acceleration of all matter (dilators) in the Universe to the speed of light in a tangential and radial directions. It also forces the thickness along R to be infinitesimal (or very small)
**THE BEGINNING OF TIMES**

At the time of the Big Bang, the Universe is a small macroscopic metric fluctuation in a 4D spatial manifold. We speculate that this moment followed a dimensional transition that made the process entropically irreversible.

![Diagram of time zero boundary conditions](image)

Figure 4. Time zero boundary conditions are shown above. When the 4D macroscopic fluctuation arises and decays, a myriad dilators are created (matter and antimatter). The distribution of matter and antimatter follows a 2s hyperspherical orbital distribution (4D space). Recombination occurs at the edge between matter and antimatter. This initial recombination is what propels the whole Universe outwards traveling at the speed of light. Here is where spin quantization and tunneling frequencies plays the most important role on the Universe. From our discussion of dilators and the stroboscopic Universe it is clear that interaction can only exist at specific angles, so the acceleration happens coherently even if the interaction takes place on several dilator cycles.

When one considers a coherent process like spinning, the first question is about dephasing processes. We postulate that the spatial manifold is defect free and that there isn’t anything ahead of us (energy equipartition at time zero demands a single Universe radial velocity c).
We propose that Fundamental Dilator Coherences (FDC) are the basic building block of matter. They are coherences between two metric deformation stationary states in a rotating four-dimensional double potential well. A single coherence between two 4D-space deformation states or fundamental dilator is proposed to account of all the constituents of non-exotic matter (elements, neutrons, electrons and protons and their antimatter counterparties) and hyper-nuclei (hyperons) on Hypergeometrical Universe Standard Model Section. This coherence is between two deformation states with 4D volumes corresponding to the electron and proton, or electron-proton coherence. Here the proton, anti-proton, electron and positron are considered to be the same particle or the fundamental dilator, just four faces of the same coin.

Figure 5 (a) Electron (Positron) and (b) Proton (antiproton) states. The beginning of each coherence represents the nature of the particle. Not represented in this graphic is the orientation of the state which can be in phase (flushed with the 3D Hyperspherical Universe) or off-phase (perpendicular or rotated to the 3D Universe) nor the positive or negative (stretch or compression of space) phase information.

Figure 6 (c) Neutron, (d) Electron Anti-Neutrino composed of two transmutation chords (half antineutrino). Half antineutrino transmutes an electron into a proton and vice-versa and it is named a transmutation chord. Similarly, from the assignment of pions, a half muon neutrino is a transmutation chord that converts matter to antimatter (electron into positron). By analogy, half Tau Neutrino will likely convert a proton into an antiproton.

Below is the Balls Diagrams, representing these coherences.
Figure 7. Diagrams representing the four fundamental particle coherences. Vertical letters mean that state is perpendicular to the 3D Universe (small cross-section for interaction). Upside down means antimatter state. Green(yellow) means positive(negative) charges or a local dilation(compression) of the metric. Compression or dilation is arbitrary since at each half de-Broglie step of the Hyperspherical Universe expansion, the phase changes 180 degrees. The return arrow is to indicate that this is a loop for the lifetime of the coherence. In the case of the fundamental dilator states, there is no other state to relax and the coherence lives forever (very long time).

The 4D mass is mapped to the 4D displacement volume of each one of those states. To understand what is a displacement volume, let’s first consider a unit radius 3D sphere in a 3D spatial manifold. If space is stretched slightly along two axes and compressed along a third axis (e.g. 2/3,2/3,-1/3 or the proton) by some very small arbitrary amount (2/3,2/3,-1/3)*\(A\), the change in volume can be approximated by the sum of those coefficients \((2/3+2/3-1/3)*A = A\).

Due to the inherent anisotropy of an expanding hypersphere, tangential and radial states are modeled to have approximately a unit volume while differing by an anisotropic coefficient very close to unit.

Since we know the masses of the 3D footprints electron and proton and since each one of these particles have positive and negative footprints, the 4D mass of a Fundamental Dilator is initially considered to be the same as a Hydrogen Atom in atomic mass units for convenience and for sake of didactics. Later, a correction due to 4DMode-factors will change slightly the perfect mapping 3D to 4D. The 3D mass is related to inertia, while the 4D mass is related to the particle ability to create dilaton waves (dilaton field). All four states have the same ability and thus the same absolute charge.

Up to now we described charged dilators. Let’s consider now a neutron and a hydrogen atom.

NEUTRON AND THE HYDROGEN ATOM

Figure 8. Hydrogen atom representing two interacting dilator coherences and neutron representing a composite coherence. The circular nature of the coherence above indicates its cyclic nature. This cycling will last the lifetime of the particle.
Figure 9. Neutron represented by a dimer, that is, two coherences composed each of two alternating chords, rotating 180° at each de-Broglie step of the 3D Universe expansion. The neutron dipole moment and energy stored in local metric deformation place constraints on the 3D Neutron radius or size. Each four balls correspond to the four states of the Fundamental Dilator Coherence. The red lines are transmutation chords (half electron-antineutrino) responsible for transmutating an electron into a proton at each de-Broglie cycle. In this model, one considers that the energy associated with tunneling could be momentarily converted into a 3D rotation while spinning continues. This means that the last state (electronRotated) in the proton sequence would remain in the electron state, execute a rotation around an axis in the 3D Universe while rotating 90° perpendicular to R. This would place the next state as being electron flush with the hyperspherical surface, thus transmutating from proton into an electron within the coherence. The neutral nature of the neutron is the result of being a rotating dimer with zero net charge.

Figure 10. Neutron decay into W-Minus which subsequently decays into an electron and an electron anti-neutrino.
Issues related to the total spin of a coherence depend upon the sum of the individual subcoherence spins and that includes transmutations chords (half neutrinos).

Pion Decay Channels:

![Diagram of Pion Minus Decay](image)

Figure 11. Pion Minus Diagram showcasing both transmutation chords. This dilator is a composite dilator with an equilateral triangle topology as seen from the radial direction (perpendicular to our 3D Universe)

<table>
<thead>
<tr>
<th>Particle</th>
<th>Symbol</th>
<th>Rest Mass (Mev/c²)</th>
<th>Decay Reaction</th>
<th>Spin</th>
</tr>
</thead>
<tbody>
<tr>
<td>PionMinus</td>
<td>π⁻</td>
<td>139.57018</td>
<td>e⁻ + νₑ</td>
<td>1/2</td>
</tr>
<tr>
<td>PionMinus</td>
<td>π⁻</td>
<td>139.57018</td>
<td>μ⁻ - ν₁</td>
<td>1/2</td>
</tr>
<tr>
<td>MuonMinus</td>
<td>μ⁻</td>
<td>105.7</td>
<td>e⁻ - νₑ + ν₁</td>
<td>1/2</td>
</tr>
</tbody>
</table>
Figure 12. Pion Minus decay into Muon Minus and a Muon Neutrino.

Figure 13. Muon Minus decay onto an electron and a muon neutrino. The muon neutrino can be detected at different Glutonic States where it performs one or more electron capture. The energy of the annihilation of the electron and proton is converted into kinetic energy for the decay products. Glutonic states are states that differ by the number of EFD internal coherences (e.g. Delta Plus Plus). Internal coherences are coherences not separated by a transmutation chord, thus they add no extra torsion to the composite coherence. They will be reviewed elsewhere.

The four fundamental particles (electron, proton, positron, antiproton) are modeled as different phases of the coherence between stationary deformation states of the local metric. The involved states express their nature (physical properties). Thus, at the first glance, the EFD should have a 4DMass similar to a Hydrogen atom. In fact, further analysis indicated that a correction should be made related to their 4D volume.

During the time taken to traverse a de-Broglie step, the dilator goes through its four phases (electron, proton, positron and antiproton) while spinning 360° around an axis perpendicular to the direction R (R is perpendicular to our 3D Universe). All times (proper time $\tau$ and Cosmological time $\Phi$) are made dimensional by the multiplication by the speed of light $c$. 
Pseudo-Time Quantization/de-Broglie Stepwise Expansion of the Universe are the result of the proposed model for matter based upon the Fundamental Dilator together with the proposed topology.

**NEUTRINOS GHOSTLY NATURE**

From the diagrams it is clear that the frequency of tunneling for neutrinos is different from the tunneling frequency between the Fundamental Dilator Coherence states. Since all known stable matter in the Universe is made up of composite coherences based on the Fundamental Dilator, interaction will be limited by the time integral of the interaction. Only a very close collision will be effective. Anything else will result in no interaction.

**PARTICLE TOPOLOGY**

Since the composite dilator coherences are degenerated (Figure 12) with respect the which state is initially in phase with the Universe, a trimer would have an equilateral geometry with respect to an axis perpendicular to the 3D Universe. Below is the topology of prime composite dilator coherences (hyperon family).

- Electron/Proton/Positron/Antiproton is a point
- Neutron is a line (segment)
- Pion minus/plus is a equilateral triangle
- Delta plus/minus are pentagons
- Kaons plus/minus are heptagons
- Xi plus/minus are undecagons
- Omega plus/minus are tridecagons

More complex hyperons will be presented elsewhere.

**NUMEROLOGY**

Since in this theory, particles are multiples of Fundamental Dilator Coherence (FDC), many conjectures, number theory axioms have physical representation:

a) Charged hyperons are Prime FDC multiples.

b) Any Majorama particle is equal to $2^n$ FDC multiples.

c) Neutral Particles are $2n$ FDC multiples or the sum of two Prime FDCs.

and perhaps the ABC conjecture (naturally used in bootstrapping the taxonomy of the hyperon family), the Goldbach Conjecture. Of course, this is not being proved here and it is just a motivational observation from the small number of particles in the hyperon family and their dissociation processes.

**ELECTROMAGNETIC AND GRAVITATIONAL DILATORS**
The archetypical Electromagnetic Dilator is represented by the Proton or Electron coherences presented previously. The Gravitational Dilator is represented by a spin zero Hydrogen Atom shown below:

![Diagram of Dilators](image)

Figure 14. Archetypical Gravitational Fundamental Dilator (GFD = zero spin Hydrogen atom) and Electromagnetic Fundamental Dilator Coherence (EFD = electron).

The first thing that comes to mind is that the Gravitational Fundamental Dilator contains two Electromagnetic Fundamental Dilators. Positive and negative phases of the dilator are positioned such as to minimize dilator work, that is, the phases are positioned to be in phase with the surrounding dilaton field.

Their 3D mass or inertial mass behaves as expected. An Electrostatic Fundamental Dilator on an electron pattern has the inertial mass of an electron. A Fundamental Dilator on a proton pattern has the inertial mass of a proton. The reason for a light speed expansion of the shockwave Universe and the synchronization event that forever synched all dilator’s spinning will be explained later when we briefly review Cosmogenesis in the Beginning of Times section.

### 3D DE-BROGLIE WAVES AND THE DE-BROGLIE FORCE

What are de Broglie waves? Are they the same as what I call the dilaton field?

Electron 3D de Broglie waves have a wavelength that is difference from the wavelength of a Fat Electron (our proposed view of the 4D displacement volume representation). The solution to the conundrum is that the dilaton tunneling, spinning and interaction with the 3D hypershell generates a bitonal dilaton field (two frequencies):

- one dependent upon the dilator footprint on 3D (our de Broglie waves)
- one dependent upon the 4D Mass.
There is the question about their amplitudes, how similar are they? Just from inspection, they seem to be equivalent to a superstrong gravity since they are expressed by a small number of particles.

The answer to this question has implication on bunching and focusing of particles. This is extremely relevant to the pursuit of Coherent Nuclear Energy. The creation of coherent bunching of deuteron atoms for instance, followed by focusing and hadronic phase matching might be feasible.

When one focus particles, they would be subject to this bitonal dilaton field components. If the de Broglie field is stronger than the EFD dilaton field, that might mean that homogeneous bunching with a larger number of particles, might be easier done than one with a small number of particles, clearing the path to coherent hadronics.

De Broglie dilaton field might be bunching and debunching depending upon which phase you consider. Both phases define a trough that might neutralize enough electrostatic repulsion to allow for phase matched nuclear reactions.

First let’s derive the de Broglie law using the proposed 4D topology. Let’s consider de Broglie waves and the dilaton field for a hydrogen atom. In the case of a Hydrogen atom, the atomic mass is HydrogenMass.

Let’s consider a Hydrogen atom traveling at the speed of light along the 3D Universe. The vertical line points to the Radial direction (perpendicular to the 3D Universe). The line at 45° corresponds to traveling at the speed of light both radially and tangentially. The oblique line indicates the projection onto the 3D Universe. Simple geometry tells you how the actual wave gets projected onto the 3D Universe.

![Diagram](image)

Figure 15. This diagram shows two consecutive de Broglie steps of the 3D Universe expansion and their relation to a volumetric dilaton wave. The 45° projection maps into the Compton wavelength.

The horizontal lines represent steps of the 3D Universe. From the figure above, it is clear that the de Broglie wavelength in 3D is twice the one seem in 4D. This creates a coincidence between the GFD dilaton field and the de Broglie field.
The de Broglie equations that calculate wavelength consistent with this 4D Perspective are given by:

\[
\lambda_{3D}^{\text{de Broglie}} = \frac{h}{m_{3D}v}
\]

\[
\sin(\alpha) = \frac{\lambda_{4D}^{\text{Vol}}}{\lambda_{3D}^{\text{de Broglie}}} = \tan(\alpha) \cos(\alpha) = \frac{\tan(\alpha)}{\sqrt{1 + \tan^2(\alpha)}}
\]

\[
\tan(\alpha) = \frac{v}{c}
\]

\[
\cos(\alpha) = \frac{\lambda_{4D}^{\text{Vol}}(0)}{\lambda_{4D}^{\text{Vol}}(v)} = \frac{1}{\sqrt{1 + \tan^2(\alpha)}}
\]

\[
\lambda_{4D}^{\text{Vol}}(v) = \lambda_{4D}^{\text{Vol}}(0)\sqrt{1 + \tan^2(\alpha)}
\]

(6)

**Hypersuperficial Mode:**

Calculate \( \lambda_{4D}^{\text{Vol}} \) equivalent to the \( \lambda_{5D}^{\text{de Broglie}} \):

\[
\lambda_{4D}^{\text{Vol}} = \lambda_{3D}^{\text{de Broglie}} \left[ \frac{\left( \frac{v}{c} \right)}{\sqrt{1 + \left( \frac{v}{c} \right)^2}} \right] = \frac{h}{m_{3D}v} \left[ \frac{\left( \frac{v}{c} \right)}{\sqrt{1 + \left( \frac{v}{c} \right)^2}} \right]
\]

\[
f_{4D}^{\text{Vol}} = \frac{m_{3D}v}{c\sqrt{2}} \frac{h}{\left[ \sqrt{1 + \left( \frac{v}{c} \right)^2} \right]^{-1}}
\]

\[
f_{4D}^{\text{Vol}} = \frac{m_{3D}v^2\sqrt{2}}{h} \sqrt{1 + \left( \frac{v}{c} \right)^2}
\]

(7)

\[
\lambda_{4D}^{\text{Vol}} = \frac{h}{m_{3D}c} \quad \text{for} \ v \ll c
\]

(8)

\[
f_{4D}^{\text{Vol}} = \frac{2m_{3D}c^2}{h}
\]

\[
\lambda_{4D}^{\text{Vol}} = \frac{h}{m_{3D}c\sqrt{2}} = \frac{0.707h}{m_{3D}c}
\]

(9)
Hypervolumetric Mode:

\[ \lambda_{4D} = \frac{0.2927307207639827 \ h \sqrt{1 + \left( \frac{v}{c} \right)^2}}{m_{4D} c} \]

\[ f_{4D}^{\text{Vol}} = \frac{m_{4D} c^2 \sqrt{2}}{0.2927307207639827 \ h \sqrt{1 + \left( \frac{v}{c} \right)^2}} = \frac{4.83111 m_{4D} c^2}{h G E} = \frac{m_{4D} c^2}{h G E} \]

\[ M_{4D}^{\text{FED}} = 1.0 \ \text{HydrogenMass} \]

\[ M_{4D}^{\text{GFD}} = 2.0 \ \text{HydrogenMass} \]

\[ h^{\text{GE}} = 0.292737 h \]

Equation 7. refers to the de Broglie 3D waves and depends only on the 3D masses. It was made general to account for different frequencies. The velocity is supposed to be invariant (low dispersion) between surface and volumetric dilatons. This is the equivalent hypervolumetric wavelength that is consistent with the observable 3D de Broglie waves. One might conclude that the Electromagnetism and Gravitational dilaton field have 29.3% of the intensity of the de Broglie dilaton field!

Equation (10) refers to the dilaton field created by all 4 phases of the dilaton coherence. One possible interpretation of the distinct nature of these dilaton modes is to map them to hypersuperficial (3D de Broglie waves) and hypervolumetric (dilaton field responsible for volumetric forces – electromagnetism and gyro-gravitation). There is an inherent uncertainty between superficial and volumetric waves in the context of waves on a surface attached to the moving frame of reference. The distinction should be made with respect to k-vectors. A superficial wave has a k-vector on the surface, while a volumetric wave has a k-vector perpendicularly to the surface that is free to move as the surface is tilted by interaction. Due to moving reference framework it is possible to map a superficial mode to a volumetric mode. This is the reason behind equations (7,10). Equation (10) refers to the de Broglie dilaton field and is certainly “superficial” since it depends only upon 3D masses.

Relative amplitudes for hypervolumetric and hypersuperficial dilaton fields might be derivable by the 4D Volumes and footprints.

Again, the k-vector for these dilaton waves are perpendicular to the local FS. This is necessary for creating a simple picture of the 3D de Broglie waves. The dilaton field propagating radially outwards corresponds to a dilator with zero velocity. Since the dilator k-vector is perpendicular to the 3D hypershell, the projection wavelength is infinite (very long). As the dilator changes velocity, the reentering dilaton field project the original wavelength into our known matter waves. The Hypergeometrical Universe theory recognizes this as a yet unknown Force, not unlike Gravitation or Electromagnetism. The mathematical formulation for force calculation is identical to other forces and presented in the next section. Specifics of this force as well on how to physically mold spacetime will be covered in detail elsewhere.
HYPER_GEOMETRICAL UNIVERSE PHYSICS

From modeling Figure 1, the rate of torsion of the local FS is proportional to the force (Hypergeometrical Universe interpretation of Newton’s Second Law) is giving by:

\[ F = m_{3D} c^2 \frac{dtanh(\alpha_\tau)}{d\tau} \]  \hspace{1cm} (11)

Adding the extra spatial dimension implies that:

\[ F = m_{3D} c^2 \frac{dtanh(\alpha_\tau)}{d\tau} = m_{4D} c^2 \frac{dtan(\alpha_\tau)}{dr} \]  \hspace{1cm} (12)

SPACE STRESS-STRAIN PARADIGM

In a geometrical theory, the only relevant constructs are space, time, dilators, dilaton fields (dependent upon dilators position, velocity and space properties). A theory about the Universe based on those constructs would recast equation 12) as:

\[ \text{Stress} = \text{Area}_{4D} \text{Strain}_{4D} = \text{Area}_{3D} \text{Strain}_{3D} \]

\[ \text{Area}_{4D} = m_{4D} c^2 \]

\[ \text{Area}_{3D} = m_{3D} c^2 \]

\[ \text{Strain}_{4D} = \frac{d\tan(\alpha_\tau)}{dr} \]

\[ \text{Strain}_{3D} = \frac{dtanh(\alpha_\tau)}{d\tau} \]  \hspace{1cm} (13)

The force between dilators can be calculated on the RXYZ frame.

From Figure 14, it becomes apparent the reason why the 4D Mass of the Fundamental Dilator is initially mapped to the the mass of a hydrogen atom in atomic units.

Transmutations chords redirect energy from tunneling into rotating in the 3D Universe, thus changing which phase is flush with the 3D Universe at the subsequent state. These chords (half-neutrinos) carry angular momentum since they correspond to rotations. They also carry linear momentum since they have a footprint on the Universe and are accelerated during the dissociation process. Since they have a different frequency, they will not produce anything that might be construed as a Gravitational nor Electromagnetic field. This would mean that it is meaningless the search for the neutrino mass as a potential indicator of the matter-induced spacetime curvature.

The EFD is a charged dilator and will be used as a probe for electromagnetism. For gravitation, the Fundamental Gravitation Dilator (GFD) archetype used will be a Hydrogen atom. Due to the Skinny Hypothesis, they can be used interchangeably – they have the same mass \( \chi \) and the same wavelength \( \lambda_1 \).

The introduction of a Fundamental Dilator and the concept of 4D Masses eliminates the asymmetry between electrons and protons and allow for the derivation of Natural Laws from first principles on a 5D Spacetime.
In this theory, a force capable of moving a body corresponds to a stress capable of deforming the Fabric of Space where that body is located. Notice that the body only has footprints on the FS where the dilators are. The strains are given by:

\[
\frac{d \tan(\alpha)}{dr} \quad \frac{d \tanh(\alpha)}{d\tau}
\]

and

\[
\frac{d \tan(\alpha)}{dr}
\]

where the angles are shown on the two cross-sections on Figure 1. The “areas” where the strain takes place are given by \(m_{04Dc^2}\) and \(m_{03Dc^2}\), respectively. They provide the extensive nature associated with mass in our current view.

Deformation of the Fabric of Space can be understood as acceleration from equation (13).

**Newton’s Third Law** also has a representation within this theory. The stress on interacting dilators (bodies) is also the same with opposing signs; this is equivalent to say that the force felt on each other is equal with opposite signs. This law is valid both on the RXYZ and in the \(\Phi\)XYZ. In addition, one can equate

\[
\text{Area}3D(1) \quad \text{Strain}3D(1) = \text{Area}3D(2) \quad \text{Strain}3D(2)
\]

where the indices refer to the particles. This applies to each de-Broglie step. This recast Newton’s Third Law also as Archimedes Law of Lever if one focus on a single de-Broglie step.

Newton’s fourth law is the Natural Law of Gravitation which will be derived later from first principles.

The above equations are the basis for the more fundamental theoretical development in this theory. In first analysis, it is just an extrapolation of Newton’s Law, which only covers the 3D space and introduces an unknown quantity \(F\). The introduction of a four spatial dimension allows for the creation of the purely geometric tautology relating Stress on the two cross-sections shown on Figure 1. The stress associated with interaction is then same on both cross-sections. The strain is expressed differently in each cross-section and that permits the derivation of our fundamental laws of physics (Newton’s, Gauss’s, Biot-Savart’s) from first principles. If you replace the masses by displacement volumes (4D) and displacement volumes overlap with FS (3D), it becomes clear that Newton’s equation can be thought as a Stress-Strain description, where the fundamental laws can be derived from comparing strain on different cross-sections of the Universe.

**PSEUDO TIME-QUANTIZATION AND THE STROBOSCOPIC UNIVERSE**

Pseudo Time-Quantization arises when one considers Newton’s Law, where mass attracts mass at the direct products of their values. On the intermediate phases, the 3D overlap of the fundamental dilator with the FS goes to zero and so goes its perceived 3D mass, resulting in an intermittent interacting Universe (Stroboscopic Universe).

This pseudo-time quantization and the introduction of a four spatial dimension creates inherent uncertainties in the dynamics of dilator which together with the Quantum Lagrangian Principle would
result in the basis for Quantum Mechanics. At each de-Broglie step, the next position where two interacting dilators (e.g. Hydrogen atom) would be depends upon their overlapping dilaton field at specific radial positions. The wavelengths and k-vectors on \( XYZ \) depends upon velocity. At any given step, the electron dilator should be in any one point on a circle drawn in the 3D space. That is the basis for the deterministic and yet uncertain motion in quantum mechanics. The loci of those steps should map to the probability density function. Since this theory is providing guidance for the underlying dynamics, it should be feasible to derive Schrodinger’s equation from first principles.

**QUANTUM LAGRANGIAN PRINCIPLE**

The Quantum Lagrangian Principle is nothing more than a direct result of the quantization of space deformation or metric deformation. It states that:

**DILATORS ALWAYS DILATE LOCALLY IN PHASE WITH THE SURROUNDING DILATON FIELD**

Since Gravitation and everything else is described in terms of metric deformations, all fields are quantized in a sense but not in another. Gravitational/Electromagnetism fields are dependent upon dilaton fields from dilators which provide quantized dilations amplitudes and have to be at any given time on a well-defined spatial interference patterned grid, although not at quantized distances. This means that the generation of the field is quantized but the actual dilaton field is not.

This means that interacting dilators (e.g. Hydrogen atom composed of electron and proton), will always be at the nearest maximum dilation (contraction) for proton (electron) at each de-Broglie step of the Universe expansion. The phase choice is arbitrary. This means that the electron (the most mobile) with have an uncertain trajectory (due to the azimuthally nature of the interferometric dilaton pattern resulting from proton-electron interaction.

The motion of a dilator can be thought in the \( RXYZ \) cross-section as being the interference between a self-wave which wavelength depends upon the torsional angle of the local metric. For relaxed space (angle=zero), the wavelength of a GFD is \( \lambda_1 \). If this dilator were accelerated to the speed of light tangentially (within the 3D), the wavelength would stretch to \( \sqrt{2}\lambda_1 \). This condition is required to keep in phase with the 3D Universe. Under adiabatic interaction, GFD would only reach the speed of light when their distance reaches \( R_0 \).

Normal gravitational attraction will deform the local metric, although much less than \( \alpha_1 \). In the \( \Phi XYZ \) cross-section, instead of a cosine projection, one would use a hyperbolic cosine.

Due to the Quantum Lagrangian Principle, position \( x \) show in Figure 16 is calculated from the interference pattern between the dilator self-generated field and the Cosmological Field reaching that region of the 4D spatial manifold. The math is quite simple, just add the two waves and calculate the maximum or minimum. That will be the position of the dilator in the next de-Broglie step. We start the calculation for EFD and allow the local metric deformation angle to be exactly the one calculated from \( x \) and \( \lambda_1 \). The local metric deformation for GFD is calculated from known \( G \) and \( x \) and \( R_0 \).
simple elasticity parameter is introduced to allow for the calculation of the natural frequency of gravitational waves.

So the peak dilaton field and dilator position can be thought as being the same, that is, a dilator will surf a dilaton field, which has the real physical meaning of a local metric deformation.

The dilaton field-FS overlap on $\Phi_{XYZ}$ cross-section corresponds to the de-Broglie material waves. While traveling within a 4D spatial manifold, a dilator will always surf the total dilaton field according to $R_{XYZ}$ cross-section. One should be careful not to interpret that particles (dilators) follow just an interference pattern in our 3D Universe. The perceived reality in the 4D spacetime ($\tau_{xyz}$) depends upon the solution of the Hypergeometrical Universe Newton’s equation of motion. Knowledge of $x$, $R_0$ and $\lambda_1$ provides information the calculating forces acting upon the dilator using the first half of eq.12)

$$F = m_{01D} c^2 \frac{dtan(\alpha_r)}{dr}$$

that is, forces are calculated from multiplying spatial strain times area. Their time dependent dynamics is defined by the second half of eq.12).

$$F = m_{01D} c^2 \frac{dtanh(\alpha_r)}{d\tau}$$

as one would expect.

![Diagram](image)

Figure 16. This figure shows a de-Broglie step $\lambda_1$ (Compton wavelength of a Hydrogen atom for GFD). $R_0$ is the age of the Universe times the speed of light. A 1000 Avogrado Number of GFD will effect a probe GFD to move to position $x$ in the next de-Broglie step. Similarly, a 1000 x Avogrado Number of FDC would effect a probe FDC to move to position $x$. The first one corresponds to a Gravitational interaction while the second corresponds to an electrostatic interaction. The difference lies on how the local metric is deformed or relaxed at position $x$. The next step for electrostatic interaction is defined with a starting reference given by $\alpha_i$ while for Gravitation the next step should be defined with respect to $\alpha_0$. The ratio between $\alpha_i$ and $\alpha_0$ is the ratio between Gravitation and Electrostatic forces, which is approximately equal to the ratio between $\lambda_1$(Compton Wavelength of a Hydrogen Atom) and $R_0$(4D Radius of the Universe). There will be a discrepancy due to the non-adiabatic nature of interactions and the elasticity of space. It is clear that when the Universe was smaller, the ratio between $\alpha_0$ and $\alpha_1$ was larger (thus Gravitation was stronger in relation to electromagnetism).

**MECHANISM OF ATTRACTION OR REPULSION**
To derive the laws of Nature, we first need a picture of what is happening during attraction or repulsion. We first write the deformational waveform for the dilaton field. This formula is valid for both electrostatic and gravitational interaction since the amplitude of each dilaton field is equal to the amplitude of the dilator at specific times of the expansion and they can be normalized to unit.

Figure 17. Ladder and pulse functions used to show how the dilator amplitude decays as a function of de-Broglie steps and cycles of the dilaton field.

Mathematica Functions:

\[ \text{ladder}[x_] = \text{HeavisideTheta}[	ext{SawtoothWave}[x-0.25]-0.5] \times \text{Round}[\text{Abs}[x]] \text{pulses}[x_] \]
\[ = \text{HeavisideTheta}[	ext{SawtoothWave}[x-0.25]-0.5] \]

(16)

The full dilaton field is given by

\[ \Psi_1(x, x_0) = \frac{\cos(k_1 \cdot (x - x_0))}{(1 + f(k_1 \cdot (x - x_0)))} \]

(17)

\[ \Psi_2(x, x_0) = \frac{N \cdot M \cdot \cos(k_2 \cdot x)}{(1 + f(k_2 \cdot (R - x)))} \]

(18)

\[ \Psi_{\text{Total}}(x, x_0) = \Psi_1(x, x_0) + \Psi_2(x, x_0) \]

(19)

\[ f(k \cdot x) = \text{ladder}[x] \]

(20)

The function ladder is used to implement the dilution of the initial dilaton amplitude (unit) into the number of cycles. So the first cycle the intensity is 1, at the second it is 1/2, at the third it is 1/3…etc. The only relevant part of the dilaton field for force derivation are the peaks. The reason being is that the dilator always corresponds to a positive or negative peak when it lands back on the 3D Universe. The derivative of the ladder function is zero for x=0.
\[
\frac{df(x)}{dx} = 0 \quad \text{for } x=0
\]  

(21)

The pulse function was used to show only that region and not the negative part of each cycle. Plots were generated with the function below:

\[
\Psi_2(x,x_0) = \frac{MN \cdot \cos[k(R-x)] \cdot \text{pulse}[x]}{(1 + \text{ladder}(N(R-x)))} \approx \frac{MN}{(1 + f(k_2(R-x)))}
\]

(22)

if \( N \) (number of dilators) is very large, the oscillations are extremely close to each other and the approximate version of the equation is used.

Notice that when \( x-x_0=R \) is a macroscopic distance:

\[
\frac{d\Psi_2(x,x_0)}{dx} = \frac{M \cdot N \cdot N \cdot k}{(N \cdot k \cdot (R-x))^2} = \frac{M}{kN^2(R-x)^2} = \frac{N \cdot \lambda_2}{2\pi R^2}
\]

(23)

\( M=1 \) for neutral matter-matter, or antimatter-antimatter interactions or opposite charge interactions \( M=-1 \) for same charge or matter-antimatter interactions

For gravitation the picture is similar. The question is how the gradient is different for matter and antimatter? Van der Walls forces are always attractive and that might be the case for
**Gravity since they originate from similar processes.** Which would be very disappointing since we always hoped for an easy way out of the Law of Gravitation.

This is a relevant result since it might answer the question about why don’t we see antimatter. We might have clusters of antimatter galaxies, segregated by antigravity if not in this quadrant, perhaps in another quadrant of the Hyperspherical 3D Universe. Another more likely scenario is that all antimatter was left behind in the inner 2s shell of the initial 2s hyperspherical macroscopic metric fluctuation.

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## THE MEANING OF SPIN

The figure below shows the formation of ortho- and para-Hydrogen atoms.

![Formation of Hydrogen Atoms](image)

Figure 19. This figure shows that a negative spin means time reversing the cycle of the Fundamental Dilator Coherence. Para-Hydrogen has lower energy due to the attractive interaction during the perpendicular phases. Similar considerations are applicable to Cooper Pairs in Superconductivity. In fact, in Cooper pairs, the intermediate matching is perfect. This understanding of spin will allow for the exploration of hidden Universe that is here when we momentarily don’t exist (in the sense, “I interact, therefore, I exist”).

---

## THE MEANING OF INERTIA

Inertia maps to the overlap of the dilator with FS at specific phases when the Universe interacts. At those phases, the larger the overlap, the larger the inertia will be. The reason lies on the Stress-Strain view of interaction. Interacting dilators create dilaton fields which affect the position of other dilators at subsequent de-Broglie steps. This is equivalent to changing the propagation direction within the 4D spatial manifold and thus locally deform the FS. The larger the area that should be deformed the larger the required stress (Force), thus the larger the inertia.

The intersection of this 4D dilator displacement volume with the very thin 4D Universe (Fabric of Space) multiplied by a 4D mass density corresponds to the perceived 3D mass, a familiar concept. Since both the dilator and the Fabric of Space are very thin, the intersection decreases extremely rapidly with spinning angle/phase tunneling. The interaction between dilators and dilaton fields (generated by other dilators) is directly dependent upon that footprint. Since the footprint is non-null only at specific spinning angles, interaction is quantized and “existence” is quantized. Where existence was construed according to the following paradigm: “I interact, therefore I exist”. Neutrinos have been called “Ghostly Particles” due to their very small interaction with the rest of the Universe (dilators) and different de-Broglie wavelength. Figure 9 and Figure 11 showed that neutrinos correspond to coherences with different wavelength or frequency than the Fundamental Dilator, thus resulting in alternating interactions that are
only effective at very short range, thus making neutrino matter interaction cross-section very small.

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**NEWTON’S FIRST LAW - WHY DO THINGS KEEP MOVING?**

Eppur si muove

![Diagram](image)

*Figure 20. Here we present a dilator in motion and its position on two de-Broglie steps. The local metric is perpendicular to the direction of propagation.*

As time goes by, the local metric deformation described by the angle alpha1 becomes the smaller alpha2, thus motion results in a more relaxed local metric. **Conversely, one could say that that is the reason for inertial motion, thus providing a reason for Newton’s First Law.** Alpha equal to zero means that the dilator would propagate along the radial direction and that the local metric would be totally relaxed. This also means that current Universe should be mostly relaxed.

Notice that the apparent motion will still exist since the fabric of space is expanding and any place in the 3D universe has a Hubble expansion velocity. Although moving relatively to its original position, the body remains static with respect to the fabric of space (alpha parallel to R). At that point, the local deformation ceases to exist and the body drifts with the expansion at the Hubble velocity. In other words, motion is a way for 4D space to relax; in the same way a tsunami is the means for the sea to regain a common level.
COSMOLOGICAL COHERENCE

Given that dilators obey the Quantum Lagrangian Principle, thus are never dephased by interactions, then it becomes clear that all dilators are in phase throughout the Universe, creating a Cosmological Coherence.

The existence of macroscopic coherence is the underlying reason why the concept of field can work. If one considers a field to be a property of space, then the coherent addition of dilaton fields is a requirement for the fields to be an extensive property of the number of dilators.

DILATOR ARCHETYPES

Before the derivation of Gauss Electrostatics and Newton’s Gravitation Laws, let’s discuss the meaning of a dilaton field for a Gravitational Fundamental Dilator (GFD) and for an Electromagnetic Fundamental Dilator. The electrostatic dilaton field is easy to understand.

- (EFD). Figure 14 shows the Electrostatic Fundamental Dilator going through the spinning and space deformational changes. Deforming space should create propagating deformation waves on the Fabric of Space. There is a subtle and very important difference between dilators and dilaton fields. Dilaton Fields propagate at the actual speed of light $\sqrt{2}c$. The 3D Universe propagates at $c$ along the radial direction. The dilator is part of the 3D Universe and thus travels at that speed. Hence, a dilator is a dilaton wave generator that travels at lower speed that the waves it creates. At each de-Broglie step the local metric displacement volume is unit. In this theory, a unit amplitude of deformation is associated with the location where the dilator lands. This is the same for both electron state and proton state because they both have the same absolute value of coherently added 4D displacement volumes.

- (GFD) For the Gravitational Fundamental Dilator shown in Figure 14, the analysis is similar. Since GFD is a Hydrogen atom, any EFD (half of a GFD) will be both attracted and repelled. This process has similarity to Van der Walls forces. The difference is that the fluctuations are not related to charge position fluctuation but to charge transmutation at each half de-Broglie step, which happens in yoctoseconds.

Since the effect of these fluctuations on EFD comprising GFDs should be null, one would expect no effect force nor deformation of the local metric. If one starts with a relaxed local metric, the GFD should land on a place where the Fabric of Space is also relaxed. That is the support for the caption in Figure 16. Like in the Van der Walls forces, there will be a residual effect (Gravitation), that is, there will be an effective dilaton field generated and the corresponding GFD will follow the Quantum Lagrangian Principle and move to position $x$ on Figure 16, independently of them being GFD or EFD. The difference will be what happens in subsequent steps. In the case of an Electrostatic Fundamental Dilator, the local metric will be twisted and the k-vector (direction where the EFD is traveling) will be changed by $\alpha_1$. In the case of a Gravitational Fundamental Dilator the change in k-vector is just $\alpha_0$. 
To calculate the position x and thus the value of the Force, one needs to map charges and 3D masses to number of dilators. One 4DKg of Hydrogen contains the same number of GFD dilators as one 4DKg of electrons (or protons) EFD.

**RELATING CHARGES AND 4D MASSES**

First let’s express Gauss law in terms of two interacting bodies of N (1000 Avogrado) of dilators separated by one-meter distance. The reason for expressing Gauss Law in term of N is to have a term of comparison with Newton’s Law, that is, both Gravitational and Electrostatic laws should be measuring the effect of the same number of dilators (N electrons or N Hydrogen Atoms).

**FOR THE ELECTROSTATIC FORCE BETWEEN TWO ONE N- EFD DILATOR MASSES:**

The standard MKS equation for electrostatic force between two one 4DKg bodies of N=1000 * Avogrado electrons (χ a.m.u. “electrons” or “protons”) = 1/e Coulombs, is giving by:

\[
F = \frac{1}{4 \pi \varepsilon_0} \left( \frac{\text{Coulombs}}{\text{meter}} \right)^2 \left( \frac{\text{EFD}}{\text{Coulombs}} \right)^2 \left( \frac{N \text{ EFD}}{\chi 4 \text{DKg}} \right)^2 \left( \frac{4 \text{DKg}}{3 \text{DKg}} \right)^2 = \]

\[
= G_{\text{Electrostatic}} \left( \frac{3 \text{DKg}}{\text{meter}} \right)^2
\]

(24)

We make \((4 \text{DKg})/(3 \text{DKg})\) =1 that is, we impose a one-to-one mapping between a 3D volume (footprint of dilators in the 3D Hypersphere and the actual effective 4D volume). This is possible since we are using an effective 4D Mass χ a.m.u. per dilator. This factor χ is justified in terms of 4DMode-factors.

\(G=\) gravitational constant=6.67408 x 10\(^{-11}\) m\(^3\) kg\(^{-1}\) s\(^{-2}\)

χ is the EFD effective 4D Mass in a.m.u.

\[G_{\text{Electrostatic}}^{4D} = \frac{1}{4 \pi \varepsilon_0} e^2 \left( \frac{N}{\chi} \right)^2 = \frac{8.369 E + 25}{\chi^2} \]

(25)

For the Gravitational Force between two one 4DKg dilator masses:

\[
F = G \left( \frac{1}{\text{meter}} \right)^2 \left( \frac{N}{2 \chi} \right)^2 \frac{GFD}{4 \text{DKg}} \left( \frac{4 \text{DKg}}{3 \text{DKg}} \right)^2 \left( \frac{3 \text{DKg}}{3 \text{DKg}} \right)^2 = G_{\text{Gravitational}}^{4D} \left( \frac{3 \text{DKg}}{\text{meter}} \right)^2
\]

\[G_{\text{Gravitational}}^{4D} = \left( \frac{1}{2 \chi} \right)^2 \]

(26)
So the ratio between the forces between two N-EFD (EGD) separated by 1 meter is given by:

\[
\frac{G_{\text{Electrostatic}}^{4D}}{G_{\text{Gravitational}}^{4D}} = \frac{1}{4} \frac{(2Ne)^2}{\pi \epsilon_0} = 5.12E + 36
\]

(27)

Where we kept \( \chi \) as referring to the 4DMass of the EFD. One 4DKg of GFD contains half the number of EFD in the same 4D displacement volume.

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**FORCE UNIFICATION**

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**QUANTUM GRAVITY AND ELECTROSTATIC INTERACTION**

Let’s consider:

\[
\vec{r}_0 = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \quad \text{and} \quad \vec{R}_0 = \begin{pmatrix} R \\ 0 \\ 0 \\ 0 \end{pmatrix}
\]

(28)

Vector expressed in terms of xyzR coordinates

After a de-Broglie cycle (\( \lambda_1 \)):

\[
\vec{r} = \begin{pmatrix} r \alpha \\ r \beta \\ r \gamma \\ \lambda_1 \end{pmatrix} \quad \vec{R}_0 = \begin{pmatrix} R \\ 0 \\ 0 \\ \lambda_1 \end{pmatrix} \quad \vec{r}_0(\lambda_1) = \begin{pmatrix} 0 \\ 0 \\ 0 \\ \lambda_1 \end{pmatrix}
\]

(29)

using director cosines \( \alpha, \beta, \gamma \).

\( \vec{r}_0(\lambda_1) \) is the unperturbed crest of our four-dimensional dilator 1 after a de-Broglie cycle.

\( \vec{r} \) is the position of that same probe dilator under the influence of dilator 2.

To analyze the interaction between a probe dilator and a 1 4DKg body (N= 1000*Avogadro and 14DKg contains N/\( \chi \) EFD or GFD), let’s express the dilaton field for a single particle as:

\[
\Psi_1(x, x_0) = \frac{\cos(k_1x)}{1 + f(k_1(x - x_0))}
\]

(30)

Where
There is a constraint on $f(x)$, which is that $\frac{\partial f}{\partial x} = 0$ for $x=0$. For any other position, $\frac{\partial f}{\partial x} = kr$.

For sake of plotting we use a stepwise constant function, implemented by the function ladder.[x]. Similarly, for a N-dilator body located at position $\vec{R}$:

$$
\Psi_2(x,x_0) = \frac{N.M.\cos(k_2(x-R))}{(1 + f(k_2(x-R)))}
$$

where the effect of the 1 N-dilator mass is implicit in the $k_2$-vector and expressed by the factor N.

Later, when representing 1 $4\text{DKg}$ mass, we will replace N by $N/\gamma$. The wave intensity scales up with the number of particles (N). $|k_2| = \langle N \rangle$. $|k_1|$, where:

$M=1$ for neutral matter-matter, or antimatter-antimatter interactions or opposite charge interactions

$M=-1$ for same charge or matter-antimatter interactions

To calculate the effect of gravitational/electrostatic attraction, one needs to calculate the displacement on the dilaton field maximum around each particle or body due to interaction with the dilatons generated by the other body.

This is done for the lighter particle, by calculating the derivative of the waveform and considering the extremely fast varying gravitational wave from the macroscopic body always equal to one, since the maxima of these oscillations are too close to each other and can be considered a continuum.

The total waveform is given by:

$$
\Psi_{\text{total}}(x,x_0) = \Psi_1(x,x_0) + \Psi_2(x,x_0) = \frac{\cos(k_1x)}{(1 + f(k_1(x-x_0)))} + \frac{N.M.\cos(k_2x)}{(1 + f(k_2(x-R)))}
$$

$x_0$ is the position in the prior de-Broglie step of the Universe expansion.

**WHY IS THE LIGHTSPEED THE LIMITING SPEED IN THIS UNIVERSE?**

The reason can be seen from equation (29), by taking the derivative of the waveform (33) with respect to x and equating it to zero. Normally we consider that $x_0=0$ as we are considering just the first step. Here we kept $x_0$ to determine asymptotic behavior of dilators under extreme fields.

Under extreme fields, let’s consider that $\Psi_2$ is saturated, that is, it doesn’t change with x anymore. Under those conditions, $\frac{\partial \Psi_2}{\partial x} = 0$ and

$$
\frac{\partial \Psi_{\text{total}}}{\partial x} = \frac{\partial \Psi_2}{\partial x} = \left( \frac{k_1 \cos \left[ k_1 x \right]}{(1 + f(k_1(x-x_0)))} \right)^2 + \frac{k_1 \sin \left[ k_1 x \right]}{(1 + f(k_1(x-x_0)))} = 0
$$

in the asymptotic regime, the next x will be equal to the prior $x_0$, thus the saturation angle will be such that:
A conclusion can be derived if one considers planar waves propagating along R and the position of the next x points to a 45° from the R direction. This is the reason why the speed of light is the limiting speed when this paradigm is used for acceleration of masses.

That is also the reason why a Lorentz transformation and Strict Relative were created. Without the Quantum Lagrangian Principle and this proposed Universe Topology, the requirement of an accumulation point at 45° can only be achieved using a hyperbolic XYZϕ spacetime. The Hypergeometrical Universe Theory not only provides the reason why things move but also provides the reason why they cannot be accelerated faster than the speed of light. This also provides the basis for alternative understanding of the passage of time, space dilation etc.

**RELATING SPEED WITH THE PASSAGE OF TIME**

Since at each de-Broglie step, the Δx associate with interaction depends upon the actual absolute speed (torsional of the local metric), when speeds are close to the speed of light, smaller Δx means slower dynamics (chemical reaction dynamics, nuclear reaction dynamics). That in turn can be understood as slower passage of time. This means that, this theory states that the passage of time is constant. The laws of Physics are what are being changed with speed, well, they are changing if the framework is not the Quantum Lagrangian Principle and the proposed topology. This also means that a particle lifetime depends upon the tilting on its local metric. Increasing speed, increases the linear velocity local metric torsion. Nuclear energy is stored in rotational velocity torsion of local metric. The effect of speed is to effectively relax the local metric, thus increasing the particle lifetime.

**DERIVING THE GRAND UNIFICATION EQUATION**

To calculate the value of x in general, we consider that space is relaxed at time zero to make calculations easier and take the derivative of the dilaton field with respect to x in the proximity of the probe dilator (x₀=0) and equate it to zero. Notice that there is no need for any rescaling (Gravitation is much weaker than Electromagnetic interaction) because the field amplitude and the amplitude generated by a dilator (EFD or GFD) is always Unit. Give the number of dilators, we will simplify Ψ₂ and use the large number limit (eliminate the oscillatory nature because peaks are extremely close to each other). Under those conditions:

\[
\Psi_{\text{Total}}(x) = \Psi_1(x) + \Psi_2(x) = \frac{\cos(k_1 x)}{(1 + f(k_1 x))} + \frac{N.M \cdot \cos(k_2 x)}{(1 + f(k_2(x - R)))}
\] (36)
And

$$\Psi_{\text{total}}(x) = \Psi_1(x) + \Psi_2(x) = \frac{\cos(k_1x)}{(1 + f(k_1x))} + \frac{N.M}{(1 + f(k_2(x - R)))}$$  \hspace{1cm} (37)

For large N. Taking the derivative at x=0:

$$\frac{d\Psi_{\text{total}}(x)}{dx} = -k_1 \sin(k_1x) + \frac{N.M k_2}{(k_2.R)^2} = 0$$

$$k_1^2 x = \frac{N.M}{k_2.R^2}$$

$$x = \frac{NM \lambda_1^2 \lambda_2}{(2\pi)^3 R^2}$$

since

$$\frac{df(k_1x)}{dx} = 0$$

$$\frac{df(k_2(x - R))}{dx} = k_2$$

$$R \gg \lambda_1$$  \hspace{1cm} (38)

Where sine function was expanded into k_1x.

Let’s define tan(α_1) as:

$$\tan(\alpha_1) = \frac{x}{\lambda_1} \delta = \frac{\lambda_1 \lambda_2 M \left( \frac{N}{\chi} \right)}{(2\pi)^3 R^2} \delta$$  \hspace{1cm} (39)

δ is a parameter related to the type of interaction and the elasticity of space. Now we can calculate the acceleration as:

$$\text{acceleration} = c^2 \frac{d\tan(\alpha_1)}{dr} = \frac{c^2 \tan(\alpha_1)}{\lambda_1} = \frac{c^2 \lambda_2 M \left( \frac{N}{\chi} \right)}{(2\pi)^3 R^2} \delta$$  \hspace{1cm} (40)

Now we can calculate the electrostatic force between two 1 Kg3D mass of EFD with R=1 meter. 

$$\left( \frac{N}{\chi} \right) = \text{Number of EFD per 1 Kg4D}$$
Remember that we are using a mapping

\[
\left( \frac{Kg 4D}{Kg 3D} \right) = 1
\]  

(41)

By allowing the actual 4DMass of a dilator to be given by \( \chi \) a.m.u.,

\[
F_{\text{Electrostatic}} = 1 Kg 3D * \text{acceleration} = \frac{c^2 \lambda_2 M}{(2\pi)^3} \delta \left( \frac{N}{\chi} \right) \left( \frac{1}{Kg 3D \text{ meter}} \right)^2 = G_{\text{Electrostatic}}^{4D} \left( \frac{Kg 3D}{\text{ meter}} \right)^2
\]

(42)

Comparing \( G_{\text{Electrostatic}}^{4D} \) with the previous calculated value using Gauss’ Law:

\[
\frac{1}{4 \pi \varepsilon_0} e^2 \left( \frac{N}{\chi} \right)^2 = \frac{c^2 \lambda_2 M}{(2\pi)^3} \delta \left( \frac{1}{Kg 3D} \right)
\]

(43)

For electrostatics, we will assign \( \delta = 1 \), \( M=1 \), that is, the local surface is totally twisted by the dilaton field. Solving the equation for \( \lambda_2 \):

\[
\lambda_2 = \frac{2\pi^2 e^2 (Kg 3D)}{\varepsilon_0 e^2} = 6.36737 * 10^{-43}
\]

(44)

\( \lambda_2 \) is the Compton wavelength of 1000*Avogado of 1 4D a.m.u dilator. Subsequently, we will hide the Kg3D unit for convenience, but that unit is necessary to recover \( \varepsilon_0 \) proper units.

For the case of the electron, using 4DMass of 1 a.m.u., one can calculate the effective electron 4DMass \( \chi \):

\[
\frac{\lambda_2}{\lambda_1 (a.m.u.)} = \left( \frac{1}{\chi} \right) \frac{1}{1000 * \text{Avogado}}
\]
This result is the reasoning behind equation (10):

\[ \lambda_1 = \frac{h}{c \text{ a.m.u.}} = 1.3205 \text{ femtometer} \]

\[ \chi = \frac{\lambda_1}{\lambda_2 \times 1000 \times \text{Avogrado}} = 1.70918 \text{ a.m.u.} \]

(45)

DE-BROGLIE STEP CHARACTERIZATION

To calculate the time for GFD (us) to traverse a de-Broglie step:

\[ \lambda_1 = 0.292731 \frac{h}{c \text{ m}_4^D} = 1.91753 \times 10^{-16} \text{ meters} \]

where \( m_4^D = \text{HydrogenMass for a EFD (electron or proton).} \)

Since the dilaton field for Gravitation is not the same as the 3D de Broglie matter wavelength, one might consider using equation (10) for both EFD and GFD, thus

\[ \frac{\lambda_{EFD}^{4D}}{\lambda_{GFD}^{4D}} = 2 \]

(46)

EFFECTIVE 4D MASSES

This means that the effective 4DMode-factors was:

\[ G_{EFD} (\text{observed}) = \frac{\text{HydrogenMass}}{\chi} = 0.292731 \]

(47)

This factor actually relates to the frequency of this corresponding dilaton mode.

Let’s write our expression for the vacuum permittivity \( \varepsilon_0 \):
\[ \epsilon_0 = \frac{2\pi^2 e^3 (Kg3D)}{\lambda_2 c^2} \]  

(48)

Let’s define \( \delta \) such that the angle is measure as related to Gravitation:

\[ \delta = \frac{\lambda_1}{R_0} \xi \]  

(49)

Next we will explore a scenario where the space elasticity is considered constant throughout the Universe life. This hypothesis was created to explain measurements using Stellar Candles that might point to distances larger than the 4D radius obtained straight from Eq. = 67.8 km/s/mpc:

\[ R_0 = \frac{c}{H_0} \]  

(3). If no offending Stellar Candles measurements are ever found, then this approximation is not required and \( G \) might be constant or slightly varying throughout time. I don’t have the data at this time to decide either way.

Let’s analyze \( \delta \) for Gravitation for 1 4DKg of dilators.

\[ F_{Gravitational} = G \left( \frac{1}{2\chi} \right)^2 \frac{c^2 \lambda_2 M \left( \frac{N}{2\chi} \right)^2}{(2\pi)^3} \left[ \frac{\lambda_1}{R_0} \xi \right] \]  

(50)

\[ \xi = \frac{(2\pi)^3 G R_0}{c^2 \lambda_2 N^2 \lambda_1} = 283,087 \]  

(51)

\( G \) can be written as:

\[ G(R) = \frac{c^2 \lambda_2 N^2 \lambda_1}{(2\pi)^3} \frac{\xi}{R} \]  

(52)

Let’s calculate the gravitational force acting on a mass \( m \):

\[ F = m a = m c^2 \frac{\delta tan(\alpha_3)}{\partial \lambda_1} = (m c^2) \frac{\delta \chi}{\lambda_1^2} = m c^2 \frac{\delta}{\lambda_1^2} x = m (2 \pi f)^2 x \]  

(53)

Thus the natural frequency of gravitational waves is:

\[ f = \frac{1}{2\pi} \sqrt{\frac{c^2 \delta}{\lambda_1^2}} = \frac{c^2}{2\pi \lambda_1} \sqrt{\frac{\lambda_1 \xi}{R_0}} = 111,101 Hz \]  

(54)
Notice that this is not dependent upon any masses, only dependent upon the assumption of constant space elasticity. That should be the best frequency to look for or to create gravitational waves. Of course, Hubble red shift considerations should be used to determine the precise frequency from a specific region of the universe.

The complete Gravitostatic equation is given by:

$$F_{\text{Gravitational}} = \left\{ \frac{c^2 \lambda_2 \left( \frac{N}{\kappa} \right)^2 \lambda_1}{(2\pi)^3 \frac{\lambda_1}{R_0}} \xi \right\} \left( \frac{m_1 * m_2}{R^2} \right)$$

Later we will derive a Gyrogravitational version of this equation.

**GRAND UNIFICATION SUPERSYMMETRY**

As the dimensional age of the universe becomes smaller, the relative strength of gravitation interaction increases. Conversely, one expects that as the universe expands gravity will become weaker and weaker. This and the four-dimensional light speed expanding hyperspherical universe topology explain the acceleration of expansion without the need of anti-gravitational dark matter.

We can now calculate the radius of the Universe when Gravitational and Electrostatic forces were equal. Just make $\delta=1$ and calculate $R_0$:

Since:

$$\delta = \frac{\lambda_1}{R_0} $$

$$R_0 = \xi \lambda_1 = 283,087 \lambda_1 = 1.08566 \times 10^{-10} = 1.08566 \text{ Angstroms} $$

$$t_0 = \frac{R_0}{c} = 3.62137 \times 10^{-19} \text{ seconds}$$

Thus when $R_0$ was smaller than 283,087 times $\lambda_1$ (at 3.6E-19s into the Universe life), gravitational and electromagnetic interactions had equal strength. They were certainly indistinguishable when the radius of the universe was one de-Broglie wavelength long. This section is called Grand unification supersymmetry, because condition in equation (53) plays the role of the envisioned group theoretical supersymmetry of the grand unification force. Of course, it has a geometrical interpretation. At that exact radius, an elastic spring constant of the fabric of space allows for a change in the local normal such that it is parallel to the redirection of k-vector of a freely moving dilator.
QUANTUM GRAVITY

Quantum aspects can be recovered by not using fast oscillation approximation. It is also important to notice that equations (36) and (37) can be used to calculate the interaction between any particles (matter or anti-matter) or to perform quantum mechanical calculations in a manner similar to molecular dynamic simulations. The quantum character is implicit in the de-Broglie wavelength stepwise quantization. It is also relativistic in essence, as it will become clear when one analyzes magnetism next.

MAGNETIC INTERACTION

THE DERIVATION OF THE BIOT-SAVART LAW

Let’s consider two wires with currents $i_1$ and $i_2$ separated by a distance $R$. Let’s consider $i_2$ on the element of length $dl_2$ as the result of a moving charge of mass of 1Kg of electromagnetic fundamental dilators. This is done to obtain the correct scaling factor.

Without loss of generality, let’s consider that the distance between the two elements of current is given by:

$$r_0 = \begin{bmatrix} 0 \\ 0 \\ 0 \\ R \end{bmatrix} \quad R = \frac{R}{\sqrt{3}} \begin{bmatrix} 1 \\ 1 \\ 1 \\ 0 \end{bmatrix} \quad \hat{R} = \frac{1}{\sqrt{3}} \begin{bmatrix} 1 \\ 1 \\ 1 \\ 0 \end{bmatrix}$$

(57)

The velocities are:

$$V_1 = \begin{bmatrix} v_1 \alpha_1 \\ v_1 \beta_1 \\ v_1 \gamma_1 \\ c \end{bmatrix} \quad V_2 = \begin{bmatrix} v_2 \alpha_2 \\ v_2 \beta_2 \\ v_2 \gamma_2 \\ c \end{bmatrix}$$

(58)

Since one expects that the motion of particle 2 will produce a drag on the particle 1 along particle 2 direction of motion. Particle 1 is located at position $R(0 \ 0 \ 0 \ 1)$, just prior to the next de Broglie Universe expansion step.

Particle 2 was placed at position $\frac{R}{\sqrt{3}} \begin{bmatrix} 1 \\ 1 \\ 1 \\ 0 \end{bmatrix}$ and traveling at speed $V_2 = \begin{bmatrix} v_2 \alpha_2 \\ v_2 \beta_2 \\ v_2 \gamma_2 \\ c \end{bmatrix}$. The retarded potential time difference is $\frac{R}{c} = \frac{\sqrt{2}R}{\sqrt{2}c}$ just to remind us that the actual light speed is $\sqrt{2}c$ and it traverses $\sqrt{2}R$ in a 4D spatial manifold at 45 degrees.

The direction of the drag will be:
\[ \hat{r} + \frac{v_r}{c} = \frac{1}{\text{NormalizationFactor}} \left( \begin{pmatrix} \frac{1}{\sqrt{3}} \\ \frac{1}{\sqrt{3}} \\ \frac{1}{\sqrt{3}} \\ -1 \end{pmatrix} + \begin{pmatrix} \frac{v_2}{c} \alpha_2 \\ \frac{v_2}{c} \beta_2 \\ \frac{v_2}{c} \gamma_2 \\ 1 \end{pmatrix} \right) \]

where

\[ \text{NormalizationFactor} = \begin{pmatrix} \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & 1 \\ 1 & 0 & 0 & -\frac{v_2}{c} \alpha_i \\ 0 & 1 & 0 & -\frac{v_2}{c} \beta_i \\ 0 & 0 & 1 & -\frac{v_2}{c} \gamma_i \\ \frac{v_2}{c} \alpha_i & \frac{v_2}{c} \beta_i & \frac{v_2}{c} \gamma_i & 1 \end{pmatrix} \begin{pmatrix} \frac{1}{\sqrt{3}} + \frac{v_2}{c} \alpha_2 \\ \frac{1}{\sqrt{3}} + \frac{v_2}{c} \beta_2 \\ \frac{1}{\sqrt{3}} + \frac{v_2}{c} \gamma_2 \\ 0 \end{pmatrix} \]

This normalization factor will be deployed at the end of the calculation. If it is deployed at the beginning, there wouldn’t be any change in phase due to interaction.

Simple geometry in 4D reveals that:

\[ \alpha = a \tan \left( \frac{v_2 \alpha_2}{R} \right) = a \tan \left( \frac{v_2 \alpha_2}{c} \right) \]

\[ \cos(\alpha') = \cos \left( -\frac{\pi}{4} + \alpha \right) = \cos \left( \frac{\pi}{4} \right) \cos(\alpha) + \sin(\alpha) \sin \left( -\frac{\pi}{4} \right) = \frac{\sqrt{2}}{2} \cos(\alpha) \left[ 1 + \tan(\alpha) \right] \]

\[ \cos(\alpha') \approx 1 + \frac{v_r \alpha_2}{c} \]

The last part of the identity above shows the position where Particle would be (referred from Particle 2) after the Universe expanded by \( R \) radially. This represents the maximum drag possible where Particle 1 would imitate Particle 2. The force calculation allows for Particle 1 to be pushed into that direction.

The amount of drag is related to the intensity of the force between dilators.

After one de-Broglie cycle:
The figure below showcases the geometry associated with these two currents.

The k-vectors for the two electrons on the static reference frame are given by:

\[
k_1 = \frac{2\pi}{\lambda_1} \left[ \begin{array}{cccc} \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & 1 \\ 0 & 0 & 0 & \nu_1 c \alpha_1 \\ 0 & 0 & 0 & \nu_1 c \beta_1 \\ 0 & 0 & 0 & \nu_1 c \gamma_1 \\ \nu_1 c \alpha_1 & \nu_1 c \beta_1 & \nu_1 c \gamma_1 & 1 \end{array} \right]
\]

\[
k_i = \frac{2\pi}{\lambda_i} \left[ \begin{array}{ccccc} \frac{1}{\sqrt{3}} & + \frac{1}{\sqrt{3}} c \alpha_2 & \frac{1}{\sqrt{3}} & + \frac{1}{\sqrt{3}} c \beta_2 & 1 - \frac{1}{\sqrt{3}} c \alpha_2 \\ 0 & 0 & 0 & \nu_i c \alpha_2 \\ 0 & 0 & 0 & \nu_i c \beta_2 \\ 0 & 0 & 0 & \nu_i c \gamma_2 \end{array} \right]
\]

Similarly:
The wave intensities at \( r \) are:

\[
\Psi_1(x, y, z, r, \Phi) = \frac{\cos(k_1(r - r_0))}{(1 + f(k_1(r - r_0)))}
\]

\[
\Psi_2(x, y, z, r, \Phi) = \frac{N.M \cdot \cos(k_2(r - R))}{(1 + f(k_2(r - R)))} \equiv \frac{N}{(1 + f(k_2(r - R)))}
\]

Where \( N = 1000 \) Avogadro/\( \chi \), \( \lambda_1 = \) de-Broglie wavelength of a \( \chi \) a.m.u (atomic mass unit) particle/\( \kappa \), \( \lambda_2 = \) de-Broglie wavelength of a 1Kg4D particle = \( \lambda_1/N \).

To solve this optimization problem, we will find \( \Delta \) that solves this equation:

\[
\frac{d\Psi_1(\Delta)}{d\Delta} = \nabla \Psi_2(x, y, z, r, \Phi) \cdot \hat{R}
\]

(64)

this is equivalent to just summing up the rows in the gradient vector on the right-side equation.

Now one can calculate:

\[
k_1(r - r_0) = \left( \frac{2\pi}{\lambda_1} \right) \left( 1 + \frac{V_1 \hat{R}}{c} + \frac{V_2 \hat{R}}{c} + \frac{V_1 V_2}{c^2} \right)
\]

\[
\frac{d(k_1(r - r_0))}{d\Delta} = \left( \frac{2\pi}{\lambda_1} \right) \left( 1 + \frac{V_1 \hat{R}}{c} + \frac{V_2 \hat{R}}{c} + \frac{V_1 V_2}{c^2} \right)
\]

with

\[
\hat{R} = \frac{1}{\sqrt{3}} \begin{bmatrix} \hat{i} & \hat{j} & \hat{k} \end{bmatrix}
\]

(65)

where \( x[4]=0 \) because \( \lambda_1 \) refers to the dilator wavelength which adjusts itself to match the de Broglie step.

\[
\nabla f(k_1(r - r_0)) = 0 \quad \text{due to} \quad \left| k_1(r - r_0) \right| \ll 2\pi
\]

(66)
Similarly:
\[ k_2 (r - R) = \frac{2\pi}{\lambda_2} \left( \frac{1}{\sqrt{3}} + \frac{V_x}{c} \alpha_2 \right) \left( \frac{1}{\sqrt{3}} + \frac{V_y}{c} \beta_2 \right) \left( \frac{1}{\sqrt{3}} + \frac{V_z}{c} \gamma_2 \right) \left( 1 - \frac{V_x}{c} \alpha_2 - \frac{V_y}{c} \beta_2 - \frac{V_z}{c} \gamma_2 \right) \]
\[ \times \left( \begin{array}{c}
    r \left( \frac{1}{\sqrt{3}} + \frac{V_x}{c} \alpha_2 \right) - \frac{R}{\sqrt{3}} \\
    r \left( \frac{1}{\sqrt{3}} + \frac{V_y}{c} \beta_2 \right) - \frac{R}{\sqrt{3}} \\
    r \left( \frac{1}{\sqrt{3}} + \frac{V_z}{c} \gamma_2 \right) - \frac{R}{\sqrt{3}} \\
    0
\end{array} \right) \]
\[ k_2 (r - R) = \frac{2\pi R}{\lambda_2} \left( 1 + \frac{V_z \hat{R}}{c} \right) \]  \( (67) \)

where \( x[4] = 0 \) because \( \lambda_2 \) is \( 1/N \) of \( \lambda_2 \) and thus there is always a very close \( r \) that matches a \( 2\pi n \) condition.

And:
\[ \nabla f(k_2, (r - R)) = \nabla \left( \frac{2\pi}{\lambda_2} \left( \frac{1}{\sqrt{3}} + \frac{V_x}{c} \alpha_2 \right) \left( \frac{1}{\sqrt{3}} + \frac{V_y}{c} \beta_2 \right) \left( \frac{1}{\sqrt{3}} + \frac{V_z}{c} \gamma_2 \right) \left( 1 - \frac{V_x}{c} \alpha_2 - \frac{V_y}{c} \beta_2 - \frac{V_z}{c} \gamma_2 \right) \right) \]
\[ \nabla (f(k_2, (r - R))) \hat{R} = \frac{2\pi}{\lambda_2} \left( 1 + \frac{V_z \hat{R}}{c} \right) \]  \( (68) \)

Hence:
\[ \nabla \Psi_1 (\Delta, \Phi) \hat{R} = -\frac{\nabla (k_1, (r - r_0))}{(1 + f(k_1, (r - r_0)))} \sin(k_1, (r - r_0)) \equiv -k_1, (r - r_0) \frac{d(k_1, (r - r_0))}{d\Delta} \]
\[ \nabla \Psi_1 (\Delta, \Phi) \hat{R} = -\left( \frac{2\pi}{\lambda_1} \right)^2 \left( 1 + \frac{V_1 \hat{R}}{c} + \frac{V_2 \hat{R}}{c} + \frac{V_1 V_2}{c^2} \right)^2 \Delta \]  \( (69) \)

And
Here we calculate $\Delta$ and replace it with,

$$\nabla \Psi_2 (x, y, z, r, \Phi) \hat{R} = -N \nabla (k_2 (r - R)) \left( \frac{2\pi}{\lambda_2} \left( 1 + \frac{V_2 \hat{R}}{c} \right) R \right) = -N \lambda_2 \left( \frac{1+ \frac{V_2 \hat{R}}{c}}{c} \right)^2 R^2
$$

$$\nabla \Psi_2 (x, y, z, r, \Phi) \hat{R} \equiv -\frac{N \lambda_2}{2\pi R^2 \left( 1 + \frac{V_2 \hat{R}}{c} \right)}$$

(70)

Now we will start considering attraction or repulsion components. Negative $\Delta$ contributions are repulsion. Positive ones are attraction. In the analysis, we will have to consider electron-electron and electron-nuclei interactions, that is, to derive Biot-Savart law from first principles, we will have to consider the dilaton waves of all components of the wire and not only the electrons.

Similarly:

$$\Delta_{ee} = -\frac{N \lambda_2^2 \lambda_2}{(2\pi)^3 R^2} \left( 1 - \frac{V_1 \hat{R}}{c} + \left( \frac{V_1 \hat{R}}{c} \right)^2 + \left( \frac{V_2 \hat{R}}{c} \right)^2 + \left( V_1 \hat{R} \right) \left( V_2 \hat{R} \right) - V_1 V_2 \right)$$

(72)

$$\Delta_{ep} = \frac{N \lambda_2^2 \lambda_2}{(2\pi)^3 R^2} \left( 1 - \frac{V_1 \hat{R}}{c} + \left( \frac{V_1 \hat{R}}{c} \right)^2 \right)$$

since $\nu_2 = 0$

(73)
\[ \Delta_{pe} = -\frac{N\lambda_1^2\lambda_2}{(2\pi)^3 R^2} \left( 1 + \left( \frac{V_2 \hat{R}}{c^2} \right)^2 \right) \text{ since } v_1=0 \] (74)

\[ \Delta_{pp} = -\frac{N\lambda_1^2\lambda_2}{(2\pi)^3 R^2} (1) \text{ since } v_1=v_2=0 \] (75)

\[ \Delta_{total} = \Delta_{ee} + \Delta_{ep} + \Delta_{pe} + \Delta_{pp} = \frac{N\lambda_1^2\lambda_2}{(2\pi)^3 R^2} \frac{(V_1 \hat{R})(V_2 \hat{R}) - V_1V_2}{c^2} \] (76)

Where p stands for proton and e for electron.

\[ r = \frac{N\lambda_1^2\lambda_2}{(2\pi)^3 c^2} \left( \frac{V_1 \hat{R}}{c} \frac{V_2 \hat{R}}{c} - \frac{V_1V_2}{c^2} \right) \frac{\hat{R}}{R^2} \] (77)

Using a x (b x c) = b(a.c)-c(a.b):

\[ r = \frac{N\lambda_1^2\lambda_2}{(2\pi)^3 c^2} \left( V_1 \otimes (V_2 \otimes \hat{R}) \right) \frac{\hat{R}}{R^2} \] (78)

The number of dilators can be 1000*Avogadro/\(\chi\) for 4DKg or 3DKg, or 1/e for a Coulomb.

The force between two 1 Kg 3D dilators is given by:

\[ F = m_0 c^2 \frac{d\tan(\alpha)}{d_t} = (3DKg) \left( \frac{N}{\chi} \right) c^2 \frac{r}{\lambda_1^2} = \left( \frac{N}{\chi} \right)^2 (3DKg)\lambda_2 \left( V_1 \otimes (V_2 \otimes \hat{R}) \right) \frac{\hat{R}}{R^2} \] (79)

To scale this force into the force between two Coulomb charges traveling with velocities v1 and v2 one just have to multiply the equation by (1C\(\chi\)/Ne)^2:

\[ F = \left( \frac{1\text{Coulomb}}{e} \right)^2 c^2 \frac{r}{\lambda_1^2} = \left( \frac{1\text{Coulomb}}{e} \right)^2 \frac{\lambda_2 V_1V_2}{(2\pi)^3} \left( (dl_1 \otimes (dl_2 \otimes \hat{R}) \right) \frac{\hat{R}}{R^2} = \]

\[ = \left( \frac{1\text{Coulomb}}{e} \right)^2 \frac{(3DKg)\lambda_2 j_1j_2}{(2\pi)^3 e^2} \left( (dl_1 \otimes (dl_2 \otimes \hat{R}) \right) \frac{\hat{R}}{R^3} \] (80)

The Biot-Savart law can be written as:
\[ dF = \frac{\mu_0 I_1 I_2 (dl_1 dl_2) x_{12}}{4\pi |x_{12}|^3} \]  

Comparing the two equations one obtains:

\[ \frac{\mu_0}{4\pi} = \frac{(1\text{Kg3D})\lambda_2}{(2\pi)^3 e^2} \]

Thus

\[ \mu_0 = \frac{\lambda_2 (\text{Kg3D})}{2\pi^2 e^2} \]  

Without that extra unit (Kg3D), \( \mu_0 \) will not have the appropriate units. The same is valid for \( \varepsilon_0 \).

From equation (44)

\[ \varepsilon_0 = \frac{2\pi^2 e^2}{\lambda_2 c^3 (\text{Kg3D})} \]

Thus

\[ \mu_0 \varepsilon_0 = \frac{\lambda_2 (\text{Kg3D})}{2\pi^2 e^2} \frac{2\pi^2 e^2}{\lambda_2 c^3 (\text{Kg3D})} = \frac{1}{c^2} \]

Thus one recovers the relationship between \( \mu_0 \) and \( \varepsilon_0 \).

We recovered the Biot-Savart law for infinitesimal elements of current. This was achieved by considering the many contributions of positive and negative center charges and using the low velocity approximation. All dilators contribute to electromagnetism and not just electrons.

Within a Tokamak Nuclear Fusion device, currents are both positive and negative (hot plasma) and velocities are relativistic. Under these conditions one should use the non-approximated first half identity from equation

\[ \Delta = \frac{N\lambda_1^2 \lambda_2}{(2\pi)^3 R^2} \left( \frac{1}{1 + \frac{V_1 \hat{R}}{c} + \frac{V_2 \hat{R}}{c} + \frac{V_3 V_2}{c^2}} \right) \left( 1 + \frac{V_2 \hat{R}}{c} \right) \]
\[
\Delta \text{NormalizationFactor} = \frac{N\lambda_1^2\lambda_2}{(2\pi)^3 R^2} \left\{ \frac{1}{1 + \frac{V_1\hat{R}}{c} + \frac{V_2\hat{R}}{c} + \frac{V_1 V_2}{c^2}} \right\} \frac{1}{1 + \frac{V_2\hat{R}}{c}}
\]

\[
\Delta = \frac{N\lambda_1^2\lambda_2}{(2\pi)^3 R^2} \left\{ \frac{1}{1 + \frac{V_1\hat{R}}{c} + \frac{V_2\hat{R}}{c} + \frac{V_1 V_2}{c^2}} \right\} \frac{N\lambda_1^2\lambda_2}{(2\pi)^3 R^2} \left\{ \frac{1}{1 + \frac{V_2\hat{R}}{c}} \right\} \frac{1}{1 - \frac{V_1\hat{R}}{c} + \frac{V_1\hat{R}}{c} - V_1 V_2}
\]

\[
(71)
\]

\[
r = \left(\frac{N}{\chi}\right) \frac{\lambda_1^2\lambda_2}{(2\pi)^3 R^2} \left\{ \frac{1}{1 + \frac{V_1\hat{R}}{c} + \frac{V_2\hat{R}}{c} + \frac{V_1 V_2}{c^2}} \right\} \frac{1}{1 + \frac{V_2\hat{R}}{c}} \hat{R}
\]

\[
(86)
\]

The force between two 1 Kg4D dilators is given by:

\[
F = m_{03D}c^2 \frac{d \tan(\alpha_x)}{dr} = (Kg3D) \left(\frac{N}{\chi}\right) c^2 \frac{r}{\lambda_1^2} \hat{R}
\]

\[
F = (Kg3D) \left(\frac{N}{\chi}\right)^2 \frac{\lambda_1^2\lambda_2}{(2\pi)^3 R^2} \left\{ \frac{1}{1 + \frac{V_1\hat{R}}{c} + \frac{V_2\hat{R}}{c} + \frac{V_1 V_2}{c^2}} \right\} \frac{1}{1 + \frac{V_2\hat{R}}{c}} \hat{R}
\]

\[
(87)
\]

To scale this force into the force between two Coulomb charges traveling with velocities v1 and v2 one just have to multiply the equation by \((1C\chi/Ne)^2\):

\[
F = \frac{\mu_0 c^2 C_1 C_2}{4\pi} \frac{1}{1 + \frac{V_1\hat{R}}{c} + \frac{V_2\hat{R}}{c} + \frac{V_1 V_2}{c^2}} \frac{\hat{R}}{R^2}
\]

\[
(88)
\]

Or

\[
F = \frac{C_1 C_2}{4\pi e_0} \frac{1}{1 + \frac{V_1\hat{R}}{c} + \frac{V_2\hat{R}}{c} + \frac{V_1 V_2}{c^2}} \frac{\hat{R}}{R^2}
\]

\[
(89)
\]

Where C1 and C2 are the charges traveling at V1 and V2 and c is the speed of light.

**GYROGRAVITATION-ELECTROMAGNETISM UNIFICATION**

Similarly, one can derive the Gravitational Biot-Savart equation by simple analogy to our derivation of the Gravitation Law.
The limit with zero velocity independent term corresponds to the steady state gravitational field

\[ F_{\text{Gravitational}} = \left[ \frac{N}{\chi} \frac{\lambda_c c^2}{(2\pi)^3} \frac{\lambda_2 \xi}{R_0} \right] M_1 M_2 \frac{1}{\left( 1 + \frac{V_1 \hat{R}}{c} + \frac{V_2 \hat{R}}{c} + \frac{V_1 V_2}{c^2} \right)^2} \frac{\hat{R}}{R^2} \]

\[ G = \left[ \frac{N}{\chi} \frac{\lambda_c c^2}{(2\pi)^3} \frac{\lambda_2 \xi}{R_0} \right] \]

\[ F_{\text{Gravitational}} = \left[ \frac{N}{\chi} \frac{\lambda_c c^2}{(2\pi)^3} \frac{\lambda_2 \xi}{R_0} \right] M_1 M_2 \frac{\hat{R}}{R^2} \]  

(\text{Newton’s Law}).  

Notice that the value of the Gravitational Constant \( G \) is inversely proportional to the 4D Radius of the Universe \( R_0 \). This means that at earlier epochs, Gravitation was stronger and at a precise time in the life of the Universe all forces had the same strength. It also means that Stellar Candles would contain smaller masses in the past than they do at later epochs. This means that current measurements of distances across the Universe based upon Stellar Candles might not work properly and indicate unreasonable large distance incompatible with the age of the Universe.

For non-zero relative speed, we obtain the Hypergeometrical Universe Law of Gravitation:

\[ F = G M_1 M_2 \frac{1}{\left( 1 + \frac{V_1 \hat{R}}{c} + \frac{V_2 \hat{R}}{c} + \frac{V_1 V_2}{c^2} \right)^2} \frac{\hat{R}}{R^2} \]

Equations (88)/(89) express the force for two elements of charge in motion. They recover Gauss Law under conditions of rest and have identical form as equation (90)/(91). This means that a single equation describes everything we know about electrostatics, electromagnetism and gravitation.

The Force derivation uses a boundary condition where the dilator is at rest with respect to the FS. This is equivalent to say that all forces are partial derivatives with respect to \( R \) while keeping velocity constant. This is important since the force is velocity dependent. To obtain a potential from which one can calculate dynamics, one need to integrate the equation (91) with respect to \( R \).

\[ V_2(R, V_1, V_2) = \frac{G M_1 M_2}{\left( 1 + \frac{V_1 \hat{R}}{c} + \frac{V_2 \hat{R}}{c} + \frac{V_1 V_2}{c^2} \right)^2} \frac{1}{1 + \frac{V_2 \hat{R}}{c}} \frac{R}{R^2} \]

(92)

This potential will be used in calculating the equations of motion of Mercury around the Sun.

This equation was derived under the regimen of weak (normal) gravitational pull. It would be easy to derive the same equation for conditions in the surroundings of a Black Hole. One would just not use the derivative approximations.

This means that there is Antigravity (weakening of Gravitation) right within the Law of Gravitation. If for a moment one sets the referential frame on body 1, thus having \( V_1 = 0 \), the Gravitational Force on \( F_2 \) becomes:
This is a much more complex view of Gravitation and it is a view derived from a more fundamental model. It reduces to Newton’s Law at zero relative velocity. Other possible ways to achieve antigravity, energy production will be discussed elsewhere.

This equation is likely to explain jets emanating from Black Holes since it shows that as the Black Hole pulls matter inwards it suffers a stronger pull than when it tries to slow down that same matter. This should be expected since the maximum inward speed is the speed of light. This asymmetric pull makes the Black Hole capable of propelling itself forward by asymmetric acceleration of the matter in front of it. In the case of a symmetric distribution of matter, one would expect double jets.

VALIDITY TESTS

PRECESSION OF MERCURY PERIHELION

Let’s consider equation (91) with $V_1=0$, that is, body 1 is not rotating. The new potential is given by:

$$
F_2 = \frac{GM_1 M_2}{R} \frac{1}{1 + \frac{V_2 \hat{R}}{c}}^{2} = GM_1 M_2 \left( \frac{\hat{R}}{R} \right)^2 \left( 1 - 2 \left( \frac{V_2 \hat{R}}{c} \right) + 3 \left( \frac{V_2 \hat{R}}{c} \right)^2 - 4 \left( \frac{V_2 \hat{R}}{c} \right)^3 \right)
$$

(93)

Where the square root vanishes when the model is flattened into 3D.

This is the Gerber’s potential [5,6] which correctly predicts the precession of Mercury perihelion (42.3 arc seconds per century).

GRAVITATIONAL LENSING

To calculate Gravitational Lensing one has to remember that Electromagnetic Waves are modeled as source-position modulated dilaton fields, that is, EM are dilaton fields (extremely small wavelength = Compton wavelength of a hydrogen atom) modulated by the motion of the dilators that create them. Of course, dilators slow motion yields much larger wavelengths consistent with the electromagnetic waves they generate.

To obtain the predictions of the Hypergeometrical Model for the gravitational refraction of an electromagnetic wave, one has to remember that a Force is represented as a Stress in this model. Acceleration is modeled as a local deformation of the Fabric of Space. This is shown in the equation below:
\[ F = m_0 c^2 \frac{d \tanh(\alpha)}{d\tau} = c \frac{d(m_0 V)}{d\tau} = c \frac{d(hk)}{d\tau} = \hbar c \frac{dk}{d\tau} = h_c \frac{\Delta k}{\Delta \tau} \] (95)

Where d\tau is equal to cd\tau, that is, it is a dimensionalized time. The momentum of an electromagnetic wave was represented by h\hbar.k and its mass by this equation:

\[ m = \frac{\hbar k}{c} \] (96)

Light always travels at 45° with respect to the Fabric of Space. This means that Gravitation only affects the direction of propagation within the Fabric of Space. That cross-section is shown below:

![Diagram](image)

Figure 22. Gravitational induced scattering due to Gravitational Force acting upon a photon.

At the position of scattering R=Ro, dR/dt=0 since one cannot increase the speed of light nor decrease it. One can only change its direction within the 3D hypersphere.

The change in direction is shown in the diagram below:

![Diagram](image)

Figure 23. Phase-matching condition on Gravitational Lensing event.

\[ \Delta \tau \] is the de-Broglie step in the Hypergeometrical Expansion of the Universe. The angle is given by:

\[ \alpha = \frac{\Delta k R_0}{k \Delta \tau} \] (97)

The Force can be written in terms of Gravitational fields as:

\[ F_z(R, V_z) = -G m_1 m_2 \frac{\vec{R}}{R^2} \] (98)

The equation of motion for an electromagnetic wave is given by:

\[ F = \hbar c \frac{\Delta k}{\Delta \tau} = -G m_1 m_2 \frac{\vec{R}}{R^2} = -G m_1 \frac{\hbar k}{c} \frac{\vec{R}}{R^2} \] (99)
From our equation of motion, we obtain:

\[ \alpha = \frac{\Delta R_0}{k\Delta \tau} = \frac{Gm_1}{c^2 R_0} \]  

(100)

Which is the observed Gravitational Lensing.

We propose the usage of phase matching to increase the quantum yield of the reaction by realizing that a product direction in an angle with respect to \( R \) (the radial expansion direction) corresponds to a local velocity.

Another extremely important consideration is that the reactant beams should be polarized. The electromagnetic analogy is that one cannot perform nonlinear optics with scrambled polarization electromagnetic fields.

This means that there is a specific angle (velocity) for which this reaction yield increases significantly. This also means that a careful prepared experiment should be performed where two deuterium beams intersect each other at a specific angle and at varying velocities while products yield are measured along their phase matching (defined by momentum conservation) conditions.

The calculation depends upon the evaluation of the deformation susceptibility of the Fabric of Space, using all known isotope masses and lifetimes. Precise calculation of the appropriate angle (relative velocity) will be presented elsewhere.

Careful process optimization should create the same gains one have in nonlinear optics.

A coherent fusion process would result in the same revolution one had with the invention of nonlinear optics or lasers. The only difference is that in this case it would be the birth of Nonlinear Hadronics.

**CONCLUSIONS**

The Hypergeometrical Universe theory, a model that considers the interference of four-dimensional wave on the hypersurface of a hyperspherical expanding universe was introduced.

The complexity of the present description of the universe in our sciences\textsuperscript{4-6} is assigned to the fact that one is dealing with four-dimensional projections of a five dimensional process. Our inability to realize that made the description unnecessarily complex.

These are the ingredients for a new and simple formulation of Physics:

- A new quantum Lagrangian principle (QLP) was proposed.
- Quantum gravity, electrostatics and electromagnetism were derived using the same equations (QLP), same framework. The theory is inherently quantum mechanical and relativistic.
- A new Force of Nature (de Broglie Force) was recognized. Strong and Weak Forces were deemed unnecessary.
- The quantum version of this theory is readily achieved just by eliminating the high mass or short wavelength approximation on equation (19). It is outside the scope of this paper to implement
Hypergeometrical Universe Quantum Algorithms. In a fully geometric theory, there are no energy or mass quanta. Motion is quantized by the QLP. All the other quantizations can be recovered from that.

The Hypergeometrical Universe Model provides alternative views on matter and forces by changing the paradigm under which to describe events. The model provides an alternative Standard Model, Cosmology, Cosmogenesis while maintaining compatibility with Relativity and Quantum Mechanics. The Fundamental Dilator together with the Lightspeed Expanding Universe and the Quantum Lagrangian Principle provides the basis for Quantum Mechanics.

New Cosmology provides simple explanation for Hubble Expansion, Stellar Candles, and Cosmic Microwave Background. It also provides our estimate for the age of the Universe (14.42 billion years old), Natural Frequency of Gravitational Waves (111.101 KHz), a new estimate of the real velocity of light ($\sqrt{2}c$). The observed velocity of light is $c$ as usual.

Two fundamental parameters of the universe were calculated from the first principles (permittivity and magnetic susceptibility of vacuum). Universal Gravitational Constant $G$ was also calculated from first principles. $G$ was proposed to be inversely proportional to the 4D radius of the Universe to explain implausible Stellar Candle readings. This is a hypothesis at this time and will be evaluated when astronomical data is reviewed.

Using the Quantum Lagrangian Principle to model dynamics naturally bring about the observed speed of light as being the maximum speed in this Universe. It also explains the reason for increased inertial mass and the slowing down of time with speed (increase twisting of local FS). The larger the speed (local FS twist), the smaller the effect of subsequent interactions (accelerations) will be. This allows for a new understanding of the passage of time, another solution to the Twin Paradox.

The twin in a spacecraft would see its chemistry (aging) altered from the external observer point of view because all the dynamics (interactions) would be creating smaller changes at each de-Broglie step. Smaller changes per de-Broglie step means slower aging. Nuclear lifetimes [7] are also affected by the local twisting. A more detailed analysis is outside the scope of this paper and will be presented elsewhere.

The concept of the Fundamental Dilator brings about a view of a Stroboscopic Universe where interaction is intermittent and where particle substructure is easily explained by the polymeric nature of dilator coherences. It also brings about the possibility of thinking of matter in terms of metric deformations, thus capable of beating and nonlinear hadronic processes. We proposed new experiments that might bring about Coherent Nuclear Fusion along the lines of nonlinear optical interactions. Phase matching angle for coherent hadronic processes is tuned by changing the relative interaction velocity, which is an angle or direction in the 4D spatial manifold.

Gyrogravitation and Electromagnetism equations were derived from first principles.

The theory was applied to standard tests (Precession of Mercury Perihelion, Gravitational Lensing), was used to explain the Stellar Candle paradox without the use of inflation, Hubble expansion without Dark Energy, Neutron Decay without Electroweak Interaction, Particle Substructure without quark
composition and Black Hole’s Double Jets with the use of Gyrogravitation. It also provides a solution to the Spiral Galaxy rotation problem without the need for Dark Matter.

The Fabric of Space Stress-Strain paradigm applied to the two cross-sections of the Universe (RXYZ and ΦXYZ) allowed for the derivation from first principles of natural laws (Gauss, Biot-Savart, Newton’s Gravitation) and the derivation of a more general equation that applies to all forces.

**DE BROGLIE FORCE, THE TWO-SLIT EXPERIMENT AND QUANTUM MECHANICS**

The theory proposes a new Force – de Broglie force by providing a dilaton representation of matter waves. This new force can be used to control particles in the same way as electromagnetism or gravitation, with implications on accelerator design and coherent nuclear fusion reactor architecture.

It also explains the self-interference process occurring in a two-slit experiment. The particle rides (and creates) a de Broglie dilaton field. The particle enters one slit while the dilaton field enter both. The exiting dilaton field from both slits, interfere and guide the particle into the detector in an interferometric pattern. Thus, the electron passing through the two slits is not a good example of a Quantum Process and there is no need to invoke particle-wave duality. Instead it is wave-generator, wave interaction.

This view parallels de-Broglie–Bohm theory with the distinction that Wavefunctions are assigned a physical meaning (a propagating deformation of space or the Fabric of Space) and that consideration gives rise to the discovery of a new Force in Nature, so despite of similarities, the perspective unveiled in this theory is distinct and more profound. On the other hand, de-Broglie–Bohm theory dynamics equations fails to provide a comparative framework associating de Broglie Force Field and other dilatons fields (electromagnetism). They are free particle equations. A modification of de-Broglie-Bohm to account for potentials will be presented elsewhere. The Hypergeometrical Universe also provides an alternative interpretation for the Quantum Mechanics Wavefunction as the loci associated with each footprint of the dilators as the Universe expands.

Quantum Mechanics should be recovered from the Hypergeometrical Universe Fundamental Equation without the large-number-of-dilators approximation. It points to a new interpretation of Quantum Mechanics Wavefunctions based on Lissajous interferences in a 5D Spacetime.

**SIMPLE TOPOLOGY CONCLUSIONS**

No matter where you are, you are always at the center of your Universe.

The average radius of curvature of this hypersurface is exactly the speed of light times the age of the Universe, or $R=14.4$ billion light-years or so. This also explains why the Universe is flat and why the Cosmological constant is very small or zero.

One can easily see that the Big Bang occurred when the Universe was an infinitesimally small circle across each one of the three dimensions, thus it spanned the whole Universe. It occurred on all places at the same time. This is the basis for the non-locality of the Big Bang in a three-dimensional Universe projection. This means that in our Universe, the Big Bang occurred exactly where we are no matter
where we are. The heat, horrendous explosion and debris has long since left this region and now one only can see the beginning of the Universe if one looks very far away to see the debris that traveled the age of the Universe and are only now reaching us. This is a quite surprising and elegant conclusion.

Due to the topology of a four-dimensional Big Bang, the center of the Universe is a location in the radial direction and not in 3D space.

Most galaxies are likely to be at rest with respect to the Fabric of Space, that is, large scale motion should be happening only at Hubble speed.

One can see all the way up to the Big Bang ($\pi/2$ or thereabouts), but one can only reach a Cosmological angle of $\pi/4$ (the first Quadrant) due to the Universe expansion.

The visible Universe volume is given by:

$$\text{Visible Universe Volume} = \frac{4\pi R^3}{3}.$$  

The whole (Visible plus Invisible) Universe should have a volume of $$\text{Universe Volume} = \frac{4\pi (\pi R)^3}{3}$$. The actual radius of the Universe is $\pi R$ or around 47 billion light-years.

Beyond the visible Universe lies the Never-to-Be-Seen-Universe, whose linear dimension is actually $(2\pi-2)$ times the dimensional time radius of the hypersphere. $3\pi/2*R$ of the Universe linear dimension can never be reached

Beyond the Big Bang lies more of the same (Universe), albeit invisible Universe. The furthest visible part of the Universe is the Big Bang, that doesn’t mean that one could traveling faster than the speed of light go there and see it first-hand. The hypersphere travels inexorably into the future.

Mach’s non-local gravitational interaction explanation for inertia is replaced by a hypergeometrical local fabric of space distortion argument.

**COHERENT FUSION CONCLUSION:**

The Hypergeometrical Standard Model provide the means to envision a new process of nuclear fusion where yields are much higher. The conceptual basis for the concept of Coherent Hadronics is the direct result of the fundamental dilator and the hyperspherical expansion universe topology. The fundamental dilator model for matter implies that particles are coherences of a malleable Fabric of Space, and thus can be subject to nonlinear processes.

Current approaches to nuclear fusion uses a nuclear chemistry approach, where a barrier has to be overcome for the reaction to occur. The realization that particles could be modeled as coherences, thus similar to electromagnetic waves, allows for a change in paradigm. Instead of overcoming a barrier by extremely high temperatures, we might be able to create the products by fine tuning phase matching conditions in a 4D dynamics space.

The experimental setup for coherent nuclear fusion hadronics would be composed of an accelerator with de Broglie Force assisted bunching, and magnetic lensing for controlled focusing. Upon focusing at the phase-matching velocity, maximum nuclear fusion yields would occur and nuclear fusion products would be released at the appropriate directions and velocities.
Four Newton’s Laws were recast in terms of Stress-Strain relationships. The theory also explains why things move inertially and why the speed of light is a limit.

This is a simple theory in terms of formalism, which provides new insights and testable predictions. As any new view of reality and the proposition of the new de Broglie Force, it should allow for simple solutions of intractable problems.

REFERENCES

APPENDIX - COHERENT NUCLEAR FUSION

Below is the Hypergeometrical Standard Model representation of Deuterium.
Out of a proton and one neutron one can create only one coherence:

Figure 24. Deuterium diagram.

Figure 25. Tritium diagram.

$^3$He has the following configuration:
Let’s not be greed at this first analysis. Let’s study the following reaction:

The other product channel is given by:

\[
\text{D+D} \rightarrow ^3\text{He} \ (0.82 \text{ MeV}) + n(2.45 \text{ MeV}) \tag{101}
\]

\[
\text{D+D} \rightarrow ^3\text{T} \ (1.01 \text{ MeV}) + p(3.02 \text{ MeV}) \tag{102}
\]

Where D stands for deuterium and T for Tritium, p for proton. This reaction has 50% yield under normal fusion conditions.

The advantage of having all charged particle as products is that one can use magneto-hydrodynamics energy extraction. If one can make the products to follow specific directions (directional nuclear fusion), one can use coils to extract energy by induction.
Now we can write the equations:

\[
\text{Proton} + \text{Proton} \rightarrow \text{He}^3 (0.82 \text{ MeV}) + \text{n} (2.45 \text{ MeV})
\]

Figure 27. Nuclear Fusion diagram. D + D $\rightarrow \text{He}^3 (0.82 \text{ MeV}) + \text{n} (2.45 \text{ MeV})$
Figure 28. Nuclear Fusion products diagram. D+D→T(1.01 MeV)+p(3.02 MeV)