Gödelizng Fine Structure
Gateway to Comprehending the Penultimate Nature of Reality

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Abstract. We have questioned the value of the Planck constant in other work, such that its value is likely different for a physical reality with parameters for dimensionality (LSXD) beyond the 4D Standard Model. Now the fundamental basis of the fine structure constant (FSC) itself also comes under scrutiny. The FSC is generally determined in terms of other constants; therefore, its origin yet remains a profound mystery. One must go 'out of bounds' to obtain a holistic picture. Our understanding of the physical world has progressed from Classical to Quantum; and now to the brink of the 3rd regime of Unified Field Mechanics (UFM). We review the 2nd regime origin and development of the FSC, then propose new insights gleaned from 3rd regime UFM parameters and also review importance of the FSC in developing empirical protocols for gaining access to the 3rd regime.

In order to more fully understand this reality, we must take into account other dimensions of a broader reality. –
John Archibald Wheeler

1 Introduction Parameters of Fine Structure

From boyhood, I dreamed of a career studying the nature of awareness, now having solved the mind-body problem (to my satisfaction) [1-3]; I realize that discovery, as profound as it is, pales in the face of understanding Fine Structure, which relates to the nature of our very existence and thus houses awareness! We can measure what physicists call the Fine Structure Constant (FSC) but its fundamental origin remains a profound mystery. Bowdlerizing the original usage of the term 'Gödelization' to mean in general instead, that something 'cannot be fully understood in terms of itself'; that one must go 'out of bounds' to obtain a holistic picture, i.e. a pollywog submersed in the sea has little hope of comprehending ocean waves without being able to understand lunar cycles and wind. Our understanding of the physical world progressed from Myth and Superstition to Classical to Quantum; and now to the brink of the 3rd regime of the Unified Field Mechanics (UFM) [4]. We present a review of 3rd regime cosmology within its current stage of development. We then review and discuss relevant 3rd regime properties such as an empirical protocol violating QED by producing three new spectral lines in Hydrogen below the lowest Bohr orbit, the protocol for which allows experimental access to the new 3rd regime. We find most interesting in terms of Occam's razor curious formulations such as

$$\alpha^{-1} = 4\pi^3 + \pi^2 + \pi = \left(\pi\left(4\pi^2 + \pi + 1\right)\right) \cong 137\,. \tag{1}$$

Without knowing the 'accepted', probably most accurate values (considering only the 137.03… value of FSC), the following formula for the general (synchronistic) definition of the inverse FSC was proposed by Stanbury [5]:

$$\alpha^{-1} = 4\pi^3 + \pi^2 + \pi^1 = \pi\left(4\pi^2 + \pi + 1\right) = 137.0363037... = \alpha^{-1}\left(\pi\right) \tag{2}$$

> The 2006 CODATA Recommended value 1/137.035 999 679(94). If alpha (fine-structure constant) were bigger than it really is, we should not be able to distinguish matter from ether (the vacuum, nothingness), and our task to disentangle the natural laws would be hopelessly difficult. The fact however that alpha has just its value 1/137 is certainly no chance but itself a law of nature. It is clear that the explanation of this number must be the central problem of natural philosophy - Max Born [6].
>
> It is also obvious, that from the point of view of life, the value of the FSC cannot change arbitrarily. Were its value very different, carbon atoms would not be stable and organic life, as we know it, would not be possible. This evidence increasing underlines the significance of 137 as an integer and, at the same time, as a mediator or controlling number. While the circle cannot be squared in Euclidean space, it can in Gauss-Bolyai-Lobachevski Space [7].

The criticism that this so-called 'piety' FS doesn't calculate to observed 137 codata is easily got around. The standard usage of π is for Euclidean space. The last Planck satellite observations were not set for observing flatness of space but geared more for observing CMB spectra [8]. But the data still did apply to the curvature of space in that it did not rule out an AdS_5 dodecahedral wrap-around universe [9,10]. In Riemann space π is smaller & in Lobachevski space larger, point being that π can equal precisely 3 in these spaces! In cosmology, small fluctuations in the cosmological constant, Λ and the Planck constant, $\hbar$ around zero is possible [15]. It is easy to likewise predict a similar oscillation for the FSC around a 3-based piety for zero flatness or &c. It may be possible to predict the curvature of wrap-around space based on piety while we wait ~ 10 years for Planck satellite to be realigned for AdS-wrap-around observations [8]. We also briefly ruminate on relevant aspects of the Fibonacci Spiral, Golden Ratio, Kepler Triangle and other symbiotic curiosities.

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Table 1 Recent Fine Structure Constant Values

2006 CODATA	value = 137.035 999	679(94)
2010 CODATA	value = 137.035 999	074(44)
2012 CODATA	value = 137.035 999	173 (35)
2014 CODATA	value = 137.035 999	139 (31)

(Stanbury piety value in Euclidean Space)

$$\alpha^{-1} = 4\pi^3 + \pi^2 + \pi^1 = \pi = \pi\left(4\pi^2 + \pi + 1\right) = 137.0363037... \tag{3}$$

(Value in Non-Euclidean Space)

$$\alpha^{-1} = 4\pi^3 + \pi^2 + \pi = \left(\pi\left(4\pi^2 + \pi + 1\right)\right) \equiv 137\ . \tag{4}$$

2 Any Reason FS Should = 137? ± 136.99 – 137.01? or ≡ 137 Exactly!

Eddington argued that the value of alpha could be "*obtained by pure deduction*" relating it to the 'Eddington number' (estimated number of protons in the Universe) which led to his 1929 conjecture that its reciprocal was PRECISELY the integer 137 [11,12]. Other physicists rejected his conjecture and arguments. By the 1940s experimental values for 1/α deviated sufficiently from 137 (1950 value = 137.0429) to refute Eddington's argument! Tsk Tsk…

Table 2 Historical Evolution of FSC Values

1950	**value = 137.0429**
1952	**value = 137.0377**
1955	**value = 137.0373**
1963	**value = 137.0388**
1968	**value = 137.036 0**
1973	**value = 137.035 63 (42)**
1986	**value = 137.036 204 4 (85)**
1998	**value = 137.036 000 (20)**
2002	**value = 137.035 988 0 (51)**
2006 CODATA	**value = 137.035 999 679 (94)**
2010 CODATA	**value = 137.035 999 074 (44)**
2012 CODATA	**value = 137.035 999 173 (35)**
2014 CODATA	**value = 137.035 999 139 (31)**
2025 NODATA	**value = 137.000 000 000 000 000 (01)?**

2.1 *Looking Deeper Than 4D for Non-Euclidean 'Piety' Fine Structure*

Substituting a value of 3.141303857420 for π in Stanbury's equation [5]

$$\alpha^{-1} \equiv 4\pi^3 + \pi^2 + \pi \, , \tag{5}$$

gives a value for alpha of: 137.000000000011 to Eq. (5).

3.141592653589	Standard Euclidean Value
3.141303857420	'Piety' Non-Euclidean Value
0.000288796169	Difference

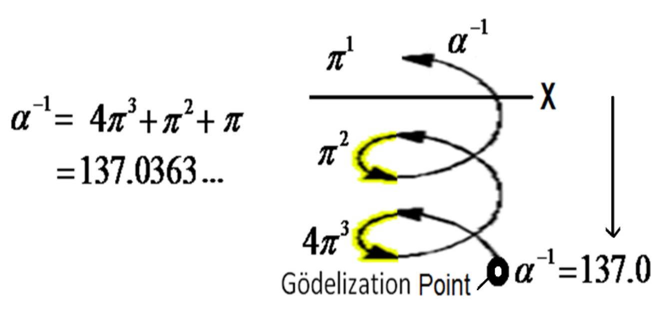

Fig. 1 Assuming piety FS has some sort of hidden π rotations into the topology of wrap-around dodecahedral space, there might be a Gödelization point leading to a 137 value for the FSC.

3. The FSC is not Fundamental

The Fine Structure Constant (FSC) describes how strongly charged particles (electron or proton) interact with an em-field. The FSC is one of few numbers in science that cannot yet be predicted theoretically. Its value has only been produced experimentally in terms of other constants as a dimensionless number with no associated units.

Some equivalent definitions of α in terms of other fundamental physical constants are:

Where:

- *e* is the elementary charge; + proton or - electron
- $\hbar = h/2\pi$ is the reduced Planck constant;
- *c* is the speed of light in vacuum;
- ε_0 the electric constant or permittivity of free space;
- μ_0 magnetic constant or permeability of free space;
- k_e is the Coulomb constant;
- R_K is the von Klitzing constant.

$$\alpha = \frac{1}{4\pi\varepsilon_0}\frac{e^2}{\hbar c}, \quad \alpha = \frac{\mu_0}{4\pi}\frac{e^2 c}{\hbar}$$

$$\alpha = \frac{k_e e^2}{\hbar c}, \quad \alpha = \frac{c\mu_0}{2R_\mathrm{K}}$$

The definition reflects the relationship between *α* and the electromagnetic coupling constant *e*, which as above equals $\sqrt{4\pi\alpha\varepsilon_0\hbar c}$.

The FSC is derived in terms of several other Constants with no theory of its fundamental origin. Physics is currently stuck on the cusp of demonstrating dimensionality beyond the 4D of the Standard Model. The SM is confined to a 0D singularity or Fermionic point particle (math). String Theory proposes a 1D vibrational extension as the fundamental object; M-Theory introduces n-dimensional branes. If we assume physicality for M-Theory, an electron, the fundamental Fermion, could be a 6D or 9D Calabi-Yau topological object with additional degrees of freedom in the form of UFM de Broglie-Bohm superimplicate order symmetry guiding control Factors totaling a 12D reality.

We propose that the fundamental basis of the FSC will be discovered within the additional dimensional regime of UFM. We will not elaborate on this scenario further now, but spend the remaining time discussing an experimental protocol to demonstrate additional dimensionality for developing a theory of the origin of FS.

4. Origin of Fine Structure?

Currently the FSC is derived in terms of other physical constants; suggesting we need to look deeper to 3rd regime physics discover the fundamental basis of FS.

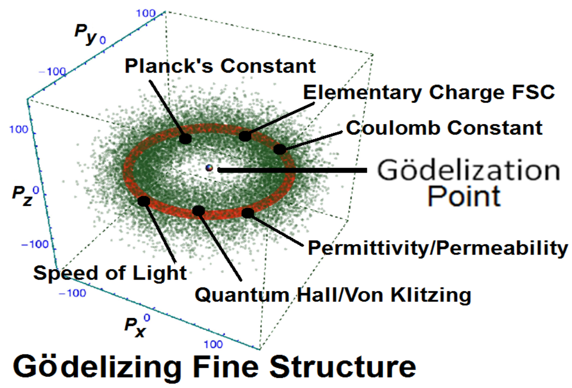

Fig. 2 Space-like metaphorical diagram showing constants derived with the FSC on a circle suggesting a fundamental locus of correspondence relative to quantum theory (current 'basement of reality'). The metaphor is meant to hint that there is a Gödelization point in the UFM regime beyond uncertainty where we might discover the fundamental basis for the FSC.

4.1 *Anthropic Principle*

The anthropic principle is a controversial argument of why the FSC has the value it does: stable matter, and therefore life and intelligent beings, could not exist if its value were much different. For instance, were α to change by 4%, stellar fusion would not produce carbon, so that carbon-based life would be impossible. If α were > 0.1, stellar fusion would be impossible and no place in the universe would be warm enough for life as we know it.

However, if multiple coupling constants are allowed to vary simultaneously, not just α, then in fact almost all combinations of values support a form of stellar fusion.

4.2 *Variable (Oscillating) Elements in Multiverse Cosmology*

1) $\pi \approx 3.1415$ to 2.9999 (± 3)

2) $\hbar$ (10^{-33} cm) (what one might suspect for
Black Hole compactification - not ordinary matter).
A virtual asymptote never reached in terms of variable T_S
Oscillates from virtual $\hbar$ to Larmor radius of Hydrogen

3) Λ ± 1 $(8\pi G)$, Small oscillation

4) Space curvature, Ω_0 Locally Euclidean (flat), Oscillates ± 1
H_R Dodecahedral 'Wrap around' proposed

4.3 *Geometry of Space*

The observed geometry of 3-space is infinitely Euclidean and flat; but recent Planck satellite observations suggest it is curved [8]. The shape of the universe is comprised of local and global geometry of the Universe, in terms of both curvature and topology. The observable universe is the radius of the Hubble Sphere, H_R surrounding the Earth**.** The shape of the global universe can be described by three categories:

1) Finite or infinite,
2) Flat (no curvature), open (negative curvature) or closed (positive curvature),
3) Connectivity - simply or multiply connected space.

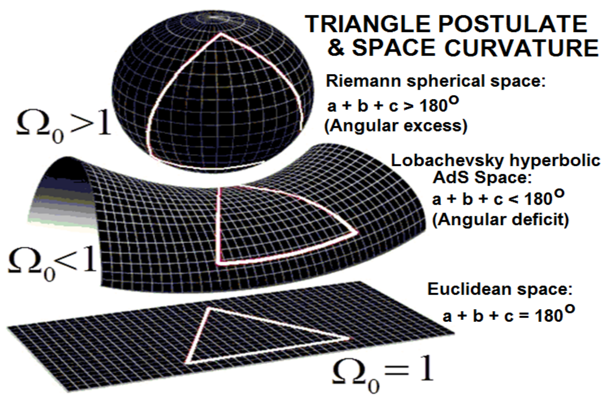

Fig. 3 The geometry of space? de Sitter derivations (dS_5-AdS_5) of FLRW metrics allow Ω to oscillate from zero to ± 1 allowing the possibility of a Poincaré wrap-around dodecahedral universe, not ruled out by Planck satellite observations.

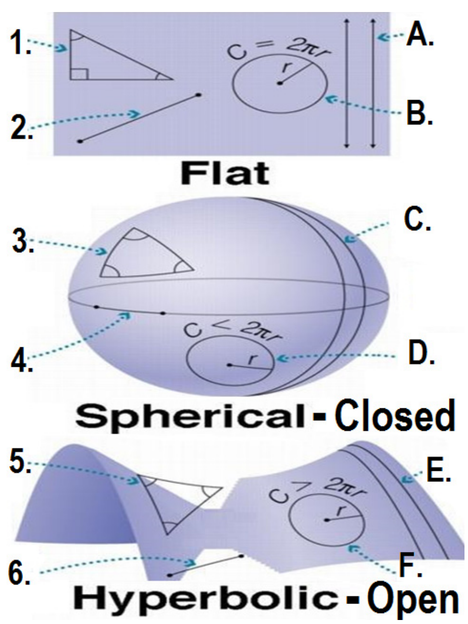

Fig. 4. The curvature of space. 1) Triangle sum of angles = 180°. 2) Straightest path = straight line. 3) Triangle sum of angles > 180°. 4) Straightest path = segment of great circle. 5) Triangle sum of angles < 180°. 6) Straightest path = segment of hyperbola. A. Parallel lines stay parallel. B) Circle: $C = 2\pi r$. C) Parallel lines converge. D) Circle: $C < 2\pi r$. D) Parallel lines diverge. E) Circle: $C > 2\pi r$.

4.4 *Topology of Space*

Topologies of spacetime can be open, flat or closed. Astrophysicists describe the curvature of the universe by the density parameter, Ω where

$$\Omega = \Omega_m + \Omega_{rel} + \Omega_\Lambda \,. \tag{6}$$

And Ω_m is the mass density of ordinary, baryonic matter, Ω_{rel} is the mass equivalence density of em-energy relativistic particles and neutrinos and Ω_Λ is the effective mass of the universe dominated by dark energy (cosmological constant).

The density parameter of the universe is given by the density divided by the critical density to result in a flat universe. If the density is exactly equal to the density required for a flat universe, then Ω = 1. Current measurements give Ω = 1.005 $\pm$ 0.0007. Thus, our Hubble universe appears nearly flat. This is seen using the Cosmic Microwave Background (CMB) in a simple relationship as measured by the Planck satellite [8]. Wrap-around cosmology is therefore not yet ruled out.

4.5 *Extending the Current Virtual View of Reality*

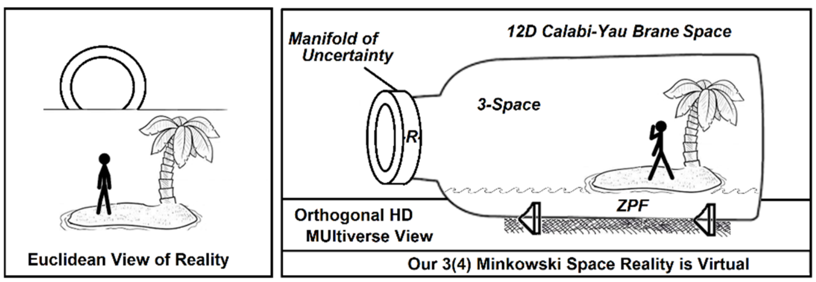

Fig. 5 a) The universe we observe appears Euclidean and flat. b) But observed 3D reality is virtual. Beyond the manifold of uncertainty (MOU) UFM discovers large scale extra dimensions (LSXD) extended to infinity in a multiverse.

5 A Broader View of Uncertainty

What's beyond the veil of uncertainty? Usual consideration of quantum uncertainty accords with Heisenberg-Pauli-Weyl uncertainty formulation on the real line. As well-known for classical Fourier analysis, a function, f and its Fourier transform, $\hat{f}$ cannot both be supported unless f = 0, which represents the simplest form of the uncertainty principle which is formulated as,

$$\|f\|_2^4 \le C_\alpha \left(\int_{\mathbb{R}^n} |x|^{2\alpha} |f(x)|^2 \, dx \right) \left(\int_{\mathbb{R}^n} |\xi|^{2\alpha} \left|\hat{f}(\xi)\right|^2 d\xi \right) [13]. \tag{7}$$

However, there are other formats such as the Breitenberger uncertainty principle (for 2π periodic functions) all of which have been generalized to Riemannian manifolds such as spheres, projective spaces, flat tori & hyperbolic spaces [14].

The underlying Hilbert space of the Breitenberger principle is the space $L^2([-\pi,\pi])$ of square integrable 2π -periodic functions with inner product

$$\langle f, g \rangle := \int_{-\pi}^{\pi} f(t)\overline{g(t)}dt \tag{8}$$

and norm $\|f\|^2 := \langle f, f \rangle$. With operators defined on $L^2([-\pi,\pi])$, the Breitenberger uncertainty principle is [14]

$$\frac{1-|\varepsilon(f)|^2}{|\varepsilon(f)|^2}\cdot\left(\|f'\|^2-|\langle f', f\rangle|^2\right)>\frac{1}{4}. \tag{9}$$

Erb's work is interesting in that he takes understanding of the uncertainty principle from the line, Fourier transform, circle, Breitenberger π-rotations and finally to the uncertainty on the Riemann sphere, inspiring a glimmer of extending uncertainty to HD Calabi-Yau manifolds [14].

We cannot yet discover the fundamental basis of the FSC relative to the 3rd regime of UFM without experiment, but the following comment by Baez gives a marvelous hint of how a new understanding of Planck's constant will be of dramatic importance. It should be obvious that the Planck constant is a mathematical object for doing the math of quantum mechanics and as such has an insufficient basis for physicality; what we mean is that quanta are not sized at 10^{-33} cm except perhaps in terms of Black Hole compactification. String theory already has a decades old addition to the Planck constant, $\hbar + T_S$; and we have boldly suggested that it is an asymptote never reached in the continuous-state compactification process oscillating from virtual Planck to the Larmor radius of the hydrogen atom [15].

Here is the comment by Baez, '*any physical calculation predicting length using only the constants c, G and* $\hbar$ *must include the Planck length, possibly multiplied by a usually considered unimportant numerical factor like* 2π *. But these arguments are far from being settled; it may be, and this is our conjecture, that a numerical factor like* 2π *might be very important and take a value that is very large or very small*' [18]!

This idea my hint at why Stanbury's 'piety' FSC is so interesting; and we are betting that some of it comes out in the wash of developing an Ontological-Phase Topological Field Theory [20].
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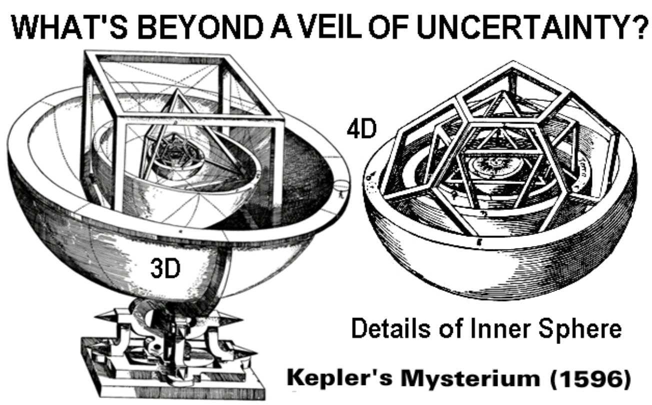

Fig. 6 Kepler's 16th century *Mysterium Cosmographicum* suggested there was more to reality than suspected at the time.

6 Some Comments in Closing

To discover the fundaments of the FSC UFM must be pragmatically utilized. A key postulate is that uncertainty is a manifold of finite radius, probably a dual mirror symmetric Calabi-Yau 3-toris with T-duality.

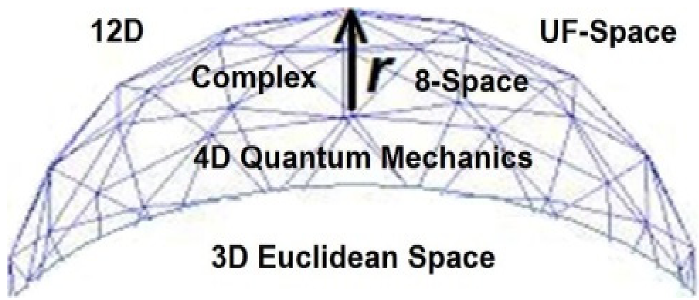

Fig. 7 The manifold of uncertainty (MOU) with finite radius; beyond which lies the 3rd regime of UFM.

HD Space contains M-Theoretic Conformal Scale-Invariant 'Copies' of the localized 4D Quantum 'Particle in a Box'. Matter as we know it in 3-space is comprised of HD cyclic mirror symmetric brane components undergoing ontological phase transitions. Proton, Electron, Photon? Gödelizng Fine Structure will reveal additional UFM atomic structure beyond the current 4D model of the traditional 3D Fermionic 0D singularity.

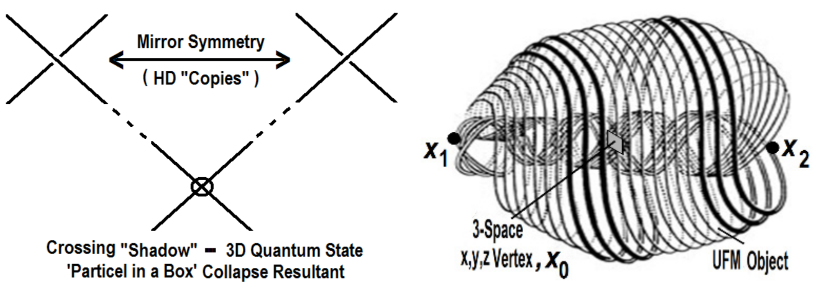

Fig. 8 a) Simplistic model representing matter in 3-space as a topological knotted shadow of HD standing-wave topological brane dynamics. b) Utilizing the Leadbetter atom to illustrate the rich HD topology involved in the structure of matter hidden in HD beyond the veil of uncertainty.

The 3rd regime of UFM is highly symmetric as hinted at by Cramer's future-past 'standing-wave' transactional interpretation of QT. QT can be completed when integrated with Bohm's superimplicate order in LSXD [20].

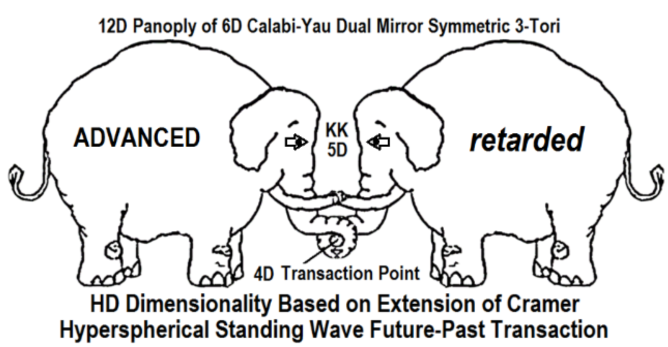

Fig. 9 Symbolic model of Cramer's transactional interpretation, showing symmetry and strength of the uncertainty principle. Figure adapted from [19].

The circle cannot be squared in Euclidean space, but can be in Non-Euclidean Space.

With π = C/D

- Euclidean geometry - exactly pi (3.1415…)
- Lobachevskian - greater than pi (3.2…)
- Riemannian - less than π (can $\equiv$ 3.000…)

Pythagorean Theorem

- Euclidean: $c^2 = a^2 + b^2$
- Lobachevskian: $c^2 > a^2 + b^2$
- Riemannian: $c^2 < a^2 + b^2$

On Extending the Standard Model Nobelist Yang said, "*Much effort and attention have been devoted by theoretical physicists to the analytic continuation from physically observable experience into unphysical regions. In particular, it has been tried by extrapolation to study properties of the singularities in the unobserved region... Is the continuum concept of space time extrapolatable to regions of space 10−14 cm to 10−17 cm, and to regions smaller than 10−17 cm?*"

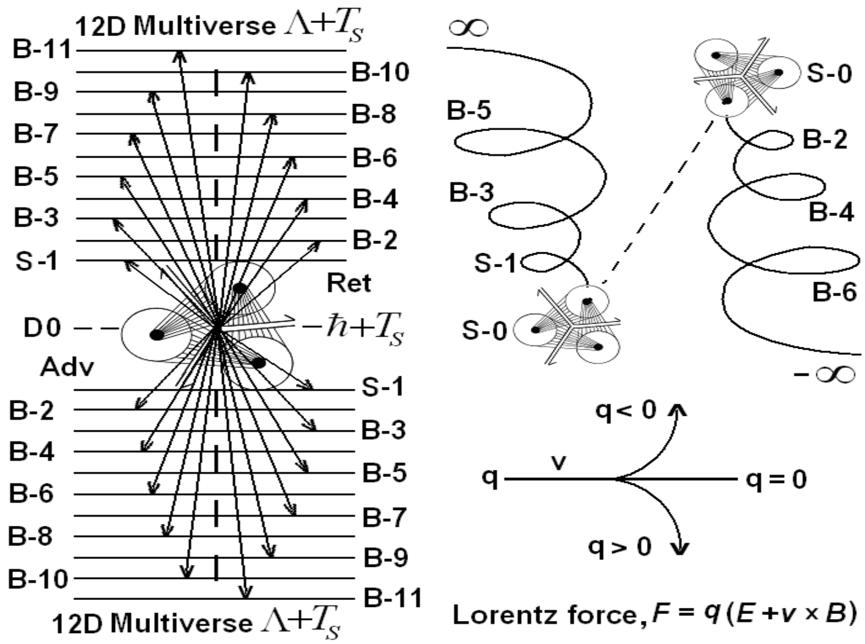

Fig. 10 The dimensional reduction - compactification cycle proceeds odd to even to asymptotic $\hbar$ then cyclically repeats.

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