Creation of Paired Entities is Ever Governed by the Golden Mean: About the Nested Repeatability of Living and Cosmic Processes and the Origin of the Universe

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Abstract

The concept of paired entities as nature's reproductive strategy is illuminated and the dominance of golden mean solutions by simple mathematical assumptions verified including 'golden' quartic polynomials. From the beginning, cosmos and life gain profit of superconducting energy and information transport by way of paired bosons like the *Higgs* bosons.

Keywords: Golden Mean, Fibonacci Numbers, Pairing Law, Paired Entities, Quasicrystals, Double Stars, Cell Division, Quartic Polynomial, Higgs Potential, Hole Superconductivity, Consciousness.

1. Introduction

Nature's reproductive power is dominated by the nested repeatability of paired entities. We know about double stars, division of living parent cells into two daughter cells or elementary particle pairs such as electron pairs, boson pairs or pairs of holes, and photons as composed entities of electrons and positrons. Importantly, all involved creation processes are governed by the golden mean respectively its fifth power, and nesting as well as entanglement (similar to a snake biting its own tail) is also a mathematical property of the golden mean. *Hardy* was the first one, who found the maximum entanglement probability of two quantum particles being the fifth power of the golden mean. We can generalize his result to any paired entities from particle to cosmic scale. We then explain the behavior of paired entities by applying depressed quartic polynomials of the potential like the *Higgs* potential that is a 'golden' polynomial and shows golden mean solutions. When applying the 'pairing law' to our universe, its beginning may be started with a twin universe like electron and positron, and matter then will crystallize by repeated pair creation from abounded energy, dominated by poly-singular, *Fibonacci*-like processes, not a single Big Bang. So matter pair entities besides hole pair ones should be created. In this way, superconductivity may be a property of the universe from the very beginning, and living creatures gain profit from effectively using this early property of nature that connects everything and constituted our consciousness. Balanced pairing of matter and antimatter, which is in reality a result of nature's hierarchical harmony,

leads to stable particles and makes any question about baryonic matter asymmetry superfluous.
When we generalize what nature constantly shows us and generalize again, then we will finally understand the universe. However, since everything is connected with everything else, literary spoken and physically conjectured, then the knowledge about the beginning of the universe seems to be hidden deep within us as an accompanying teething phantom that we keep trying to decipher.

2. Split Sphere Volume Approach

Following the concept of paired entities, we will split the volume of a parent sphere with unit radius into two smaller but equal spheres. Assuming constant density, the volume is proportional to mass and also to energy. Following **Figure 1**, interesting geometrical relations can be confirmed showing signature of the golden mean respectively its fifth power.

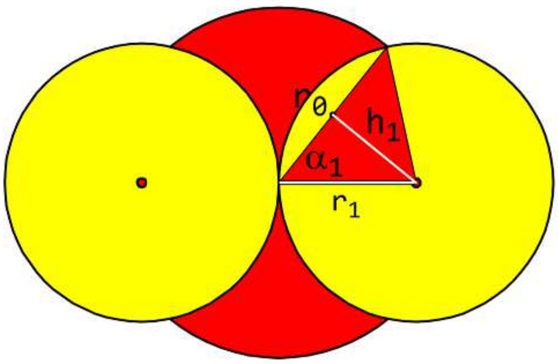

Figure 1. Splitting of a parent sphere (red) into two spheres each with half volume (yellow)

The starting sphere volume is denoted as V_0 and the half volume as V_1. Then we get the trivial results

$$V_0 = 2 \cdot V_1 \tag{1}$$

$$V_0 = \frac{4}{3}\pi r_0^3 \tag{2}$$

$$V_1 = \frac{V_0}{2} = \frac{4}{3}\pi r_1^3 = \frac{4}{3}\pi \left(\frac{r_0}{\sqrt[3]{2}}\right)^3 \tag{3}$$

$$\cos(\alpha_1) = \frac{r_0}{2r_1} \tag{4}$$

$$\alpha_1 = 50.9527898° \tag{5}$$

$$\frac{\alpha_1}{360} = 0.141535527 \approx \pi - 3 = 0.141592653 \tag{6}$$

$$\frac{\alpha_1}{180} = 0.28307105 \approx \pi \cdot \varphi^5 = 0.283277231 \tag{7}$$

$$h_1 = 0.61640938 \cdot r_0 \approx \varphi \cdot r_0 \tag{8}$$

where $\varphi = \frac{\sqrt{5}-1}{2} = 0.6180339887$ is the golden mean. If we change only marginally the sphere radius ratio, then exact golden mean solution for instance to relation (7) can be obtained using $V_0 = 1.99521 \cdot V_1$ instead of $V_0 = 2 \cdot V_1$. Clearly, surface energy should play a role besides volume energy. **Table 1** shows calculated intrinsic geometric frustrations around the α_1 angle given by the split sphere approach.

Table 1. Intrinsic Geometric Frustrations Suggested by the Split Sphere Approach

V_0/V_1	$\alpha_1(°)$	Condition
2.000000	50.952789	-
1.997685	50.970727	$\frac{g_e}{2} = 1.0011596$
1.997345	50.973355	$\frac{\alpha_1}{360} = \pi - 3$
1.995211	50.989902	$\frac{\alpha_1}{180} = \pi \cdot \varphi^5$
1.990487	51.026552	$h_1 = \varphi \cdot r_0$

This simple split sphere approach indicates an interesting case of geometric frustration, obviously leading to far-reaching consequences for life and cosmos. Geometrical frustration often leads to exotic phenomena in physics. We can understand better without sophisticated energy considerations, including volume energy and surface energy, why nature's pair entity creation strategy is so successful. The fundamental number φ^5 governs phase transitions from particle to cosmic scale [1]. It shows a quite simple infinitely continued fraction representation [2].

If we assign physical properties to the initially equal split volumes, then they could change between different states separated by the given geometric frustration.

Interestingly, the factor $\sqrt[3]{2}$ represents the *Lorentz* factor for the maximum difference velocity between rotation angular velocity and precession angular velocity in *Guynn*'s seminal structure and matter approach [3] [4]. This special *Lorentz* factor γ_1 can be approximated well by a relation that shows the fifth power of the golden mean:

$$\gamma_1 = \sqrt[3]{2} = 1.25992105 \ldots \approx 1 + \frac{5\varphi^5}{\sqrt{3}} = 1.2602982 \ldots \tag{9}$$

Furthermore, from the geometry of the great Pyramid at *Giza* we derived the ratio of the in-sphere volume to the pyramidal volume itself being exactly $\pi \cdot \varphi^5$, and the height to base ratio being $\frac{\sqrt{\phi}}{2} = 0.6360098$, where big $\phi = \varphi^{-1} = 1 + \varphi = \frac{\sqrt{5}+1}{2} = 1.6180339887 \ldots$. The pyramidal angle between the apex and the base is $\alpha = 51.82729245°$ respectively $\cos(\alpha) = \varphi$. This angle is indeed very near the angle of α_1 [5] [6].

3. Depressed Quartic Polynomials

What has depressed quartic polynomials to do with the golden mean? The minimal polynomial of the golden ratio respectively its uneven powers (proof was reported by [7]) is given by

$$x^2 - ax - 1 = 0 \tag{10}$$

where $a = L_{2n} = \{1,4,11,29 \ldots\}$ represents the series of even *Lucas* numbers [8]. The two roots of this polynomial are $x_1 = \varphi^{-(n-1)}$ and $x_2 = -\varphi^{n-1}$. The L_n number series $L_n = \{2,1,3,4,7,11,18,29 \ldots\}$ was named after the *French* mathematician *François Édouard Anatole Lucas* (1842-1891) [8].

Now introducing a simple approach to decompose important numbers such as number 137 using the following relation which has been recently applied by the present author [8]

$$a(x + x^{-1})^2 = n \tag{11}$$

This approach can be recast in the depressed quartic polynomial equation exhibiting a symmetrical double-well structure

$$x^4 - (\frac{n}{a} - 2)\, x^2 + 1 = 0 \tag{12}$$

The roots for the quartic can easily be calculated by the relation

$$x_i = \pm\sqrt{\frac{n}{2a} - 1 \pm \sqrt{\left(\frac{n}{2a} - 1\right)^2 - 1}} \tag{13}$$

indicating that $x_{3,4} = \pm x_1^{-1}$. Full quartic polynomials can be fortunately solved by applying the procedure given recently by *Tehrani* [9].

Exemplarily, for *n* = 5, *a* = 1 we are confronted with the golden mean as roots of the quartic

$$x_{1,2} = \pm\varphi^{-1} = \pm\, 1.6180339887 \ldots, \quad x_{3,4} = \pm\, \varphi = \pm\, 0.6180339887\ldots$$

and for *n* = 9, *a* = 1 it yields the second power of the golden mean

$$x_{1,2} = \pm\varphi^{-2} = \pm\, 2.6180339887 \ldots, \quad x_{3,4} = \pm\varphi^2 = \pm 0.38196601 \ldots \tag{14}$$

4. Higgs Boson Pairs

The *Higgs* boson, considered as spin-less paired entity, is suggested to be a superconducting transporting medium for energy and information [10] like the energy lines in the new gravity concept of *Bharani* [11 [12] [13]. Depressed quartic polynomials of potentials like the *Higgs* potential are ever 'golden' polynomials and in this way show golden mean solutions. The teleportation of information by way of superconducting transport is also intimately connected with the human consciousness [14] [15] [16]. Furthermore, by accepting the concept of *Bharani*, depressing of energy lines can explain gravity [11 [12] [13].

From the *LGW* theory (*Landau-Ginzburg-Wilson*) features of critical transitions at the critical temperature T_c can be obtained by writing down the most general quartic polynomial of the *Hamiltonian*, which can be specialized for superconductor transitions using for instance the *Anderson-Higgs* approach. If $\Psi(r) = |\Psi(r)| \cdot \exp(i\Theta(r))$ represents the wave function, a depressed quartic in $|\Psi(r)|$ is derived for the potential by *Sudbø*'s resulting in [17]

$$V(|\Psi(r)|) = k\left(\frac{T-T_c}{2T_c}\right)|\Psi(r)|^2 + \frac{U}{4!}|\Psi(r)|^4 \tag{15}$$

This quartic polynomial indicates that pairing of the *Higgs* boson is associated with the golden mean and vice versa certainly with superconductivity.

Turning to unconventional superconductivity of the high-T_c cuprates, an optimum number of holes resulted in the unique number σ_o = 0.229. This number can also be confirmed for the family of FeAs-based superconductors. Some time ago, the present author connected this optimum with *Hardy*'s quantum entanglement probability φ^5 [18] [19] [20]

$$\sigma_0 \approx \frac{8}{\pi}\varphi^5 = 0.2296, \tag{16}$$

However, we can also approximate σ_o by the following relation using properties of the electron

$$\sigma_0 \approx \frac{\varphi^5}{\theta_{ea}} = 0.22928\ldots \tag{17}$$

where the angle $\theta_{ea} \approx \frac{\pi}{8}$ is given by the integral of the *Lorentz* transform between the limits β_0 and β_1 of *Guynn*'s matter and space approach (*ea* means electron anomalous) [3]. β_0 is the relative difference velocity of the electron, where rotation velocity and precession velocity are equal, and β_1 is the maximum difference velocity. Then it yields [3]

$$\theta_{ea} = \int_{\beta_1}^{\beta_0} \frac{1}{\sqrt{1-\beta^2}} d\beta = \arcsin(\beta_0) - \arcsin(\beta_1) = 0.3932696\ldots \tag{18}$$

Combining the special *Lorentz* factor $\gamma_1 = \sqrt[3]{2}$ with θ_{ea}, then according to *Guynn* the main part of the gyromagnetic factor of the electron is given as

$$g_1 = \frac{5 \cdot \gamma_1}{8 \cdot \theta_{ea}} = 2.0023175927439\ldots \tag{19}$$

A small further correction based on *Sommerfeld*'s α constant gives the exorbitant accurate value of *Guynn*'s gyromagnetic factor for the electron, where $|\beta_g| = \left|\frac{-v_g}{c}\right|$ is the relative galactic velocity [3]

$$g_2 = \frac{|\beta_g|}{\frac{\pi}{\alpha}+\frac{3}{2}} = 0.00000171161723\ldots \tag{20}$$

$$g_e = g_1 + g_2 = 2.0023293043612 \tag{21}$$

In addition, the superconducting transition temperature $T_{co}(K)$ is connected with the magic *Sommerfeld*'s constant α (not to be confused with the α angle of the Great Pyramid) and the mean cationic charge $< q_c >$ by the simple relation [20] [21]

$$T_{co}(K) \propto 2740 \ < q_c >^{-4} \approx \frac{20}{\alpha} < q_c >^{-4} \tag{22}$$

The interpretation of the fractal nature of electronic response in superconductors is consistent with generated *d*-wave fractal patterns in unconventional superconductors as a consequence of antiferromagnetism, documented by scanning tunneling microscopy.

5. Baryonic Matter Asymmetry Doesn't Exist

Balanced pairing of matter and antimatter from the very beginning of the universe has created the known elementary particles. The reader may follow *Kosinov*'s baryogenesis approach to understand these facts [22]. Accordingly, baryonic matter asymmetry doesn't exist. Why complicate things when there are simple explanations!

6. Pairing Law and Twin Universe

When applying the 'pairing law' to our universe, its beginning may be started with a twin universe like electron and positron, and matter then will crystallize by repeated pair creation from abounded energy, dominated by poly-singular, *Fibonacci*-like processes, not a single Big Bang. Besides matter pairs we should consider hole pairs, too, because superconductivity may be due exclusively to hole pairing [23].

7. Conclusion

Nature uses permanently quite simple strategies, which can be analyzed by just as easy mathematical strategies. In this way, cosmos and life frequently are organized in pairs. Superconductivity is an outcome of particle pairing and is important in cosmos as well as in life from the very beginning. All such processes are governed by the golden mean respectively its fifth power, if phase transitions are considered. The origin of our universe may be traced back to a creation process where twin universes are formed from plenty of energy available like the creation of electron and positron from a high-energetic photon. An extern energy source to power our universe could be such a twin to our universe.

Conflicts of Interests

The author declares no conflicts of interest regarding the publication of this paper.

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