TGD INSPIRED THEORY OF CONSCIOUSNESS
p-Adic physics as physics of cognition and intentionality

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Basic ideas

- **p-Adic space-time sheets** correlates for cognition and intention.

- **p-Adic-to-real phase transition** for space-time sheet transforms intention   to action. Zero energy ontology: everything creatable from vacuum by intentional action.

- **Most points of p-adic space-time sheets are at infinity if regarded as real points!** Our cognitive bodies have size of cosmos!

- **Rational/algebraic points of H correspond to points common to real and p-adic space-time sheets.** If the number of these points large, real space-time sheet reflects via long range correlations the p-adic topology and it makes sense to speak about effective p-adic topology.

- **Cognitive representations at space-time level always discrete.** Explanation for why practical mathematics always discrete. Intention has only discrete grasp on reality.

Does p-adic physics make itself visible in real physics?

- If real partonic space-time sheet is created in intentional action, it obeys effective p-adic topology in some length scale since the number of common points is large. **Partonic 3-surfaces possess p-adic topology corresponding to single p-adic prime.**

- **Interior of space-time sheet corresponds to multi-p p-adic topology** since partonic 2-surfaces correspond to different p-adic primes.

- Short distance physics in p-adic sense determined by p-adic continuity and smoothness and dictates real physics in long length scales and vice versa. **Intentionality should manifest itself via p-adic fractality and long range temporal correlations.** Short term chaos but predictability in long time scales.

- Characteristic p-adic time scales coming in powers of 2 if p-adic length scale hypothesis accepted. For instance, the universal biological time scale .1 seconds corresponds to secondary p-adic time scale associated with Mersenne prime M_{127} characterizing electron.

Time scales of cognition, intentionality, memory

- p-Adic time scale hierarchy. Preferred p-adic primes. For instance, .1 seconds corresponds to secondary p-adic length scale associated with Mersenne prime $M_{127}=2^{127}-1$ (electron).

- Dark matter hierarchy/hierarchy of Planck constants makes possible intentional action in all length and time scales. Preferred time scales of memory and planned action are predicted.

- Preferred Planck constants for which which **n characterizes n-polygon constructible using compass and ruler** number theoretically suggestive since the quantum phase $\exp(i\pi /n)$ is expressible using iterated square rooting to rational number and thus very simple :

$$n= 2^k \prod_s F_s \ , \quad F_s = 2^{2^s} +1 \ , \ s=0,1,2,3,4, \text{others?}$$

Given F_s at most once. Known Fermat primes **3,5,17, 257,** $2^{16}+1$.

- $n=2^{k11}$, k=0,1,2,... seems to be favored in living matter. 2^{11} fundamental constant in TGD.

Fermions and Boolean cognition

- **Fock states in 1-1 correspondence with Boolean statements.** Fermion number 0/1 represents bit.   Could fermions represent Boolean cognition?

- Quantum variant of Boolean algebra. Problem: **quantum superpositions of states with different fermion numbers are not consistent with fermion number conservation.**

- **Zero energy ontology comes in rescue.** All physical states have vanishing net conserved charges. Positive energy fermion state and its negative energy conjugate as pairs and quantum superposition of Boolean statements possible. Statement and its conjugate appear always pairwise. Somewhat like DNA strand and its conjugate.

- **Positive and negative energy states have interpretation as arguments and outcome of Boolean function** between Boolean algebras. Logical thinking at level of quantum states. Time like entanglement makes possible to represent entire function

Construction of infinite primes

- Call the <u>**product of all finite primes**</u> X. X+1 is not divisible by any finite prime and is infinite prime. Same true for X-1.

- Form the number P = n X/s + ms, n and s are coprime, m and n are coprime, and s is square free (contains given prime only once) is also infinite prime. These are **simple infinite** primes. Much more general infinite primes can be constructed.

- Infinite hierarchy of infinite primes. Form the product X of infinite primes at given level and repeat the construction.

- **Simple infinite primes are in 1-1 correspondence with the states of super-symmetric arithmetic quantum field theory**. n and m represent boson states, s represents fermion state. X Dirac sea, division of X by s formation of holes in Dirac sea. Construction of infinite primes repeated second quantization of arithmetic quantum field theory. Do non-simple infinite primes correspond to bound states of this field theory?

Infinite primes, cognition, and intention

- Infinite primes at first level of hierarchy have decomposition to fermionic and bosonic finite primes. Could these primes label fermionic and bosonic partons (3-D lightlike partonic space-times sheets) associated with given space-time sheet?

- Infinite prime as decomposition $P = A + a$ into infinite and finite part. Could the primes in the infinite part A characterize multi-p-p-adic effective topology of the real 4-D space-time sheet forced by different topologies of lightlike partonic 3-surfaces with different primes ?

- Could the primes in finite part a label the p-adic partons?

- Do bosonic primes correspond to bosonic partons which are real (action) or p-adic (intention)?

- Fermionic primes correspond always to both real and p-adic space-time sheet. Does p-adic space-time sheet characterized by same algebraic equations represent the real space-time sheet cognitively? Hole-fermion dichotomy corresponds to system-cognitive repr on dichotomy.

- This would define space-time correlates for fermion states identified as correlates of Boolean cognition. **Bosons←>intentionality, fermions←>cognition**.

- Quantum superposition of Boolean statements requires that every fermion state is accompanied by its antifermion conjugate with opposite net quantum numbers. Negative energy part of state as conjugate state? Would give constraint on Boolean functions.

- **Or could p-adic fermion have fermion number opposite to that of real fermion** so that real-p-adic fermion pair could be created from vacuum?

- **Could one assign genuine conserved quantum numbers to p-adic space-time sheets?** Could one say that the Noether charges defined by C-S action are opposite for the p-adic counterpart of the real space-time sheet? p-Adic conserved charges defined as integrals do not make sense but if p-adic space-time sheet obeys same algebraic equation as real one, p-adic conserved charges can be identified as real ones if they belong to the algebraic extension of p-adics used.

- **Are sums of p-adic and real conserved charges conserved** if real and p-adic fermionic space-time sheets have opposite energies?

Number theoretic Brahman=Atman and algebraic holography

- **Quantum classical correspondence taken at its extreme: world of classical worlds (WCW) and its spinor fields should have space-time correlates or even representation at the level of space-time. How this could be possible?**

- **The hierarchy of infinite primes implies infinite hierarchy of real units as ratios of infinite integers. This generalizes to quaternions and octonions. One can multiply any point by this kind of unit without changing it as a real number. Space-time and imbedding space points can have infinitely complex algebraic anatomy.**

- **Infinite integers represent positive any many-particle states. Inverses of infinite integers have interpretation as negative energy states. Also infinitesimals have number theoretic anatomy!**

- **Point of space-time can represent in its number theoretic anatomy quantum states of entire Universe! For instance, infinite integers have bosonic parts and fermionic parts just as the states created by super-conformal algebras of configuration space have. Number theoretic realization of Brahman=Atman identity and algebraic holography!**

Number theoretic Brahman=Atman and algebraic holography

- **Hypothesis: sub- WCWs are realized in the number theoretic anatomies of imbedding space and space-time points. Preferred point of sub-WCW represents the quantum state of this sub- WCW!   Tip of the lightcone=big bang singularity codes in it structure the entire quantum cosmology!**

- **Imbedding space evolves number theoretically. In quantum jump the number theoretical anatomies of imbedding space points change. The anatomy of space-time points not accessible to physical measurements but the changes of these anatomies in quantum jumps are experienced as mathematical ideas.**

- **Unit property ←> zero energy state property. Oneness←> emptiness experiences of mystics. Space-time point would be the Platonia able to represent in its structure state of the universe. Each point of H defines a sub-world of WCW (tip of the lightcone and preferred point of CP$_2$)**

- **Resolution of the question whether and in what sense derived mathematical structures such as space of quantum states as opposed to space-time are real. Inventions of mathematicians are real only if they allow imbedding to the number theoretic anatomy of points** **senting Platonia.**