

# TGD Inspired Quantum Model of Living Matter

M. Pitkänen

Email: [matpitka@rock.helsinki.fi](mailto:matpitka@rock.helsinki.fi).

<http://www.helsinki.fi/~matpitka/>.

## Abstract

Basic ideas of TGD inspired view about quantum biology are discussed. TGD inspired theory of consciousness provides the basic conceptual framework besides new view about space-time and quantum theory.

### *The new view about time and energy*

The new view about time and energy makes possible to distinguish even at elementary particle level between positive energy particles propagating to geometric future and negative energy particles propagating to geometric past and explains phase conjugate photons as a particular case of a completely general phenomenon. This distinction inspires a new view about realization of memory and of intentional action, and allows also the notion of remote metabolism. For all these mechanisms negative energy photons propagating to geometric past are essential.

### *p-Adic physics as physics of intentionality and cognition*

p-Adic physics as physics of cognition and intentionality is an essential element in the understanding of living matter. The fusion of real and p-adic physics leads to a generalization of the notion of number obtained by gluing reals and p-adics together along common algebraic numbers and to a generalization of notion of imbedding space and space-time time. p-Adic space-time sheets are identified as representations of intentions (bosons) and cognitions (fermions). p-Adic fractality of real physics at long scales can be seen as a direct counterpart of smoothness and continuity of p-adic physics in short length scales. p-Adic length scale hypothesis leads to quantitative

predictions based on simple scaling arguments. What is fascinating that in the length scale range 10 nm-5  $\mu\text{m}$  all p-adic length scales  $p \simeq 2^k$ ,  $k$  prime, correspond to Gaussian Mersennes  $(1 + i)^k - 1$ .

*Hierarchy of Planck constants and dark matter hierarchy*

The dark matter hierarchy assigned with a hierarchy of Planck constants is what makes living matter living. Number theoretically preferred values of Planck constants expressible in terms of integers characterizing n-polygons constructible using ruler and compass lead to precise quantitative predictions for fractal hierarchies of biologically important time scales and bio-rhythms. An especially important fractal hierarchy seems to correspond to  $n = 2^{k+1}$ ,  $k = 0, 1, 2..$

Dark matter hierarchy inspires the generalization of imbedding space  $H$  obtained by gluing together along common  $M^4$  or  $CP_2$  factor an infinite number of copies with various values of  $M^4$  and  $CP_2$  Planck constants and having singular bundle structure  $H \rightarrow H/G_a \times G_b$ ,  $G_a \times G_b \subset SU(2) \times SU(2) \subset SL(2, C) \times SU(3)$  (Cartesian product of Lorentz group and color group). Visible-dark phase transitions and their generalizations would correspond to a leakage of 3-surfaces between different sectors of  $H$ .

The generalization of imbedding space concept encourages possible generalizations of the notions of atom and molecule, and raises the possibility that symbolic representations emerge already at the level of biochemistry and play a key role in bio-catalysis. In particular, the free electron pairs associated with cyclic molecules containing 5- and 6-cycles and dominating biochemistry could be in dark phase corresponding  $n = 5$  and  $n = 6$  multiples of Planck constant and the delocalization of electron pairs would make possible phenomena like anomalous DNA conductivity.

The hierarchy of Planck constants corresponds naturally to an evolutionary hierarchy, and great leaps in evolution would correspond to the the increase of the value of Planck constant characterizing the highest level in the personal dark matter hierarchy.

*Magnetic body as intentional agent*

The hypothesis that dark magnetic body serves as an intentional agent using biological body as a motor instrument and sensory receptor is consistent with Libet's findings about strange time delays of consciousness. Magnetic body must be able to perform motor control and receive sensory input from biological body. Motor control would be most naturally performed via genome: this is achieved if flux sheets traverse through DNA strands. Flux quantization for large values of Planck constant requires rather large widths

for the flux sheets. If flux sheet contains sequences of genomes like the page of book contains lines of text, a coherent gene expression becomes possible at level of organs and even populations and one can speak about super- and hyper-genomes. Introns might relate to the collective gene expression possibly realized electromagnetically rather than only chemically.

Magnetic body could carry cyclotron Bose-Einstein condensates of various ions. Dark cyclotron radiation with photon energy above thermal energy could be used for coordination purposes at least.

The predicted hierarchy of copies of standard model physics leads to ask whether also dark copies of electro-weak gauge bosons and gluons could be important in living matter. In particular, dark  $W$  bosons could make possible charge entanglement and non-local quantum bio-control by inducing voltage differences and thus ionic currents in living matter. For instance, nerve pulse generation could be induced by the reduction of membrane potential below activation potential in this manner.

#### *Universal metabolic currencies*

The dropping of particles to larger space-time sheets can liberate metabolic energy as zero point kinetic energy, and if Coulombic interaction energies can be neglected this leads to a spectrum of universal metabolic currencies meaning that one gets rid of the hen and egg problem whether metabolism preceded the chemical energy storage or vice versa. Also the phase transition reducing the value of Planck constant can induce emission of radiation at precise energies.

#### *High $T_c$ super-conductivity*

The model for high  $T_c$  super-conductivity realized as quantum critical phenomenon predicts the basic scales of cell membrane and this leads to the vision that cell membrane and possibly also its scaled up dark fractal variants define Josephson junctions generating Josephson radiation communicating information about the nearby environment to the magnetic body.

The idea about cell membrane as a sensory receptor of magnetic body inspires a new interpretation for the puzzling findings challenging the notions of ionic pumps and channels. Ionic currents are found to be quantal and universal in the sense that they remain the same when cell membrane is replaced with silicon rubber membrane. Ionic currents also continue to flow in absence of metabolic energy feed. These findings suggest the interpretation of pumps and channels as sensory receptors of magnetic body taking only small samples of ionic currents suggests itself.

### *Model for a hierarchy of EEGs*

The effects of ELF em fields on vertebrates lead to a model EEG based on the requirement that dark EEG photons have energies above thermal threshold. That the effects are observed for vertebrates only, supports the view that the largest value of Planck constant in the "personal" hierarchy of Planck constants determines the evolutionary level. The model explains the basic band structure of EEG and predicts correctly the narrow resonances in beta and theta bands. Entire hierarchy of scaled variants of EEG is predicted with precise predictions for biorhythms corresponding to narrow resonances of EEG. The biologically most important bosonic ions correspond have cyclotron frequencies in alpha band and corresponding Josephson radiation generated by Josephson junction interacting with cyclotron radiation gives rise to theta and beta bands. Also electro-weak and gluonic variants of EEG suggest themselves.

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