

Summary of Recent TGD View about Quantum Biology and Remote Mental Interactions

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1 Introduction

In the following some aspects of TGD inspired theory of consciousness and quantum biology are summarized since several new insights inspired by the notions of magnetic body and dark matter have emerged lately. This includes improved views about quantum metabolism and prebiotic life: the basic input comes from the claimed free energy phenomena interpreted in TGD framework. Water structures representing simplified analogs of basic biomolecules suggested by water splitting producing so called Brown's gas might be highly relevant also for the ordinary metabolism. The main new input concerning remote mental interactions comes from a possible answer to the question whether TGD based ontology of physics could allow the "shamanistic" view that the experiences (say encounters with strange life forms assigned with distant civilizations) induced by various psychedelics used in the spiritual practices of indigenous people could be genuine remote sensory perceptions rather than hallucinations. Affirmative answer would mean a direct and testable connection between neuropharmacology and remote sensory perception with serotonin defining the crucial neurotransmitter and pineal gland ("third eye") serving as a candidate for the brain area of special importance in this respect.

Concerning the questions about meditation, mind-body medicine and placebo, the key concept is that of magnetic body. Usually organism and environment are seen as members of an interacting pair: organism receives sensory data from environment and controls it. Now magnetic body appears as a third party, "intentional agent" using biological body as a kind of interface between magnetic body and environment. Various "motor actions" of the magnetic body are highly relevant for both consciousness and biochemistry. The pairs formed by various information molecules and corresponding receptors could define plug-ins to the Indra's net (or Internet) defined by the magnetic bodies and Josephson radiation emitted by Josephson currents assignable to receptors would propagate along flux tubes. Meditation can be seen as "bodily exercise" of the magnetic body and a method to improve the communications between magnetic body and biological body. In healing magnetic body would be the active participant and healing would be also the healing of magnetic body. The placebo effect could be seen as an outcome of intentions of magnetic body affecting biological body.

The change of gene expression in meditation could also be understood in terms of magnetic body: genetic expression would be naturally determined by the permanent flux tube connections from the magnetic body to the promoter portions of DNA. Differentiation would select the promoters to which the magnetic body has permanent connections. The change of gene expression could be due to a change of these connections. If dark photons are involved with the communications to and from the magnetic body then also BPEs as dark photon leakages would reflect the change of genetic expression.

2 Brief summary about TGD based vision about life and consciousness

2.1 Magnetic and electric bodies

The notion of "magnetic body" has become more and more central concept in TGD inspired theory of quantum biology. Also electric fields are fundamental in living matter consisting of electrets and one could speak about electric bodies too. The notion of field body is possible only in TGD framework where space-times are 4-surfaces of 8-dimensional space $M^4 \times CP_2$ and various classical fields are geometrized in terms of geometry and spinor structure induced from those of imbedding space.

One can assign to any physical system magnetic body (or more generally field body), which consists of space-time sheets representing field quanta of magnetic and electric fields geometrically: typically they have the shape of flux tube or flux sheets. Of special importance are flux tubes carrying monopole Kähler magnetic flux - as if there would be magnetic monopole serving as the source of the magnetic field. There are however known magnetic monopoles in TGD Universe. These flux tubes are in fundamental role in the description of elementary particles and very probably also the magnetic flux tubes relevant for living matter carry monopole fluxes: even magnetic field associated with permanent magnets could involve monopole flux tubes, whose characteristic property is that there is no current creating the field. In cosmology this kind of fields are present in all scales and the mystery in the standard physics framework is caused by the fact that permanent currents in this scales are not possible.

The topological dynamics of magnetic flux tubes is based on reconnection process creating and modifying the topology of the web of magnetic flux tubes. In living matter this web is assumed to be responsible for the coherent behavior of living organisms. The reconnection building a double flux tube bridge between two systems is assumed to define the space-time correlate for the generation of directed attention. Second important piece of dynamics is the change of the length of the magnetic flux tube induced by the change of h_{eff}/h . The shortening of flux tubes connecting distant biomolecules would force them near each other and make possible selective bio-catalysis. This mechanism should be crucial for DNA replication and transcription, and mRNA translation.

Also the dark matter at magnetic flux tubes is assumed to be essential element of what it is to be living. Dark matter hierarchy corresponds to a hierarchy of effective values of Planck constant given by $h_{eff}/h = n$. Cyclotron frequencies for charged bosons and Cooper pairs of charged fermions could be carriers of metabolic energy realized as cyclotron energy which is large for large values of n .

One can of course also speak about electric bodies - living matter is full of electrets and already Fröhlich realized the importance of electric fields - and cell membrane would define a fundamental system of this kind. The flux tubes connecting the interior and exterior of membrane would carry electric voltage in the stationary case and in super-conducting situation oscillating Josephson currents generating dark Josephson radiation at frequency $f_J = ZeV/h_{eff}$ are present. EEG - or rather hierarchy of dark EEGs at various frequency scales but with same energies actually assignable to biophotons - could correspond to this radiation and dark cyclotron radiation. They would mediate communication of sensory data to the magnetic body and control commands

from the magnetic body.

2.2 Frequency coding and targeted attention

Dark photons are also an important piece of the bio-puzzle. Microscopically they correspond wormhole contact pairs connecting to "massless extremals" (MEs) (as a matter of fact, all elementary particles have this kind of identification). Dark photons would be generated as Josephson photons and cyclotron photons. The simplest assumption is that standard mechanisms of biochemistry generate only ordinary photons. The basic property of dark photons is that the energy for a given frequency is scaled up by factor h_{eff}/h so that ELF radiation can correspond to energies of even visible photons as would indeed do if EEG corresponds to dark photons having energies of visible and perhaps even UV photons.

1. If the photons are absorbed resonantly, photons frequencies serve as analogs of passwords so that living matter would apply the analog of radio communications for dark photons. Given part of living system in given scale would be characterized by photon frequency which by p-adic length scale hypothesis would correspond to a power of two. A collection of these frequencies coming as powers of two would effectively define a sequence of binary digits specifying the p-adic space-time sheet of the receiver. This coding mechanism could be at work not only inside organism but also between different organisms. The magnetic bodies have astrophysical dimensions and in principle there is no limit for the scales involved. Directed attention would correspond to reconnection of magnetic flux tubes implying common cyclotron frequency spectrum plus cyclotron transitions induced by the radiation transferred between the participants.

Frequencies serving as passwords would make possible precisely targeted communications if receiver frequencies vary as a function of position. Cyclotron radiation along massless extremals parallel to magnetic flux tubes serving as kind of waveguides achieves the same. These two mechanisms could be actually one and same.

2. Zero energy ontology in turn strongly suggests communications based on reflections in time direction at the opposite boundaries of causal diamonds (CDs) having interpretation in terms of state function reductions. This allows to speculate about communications in cosmic scales taking place instantaneously with respect to subjective time. It is not clear whether the standard view about causality based on unique direction of geometric time denies this possibility.
3. Very probably frequency alone is not all that is involved. Just as in the ordinary radio communications, the signal itself could be coded by amplitude or frequency modulation of the carrier frequency. One of the possible mechanisms generating dark photons would be amplitude modulation. Frequency modulation could be realized as variation of Josephson frequency induced by that of membrane potential and cell membranes indeed carry membrane potential waves besides nerve pulses. Cyclotron frequency could be modulated by oscillations of the flux tube thickness induced the variation of magnetic field strength forced by the flux conservation.

There is evidence that a process interpreted as a propagation of biophotons along neural fibers takes place. In TGD framework this would correspond to the propagation of dark photons along magnetic flux tubes parallel to the fibers. I have proposed that magnetic flux tubes assignable to neural pathways (and also meridians of acupuncture system) serve as analogs wave guides for dark photons. If sensory organs are really the seats of the fundamental sensory experiences and brain builds cognitive representations by analyzing the sensory input and decomposing it to objects with names as TGD suggests [K5], then the feedback from brain and even magnetic body is needed in order to build the sensory representations as kind of art works. This would explain dreams (REM) and hallucinations as being caused by virtual sensory input from the magnetic body (maybe induced by sensory input to magnetic body even from some other magnetic body as in case of remote mental interactions).

2.3 Meditation and magnetic body

One manner to see meditation is as a method to develop ability to precisely targeted attention by getting rid of all perturbing mental images. If one accepts that recon-nections for the flux tubes of the magnetic body are crucial for the targeted attention and that the h_{eff} serves as a kind of universal quotient of spiritual intelligence, the conclusion would be that meditation means practices for developing maximally flexible magnetic body able to build rapidly contacts with higher levels of the personal magnetic body and also with other magnetic bodies. Meditator would be a master of magnetic motor actions whereas yogi would be a master of motor actions of biological body. If healing involves connection between magnetic bodies or magnetic body and biological body of healee, meditation should help also to achieve healing abilities.

In biology everything seems to obey engineering standards and the build-up of connections to other magnetic bodies need not be an exception to the rule. Various information molecules and corresponding receptors would indeed define natural candidates for the plugs connecting brain and body to the magnetic Indra's net. Therefore meditative practices should develop the ability to control the levels of various information molecules and receptors in body.

3 NMP, hierarchy of Planck constants, p-adic length scale hypothesis and negentropic entanglement

Around the year 2003 a number of new ideas emerged simultaneously. Learning about hyper-finite factors of type II_1 and their inclusions [K10] lead to a proposal for the mathematical description of finite measurement resolution and cognitive resolution. Also the idea about hierarchy of Planck constants allowing to identify dark matter as phases of ordinary matter, and the notion of negentropic entanglement emerged and led to a lot of speculation. Over the years connections between these notions and vision about their more detailed realization have emerged. One can say that NMP, hierarchy of Planck constants, p-adic length scale hypothesis, negentropic entanglement, and even inclusions of hyperfinite factors are very intimately related. Of course, all of this is just a highly entertaining intellectual game - very much like solving a crossword puzzle - and only time and experiment will show whether it has anything to with reality.

3.1 Negentropic entanglement and hierarchy of Planck constants

The hierarchy of Planck constants makes possible negentropic entanglement and genuine information represented as negentropic entanglement in which superposed state pairs have interpretation as incidences $a_i \leftrightarrow b_i$ of a rule $A \leftrightarrow B$: apart from possible phase the entanglement coefficients have same value $1/\sqrt{n}$, where $n = h_{eff}/h$ define the value of effective Planck constant and dimension for the effective covering of imbedding space. This picture generalizes also to the case of multipartite entanglement but predicts similar maximal entanglement for all divisions of the system to two parts. There are however still some questions which are not completely settled and leave some room for imagination.

1. Negentropic entanglement is possible in the discrete degrees of freedom assignable to the n -fold covering of imbedding space allowing to describe situation formally. For $h_{eff}/h = n$ one can introduce $SU(n)$ as dynamical symmetry group and require that n -particle states are singlets under $SU(n)$. $SU(n)$ brings in mind the dynamical gauge symmetry group introduced earlier for inclusions of hyper-finite factors of type II_1 [K10] to which one can assign simply laced Lie groups such as $SU(n)$ by Mac Kay correspondence [A1]. I proposed these groups as effective gauge group making possible emulation of all possible gauge group dynamics so that TGD Universe would be like Turing machine able to mimic any mathematically consistent dynamics. The inclusions would also characterize the finite measurement resolution: the states created by the included algebra would create states not distinguishable from each other in the resolution used.

This gives rise to n -particle states constructed by contracting product of some number k of n -dimensional permutation symbols contracted with many particle states assignable to m factors. These states would generalize k -particle states. For $k = 1$ and $m > 1$ one would have single particle state in "schizophrenic state" consisting of m particles with fractional quantum numbers n_i/n times the usual quantum numbers. Spin-statistics connection might produce problems - at least it is non-trivial - since one possible interpretation is that the states carry fractional quantum numbers - in particular fractional fermion number and charges.

These strange states with completely unique form would generalize the notion of N-atom proposed for decade ago as giving emergence of symbols and "sex" at molecular level [K1]. The status of this idea has remained very uncertain but I have not been able to throw it to paper basked. The second quantization associated with the finite coverings of imbedding space would give rise to the negentropic entanglement, symbolic dynamics, and also to "Akaschic records" as almost invariants of the quantum jump sequence (thanks to their negentropic resources respected by NMP). "Molecular sex" means that all states can be seen as composites of two states with opposite fractional $SU(n)$ quantum numbers (this decomposition need not be unique!). This brings in mind the monogamy theorem for ordinary entanglement stating that maximal entanglement means this kind of decomposition to two parts.

2. While writing this I realized that the question whether negentropic entanglement is possible only in the new covering degrees of freedom or also in more familiar

angular momentum, electroweak, and color degrees of freedom, remains open [K8]. The latter states are especially interesting biologically and from the point of view of photosynthesis and navigation of birds if one believes on the proposed explanations: long-lived negentropically entangled spin singlet electron-hole pairs and electron pairs are proposed as explanation of the experimental findings. If only the covering degrees of freedom are involved the entanglement stable against thermal perturbations is in these degrees of freedom.

3.2 NMP and evolution of intelligence

Alexander Wissner-Gross, a physicist at Harvard University and the Massachusetts Institute of Technology, and Cameron Freer, a mathematician at the University of Hawaii at Manoa, have developed a theory that they say describes many intelligent or cognitive behaviors, such as upright walking and tool use [J7, J1]. The basic idea of the theory is that intelligent system collects information about large number of histories and preserves it. Thermodynamically this means large entropy so that the evolution of intelligence would be rather paradoxically evolution of highly entropic systems. According to standard view about Shannon entropy transformation of entropy to information (or the reduction of entropy to zero) requires a process selecting one of instances of thermal ensemble with a large number of degenerate states and one can wonder what is this selection process. This sounds almost like a paradox unless one accepts the existence of this process. I have considered the core of this almost paradox in TGD framework already earlier.

According to the popular article (<http://www.insidescience.org/content/physicist-proj-987>) the model does not require explicit specification of intelligent behavior and the intelligent behavior relies on "causal entropic forces" (here one can counter argue that the selection process is necessary if one wants information gain). The theory requires that the system is able to collect information and predict future histories very quickly.

The prediction of future histories is one of the basic characters of life in TGD Universe made possible by zero energy ontology (ZEO) predicting that the thermodynamical arrow of geometric time is opposite for the quantum jumps reducing the zero energy state at upper and lower boundaries of causal diamond (CD) respectively. This prediction means quite a dramatic deviation from standard thermodynamics but is consistent with the notion of syntropy introduced by Italian theoretical physicist Fantappie already for more than half a century ago as well as with the reversed time arrow of dissipation appearing often in living matter.

Negentropy Maximization Principle (NMP) resolves also the above mentioned almost paradox (at least). I have proposed analogous principle but relying on generation of negentropic entanglement and replacing entropy with number theoretic negentropy obeying modification of Shannon formula involving p-adic norm in the logarithm $\log(p)$ of probability. The formula makes sense for probabilities, which are rational or in algebraic extension of rational numbers and requires that the system is in the intersection of real and p-adic worlds. The dark matter matter with integer value of Planck constant and $h_{eff} = nh$ predicts rational entanglement probabilities: their values are simply $p_i = 1/n$ since the entanglement coefficients define a diagonal matrix proportional to unit matrix. Negentropic entanglement makes sense also for n-particle systems as found and the form of the states is essentially unique.

Negentropic entanglement corresponds therefore always to $n \times n$ density matrix proportional to unit matrix: this means maximal entanglement and maximal number theoretic entanglement negentropy for two entangled systems with number n of entangled states. n corresponds to Planck constant $h_{eff} = n \times h$ so that a connection with hierarchy of Planck constants is also obtained. Power of the p-adic prime by definition defines largest prime power divisor of n . Individually negentropically entangled systems would be very entropic since there would be n energy degenerate states with same Boltzmann weight. Negentropic entanglement changes the situation: thermodynamics of course does not apply anymore. Hence TGD produces same prediction as thermodynamical model but avoids paradox.

3.3 How to produce dark matter

If one wants to test the vision about dark matter, one must be able to manipulate and even produce it. I have considered several mechanisms for producing dark matter. It must be emphasized that the ideas are yet at rather heuristic level.

1. Modulation of high frequency radiation by low frequency radiation such that the ratio of the frequencies is integer, call it n , characterizing the effective Planck constant $h_{eff}/h = n$ is one proposal inspired by experimental findings of Cyril Smith related to water memory [I1]. Smith suggests that one particular ratio $n \simeq 2 \times 10^{11}$ is of special importance. Number theoretical simplicity and p-adic length scale hypothesis suggest Fermat integers - are products of distinct Fermat primes and powers of two - as good candidates for n . One could perhaps say that ordinary higher frequency photons is replaced with a bundles of n fractional photons with energy and frequency divided by n . At the level of space-time and imbedding space geometry this means the emergence of effective n -fold covering. The extreme non-linearity of Kähler action could give rise to these n -furcations.
2. The presence of strong electric fields and voltages and plasma phase seem to generate effects having explanation in terms of the hierarchy of Planck constants. In particular, di-electric breakdown seems to be involved. For instance, cell membrane characterized by the presence of extremely strong electric field. Plasmoids as lifeforms would also involve strong electric fields. Also magnetic fields seem to be essential. Splitting of water in electrolysis using strong electric fields ("peaky" electrodes) involves also strong electric fields and generates Brown's gas having anomalous properties. One could argue that the presence of strong electric fields is what leads to the generation of n -furcations at the level of space-time dynamics.
3. The latest proposal is based on some input from observations related to free energy leading to the observation that the quantum mechanical description of a system to which constant torque is applied leads to mathematical problems in the framework of standard quantum theory solved by introducing n -fold covering space of circle, hierarchy of Planck constants, and zero energy ontology [K7] [?]. The value of n is at least the number of turns made by the rotating system during the time the torque is applied. This mechanism would explain why the values of n are so large. Constant torque represents an example of an open system driven by external generalized forces and living systems are systems of

this kind. Formally the system is conservative but the potential function is either many-valued or discontinuous at 2π and this forces to introduce the covering space if one wants to describe rotating and accelerating wave packets. Note also that the force can be arbitrarily small so that there is instability against generation of higher values of h_{eff} . What is of special interest is that ATP synthase (http://en.wikipedia.org/wiki/ATP_synthase) involves generator with a rotating shaft (just like an electric power plant) and therefore also a torque to compensate for dissipative losses. Is its purpose to generate large h_{eff} phase?

Note that cavitation is one manner to generate water splitting and associated charged water clusters and plasmoids: it is typically produced by a rotating shaft. Does this mean that turbulent water could have served as a seat for primordial life forms? Note that in homeopathy mechanical agitation is applied to the diluted sample: the proposed interpretation has been that this drives the replication and evolution of dark life forms defined by dark nucleon sequences [K6].

3.4 Dark proton sequences, genetic code, and primordial life forms

Free energy input. Charged plasma clusters. Brown's gas. Exotic water polymers as a primordial life form. Genetic code. Analog for hydrolysis metabolism. Simple analogs for basic molecules of life. [K7]

The general strategy should be simple. I start from experimental facts and explain them in terms of TGD allowing free imagination and trying to achieve internal consistency between different ideas [K7].

1. The old result is that I cannot avoid mentioning again and again is that in attosecond scale water obeys stochography $H_{1.5}O$ as if 1/4:th of hydrogens were dark and thus not visible in electron scattering and neutron diffraction. This fact can be found from Chaplin's homepage (<http://www1.lsbu.ac.uk/water/>) devoted to water and containing impressive list of anomalies related to the physics of water. This finding was one of the original motivations for introducing hierarchy of Planck constants.

I introduced dark nuclei identified as sequences of dark hydrogens/protons as explanation of the strange stoichiometry and also for the anomalies: there would be two phases (at least, not the h_{eff} can have several values) present and this makes the behavior of water more complex. Dark nuclei are strings of dark protons connected by color bonds. The size scale of nucleus is scaled up by h_{eff} and would be about atomic scale: attosecond multiplied by c gives this scale.

The really big surprise was that the model for dark proton led directly to the realisation of vertebrate genetic code [K9, K6]: the states of dark proton can be naturally arranged to groups corresponding to DNA, RNA, amino acids, and remaining states whose number is smaller than 64 which I tentatively identify in terms of tRNA. Genetic code is obtained if states in different groups are identified

by requiring that states corresponding to each other have same total quark spin and same spin assignable with the flux tube (two colour bonds connecting quarks).

In TGD framework this relates also to the understanding of water memory and homeopathy [K6] and to the evolution of immune system as well.

2. The field of free energy (presumably possessing somewhat similar academic status as the research of remote mental interactions) represents second source of experimental input. Quite lately I have been reconsidering what is believed to be known about the splitting of water - for instance using strong electric fields or cavitation. This is a rich store of anomalies. In particular although the splitting of water molecules requires energy, more energy is claimed to emerge from the process in some situations. Also cold fusion is reported to occur in this kind of system and liberates energy as heat. Nuclear transmutations in living matter have been reported much before the cold fusion was claimed for the first time [?, ?].

Already more than century ago it was reported that the resulting vapor - christened as Brown's gas according to its discoverer - behaved strangely. For instance, its temperature was 130 C but it melted metal as if it had stored a lot of energy which was liberated and was heating the metal about thousand of degrees of Celsius. These results do not of course fit standard physics and have been actively forgotten and denied by the academic environment (for an authoritative skeptic explanation see Wikipedia article http://en.wikipedia.org/wiki/Brown's_gas#Brown.27s_gas). I know personally some people in the field of free energy and I am not able to see them as "fringe scientists" as opposed to "real scientists". It is a pity that this kind of schizophrenic splitting prevents the study of the free energy claims using the resources provided by the academic environment.

Free energy enthusiasts have been studying this process and a lot is believed to be known about it. According to Moray B. King [H2, H1] Brown's gas can be separated from water vapor and hydrogen and is weightier than air. It is believed that charged plasma clusters resulting in the "electric expansion" of water are involved with electrons and protons separated. Torus shaped plasmoids are introduced also. In TGD framework plasmoids, which involve magnetic body carrying electron Cooper pairs at least, are identified as primordial life forms.

3. The question is how many properties assigned with chemical life are shared by plasmoids. Could linear biomolecules, storage and liberation of metabolic energy, and even genetic code have plasmoidal analogs?
 - (a) Circular sequences of OH:s has been proposed by King [H2] as basic building bricks of plasmoids. To my best understanding this does not fit with the ordinary chemistry (covalent bond between OHs cannot be realized). TGD inspired proposal is that actually OHH_{dark} sequences are in question. Covalent bonds are replaced with color bonds between dark nuclei, which are scaled up variants of ordinary nuclear modelled as highly entangled nucleon strings in TGD framework. Already this represents a new view about nuclear physics (it is ironic that string like appear at practically all levels

in TGD Universe but that string theorists desperately try to understand physics by putting them to Planck scale).

- (b) Free energy phenomena involve the splitting of water. Water splitting is also the first step in the storage of energy to biomolecules in photosynthesis. Could OHH_{dark} sequences define simplified counterparts of basic biomolecules, and could they carry metabolic energy in colour bonds between dark protons replacing "high energy covalent bonds"?
- (c) This metabolic energy would be liberated as metal melts in the presence of Brown's gas. This is completely analogous to the splitting of biopolymers in catabolism leading to liberation of metabolic energy. This liberation does not take place in the interaction with living matter: why the conductor property of metals leads to the burning? Why the presence of conduction electrons induced the phase transition reducing h_{eff} and scaling up p-adic prime p correspondingly so that energy is liberated. Do conduction electrons perhaps serve as a seed like in ordinary phase transitions forcing the dark Cooper pairs to decay to ordinary electrons?
- (d) This framework inspires the conjecture that chemical life has preceded by plasmoids consisting of these ultrasimplified versions of basic biomolecules. "Ontogeny recapitulates phylogeny" forces to ask whether this primordial life form could be still in key role living matter meaning that the role of water would be much more than serving as a passive solvent of biomolecules. The phase of water known as ordered water and having ice as the closest analog is believed to be crucial for the stability of DNA against hydrolysis, and one can wonder whether the dark DNA defined by half dark water molecule sequences could be the basic building brick of the ordered water and accompany the ordinary DNA. This would make also highly probable the analogs of transcription and translation between ordinary and dark variants of basic biopolymers. Note that Brown's gas would be ideal fuel since it would "burn" to water: no CO_2 would be produced as in case of biofuels. Again the problem is that academic community how refuses to take free energy people seriously enough to try to demonstrate that they are wrong. Free energy enthusiasts in turn seem to concentrate too much to their dream and fail to realize that Brown's gas could carry the usable energy and the amount of this energy liberated as heat need not measure the actual success of the experiment.

4 TGD view about metabolism

The general strategy in TGD based attempts to understand metabolism [K7] is based on the assumption that a very large class of anomalous phenomena rely on same basic mechanism. This includes life as a gigantic collection of anomalies, water memory and homeopathy, free energy phenomena involving over-unity energy production related to the dissociation of water, lightning and ball lightning, anomalous effects associated with rotating magnetic systems, phenomena related to UFOs (light balls), and remote mental interactions. One must have a unified explanation for all these phenomena based on a real theory.

Plasmoid as primitive life form would be the underlying connecting thread between these phenomena so that all the listed phenomena would involve life and prebiotic (or/and possibly postbiotic!) life. This gives very strong constraints on the model. Plasmoid should consist of the analogs of linear biomolecules, it should metabolize and communicate, in TGD Universe it should have magnetic body, and even genetic code might be realized. In particular, the simplified analog of biological metabolism would be at work. In living matter photosynthesis relies on the splitting of water whereas cell respiration relies on the reversal of this process producing carbon di-oxide and water. Something very similar should happen in free energy systems involving electrolysis, and the fact that water splitting occurs also in several free energy phenomena suggests that these processes are analogous to photosynthesis and store energy to "molecules" analogous to various linear biomolecules, in particular sugars. Even the simplified version of ADP-ATP process might be realized.

TGD suggests a very general model for the metabolism of pre-biotic systems identified as plasmoids consisting of cyclic linear structures formed by exotic water molecules. For a dark water molecule one proton would be dark and dark protons of the neighboring exotic water molecules would bind to form a linear structure identifiable as dark nucleus: this picture is a direct generalization of nuclear string model [K4, K2, K9]. These linear structures would define the analogs of linear biomolecules. This metabolism would be more fundamental than ordinary biochemical metabolism and form a yet unknown part of the latter. One cannot exclude the possibility that also other than water molecules contain dark protons: the signature would be the presence of apparently non-allowed covalent bonds due to the fact the dark proton is not visible. In the following I will discuss the basic principles involved.

The older view about the metabolic energy quanta as energies liberated as particle "drops" to a larger space-time sheet is modified (an objection against this mechanism is that its coherence for many particles is far from obvious). Metabolic energy quanta are liberated when the space-time sheet at which the particles reside expands in a phase transition increasing its p-adic prime and reducing the value of Planck constant correspondingly so that the net result is that the size of the space-time sheet remains the same. This condition implies a close relationship between p-adic and dark matter hierarchies. This process is automatically coherent since all particles suffer the change simultaneously. It applies also to a situation in which particles are in magnetic field: in this case the scale of cyclotron energies changes since the strength of the magnetic field is scaled down to guarantee the conservation of magnetic flux. This transition is not cyclotron transition but liberates essentially the same energy as coherent cyclotron transition so that magnetic fields (their "motor actions") become essential players also in metabolic activities.

4.1 Three possible models for liberation of metabolic energy

One can imagine three different models for the liberation of metabolic energy.

1. The simplest TGD based model is as a phase transition increasing the value of p-adic prime p assignable to the space-time sheet at which particle is topologically condensed:

- (a) Particle drops to a larger space-time sheet with larger p-adic prime p_1 with $p_1/p \simeq 2^k$. The problem is that different particles need not drop simultaneously so that coherent liberation of energy is not automatic consequence of the assumption.
- (b) The space-time sheet itself suffers a phase transition increasing its p-adic length scale. In absence of interactions (particles in box) the energies are scaled down by factor 2^{-k} and the difference is liberated as usable energy. Coherent liberation of energy is achieved automatically. If the particle inside the space-time sheet is free in good approximation a model as particle in box applies, and if the expansion of the space-time sheet takes place adiabatically, the quantum numbers characterizing the state of the particle do not change in the transition. As a consequence, the energy $E_{\{n_i\}} = k \sum_i n_i^2 \hbar^2 / 2mL_p^2$ is reduced as $L_p \propto \sqrt{p}$ increases to L_{p_1} , where $p_1/p \simeq 2^k$ holds true. The difference of vacuum energies is liberated as usable energy in coherent manner: this is of special significance in living systems. This has led to the identification of p-adic length scales that would correspond to fundamental metabolic quantum with value about .5 eV. Entire hierarchy of metabolic quanta is predicted.
2. The space-time sheet could also carry magnetic energy and particles are expected to be in cyclotron states and perhaps form a cyclotron Bose-Einstein condensate. In this case the phase transition reduces the value of B but preserves the magnetic flux so that $B \rightarrow B/2^k$, $p_1/p \simeq 2^k$, takes place. This scales down the energies of cyclotron states by the same scaling factor 2^{-k} as in the case of free particle. The liberated energy is in good approximation just the cyclotron energy for large enough values of k . Coherence is achieved automatically. The value of the fundamental metabolic energy quantum and the value of endogenous magnetic field of about $B_{end} = .2$ Gauss deduced from the experiments of Blackman and others [J2] fix the value of h_{eff} . It would be proportional to particle mass number A .
3. The earlier model for the liberation of cyclotron energy was based on the assumption that the value of B is not changed but that the value of magnetic quantum number n changed. If n is reduced one achieves liberation of energy. Coherence of the transition might produce problems now. Both models can explain the observations of Blackman and others concerning the effects of ELF radiation on vertebrate brain since the spectrum of photons energies inducing effects correspond to cyclotron energies for the latter option and in excellent approximation to it for the previous model. The mechanism is however quite different.

This phase transition for the larger space-time sheet can take place in two steps.

1. First a phase transition increasing h_{eff} of the background space-time sheet by $n = 2^k$ occurs. This leaves ZPKE invariant but scales up the size of the space-time sheet by $2^{k/2}$. The interpretation would be as "electric expansion" of Brown's gas. No energy transfer takes place since both kinetic and magnetic energies are invariant under the scaling of \hbar . Note however than in the original situation the

magnetic field can be very strong so that zooming up from microscopic scales can happen.

2. After this a phase transition reducing Planck constant back to h but increasing p-adic length scale by 2^k occurs. The size scale of the background space-time sheet is not affected but the zero point kinetic energy is reduced by factor 2^{-k} and liberated as usable energy. This phase transition would take place for the dark component of Brown's gas in the melting of the metal and other similar phenomena. Also the liberation of metabolic energy in living matter could correspond to this phase transition.

This model for electric expansion, implosion, and energy liberation assumes nothing about the particles involved since dark particle means ordinary particle topologically condensed on dark space-time sheet and having wave function de-localized in the n-sheeted structure. For instance, water can be dark in this sense. One could indeed consider the possibility that the vapor phase identified as charged water cluster is just water containing positive ions H_+^3 or protons and electrons and that phase transition to large \hbar phase expands the space-time sheet at which water is topologically condensed at evaporates the water. Ordinary liquid to gas transition could proceed in the same manner and involve liberation of ZPKE at the second step of the process. In the general case the binding energy involved with the formation of the denser phase could compensate for the energy gain in the increase of the p-adic prime so that the melting would require energy feed.

4.2 Where the metabolic energy is stored?

High energy phosphate bond is one of the problematic notions of standard biology, and has served as inspiration in attempts to understand metabolism in TGD framework. The ideas have evolved gradually and the only defense for those which have survived is that they are inspired by a rather wide spectrum of anomalies including biology, neuroscience, and free energy phenomena so that the constraint of internal consistency eliminates many options.

1. The notion of negentropic entanglement allows to consider the possibility of bound states which have wrong sign of binding energy. Entanglement would be stable because it is negentropic rather than being characterized by binding energy. This led to the idea that high energy phosphate bond as a carrier of negentropic entanglement. The milder assumption is that ATP has the ability to generate it. The problem is that one can imagine endless variety of mechanisms without further conditions.
2. A highly attractive idea is that magnetic body could serve as the fundamental storage of metabolic energy with negative energy photons serving as a manner to extract energy from the personal magnetic body or even other magnetic bodies. This would locate higher energy phosphate bond to magnetic flux tube and suggests that the energy is assignable to an analog of Cooper pair. This vision inspires also speculations about future energy technologies.

3. The generalization of the simple picture about liberation of metabolic energy as associated with the dropping of particle to a larger space-time sheet to a phase transition liberating cyclotron energy of charged particles led to the realization that
4. The negentropic states with wrong sign of binding energy could also correspond to cyclotron states with large h_{eff} (equally well to the states of a free particle in box, now space-time sheet). Magnetic body could carry metabolic energy and negentropic entanglement as that associated with dark pairs of charged particles. Because of their small mass electrons carry highest energy for given value of h_{eff} and magnetic field B . The deep irony is that one cannot automatically exclude even the elusive neutrinos as key players of metabolism: neutrinos have even smaller masses than electron and would carry even more energy in classical Z^0 magnetic fields possible in cell scales for large enough values of h_{eff} [K11]!
5. Also ordinary biomolecules can be said to carry metabolic energy in covalent bonds: one could therefore assign the attribute "high energy" also the them. Do we really understand these bonds or do we just accept and forget? Do we really understand what the valence electron pairs associated with covalent bonds are? Is this really nothing but standard chemistry understood for long time ago? To my best knowledge we cannot deduce the existence of chemical bonds from Schrödinger equation because the numerics gets too intensive and choose to believe on reductionistic dogma. Hence there is some room for imagination.
 - (a) Concerning covalent bond, the first option is conservative and based on the free energy inspired idea that the orderer water stabilizing DNA corresponds to dark DNA sequences. If this situation prevails also for RNA and proteins known to be surrounded by order water, one can wonder whether the covalent bonds are indeed more or less standard chemistry but that it is dark DNA parallel to the ordinary DNA that carries the metabolic energy as cyclotron energy liberated as the biopolymer and its dark variant image is catabolized. The metabolic energy would be carried by the same structures as in the case of plasmoids which would be therefore be a key element of also life as we know it!

For this option the long color flux tubes carrying quark or electron pairs would give rise to the flux tubes needed for reconnections. The transfer of metabolic energy would rely on reconnection mechanism transferring also electron Cooper pairs. Dark and thus scaled-up variant of strong interactions would become perhaps the most essential part of biophysics! Chirality selection suggests strongly that also dark variant of weak physics is in a central role in living matter.
 - (b) Second option suggests a radically new view about covalent bond itself. Could valence bonds corresponds to Kähler magnetic flux loops carrying this kind of dark electron pair? Could they define the loops by which biomolecules could touch each other and reconnect to form dynamical webs. Could the fundamental energy transfer process be the transfer of electron pair between molecules involving two reconnections so that piece of mag-

netic loop would be exchanged? Could ATP could simply give piece of flux loop containing dark electron pair to the biomolecule as it is constructed?

6. Both options would unify also biochemistry with DNA as topological quantum computer vision. DNA sequences accompanied by magnetic flux loops would make possible DNA-cell membrane flux tube connections and topological quantum computer. Also for DNA as topological quantum computer I have considered two options: one for which quarks and antiquarks are associated with the ends of flux tubes and second one in which only electron pairs are involved [K3].

These ideas are of course speculative and time will probably show that Nature has not chosen them. What I see as the beauty of the general picture is that all relevant elements of biology at molecular level would reduce to the basic "motor actions" for magnetic body and their effects on cyclotron Bose-Einstein condensates. Same can be said about basic elements of consciousness: directed attention and sensing the presence of other molecule relying on the use of cyclotron frequencies as passwords and reconnection of flux tubes.

5 Dark photon-biphoton connection

TGD inspired model for biophotons is as ordinary photons resulting as decay products of dark photons in energy-momentum conserving decay. I have discussed this model [K12] [?] using the input from the findings of Persinger et al [J3, J4, J5].

1. In the first article [J3] entitled *Congruence of Energies for Cerebral Photon Emissions, Quantitative EEG Activities and ~ 5 nT Changes in the Proximal Geomagnetic Field Support Spin-based Hypothesis of Consciousness* correlations between cerebral photons emissions, EEG, and changes of the proximal geomagnetic field are reported. The findings provide support for the proposal of Hu and Wu [J8] that nerve pulse activity could induce spin flips of spin networks assignable to cell membrane motivated by the observation that the magnetic spin-spin interaction between protons at a distance of 10 nm (cell membrane thickness) corresponds to energies for which frequency is in EEG range.
2. In the second article [J4] entitled *Demonstration of Entanglement of Pure Photon Emissions at Two Locations That Share Specific Configurations of Magnetic Fields: Implications for Translocation of Consciousness* the group reports an excess correlation between "pure" photon emissions at two locations separated by few meters that share specific correlations of frequency modulated magnetic fields. The photon emissions were from LEDs in the experiment consider. In an earlier similar experiment, which is also discussed, they were from chemical reactions occurring in solutions contained by cell cultures.
3. In the third article [J5] entitled *Experimental Demonstration of Potential Entanglement of Brain Activity over 300 Km for Pairs of Subjects Sharing the Same Circular Rotating, Angular Accelerating Magnetic Fields: Verification by s-LORETA, QEEG Measurements* an excess correlation of brain activity of subject persons separated by 300 km and sharing the same circular rotating, angular accelerating magnetic fields is reported.

The frequencies of the ordinary and dark photon are predicted to be in integer ratio $f_h/f_l = h_{eff}/h = n$ and I have already considered amplitude modulation as a manner to produce dark photons and mentioned Cyril Smith's experiments which can be interpreted in terms of this transformation.

1. The biophoton emissions at two ends should be compared. The correlations between temporal patterns would be one basic signature. Temporal correlations are extremely important and should be studied further: otherwise the findings are taken as mere claims by mainstream.
2. Collection of frequencies as a password is the rather strongly TGD based prediction. Common frequencies at both ends define second signature. Phase transitions changing frequencies but preserving photon energies are of course possible so that also sub-harmonics must be considered. More specific predictions lead soon to bio-electromagnetism. I do not know whether bio-electromagnetists have continued the work of pioneers or whether anything is done nowadays.

This picture raises an interesting question: suppose that one has identified a collection of frequencies responsible for a biological password. Could one produce these effects artificially using these frequencies to modulate a carrier wave corresponding to some biophoton frequency?

3. Time delay is one signature and would give idea about how long distance the radiation travels and at the same time can give additional support for magnetic bodies of astrophysical size, which is certainly the most astral looking feature of TGD model for biologist.

Delayed luminescence is also a phenomenon related to biophotons. Delayed luminescence has been produced as a model of visual after images: this could apply to all mental after images. TGD enthusiast could see after images as a indirect support for the idea that communications to and from the layers of magnetic body take place and require definite time measuring directly the size scale of the layer. The time delay is rather long in the model of after images so that the magnetic bodies in question would be rather large involving photon travels over cosmic distances! Mainstream thinking suggests that some other mechanism is in question and the complexity of nervous system certainly allows to invent alternative mechanisms.

4. The ability to tune the cyclotron and Josephson frequencies by varying magnetic field would be basic magnetic motor skill of the meditator besides ability to move magnetic body parts to make reconnections more probable. For Josephson frequencies this skill would mean the ability to tune the value of the membrane voltage and Josephson frequency characterized by the associated value of h_{eff} . If given receptor-information molecule pair corresponds to a particular value of h_{eff} defining a connection to a particular magnetic body part as will be suggested below, an advanced meditator would have developed the ability to control the density of the receptor-information molecule pairs.
5. How to detect changes of cyclotron frequencies? In Persinger's experiments, magnetic field identified as that of Earth, was slightly reduced and therefore also

the frequency. Could one learn to detect the tuning of the value of magnetic field? Can one demonstrate the ability of meditator to modify these frequencies? Can one try to identify the place where the radiation with these frequencies originates. Can one characterise body parts by slightly differing frequencies and build a kind of frequency map about body? Do deviations from standard values characterize unhealthy state?

6 Psychedelic induced experiences as key to the understanding of the connection between magnetic body and information molecules?

There is a book about psychedelics titled as "Inner paths to outer space: Journeys to Alien Worlds through Psychedelics and Other Spiritual Technics" written by Rick Strassman, Slawek Wojtowicz, Luis Eduardo Luna and Ede Frecska [J6].

6.1 Some background about psychedelics

Psychoactive drugs can be classified into three basic types. Some raise the activity level, some calm down, and some change the character of consciousness profoundly. Psychedelics/hallucinogens [J6] belong to the third group. Psychedelics (such as psilocybin, psilocybin, DMT, LSD) are molecules containing aromatic rings and many of them (such as psilocybin, psilocybin, DMT, LSD) attach to serotonin receptors.

As the official term "hallucinogens" implies psychedelic induced experiences are regarded as hallucinations in the materialistic world view although the denial of the reality of subjective experiences themselves requires a really hard-nosed skeptic. The title of the book reveals that the question posed in the book is whether these experiences could be about real world, kind of sensory input from distant parts of the Universe. The indigenous people using ayahuasca and similar psychedelics have regarded these experiences involving meeting of representatives of other civilizations as perceptions about real worlds. Also Terence and Dennis McKenna, who are pioneers of systematic study of the effects of various psychedelics, shared this view. In the materialistic ontology of standard physics this kind of interpretation is of course excluded. That hallucinations are in question is "obvious", too obvious actually!

The classical psychedelics LSD, psilocybin, DMT, and mescaline are derivatives of two basic chemical groups: tryptamine and phenethylamine which in turn derive from the aminoacids trp and phe. DMT is endogenous psychedelic and there is pumping of DMT blood-brain barrier so that DMT must have important function in brain. The action of classical psychedelics is on serotonin receptors and affects the serotonin intake so that the effect is stronger. The amount of serotonin in brain is not large but manifest in all functions. According to the book, the situation might be different for pineal gland which is the only nucleus of brain which does not appear as left-right pair. Descartes regarded it as the seat of soul. Pineal gland is also known as "third eye" and in lower species it indeed serves the function of eye. Taking the title of the book seriously, one can ask whether this eye is able to see but to cosmic distances possibly using large h_{eff} photons.

6.2 Could instantaneous communications in cosmic scales be possible in TGD Universe?

In TGD inspired ontology the notion of magnetic body with astrophysical, galactic or even super-galactic size changes the situation completely. The basic communication tool would be touch of magnetic bodies generating reconnections and making possible signalling from the biological body member of distant civilization. The perception of the biological body of alien would differ in no manner from that of my neighbor since the mechanisms would be the same as involved with the transfer of sensory data to my personal magnetic body and control commands from there to biological body (at least through genome).

The basic objection against the possibility suggested by the title of the book is that finite light velocity poses absolute upper bound for the distance of objects with it is possible to be in contact during "trip". One must be however very cautious here: the assumption that signals propagate only to singlet direction of time is essential also and derives from classical thermodynamics. In TGD framework second law continues to hold true but the arrow of geometric time for zero energy states changes in each state function reduction occurring to the either boundary of CD. Hence instantaneous communications ("remote seeing"!) using reflection in time direction become possible even over cosmological distances and define among other things the mechanism of memory in TGD Universe.

Time consuming and expensive space travel would become un-necessary: our magnetic body giving us cosmic size together with zero energy ontology making possible instantaneous "seeing" of both future and past by reflection of photons in time direction would be enough. Memory and anticipation would be basic examples about seeing in time direction. This view would also resolve Fermi paradox. We could be actually in a continual contact with the distant civilizations but without realizing it. One can ask whether similar contacts could take place in psychedelic induced experiences. Memories and future plans would be examples of "seeing" in time direction. The continual re-creation of the Universe by quantum jumps would of course mean that the actual future/past need not be same as those which are "seen". Shamans identify various plants as conscious entities teaching them - in TGD framework this would translate to magnetic bodies of representatives of distant civilizations remotely teaching the representatives of more primitive civilizations.

6.3 Neurotransmitter receptor complex as plug-in to cosmic internet and a new perspective on remote seeing

If one - just for fun - takes seriously the claims of shamans, one must ask whether our brain has well developed tools available for building contacts with distant civilizations and what these tools might be. The receptors of neural transmitters are obviously the natural candidates for the pathways to cosmos. One can argue that evolutionary pressures have forced living matter to develop highly standardized connections to various parts of the personal magnetic body and possibly also other magnetic bodies. Personal magnetic body has astrophysical size and EEG frequencies would correspond to communications in Earth size scale. Receptors serving as Josephson junctions emitting Josephson radiation with frequency characterised by h_{eff} are natural candidates for

plug-ins.

The model for cell membrane as Josephson junction leads at the microscopic level to the view that the proteins associated with various ion pumps, channels, and receptors (of also neurotransmitters in postsynaptic junction) define Josephson junctions to which magnetic flux tubes are associated and characterized by local value of Josephson frequency, that is membrane potential and Planck constant h_{eff} . As the information molecule is attached to a receptor, a connection to some part of the some magnetic body would be generated and split as the molecule is not present. These connections are possible in the scale cell, organelle, organ, organism, population and maybe even in the scale of cosmos. Psychedelics affect serotonin receptors so that serotonin spends longer time in receptor.

The simplest picture is that the connection corresponds to a pair of flux tubes. As the connection is broken, the pair has suffered reconnection cutting it to two U-shaped closed flux tubes. When molecule is attached to the receptor, these U-shape closed flux tubes reconnect. The actual situation is of course expected to be more complex but the basic principle would be this.

In this framework psychedelics would be molecules associated with the reaction pathways facilitating the binding of neurotransmitters responsible for building connections to certain parts of the magnetic bodies characterised by passwords defined by collections of cyclotron frequencies corresponding to a hierarchy of space-time sheets. The Josephson frequency associated with the receptor is inversely proportional to h_{eff} . The natural guess is that it corresponds to the cyclotron frequency of the magnetic body part for electron, proton, or some ion associated with it. Josephson frequency should serve as kind of passwords and receptors would be in one-one correspondence with these passwords defining gateways even to the outer space if the value of Planck constant is large enough.

One might be able to test this crazy hypothesis. Pineal gland could still serve as the "third eye" but utilizing large h_{eff} photons. Fishes and birds are able to navigate to their birth places. This mechanism could involve dark electron Cooper pairs at the magnetic flux tubes of Earth's magnetic field generated by visible photons with energies above energy of red light making possible to move along magnetic flux tube: as the direction of flight ceases to be along it and spin direction of cyclotron Bose-Einstein condensate changes, cyclotron transitions induce dark photon emission at energy of visible photons in turn generating visual sensation. This would explain why radiation at MeV frequency leads to disorientation (cyclotron transitions are induced resonantly). This need not be enough. Could also "remote seeing" by pineal gland using the dark light coming along flux tubes (or maybe even active variant of this process by sending light which is reflected back in time direction). What about remote seeing in the "usual" sense of the word: could psychedelics help also in this process?

The role of DMT is especially interesting. Body synthesizes it and pumps it through blood-brain barrier. I learned in private discussion that the experiences induced by DMT are relatively predictable (Terence Mac Kenna has described it as a sudden "dropping" to another world somewhere "below" through some kind of wall.) whereas other psychedelic substances induce rather unpredictable experiences. Could it be that DMT corresponds to a permanent connection to some fixed external magnetic body or to a higher layer of level of personal magnetic body with permanent reconnection to some part other magnetic body? DMT as also other psychedelic substances would

only help to induce the signal as Josephson radiation. This would be analog to the higher probability of remote mental interaction due to pre-bonding. What happens during sleep: is this connection generated during sleep: what about concentration of DMT during sleep in various brain regions.

The transmitter-receptor complex would be naturally associated with the communications to the magnetic body and possible communications from magnetic body as sensory experiences such as psychedelic experiences and mediated by radiation in opposite time direction. Also control commands from magnetic body - assumed to be realized as signals in opposite time direction as compared to sensory signals - are important and a natural assumption is that the commands initiating gene expression enter through genome via flux sheets traversing through DNA: the time scale for gene expression is slow and also other mechanisms are very probably involved. If both genome and cell membrane can (on general grounds it seems that they must do so) send signals in both time directions, the general vision about motor action as time reversal of sensory perception implies that cell membrane receives also control commands. More generally, the complex formed by reacting biomolecules and catalyst could form a complex receiving control commands from the magnetic body. A temporary fusion of a catalyst molecule and of reacting molecules could serve as the analog of the information molecule-receptor complex. The protein Josephson junction associated with this complex would receive in a resonant manner cyclotron radiation from the magnetic body inducing a transition to a state in which the potential barrier preventing the reaction would be lower.

Irrespective of whether one takes seriously the thought game leading to this proposal, one must admit that it would provide deep for the notion of "information molecule".

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