"Applied biophysics of activated water" and the basic mechanism of water memory in TGD framework

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1 Introduction

A considerable progress has occurred in the understanding of TGD inspired theory of consciousness and quantum biology during the first half of 2013. I have not however included separate sections about this progress since other chapters of "TGD Inspired theory of consciousness" already contain the relevant material. A detailed representation of the recent vision about TGD inspired theory of consciousness [K10] is recommended for the reader interested in details and various philosophical problems and their solutions in TGD framework. Also the chapter about the relationship between biophotons and dark photons is highly recommended.

The new picture allows also much better understanding of quantum biology. The work during the first half of 2013 has allowed to develop in detail several ideas about the role of the magnetic body. Magnetic flux tubes serve as correlates for the formation of quantum coherence and directed attention. The phase transitions changing the value of $\hbar_{eff}$ leading to a change of flux tube length and the reconnections of the flux tubes play a key role in bio-catalysis. The dark photons propagating along MEs parallel to the flux tubes make possible resonant interactions between the entities at their ends and the proposed view about sensory, memory, and cognitive representations relies on hypothesis that the braiding of flux tubes defines negentropically entangled systems representing information which is read consciously and non-destructively in good approximation by using interaction free quantum measurements. Dark photons transform to ordinary photons in energy conserving manner and biophotons are identified as outcome of this process.

With this background one return to the old question "What is the exact mechanism of homeopathic healing?". I have considered already earlier answers to this question but they have not been completely convincing. It turns out that one manages to add the missing piece to the puzzle by making the simple question "What is the molecular cause of illness and how homeopathic remedy eliminates it?". Amusingly, I could have identified this piece for years ago but for some reason did not pose the correct question.

The resulting model of homeopathic healing is amazingly simple and at the same time a universal model of bio-catalysis. The entity mimicking the invader molecules "steals" its cyclotron frequencies by varying the thickness of magnetic flux tube and thus magnetic field strength and cyclotron frequency until reconnection with the molecule's magnetic body becomes possible and fusion to single quantum coherent system occurs. In TGD inspired theory of consciousness this process corresponds to directed attention and conscious recognition of the presence of the invader molecule. After this the mimicking entity freezes the thickness of the flux tubes in question becoming thus capable of mimicking the invader molecule and attach to the receptors of the invader molecule and steal the attention of the host organism and induce healing.

The results summarized in the book Applied Biophysics of Activated Water of Vysotskii et al [I3] provide a test bench for the proposal and allow to formulate it in a more detailed manner. The basic message of the book is that the activation process yields water with anomalous physical properties including water memory and having highly non-trivial - in general positive - effects on living matter. The identification of activated water as ordered water appearing in cell interior is proposed.

This and the general features of the activation process inspire the question whether the analog of the activation process might have taken place during pre-biotic evolution and generated ordered water making DNA stable. Molecular mimicry making possibly immune system would have emerged at the same step and meant also the emergence of symbolic representations. Also the pairs formed by receptor molecules and molecules attaching to them would have emerged at this crucial step when dark matter enters the game. One of they key questions is whether it is dark water molecule clusters or dark DNA that performs the mimicry of various molecules. The results of the book lend support for the model based on dark DNA.

1.1 The anomalies of the ordinary water

It is well-known that ordinary water is characterized by a larger number of anomalies and the existing standard physics models can at best can provide parametrization of the findings but cannot really explain the anomalies. The tough challenge is to not only predict the physical properties (mechanical, electromagnetic, spectral) of water but also to understand the effects of the activation of water on these properties plus the effects of aactivactivated water on living organisms.

The authors describe so called clathrate model introduced already by Pauling. The assumption is that water molecules form tetrahedron like structures having at its vertices dodecahedrons built out of water molecules. This clustering means that the system can be seen as a two phase system consisting of these clusters and "free water".

The key challenge is to understand the relaxation times for various changes of water induced by say electromagnetic fields. The general order of magnitude for the relaxation of mechanical changes is given by so called Drude time, which is about 10^{-13} seconds according to quantum mechanics and thermodynamics. The duration for the changes induced by activation are measured in days to that the discrepancy is 18 orders of magnitude: quite a challenge for a theoretician refusing to consider the possibility that biology and even the physics of water might involve new physics. An interesting

observation is that in TGD framework the values of $\hbar_{eff}/\hbar$ can have even order of magnitude of order 10^{18}. Note that the time period associated with photons with 2 eV energy is $.2 \times 10^{-14}$ seconds: this is by a factor $1/50$ shorter than Drude time.

1. Could Drude time τ_D be scaled up like $\hbar_{eff}$? This is not possible. Drude time is thermodynamical parameter: essentially the time $\tau_D = a/v_{th}$ taken for proton to move distance of order interatomic distance $a \sim 1$ Angstrom with thermal velocity $v = \sqrt{2T/m_p}$. Drude time does not depend on Planck constant so that the scaling $\hbar \to \hbar_{eff} = N\hbar$ does not affect τ_D. Some other time scale should characterize the stability and duration of the structures responsible for water memory. Moreover, these structures need not be made of ordinary water molecules. If so, dark protons - giving rise to what I have called dark DNA, RNA,... - and their magnetic bodies define an a building brick of the needed structures. The earlier proposal inspired by anomalous stoichiometry of water in atto-second time scales indeed is that dark DNA sequences are formed in water.

2. An interesting observation relating to τ_D is that apart from a numerical factor of order one it happens to correspond to a photon energy of $.041$ eV, which is somewhat below the value of electrostatic energy associated with the membrane potential (and also the energy of thermal photon in physiological temperature). In TGD inspired biology cell membranes are Josephson junctions for electronic super-conductor and the model of high T_c superconductor predicts that the p-adic length scale $L(151) = 10$ nm defining cell membrane thickness are associated with both high T_c and bio-super-conductivity. The so called Josephson time defining the fundamental period of Josephson radiation given by $\tau_J = 1/f_J = \hbar_{eff}/ZeV$ and scales like $\hbar_{eff}$, and can therefore be very long. Also cyclotron times characterizing magnetic bodies are very long as compared to Drude time. Could these time scales replace Drude time?

3. Activated water is reported to contain polarized layered structures. The proposal is that activated water is actually ordered water appearing inside living cell. Living cell is filled by membrane like layered structures of thickness given by $L(151) = 10$ nm with voltage over the membrane given by membrane potential. Could the polarised layeres of activated water be predecessors of cell membranes? Could Drude time be replaced with the fundamental period of Josephson radiation given by $\tau_J = 1/f_J = \hbar_{eff}/ZeV$ and by cyclotron times $\tau_c = 1/f_c$, $f_c = ZeB/2\pi m$ depending on charge and mass of charge superconducting object?

4. The electric field over cell membrane is very strong and one can argue that so strong an electric field cannot prevail in water. This might be the case. The problem could be however circumvented by assuming that the layers are thicker but have same voltage over them.

1.2   Basic notions related to water activation

In the second chapter authors discuss the basic conceptual framework behind water activation. They introduce the notions of fractalization, complementary, and the existence of a lattice like structure formed by membranes that act as barriers.

1. The notion of fractalization is rather easy to understand. Fractal growth reducing to a scaling of the overall size is basic example of this. The basic question concerns the mechanisms making possible fractal growth, and the replication of existing basic structures is a natural basic mechanism. For a layered structure this would mean the division of layer two two thinner layers, which then grow to the original size. This kind of mechanism might be at work also in the activation of water and in manufacture of a homeopathic remedy.

2. Complementary remained somewhat fuzzy notion to me. It is stated that it means minimization of contradictions: this brings to my mind Marxist philosophy and Hegelian dialectics. What comes in my mind are spin glass like systems characterized by large degeneracy of ground states with same energy. In TGD framework the vacuum degeneracy of Kähler action strongly suggests 4-D variant of spin glass degeneracy.

3. Biology is full of lattice like structures formed by membranes dividing the world into interior and external parts and serving as barriers. Cell mebranes and endoplasmic reticulum [I1] inside cell are basic examples of this kind of structures.

1.3   MRET

MRET is a shorthand for Molecular Resonance Effect Technology used to activate water. Reader is encouraged to consult the book to get more detailed view about MRET.

1. Activation process involves irradiation of a cylinder containing polymer compound using optic pulses with frequency varying in ELF range 7-8 Hz arriving in vertical direction from above. One could also speak about slow modulation of visible light beam using ELF frequency. The cylinder contains transversal magnets generating magnetic fields inside the polymer compound. The vessel containing the water is below the cylinder.

2. The cylinder containing a complex polymer compound characterized by fractal volumetric matrix. This structure consists of linear polymers in parallel giving rise to lattice like structure. The polymers are liquid crystals and piezo-electrics transforming electromagnetic radiation to mechanical oscillations and vice versa. Epoxy is mentioned as an example of a polymer used in activation.

   There are three horizontal magnets inside the cylinder. The value of the magnetic field inside the polymer varies but is at most of order 100 Gauss. At distance of about 3 cm from the polymer the field in water has order of magnitude of 10 Gauss and is reduced rapidly with distance. In the approximation as a sum of three dipole fields created by horizontal magnets the field decreases as $1/r^3$ where r is the distance from the dipole approximating the three parallel horizontal magnets. In the first rough approximation the field lines of the magnetic field are horizontal in the water sample. In TGD framework the topological quantization of the magnetic fields is an important additional factor and could be highly relevant for understanding how the layered structure of the polymer is transferred to that of the activated water.

3. The structure of the polymeric compound is rather complex. The geometric structure is that of a fractal volumetric matrix - as authors state it. The structure contains nano-rings forming larger rings with 10 nm size scales and these in turn form larger rings. The sizes of the larger rings are reported to vary from 100 nm to 1000 nm. The polymer contains also various metal ions. The field patterns generated or modulated by this structure - in particular magnetic fields - should reflect the structure itself and could transfer some of it to the structure of the activated water.

2   Physical effects of activation and biological effects of activated water

2.1   Physical effects of the activation

The book reports the effects of the varaiation of various parameters on the properties of the activated water. Some variable parameters are the duration of the activation and the storage time. The general observation already mentioned and in blatant conflict with the quantum theory prediction is that the changes can last for days.

1. Long range correlations lasting for even days are induced in water. Layered structures consisting of polarized layers are generated with strong hydrogen bonding inside layers which have very weak mutual couplings. Mechanical, electrical, and spectral properties of water are affected. Viscosity can be anomalously low: this could be understood if the layer like structures having very weak coupling between them flow as almost independent units without mutual viscosity. Conductivity is reduced: for currents orthogonal to the layers this could be understood if charge carriers tend to be confined inside layers. Di-electric constant is modified at low frequencies. Long lasting pH oscillations of activated water are observed.

2. It is stated that that the stoichiometry of water is affected but details are not given. It is mentioned that the effect on water is probably on protons of the water atoms and the lattice structure formed by them. It is stated that the effect of activation is also on proton spins and currents associated with hexagons of water molecules.

3. The activation process is known to generate ELF em fields with frequency spectrum in the range $[f_1, f_2] = [.1\ Hz, 1\ kHz]$. The mechanism is not understood but the properties of the polymer compound must be partially responsible for this.

2.2 The biological effects of activated water

Most chapters of the book are devoted to the biological effects of the activated water. In general, the effects tend to be positive from the point of view of patient.

1. The effect of the activated water on plants - especially vegetables and crops - is studied. The activated water tends to promote their growth. One interesting finding is that activated water inhibits the growth of callus.

2. The effects on microbiological systems is investigated. The effect on cell cultures and cell cultures involving multifunctional symbiosis are studied. Both aerobic and anaerobic systems are considered. A general observation is that reductase activity grows. Reductase is an enzyme catalysing reductase (oxidation) reaction in which oxidation states of atoms are changed. Simple examples are oxidation of carbon to yield carbon dioxide and oxidation of glucose taking place in respiration. The effect of antibiotics is affected and can either increase of decrease. Bactericidal properties are enhanced: the growth of pathogenic cell cultures is inhibited, and the proposal is that activation could be used to sterilize water.

3. The effects of the activated water on prophylaxis (prevention of diseases) and on oncogenic diseases (cancer) are studied using animal models and cell cultures. It is found that the growth of certain kinds of tumours slows down and the life expectation increases. No negative side effects are found. There are also positive effects on immune system. The number of lymphocytes grows and the index characterizing cytotoxic activity increases. The dependence of effects in parameters like the duration of treatment by activated water and mode of treatment (before or after the incubation).

4. The effects of the activated water on staphylococcus infection are investigated in vivo using mice as an animal and in vitro using staphylococcus cell culture.

The general conclusion is that the treatment by activated water promotes healing, the anti-tumoral effect of lymphocytes with natural killing properties, and bactericidal properties. It inhibits the grows of tumor tissues, lengthens the life expectation of sick animals and prevents the growth of callus tissue. The conclusion is that activated water could have applications in both medicine, biology, biotechnology, and agriculture.

3 The basic ingredients of TGD inspired model of water memory

3.1 Magnetic body and the hierarchy of effective Planck constants characterizing dark matter

1. The notions of magnetic body and flux quantum - in particular flux tube carrying dark matter, and cyclotron frequencies whose collections serve as passwords are basic elements of TGD inspired quantum biology. The contraction of magnetic flux tubes in the phase transitions changing the value of $\hbar_{eff}$ and therefore the length of flux tubes is the first basic process. Reconnection is second basic process allows the magnetic bodies to get in contact and rearrange so that the two distant systems can fuse to single macroscopic quantum system.

2. The formation of connection flux tube is interpreted as a geometric correlate for attention in TGD inspired theory of consciousness and the proposal is that consciousness is present already at the biomolecular level - maybe even at elementary particle level. Reconnection is possible if local magnetic fields and therefore cyclotron frequencies of the two flux tubes are identical so that resonance interaction by dark cyclotron photons follows as a consequence. The tuning of the local magnetic field by varying flux tube thickness would be an essential element in

searching of molecules of environment. The finding of molecule would meana generation flux tube connection and resonant interaction and also consciously experience "sense of presence". After this a shortening of the flux tubes by $\hbar_{eff}$ reducing phase transition could take place and allow biomolecules or even more general entities to get in a contact allowing short range interactions such as chemical reactions. These would be the basic new physics elements in the TGD based description of bio-catalysis.

3. This picture allows also to understand the mechanism of water memory and homeopathy. Suppose that some structures in the water - perhaps water clusters with hydrogen bonds accompanied by flux tubes or dark DNA to be discussed - are able to vary the flux tube lengths of their dark magnetic body and in this manner consciously detect invader molecules. After having identified the invader they cold freeze the length of the flux tube fixed and gain the ability to mimic the biologically essential aspects of the invader molecule coded by its cyclotron frequencies coded in turn by the field strengths constant along flux tubes in the first approximation (this is of course only a simplifying assumption). For instance, they can effectively replace invader molecules in organism in the sense that the receptors usually accepting the invader accept also the fake invaders meaning that invaders loose the attention of the host organism. This could be the basic mechanism of homeopathic healing. The cheating mechanism has many variants since also fake variants of the ordinary biomolecules are possible. Dark DNA actually could be seen as example of this kind of structure.

4. Hydrogen bonds are certainly one factor making water so special. A natural candidate for the flux tube performing mimicry would be a flux tube accompanying hydrogen bond and one could consider the possibility that dark flux tube corresponds to a dark hydrogen bond between dark protons.

5. The original model for the water memory and homeopathic healing was more complex. The idea was that water molecule clusters or dark DNA "steals" the magnetic body of the invader molecule. The idea was that ordered water forms an "ice" layer around the invader molecule and magnetic body of the invader molecule attaches to this. After that the magnetic body associated with the layer would be "stolen". This is however un-necessarily complicated. For biological purposes (ability to reconnect with molecules able to reconnect with the invader) it is enough to steal/copy the cyclotron frequencies and the tuning mechanism makes this possible. The topologies and geometries of the two magnetic bodies can be quite different: only the identical values of local magnetic field is required.

6. One should keep mind open for a great variety of mimicries since dark magnetic body characterizes all ordinary matter systems, and the mechanism of attention making possible conscious recognition of other molecules and their subsequence mimicry is completely general. This would conform with the vision about Universe as a topological quantum computer and with the idea that the basic characteristic of a computer is ability to emulate, mimic. Note however that it requires $\hbar_{eff}/\hbar = N > 1$ and is not possible for ordinary matter: dark matter in TGD sense is required.

3.2   Negentropy Maximization Principle and dark matter hierarchy

In its recent form NMP [K6] is assumed to apply only in the rational intersection of the real and p-adic worlds, which for quantum states means that they are superpositions of pairs with identical entanglement probabilities $p = 1/N$. The number theoretic Shannon entropy indeed makes sense only in this intersection unless one identifies the integer valued p-based logarithm of p-adic norm as p-adic integer. For a generic entanglement one only requires that state function reduction gives rise to a measurement of the density matrix. This assumption implies that the final state is a maximally entangled system involving superposition of N states with identical and obviously rational entanglement probabilities $p = 1/N$.

According to the recent interpretation the hierarchy of effective Planck constants $\hbar_{eff} = N\hbar$ corresponds geometrically to N-furcations for space-time sheets made possible by the failure of the strict determinism of Kähler action and producing physically essentially identical copies of the system. The negentropic entanglement central in TGD inspired biology corresponds to entanglement of two

systems of this kind with density matrix equal to $N \times N$ unit matrix. State function reduction as a measurement of density matrix can lead to this kind of density matrix stable under NMP. By NMP real-to-padic transitions giving rise to cognitive representations can take place only to p-adic sector for which the power of prime dividing N is largest among the prime power divisors and cognition is possible only for large for systems with $N > 1$ and therefore not for the ordinary matter.

Clearly, several ideas are unified: quantum criticality as a presence of N degenerate states realized by space-time sheets of N-furcation, negentropic entanglement, hierarchy of Planck constants, and the idea about life as something in the intersection of real and p-adic worlds ($p = 1/N$ is rational number). Furthermore, the measurement of density matrix automatically leads to exact criticality. In dynamics without state function reduction criticality is approached only asymptotically. Note that in self-organized criticality [B1] the criticality corresponds to a minimum of potential with some flat directions in which the situation is non-deterministic at criticality.

3.3   Dark photons and their production by amplitude modulation

The recent view about TGD inspired theory of consciousness [K10] involves besides dark magnetic bodies also dark photons. Dark photons have $\hbar_{eff}/\hbar = N > 1$. The model for sensory, memory and cognitive representation as realization of the reflective level of consciousness identifies these representations as approximate invariants of quantum jump sequence formed by negentropically entanglement systems defining kind of Akashic records. The approximate invariance is guaranteed by NMP. In ZEO quantum jumps occur alternately at the opposite boundaries of CD and can add additional tensor factors to the negentropically entangled system representing "Akaschic records". The reductions to the opposite boundaries of CD correspond to sensory reception and motor action at the level of brain functioning.

Dark photons make possible a conscious non-destructive reading of the "Akashic records" by interaction free measurement in arbitrarily good approximation. Also dark phonons and more general quanta of wave motion might be involved. Dark photons could be much more general than ordinary acoustic phonons, and the oscillations of string like object connecting two wormhole throats define the fundamental analog of phonon. String world sheets carrying induced spinor fields (right handed neutrino is exception) are indeed a prediction of TGD. Dark photons and phonons might related to the imagination and internal speech which are the two key aspects of cognition. One can also ask whether right and left hemispheres are specialized to utilize dark photons and phonons respectively.

Concerning possible experimental proof of the notion of dark matter in TGD sense, the key question is "How to produce dark matter". I have proposed that dark photons could be produced by low frequency amplitude modulation of high frequency photons. The ration f_h/f_l would be equal to $\hbar_{eff}/\hbar = N$ and should be integer valued, which gives strong constraint. The theoretical justification of the mechanism is not yet completely satisfactory.

3.4   Dark DNA

I ended originally to the notion of dark DNA by what looks a pure accident. I considered a model for what dark proton (or nucleon) could be, and had in mind that nucleus would be a string of dark nucleons as a generalization of nuclear string model [K7] developed already earlier. The surprising finding was that the states of dark proton in the simple model correspond in a natural manner to DNA, RNA, tRNA, and amino-acids: in case of tRNA the number of states is predicted to be smaller than 64. Even more, vertebrate genetic code as an assignment of DNA codons to amino-acids followed from simple assumptions. This raised the question whether genetic code and the counterparts of biomolecules could be realized already at the level of dark nuclear physics as sequences of dark protons or neutrons or both. If this were the case, then biological life could be seen as a kind of chemical emulation of the life at this more fundamental level.

The natural question is whether the dark variants of biomolecules can be transformed to their ordinary counterparts and vice versa by processes analogous to transcription and translation. If so, one can consider a possibility of R&D department of biology performing experimentation with dark variants of biomolecules. The biological evolution in this framework would not be due to a random mutations followed by selection performed by environment but a guided and controlled process analogous to what happens in the evolution of technology. Basically the question is about whether the Nature so silly that it decides to develop a highly refined technological product such as computer

by throwing some silicon and metals to jungle and patiently waiting for them to self-organize to a computer.

The basic unit of dark DNA would be proton. The states of single dark proton would corresponds to DNA, RNA, ..etc. One can imagine dark DNA double strands and the finding Hu and Wu [J1] that proton pairs with distance of 10 nm associated with opposite lipid layers of cell membrane correspond to an analog of cyclotron frequency in EEG range, suggest that the pairs of protons located at opposite sides of cell membrane give rise to dark DNA double strands. The protons would be connected by a "short" flux tube and also a "long flux" tube outside the structure is needed to obtain closed flux lines: this could be of course avoided by assuming wormhole flux tube consisting of parallel flux tube space-time sheets extremely near to each other and having same M^4 projection and carrying opposite fluxes. If the "long" portion of the flux tube is present as assumed in the model of "Akashic records", it carries the cyclotron Bose-Einstein condensate allowing to consciously read the records realized in terms of the braiding of the short portions of flux tubes. This is certainly not the only possible option. The flux tube portions connecting dark protons to ordinary DNA could also carry the braiding serving as a correlate for the negentropic entanglement. This alternative conforms with the vision about DNA as topological quantum computer [K2].

The stability of the highly charged sequence of dark proton pairs is of course a problem. The lipids could carry the stabilizing charge: phosphates serving as the energy carrying part of ATP are in general negatively charged and this could stabilized the system formed in this manner. Note that also DNA double strand is negatively charged due to the presence of phosphates: the stability is in fact a challenge for a theoretician. One possibility is that dark protons with large value of Planck constant participate in the stabilization of the double strand.

The anomalous stoichiometry of water at atto-second time scale could be due to the formation of dark sequences of protons. Suppose that the manufacturing of the homeopathic remedy produces ordered water having layered structure and that these layers are analogous to cell membranes and that double dark DNA strands are formed at the both sides of the layer. Coulombic stability is an important factor. For arrangement of type NP-NP-NP... the oppositely charged neighboring outer surfaces of the layers would stabilize the system. For PN-NP double layer the stabilization might be due to the presence of dark protons attached to the two outer surface of type N. In this case one would have a system analogous to two lipid layers. Note that also negative charges, presumably electrons would be required to stabilize the system.

If one takes homeopathy seriously, one can deduce an argument favoring not only dark DNA but requiring also its evolution. The problem is that continual dilution of the water in the manufacture of the homeopathic remedy leads also to an extremely low density of the entities able to mimic the magnetic body of the molecules initially present. This is true also for dark DNA unless dark DNA is able to replicate or at least transcribe to dark RNA in turn transcribing to dark DNA. The replication mechanism could be similar to that of ordinary DNA and rely on the reconnection of flux tubes.

What could then be the role of agitation in the manufacture of the homeopathic remedy?

1. The mechanical agitation accompanying dilution could feed the energy forcing the replication of dark DNA. This process could be accompanied by the division of water layer to which dark DNA double strand is associated to two layers which eventually grow to the original size. Clearly, the division of the water layer involving replication of dark DNA would be the analog for cell division.

2. Could the mechanical agitation serve as an "environmental catastrophe" driving the evolution of dark DNA (and possible other dark variants of biomolecules evolving in the process). Could this evolution correspond to a gradual increase of $\hbar_{eff}$? This can be the case if the dark photons involved can have also sub-thermal energies. In this case the evolution would mean increase of the energy of dark protons so that it would be eventually that of ordinary visible photons. The proposal that amplitude modulation produces dark photons would however suggest that the value of $\hbar_{eff}$ is large from beginning.

   Of course, it is also possible that energy conserving transformations of dark photons to dark photons $\hbar_{eff} = N_1\hbar$ such that N_1 divides N are possible. One must be very cautious in making strong conclusions since the the value of N for dark photons is very large and need not be identical for that for dark protons for which $\hbar_{eff} = N_p\hbar$ is expected to be roughly the ratio of

cell membrane thickness to Compton length of ordinary proton and much smaller. It could well be that N_p is relatively small factor of N.

3. There is an interesting connection with Mersenne primes. The integers $P_n = (2^n - 1)2^{n-1}$, where $M_n = 2^{n-1}$ Mersenne prime, are known as perfect numbers which by definition are sums of their proper divisors: the number $P_3 = 28 = 1 + 2 + 4 + 7 + 14$ is an example. P_n contains very large number of divisors as is clear from the presence of a power of 2. Also Mersenne prime itself divides perfect number. Hence, if one wants to produce a dark system with very large number of different values of Planck constant, $N = P_n$ is the proper choice. The number of divisors proportional to power of 2 is large also for the modulus of the analog of perfect number associated with Gaussian Mersenne.

What is especially interesting from the point of view of p-adic length scale hypothesis is that the values of Planck constant 2^k up to $k = n - 1$ are obtained. For $M_7 = 127$ powers of 2 put to $2^6 = 64$ are obtained and this might relate to genetic code. For M_{127} powers up to 2^{126} are obtained: this Mersenne corresponds to the proposed memetic code [K4].

Mersenne primes are the most important p-adic primes in TGD framework and label various scaled variants of hadron physics, weak gauge bosons, as also electron and tau lepton. Muon is labelled by Gaussian Mersenne. Could it be that Mersenne primes are favored because they give rise to maximally complex dark matter systems giving rise to cognition?

3.5 What replication could mean?

One can consider several meanings for replication central for living system.

1. Clays have been proposed by Cairns-Smith [I2] as a candidate for predecessors of life. The reason is that silicon which is the building brick of clay minerals has a chemistry similar to that of carbon and allows very rich repertoire of polymers. The division of clay layer to two layers growing after that to the original size could be seen as very simple replication mechanism. Similar mechanism might apply in ordered/activated water containing water layers.

2. The replication of dark DNA has been already mentioned. It could be analogous to production of dark RNA in which only second strand serves as a template or genuine replication in which both strands replicate. The description would be in terms of reconnection the dark protons having flux loops come between the two dark DNA strands and reconnect with the flux tubes connecting the dark protons of strands. At the same time the analogs of valence bonds in longitudinal direction giving rise to dark nucleus as nuclear string emerge. After this a de-reconnection takes place and one obtains the analog of RNA strand besides the original DNA. A more complex process involves the same process for both strands and corresponds to DNA replication.

Note that the intensity of the flux associated with flux tubes must be same for all dark DNAs coding same dark amino-acid and for dark DNA coding corresponding RNA. Therefore dark variants of fundamental biomolecules correspond to frequencies. If also ordinary biomolecules are coded by same frequencies, the analogs of transcription and translation processes between ordinary and dark variants of biomolecule become possible by reconnection-contraction mechanism.

As noticed, the replication of dark DNA could induce the replication of corresponding layer, say, by inducing Coulomb instability.

4 TGD inspired model for homeopathy

4.1 Does homeopathic remedy mimicking the pathogenic molecules prevent the chemical reaction causing the illness?

After a work of more than decade after the realisation that homeopathy might be understood in TGD Universe, I still find that I have not given an absolutely convincing answer to the question "What is the exact mechanism of homeopathy?". The basic rules is that "like cures alike". Why should this be the case? Let us go our arguments through once again.

1. Certainly the imprinting of water using molecules causing the illness - call these molecules just I for brevity - must be an essential part of the healing mechanism. The imprinting means imprinting of water with some frequencies in the low frequency spectrum of I. The TGD inspired idea is that the magnetic body of appropriate water cluster or even dark nucleon sequence representing DNA sequence, call this entity I^*, is able to mimic I in the sense that its cyclotron frequency spectrum is same.

2. This in turn strongly suggests that the molecules in the organism to be healed - call them P - have a long range interaction with molecules I induced by dark photons with cyclotron frequencies but having energies above thermal threshold. The interaction involves a formation of a magnetic flux tube accompanied by a parallel topological light ray/ "massless extremal" (ME) along which dark photons at specific resonance frequencies propagate and induce resonant interaction between P and I. Thus both the formation of flux tube bridge and the resonant interaction made possible by it, would be essential for the homeopathic healing to take place. In fact, in TGD inspired theory of consciousness [K10], the formation of resonating flux tube connections makes possible the quantum coherence for the combined system $I + P$ and serves as a correlate for attention between I and P.

3. The presence of the entities I^* able to mimic the cyclotron frequency spectrum of I and forming resonant flux tube bonds with molecules H is however not enough to explain the healing effect (I have already considered some answers but they do not convince me). To understand this, one must be able to understand how I causes the illness. The answer of the standard medicine is that the mechanism is chemical and thus requires contact interaction between I and P. It is easy to believe this. Standard medicine also tells that in order to prevent the chemical interaction between I and P, one must use some medicine molecules M, preventing this chemical interaction. It is easy to believe also this.

   In TGD Universe there is indeed a very natural mechanism preventing the chemical interaction between I and P. The reduction of the value of the effective Planck constant associated with the flux tubes connecting I and P leads to a contraction of the flux tube length (proportional to $\hbar_{eff}$). This indeed makes possible a chemical contact interaction between both I and P causing the illness. In fact, I have proposed this mechanism as a completely general mechanism of catalyst action allowing biomolecules to find each other in the the dense bio-molecular soup. But this holds true also for I^* and P! Using terms of "molecular psychology" , the entities I^* mimicking I steal the attention of molecules P so that molecules I cannot cause the illness anymore!

This indeed looks extremely simple and natural and thus also convincing. What is important is that the proposed mechanism is not in conflict with standard medicine: it only makes possible the miracles of bio-chemistry and provides a completely new mechanism of healing. It is easy to imagine that a new kind of medicine using only water imprinted by the cyclotron frequency spectra of molecules responsible for the illness. This medicine would be completely free of the negative -basically chemical - side effects of the ordinary drugs. This mechanism would also use all the knowledge gained by ordinary biochemistry based medicine: if the relevant molecule I is known, it can be used to imprint water to get I^*.

Also the effect of vaccines could rely on the "like cures alike" mechanism albeit in different form. Now the molecules or organisms - call them just B - causing the disease would be injected directly into the body rather than water. Water memory could give rise to a mimicry of B:s and give rise to primitive immunity. A more refined mechanism proposed earlier would involve dark DNA mimicking B:s and translating to ordinary DNA sequences coding for proteins able to catch B:s by the same flux tube mechanism.

The proposed mechanism of homeopathic healing leaves open the exact mechanism behind the cyclotron mimicry. The entities I^* could be water clusters with magnetic bodies mimicking those of I, they could be water clusters which have stolen the magnetic bodies of I, or they could be even dark DNA accompanying water molecules and able to mimic I. Of course, the least science fictive option is that the possibly existing dark DNA couples only with ordinary DNA by the flux tube mechanism.

Above I have defined illness as something caused by the detrimental chemical activities induced by invader molecules attaching to the receptors at cell membranes. This definition is too restrictive since it

excludes genetic diseases. In this case, the removal of the cause of disease requires genetic engineering. If the universal reconnect-and-contract mechanism makes is possible to transcribe dark DNA to DNA, a new kind of genetic engineering can be imagined since the dark variants of biomolecules connected by flux tubes to cell interior could leak through the cell membrane serving as a barrier for larger biomolecules. A mechanism replacing a portion or damaged DNA with an undamaged one would be needed besides reconnect-and-contract mechanism. Also this mechanism could use reconnect-and-contract as a basic building brick it is easy to see by considering single DNA nucleotide as a simplified example. These mechanisms would also transform evolution by random mutations in presence of environmental pressures to a guided and controlled process involving experimentation with dark DNA defining kind of virtual DNA. A slight-modification of this mechanism would transform damaged DNA portion to intron and add near it the transcription of dark DNA as exon. To transform exons to introns one must one understand the distinction between them. TGD inspired proposal is that exons carry an electric field parallel to them whereas for introns there is no electric field. The control of this field - perhaps by manipulating electric charges generating it - is what comes in mind.

The interpretation of biophotons as decay products of dark photons in energy conserving phase transition $\hbar_{eff} \to \hbar$ [K8] suggests that the dark photons involved with the communications have rather large value of $\hbar_{eff}$ given by $\hbar_{eff} = f_h/f_l$. The simplest working hypothesis is that dark photons have same energy spectrum as biophotons. The prediction iwould be that biophoton spectrum from a homeopathic remedy - in particular its fluctuations - should correlate with the spectrum of the cyclotron frequencies. A weaker hypothesis is that the energies of dark photons are above thermal energy at physiological temperature.

4.2 What is the role of agitation in the preparation of the homeopathic remedy?

What could then be the role of agitation in the manufacture of the homeopathic remedy?

1. The mechanical agitation accompanying dilution could feed the energy forcing the replication of dark DNA. This process could be accompanied by the division of water layer to which dark DNA double strand is associated to two layers which eventually grow to the original size. Clearly, the division of the water layer involving replication of dark DNA would be the analog for cell division.

2. Could the mechanical agitation serve as an "environmental catastrophe" driving the evolution of dark DNA (and possible other dark variants of biomolecules evolving in the process). Could this evolution correspond to a gradual increase of $\hbar_{eff}$? This can be the case if the dark photons involved can have also sub-thermal energies. In this case the evolution would mean increase of the energy of dark protons so that it would be eventually that of ordinary visible photons. The proposal that amplitude modulation produces dark photons would however suggest that the value of $\hbar_{eff}$ is large from beginning.

   Of course, it is also possible that energy conserving transformations of dark photons to dark photons $\hbar_{eff} = N_1\hbar$ such that N_1 divides N are possible. One must be very cautious in making strong conclusions since the the value of N for dark photons is very large and need not be identical for that for dark protons for which $\hbar_{eff} = N_p\hbar$ is expected to be roughly the ratio of cell membrane thickness to Compton length of ordinary proton and much smaller. It could well be that N_p is relatively small factor of N.

3. There is an interesting connection with Mersenne primes. The integers $P_n = (2^n - 1)2^{n-1}$, where $M_n = 2^{n-1}$ Mersenne prime, are known as perfect numbers which by definition are sums of their proper divisors: the number $P_3 = 28 = 1 + 2 + 4 + 7 + 14$ is an example. P_n contains very large number of divisors as is clear from the presence of a power of 2. Also Mersenne prime itself divides perfect number. Hence, if one wants to produce a dark system with very large number of different values of Planck constant, $N = P_n$ is the proper choice. The number of divisors proportional to power of 2 is large also for the modulus of the analog of perfect number associated with Gaussian Mersenne.

   What is especially interesting from the point of view of p-adic length scale hypothesis is that the values of Planck constant 2^k up to $k = n - 1$ are obtained. For $M_7 = 127$ powers of 2 put

to $2^6 = 64$ are obtained and this might relate to genetic code. For M_{127} powers up to 2^{126} are obtained: this Mersenne corresponds to the proposed memetic code [K4].

Mersenne primes are the most important p-adic primes in TGD framework and label various scaled variants of hadron physics, weak gauge bosons, as also electron and tau lepton. Muon is labelled by Gaussian Mersenne. Could it be that Mersenne primes are favored because they give rise to maximally complex dark matter systems giving rise to cognition?

5 TGD based view about the activation of water

There are several questions to be answered if one wants to understand what happens in the activation of water and the properties and effects of the activated water. Could the model for water memory and homeopathy [K5] apply to water activation and to the biological effects of the activated water? Could the water produced in homeopathic process be actually activated water (this should be easily testable)? Could the observations allow a more detailed model of homeopathy? Could the emergence of ordered water inside cell interior stabilizing DNA be understood as a process in which the environment manages to mimic the activation process and activates ordinary water. In the following these questions are considered in TGD framework.

The basic TGD based claims about activation process inspired by previous considerations are following.

1. Amplitude modulation produces dark photons and magnetic flux tubes containing dark particles and having at their ends dark protons. The emerging values of $N_i = \hbar_{eff}/\hbar$ are factors of corresponding integer defined by the ratio of modulated and modulating frequencies which should be integers with maximal number of factors to obtain optimal situation. Perfect numbers associated with Mersenne primes are optimal in this respect. Also the analogs of perfect numbers defined as moduli of $P_{G,n} = ((1 + i)^n - 1)(1 + i)^{n-1}$ for Gaussian Mersennes $M_{G,n} = (1 + i)^n - 1$ could be optimal choice since the modulus is proportional to $2^{(n-1)/2}$.

2. Activation produces ordered water with layered structure and dark DNA strands consisting of sequences of dark protons at opposite sides of the layer are formed. The flux tubes associated with them can have varying thickness and this makes possible conscious recognition (at level of dark DNA) of the external molecules via reconnection process and copying its cyclotron frequency. This in turn makes it possible for the molecule to mimic the invader molecule and attach to the same receptors as invader. This would be a fundamental biochemical process involving conscious experience and also intelligence!

5.1 Does the activation process generate dark photons?

As explained, the activation process involves irradiation of the polymer cylinder in vertical direction from above using optic pulses with frequency varying in ELF range 7-8 Hz in the arrangement described. One could also speak about slow modulation of visible light beam using ELF frequency.

I have proposed this kind of modulation process as a manner to produce dark photons with large value of $\hbar_{eff}$ given by $\hbar_{eff})/\hbar = N = f_h/f_l$ where f_h and f_l are the high and low frequency respectively. I have also proposed that the process transforming high frequency ordinary photons to ordinary photons with the same energy could be essential also for the imprinting of water by certain frequencies [J2]. Gariaev's finding about transformation of visible light to radio-waves could also take place via this process: now DNA would produce the low frequency radio-wave modulation modulating visible light beam and in this manner produce dark radio photons having biological effects. Biophotons would result in the reversal of this transformation for large $\hbar_{eff}$ photons. There is experimental evidence for a correlation between fluctuations of EEG spectra and biophoton spectra so that EEG photons would represent one example of dark photons [K8, K9].

The frequency band for ELF frequencies contains Schumann resonance $f_S \simeq 7.8$ Hz. This might not be an accident. In TGD inspired theory of consciousness self hierarchy is a basic prediction and "Mother Gaia" as a higher level in the self hierarchy corresponds to the Earth's topologically quantized magnetic field. The flux quanta of personal magnetic bodies would reside inside the magnetic flux quanta of Mother Gaia and this would give rise to interaction between Mother Gaia and individual conscious entities.

Besides the Earth's magnetic field also the magnetic field created by the magnets inside polymer is present in the water sample and a good guess it has a crucial role in water activation. These flux quanta need not however correspond to the flux tubes responsible for the water memory. Rather, flux sheets could be in question and they could define templates for the layers of the ordered water.

The polymer compound has fractal layer structure and contains nano-rings, rings or rings with size 10 nm, and rings made of these having sizes in the range 100-1000 nm. This length scale hierarchy brings in mind the existence of as many as 4 Gaussian Mersenne primes $M_{G,n} = (1+i)^n - 1$, $n = 151, 157, 163, 167$ with corresponding p-adic length scales in the range $L(151) = 10$ nm $-L(167) = 2.5$ μm. $L(151)$ corresponds to cell membrane thickness and also to the thickness of the coil formed by DNA. This scale appears repeatedly in biology. Also TGD inspired model for high T_c superconductivity involves this scale. The length scales corresponding to $L(k)$, $k = 157, 163, 167$ are obtained from $L(151)$ by scaling with $2^{(k-151)/2}$. Note that $L(167) = 2.5$ μm corresponds roughly to the size of cell nucleus.

5.2 Effects on stoichiometry of water as indication for the presence of dark protons

It is stated that the stoichiometry of water is modified in the activation process but it is not stated what this actually means. The natural guess that this change reflects the transformation of protons to dark protons. I began to consider seriously the notion of hierarchy of Planck constants as I learned about the observations that in atto-second time scales the stoichiometry of water is anomalous: water behaves as $H_{1.5}O$ rather than H_2O in neutron diffraction and electron scattering as if $1/4$ of protons were dark and not visible to the incoming neutron and electron.

5.3 Generation of ELF em fields in the activation process

The activation process is known to generate ELF em fields with frequency spectrum in the range $[f_1, f_2] = [.1 \ Hz, 1 \ kHz]$. Their presence can be deduced from the modification of the di-electric constant in this frequency range. The mechanism is not understood but the properties of the polymer compound must be partially responsible for this.

The TGD based explanation could be in terms of amplitude modulation producing dark photons with frequencies in the range 7-8 Hz, whose interaction with the magnetic field of the polymer compound produces other dark photons as cyclotron photons with large $\hbar_{eff}$ and energy proportional to $E_c = \hbar_{eff} \times ZeB/M$, where Z and M are charge and mass of the ion. For instance, the energies of various dark ions at the possibly dark magnetic flux tubes of the magnetic field created by the system are in the frequency range considered.

An alternative interpretation is encouraged by the TGD inspired model of water memory and homeopathy [K5] involving dark proton sequences as representations of DNA, mRNA, tRNA, and amino-acid sequences inspired by the observation that the states of dark proton are in one-one correspondence with states of these basic bio-polymers and that vertebrate genetic code follows naturally. The finding of Hu and Wu [J1] in turn leads to the proposal that dark DNA sequences are realized as dark DNA double strands assignable to cell membrane which is also layer like structure. Could it be that the water layers carry parallel pairs of dark DNA strands and that these generate the radiation in the frequency range $[f_1, f_2] = [.1 \ Hz, 1 \ kHz]$? These dark DNA sequences would give for the water its ability to mimic various molecules by reproducing their cyclotron frequency spectrum. This would require only the tuning of flux tube thickness to tune the value of magnetic field dictating the value of the cyclotron frequency.

The emergence of frequencies relevant to biology might be due the fact that all four biologically important Gaussian Mersennes might be involved with the fractal hierarchy of the rings. In any case, the first guess is that these frequencies are associated with dark photons with energy of visible photon (with energy say 2 eV for red light) and Planck constant varying in the range $\hbar_{eff}/\hbar = N \in [f_h/f_2, f_h/f_1] = [5 \times 10^{11}, 5 \times 10^{15}]$.

The notion of imprinting of water by frequencies of incoming radiation is essential in the attempts to understand water memory [J2]. Imprinting means that water generates radiation with frequencies used in imprinting and in this sense remembers them. Homeopathic effects can be indeed produced by using only certain imprinted frequencies characterizing the molecule causing the effects on water and stored in computer memory.

This raises some questions. Are the ELF frequencies in question imprinted from those produced by the polymer? Do they correspond directly to cyclotron frequencies assignable to the magnetic field created by it? Does also the homeopathic treatment of water produce activated water with detectable layer structures?

5.4 Could the analog of activation process be involved with the emergence of ordered water in cell interior?

Suppose that the activated water is indeed ordered water as the authors of the book suggest. One of the basic steps of evolution is the formation of ordered water in cell interior stabilizing DNA. Could the structure of the activation process allow to guess what might have happened at this crucial step?

1. Earth's magnetic field should have played important role in the prebiotic evolution and the Schumann resonance frequency depending only on the inverse of the radius of Earth in the first approximation should correspond to the ELF frequency used in the activation process. Solar photons would replace the visible photons used in the activation process. A good guess is that Schumann resonance produces an ELF modulation of the visible light from Sun and produces ELF radiation with large value of $\hbar_{eff}$. If one takes seriously the proposed model of Expanding Earth, the radius of Earth would have been by a factor of $1/2$ smaller than its recent radius during primordial period (and therefore equal to the radius of Mars) so that Schumann resonance frequency would have been around 15.6 Hz .

2. What could be the counterpart of the polymer compound? It is difficult to imagine any other candidate than polymers of Si, which is chemically very similar to carbon. Silicates and clay minerals represent basic example of this kind of polymer structure and have been proposed by Cairns-Smith [I2] to be a predecessor of life. For instance, the shales of clay can replicate by dividing into two and this replication mechanism might have preceded more refined replication. During the primordial states the replication of layers of clay might have induced the replication of flux sheets in 1-1 correspondence with them.

3. If ordinary photons are transformed to dark photons, they can penetrate Earth's crust through without difficulties. This brings in mind also the TGD inspired vision about the evolution of life in water reservoirs inside Earth, where it is sheltered from cosmic radiation and meteoric bombardment [K3].

4. One can imagine that the irradiation producing dark photons and the presence of the Earth's magnetic field (and possible additional magnetic field) could tranform the water to ordered water and provide it with the ability to store memories. If the dark variants of biomolecules are generated by the proposed mechanisms, water would learn to recognize and mimic various molecules. At this step also pairs formed by receptors and molecules binding to them having same cyclotron frequencies and able to attach together and react in the case that the surface geometries are consistent would have emerged.

5.5 Does the activated water inherit the layered fractal structure of the polymer compound?

There are several questions to be answered.

1. The complex structure of the polymer compound could be reflected in the structure of light emitted by it as a response to the incoming light. If the photons transform to dark photons in amplitude modulation, and if the polymer compound is ordinary matter, its structure need not be reflected in the structure of the spectrum of dark photons and basic factor is the decomposition of $\hbar_{eff}/\hbar = N$ to integers defining the spectrum of the $\hbar_{eff}/\hbar$. This is quite a strong prediction.

2. Does the thickness of the flux tubes and/or flux sheets emanating from the magnets depend on the magnets only or does the presence of polymer compound modify them? The layered structure of the polymer compound could indeed induce a layered structure of the magnetic field as parallel flux sheets continuing outside the polymer structure and to the ordered water and induce to it a layered structure. The flux sheets would be parallel to the layers of ordered water. If the

flux penetrates as flux tubes, the layers would be generated by some other mechanism and are most naturally be orthogonal to the flux tubes. The experimenters could probably tell what the orientation of the layers is.

Extrapolating to the case of cell membrane, one can ask whether cell membranes and also the complex fractal structure of endoplasmic reticulum corresponds to a magnetic flux penetrating into super conductor of type I near criticality as complex sheet like structure proposed earlier [K1] and whether these flux sheets can be assigned to the Earth's magnetic field.

The intensity of the magnetic field at sheets decreases with the distance from the dipole unless the density of sheets decreases. In an experiment involving rotating magnetic systems the concentration of the magnetic flux to flux walls with constant distance was observed [H1]: this would conform with the idea that flux sheets induce the layered structure of the activated water.

The flux tubes connecting dark protons of dark DNA would be orthogonal to the flux flowing along the flux sheets so that their origin would not be due to the external magnetic field. Of course, protons themselves generate these magnetic field so that this is not a problem. These flux tubes could also carry monopole flux.

3. Are the cyclotron frequencies assigned with the structures of polymer compound imprinted in water? This only requires that the flux tubes possibly emanating from the polymer preserve their thickness. This means obviously deviation from Maxwell's theory where field intensity decreases. For flux sheets the reconnection mechanism does not work.

REFERENCES

Theoretical Physics

[B1] Self-Organized Criticality. http://en.wikipedia.org/wiki/Self-organized_criticality.

Fringe Physics

[H1] V. V Roshchin and S.M. Godin. An Experimental Investigation of the Physical Effects in a Dynamic Magnetic System. *New Energy Technologies*, 1, 2001.

Biology

[I1] Endoplasmic reticulum. http://en.wikipedia.org/wiki/Endoplasmic_reticulum.

[I2] A. G. Cairns-Smith. The First Organisms. *Scientific American*, 252(6):90–100, 1985.

[I3] I. V. Smirnov V. I. Vysotskii, A. A. Kornilova. *Applied Biophysics of Activated Water*. Word Scientific. http://www.amazon.com/Applied-Biophysics-Activated-Water-Applications/dp/9814271187, 2009.

Neuroscience and Consciousness

[J1] H. Hu and M. Wu. Action Potential Modulation of Neural Spin Networks Suggests Possible Role of Spin. *NeuroQuantology. http://cogprints.org/3458/1/SpinRole.pdf*, 4:309–317, 2004.

[J2] C. Smith. Learning From Water, A Possible Quantum Computing Medium. In *CASYS'2001, 5th international conference on Computing Anticipating Systems held in Liege, Belgium, August 13-18. Abstract book*. CHAOS, 2001.

Books related to TGD

[K1] M. Pitkänen. Bio-Systems as Super-Conductors: part I. In *Quantum Hardware of Living Matter*. Onlinebook. `http://tgdtheory.com/public_html/bioware/bioware.html#superc1`, 2006.

[K2] M. Pitkänen. DNA as Topological Quantum Computer. In *Genes and Memes*. Onlinebook. `http://tgdtheory.com/public_html/genememe/genememe.html#dnatqc`, 2006.

[K3] M. Pitkänen. Expanding Earth Model and Pre-Cambrian Evolution of Continents, Climate, and Life. In *Genes and Memes*. Onlinebook. `http://tgdtheory.com/public_html/genememe/genememe.html#expearth`, 2006.

[K4] M. Pitkänen. Genes and Memes. In *Genes and Memes*. Onlinebook. `http://tgdtheory.com/public_html/genememe/genememe.html#genememec`, 2006.

[K5] M. Pitkänen. Homeopathy in Many-Sheeted Space-Time. In *Bio-Systems as Conscious Holograms*. Onlinebook. `http://tgdtheory.com/public_html/hologram/hologram.html#homeoc`, 2006.

[K6] M. Pitkänen. Negentropy Maximization Principle. In *TGD Inspired Theory of Consciousness*. Onlinebook. `http://tgdtheory.com/public_html/tgdconsc/tgdconsc.html#nmpc`, 2006.

[K7] M. Pitkänen. Nuclear String Hypothesis. In *p-Adic Length Scale Hypothesis and Dark Matter Hierarchy*. Onlinebook. `http://tgdtheory.com/public_html/paddark/paddark.html#nuclstring`, 2006.

[K8] M. Pitkänen. Are dark photons behind biophotons. In *TGD based view about living matter and remote mental interactions*. Onlinebook. `http://tgdtheory.com/public_html/pdfpool/biophotonslian.pdf`, 2013.

[K9] M. Pitkänen. Comments on the recent experiments by the group of Michael Persinger. In *TGD based view about living matter and remote mental interactions*. Onlinebook. `http://tgdtheory.com/public_html/pdfpool/persconsc.pdf`, 2013.

[K10] M. Pitkänen. Comparison of TGD inspired theory of consciousness with some other theories of consciousness. In *TGD based view about living matter and remote mental interactions*. Onlinebook. `http://tgdtheory.com/public_html/pdfpool/consccomparison.pdf`, 2013.