

Could Cancer be a Disease of Magnetic Body?

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Abstract

Li and Heroux have made a highly interesting discovery. The treatment of cancer cell population by 60 Hz oscillating magnetic field with extremely small strength above 25 nT leads to a reduction of the abnormally large chromosome number of the mitochondria of cancer cells and eventually the cancer cells return to the normal state.

TGD based explanation for the findings relies on the basic notions of TGD inspired quantum biology. The basic notions are magnetic body (MB) and hierarchy of Planck constants $h_{eff} = n \times h_0$ ($h = 6h_0$) emerging from the adelic physics as a prediction but originally proposed on basis of anomalous effects of ELF em fields in living matter. The value of n can be relatively small or very large corresponding to flux tubes mediating em and gravitational interactions. The anatomy of MB has remained unclear hitherto but in this article a detailed model is developed allowing to understand the formula $h_{gr} = h_{eff} = n_{gr}h_0$ for gravitational Planck constant and leading to a further formula for h_{gr} relating magnetism and gravitation.

A further central notion is TGD based model for water memory as the ability of the MB of water to control the thickness of its flux tubes to entrain with external frequencies and reproduce them. This is a central element in the TGD based view about immune systems and homeopathic effects. Cancer would reduce to a disease of the MB of the system, to a high degree determined by MB of water and homeopathy like treatment based on irradiated water could serve as a cure.

The model is applied both to the findings of Montagnier's group about remote regeneration of DNA without template and to those of Li and Heroux. Also the dramatic effects of 2 Tesla magnetic fields on mice reported by Walter Rawls Jr are discussed.

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1 Introduction

I received from Prof. Dana Flavin a link to an extremely interesting popular article “*A Unified Theory of Weak Magnetic Field Action*” by L Slesin, editor of Microwave News published in in EMFact (see <http://tinyurl.com/yd4jpuq6>). The article tells about the work of karyologists Ying Li and Paul Heroux. Karyology is a branch of biology studying chromosomes. The research article “*Extra-low-frequency magnetic fields alter cancer cells through metabolic restriction*” by Li and Heroux is published “*Electromagnetic Biology ad Medicine*” [I13] (see <http://tinyurl.com/y91v47qp>).

1.1 Experimental findings of Li and Heroux

The abstract of the article is following.

Background: *Biological effects of extra-low-frequency (ELF) magnetic fields (MFs) have lacked a credible mechanism of interaction between MFs and living material. Objectives: To examine the effect of ELF-MFs on cancer cells. Methods: Five cancer cell lines were exposed to ELF-MFs within the range of 0.0255 μ T, and the cells were examined for karyotype changes after 6d.*

Results: *All cancer cells lines lost chromosomes from MF exposure, with a mostly flat dose-response. Constant MF exposures for three weeks allow a rising return to the baseline, unperturbed karyotypes. From this point, small MF increases or decreases are again capable of inducing karyotype contractions (KCs). Our data suggest that the KCs are caused by MF interference with mitochondrias adenosine triphosphate synthase (ATPS), compensated by the action of adenosine monophosphate-activated protein kinase (AMPK). The effects of MFs are similar to those of the ATPS inhibitor, oligomycin. They are amplified by metformin, an AMPK stimulator, and attenuated by resipistin, an AMPK inhibitor. Over environmental MFs, KCs of various cancer cell lines show exceptionally wide and flat dose-responses, except for those of erythroleukemia cells, which display a progressive rise from 0.025 to 0.4T.*

Conclusions: *The biological effects of MFs are connected to an alteration in the structure of water that impedes the flux of protons in ATPS channels. These results may be environmentally important, in view of the central roles played in human physiology by ATPS and AMPK, particularly in their links to diabetes, cancer and longevity.*

Li and Heroux count the number of chromosomes in cancer cell population before and after a irradiation with 60 Hz oscillating magnetic field, which is extremely weak, with strength above 25 nT. Unlike normal human cells with 46 chromosomes, cancer cells have a variable number of chromosomes (typically this causes trouble, Down’s syndrome is one example). Plants have very often this kind of replication of chromosomes and have isolated cells. Could the replication be due to an effective isolation of cancer cells from each other due caused by a loss of coherent behavior.

Cancer cells typically 74 chromosomes. Li and Heroux report that the irradiation using extremely weak magnetic 60 Hz fields as low as 25-50 nT for 6 days, the cells lose 190 per cent of their chromosomes. They call the effect karyotype contraction.

They repeated the experiment with 4 other cell lines - lung and colon cancer and two different types of leukemias and found essentially the same effect every time.

1. After 3 weeks on the field, the number of chromosomes returns to baseline numbers.
2. Once adapted to the magnetic field, the cells become exquisitely sensitive to further variations of the magnetic field. An increase or decrease of only 10 nT will prompt another round of karyotype contractions.
3. The karyotype contractions vary very little over a wide range of field intensities: from 100 500 nT so that only frequency seems to matter.

1.2 The proposed interpretation of findings of Li and Heroux

The interpretation of the findings in the standard physics framework is far from obvious. So weak magnetic fields should not have so strong effects on cancer cell population. Li and Heroux locate the problem to ATPase molecules acting as kind of power plants of cell associated with mitochondrial membrane. ATPase pumps protons against potential gradient and when protons return back, they provide their energy for the formation of ATP serving as the metabolic energy currency of cell. The basic observation is that that the impairing the action of ATPase leads also to karyotype contraction and in the long run makes cells normal. This happens if the cell does not receive enough oxygen in which case anaerobic metabolism starts and produces lactic acid.

From this Li and Heroux conclude that the problem is too high rate for the metabolic energy and that the irradiation reduces the metabolic energy feed by somehow changing the properties of ATPase. They suggests that the weak oscillating magnetic field affects the physical properties of water in the ATPase. The flow of protons becomes slower and the rate of metabolism becomes slower. One could imagine that the conductivity of protons is reduced.

Li and Heroux refer to the article (see <http://tinyurl.com/yd7kqzng>) *Effect of weak magnetic fields on the properties of water and ice* by Russian physicists L Semikina and V Kiselev [I2] (see <http://tinyurl.com/yd7kqzng>). They show that magnetic fields with strengths in the range 7 Gauss - 2 nT and with frequencies in the range .01-200 Hz have measurable effects on the properties of water. A possible mechanism would be reduction of proton conductivity.

The abstract of the article is here.

We establish that a number of physical properties of water and ice are significantly changed by an alternating magnetic field of a certain frequency. The changes in the physical parameters of ice are several times stronger than the changes in the corresponding parameters of water. Heating water to 50 °C destroys the magnetic effects. When the field is much weaker than the geomagnetic field, a change in water purity (bidistilled instead of distilled water) only broadens the extrema observed in the state dependences of water and ice on the frequency of the alternating magnetic field of constant amplitude. The magnitude and intensity of these extrema are unaffected by water purity. The effects of the geomagnetic field on the properties of ice and water are also discussed.

One important observation is that the effects of ELF em fields depend very weakly on strength but depend on frequency. In standard physics it is difficult to understand this.

1.3 Criticism

There are at least two objection against the interpretation of the findings proposed by Li and Heroux.

1. First objection relates to what happens in real cancer as compared to cancer in cell lines. One can argue that cell lines is different from real cancer tissue because they live in a “luxury” whereas real cancer cells suffer from the lack of oxygen. Reduction of metabolic energy feed seems to bring the cells to normal state. Could too high feed of metabolic energy transform ordinary cells to cancer cells? Why? Could the primary reason for cancer be something else than too high metabolic energy feed and be in action also in the real cancer tissue suffering from too low oxygen feed. Could the too low oxygen feed be an attempt of organism to get rid of cancer cells or force them to act like ordinary cells? What could this primary reason for cancer be?

2. Physicist inside me objects strongly the proposed explanation for the return of normal state. Reduction of metabolism could explain it but the magnetic fields seem quite too weak to reduce the rate of proton flow.

A leading example is provided by sociology - I have a concrete experience from my own country at 90's. Things were extremely well but then something strange happened. People became extremely greedy and selfish and kind of manic consumption emerged. Intensive financial speculation began and eventually led to a very bad economical depression. Trust disappeared from the society and social structures started to decay, and loneliness is the basic problem of quite many people nowadays. Social coherence was lost and during decades the situation has become even worse as society has split into rich and poor. Civilizations have life cycle beginning with healthy social structures and ending up to a deeply corrupted deeply divided civilization eventually collapsing. The collapse of civilization means very hard times for individuals but leads to a new civilization with healthy social structures. Do good times have the effect that people do not need each other anymore and this leads to a loss of coherence.

What happened was very much like cancer in which tissue decomposes into cells with only one goal which is to replicate. In the case of bacteria populations it has been found that starvation leads to a formation of analogs of multi-cellulars. The opposite happens in the case of cancer.

In a framework of quantum physics based theory of consciousness predicting a hierarchy of conscious entities [K14] it is rather natural to apply same principles in attempts to understand the behaviour of human society and cell community. Could hard times have a healthy effect also on cancer cell line living in luxury? Could the primary reason for the return of normal state be the generation of coherent less selfish behavior of cells leading also to a restriction of metabolism.

What the coherent behaviour of the population does mean physically, what does induce it? Standard physics does not provide any obvious answer.

1.4 TGD based model

TGD based model for the findings relies on some central aspects of TGD inspired quantum biology summarized first. Some new important details related to the magnetic body (MB), dark matter hierarchy labelled by the value of Planck constant h_{eff} , and the notion of gravitational Planck constant h_{gr} are discussed. The TGD based view about water memory and homeopathy are introduced. The basic mechanism is the entrainment of the MB of water to frequencies of external em signals by varying the thickness of its flux tubes so that cyclotron frequencies are tuned to resonance. Kind of living radio set also able to serve as a sender is in question.

The model is applied to two situations. The first application is to the earlier findings by Montagnier's group [I10] about remote regeneration of DNA discussed already earlier in TGD context [L1]. There are two samples A and B. The remote regeneration of DNA occurs in B in absence of template and without any physical contact to A serving effectively as a template. A contains originally the DNA but is extremely diluted.

Second application is a model of cancer applied to the experiments of Li and Heroux. The MB of water would go out of synch from central control frequencies or lose part of its MB generating these frequencies. The proposed healing mechanism would be "homeopathic" treatment by water entrained to the missing control frequencies.

The third application is to the findings of Walter Rawls Jr. about the effects of 2 Tesla magnetic fields on mice [I12]. The findings are not published in any respected journal but their potential implications are enormous. The findings fit nicely with the TGD view explaining above findings. One also ends up to a concrete proposal for the function of magnetite in brain and even to an idea about magnetic healing. Hence comments about the claimed findings are in order.

2 Some aspects of TGD inspired quantum biology

TGD based explanation for the findings relies on the basic notions of TGD inspired quantum biology. The basic notions are magnetic body (MB) and hierarchy of Planck constants $h_{eff} = n \times h_0$ [K20, K21] emerging from the adelic physics as a prediction [L14, L15] but originally proposed on basis of anomalous effects of ELF em fields in living matter. The anatomy of MB has remained unclear hitherto but in this article a detailed model allowing to understand the formula $h_{gr} = h_{eff}$

for gravitational Planck constant and leading to a further formula for h_{gr} relating magnetism and gravitation.

A further central notion is TGD based model for water memory as the ability of the MB of water to control the thickness of its flux tubes to entrain with external frequencies and reproduce them. This is a central element in TGD based view about immune system and homeopathic effects [K4]. Cancer would reduce to a disease of the MB of the living system to high degree determined by the MB of water. Details of the bio-chemistry and even cell membrane dynamics would have surprisingly minor role in the model.

2.1 Is the cosmological constant really understood?

The interpretation of the coefficient of the volume term as cosmological constant has been a long-standing interpretational issue and caused many moments of despair during years. The intuitive picture has been that cosmological constant obeys p-adic length scale evolution meaning that Λ would behave like $1/L_p^2 = 1/p \simeq 1/2^k$ [K22].

This would solve the problems due to the huge value of Λ predicted in GRT approach: the smoothed out behavior of Λ would be $\Lambda \propto 1/a^2$, a light-cone proper time defining cosmic time, and the recent value of Λ - or rather, its value in length scale corresponding to the size scale of the observed Universe - would be extremely small. In the very early Universe - in very short length scales - Λ would be large.

It has however turned out that I have not really understood how this evolution could emerge! Twistor lift seems to allow only a very slow (logarithmic) p-adic length scale evolution of Λ [L26]. Is there any cure to this problem?

1. Could one consider the *total* action for preferred extremals - at least flux tubes - as proportional to effective cosmological constant Λ_{eff} ? Since magnetic energy decreases with the are of string like $1/p \simeq 1/2^k$, where p defines the transversal length scale of the flux tube, one would have effective p-adic coupling constant evolution of Λ_{eff} approaching to Λ , which must be extremely small.

The corresponding size scale would correspond to the density of the magnetic energy equal to that of dark energy. Flux tubes with quantized flux would have thickness determined by the length scale defined by the density of dark energy: $L \sim \rho_{vac}^{-1/4}$, $\rho_{dark} = \Lambda/8\pi G$. $\rho_{vac} \sim 10^{-47}$ GeV⁴ (see <http://tinyurl.com/k4bwlzu>) would give $L \sim 1$ mm, which would could be interpreted as a biological length scale (maybe even neuronal length scale).

2. But can Λ be very small? In the simplest picture based on dimensionally reduced 6-D Kähler action this term is not small in comparison with the Kähler action! If the twistor spheres of M^4 and CP_2 give the same contribution to the induced Kähler form at twistor sphere of X^4 , this term has maximal possible value!

The original discussions in [K23, K22] treated the volume term and Kähler term in the dimensionally reduced action as independent terms and Λ was chosen freely. This is however not the case since the coefficients of both terms are proportional to $1/\alpha_K^2 S$, where S is the area of the twistor sphere which is same for the twistor spaces of M^4 and CP_2 if CP_2 size defines the only fundamental length scale. I did not even recognize this mistake.

The proposed fast p-adic evolution of the cosmological constant would have extremely beautiful consequences. Could the original intuitive picture be wrong, or could the desired p-adic length scale evolution for Λ be possible after all? Could dynamics somehow give it? To see what can happen one must look in more detail the induction of twistor structure.

1. The induction of the twistor structure by dimensional reduction involves the identification of the twistor spheres S^2 of the geometric twistor spaces $T(M^4) = M^4 \times S^2(M^4)$ and of T_{CP_2} having $S^2(CP_2)$ as fiber space. What this means that one can take the coordinates of say $S^2(M^4)$ as coordinates and imbedding map maps $S^2(M^4)$ to $S^2(CP_2)$. The twistor spheres $S^2(M^4)$ and $S^2(CP_2)$ have in the minimal scenario same radius $R(CP_2)$ (radius of the geodesic sphere of CP_2). The identification map is unique apart from $SO(3)$ rotation R of either twistor sphere. Could one consider the possibility that R is not trivial and that the induced Kähler forms could almos cancel each other?

2. The induced Kähler form is sum of the Kähler forms induced from $S^2(M^4)$ and $S^2(CP_2)$ and since Kähler forms are same apart from a rotation in the common S^2 coordinates, one has $J_{ind} = J + R(J)$, where R denotes the rotation. The sum is $J_{ind} = 2J$ if the relative rotation is trivial and $J_{ind} = 0$ if R corresponds to a rotation $\Theta \rightarrow \Theta + \pi$ changing the sign of $J = \sin(\Theta)d\Theta \wedge d\Phi$.
3. Could p-adic length scale evolution for Λ correspond to a sequence of rotations - in the simplest case $\Theta \rightarrow \Theta + \Delta_k\Theta$ taking gradually J from $2J$ at very short length scales to $J = 0$ corresponding to $\Delta_\infty\Theta = \pi$ at very long length scales? A suitable spectrum for $\Delta_k(\Theta)$ could reproduce the proposal $\Lambda \propto 2^{-k}$ for Λ .
4. One can of course ask whether the resulting induced twistor structure is acceptable. Certainly it is not equivalent with the standard twistor structure. In particular, the condition $J^2 = -g$ is lost. In the case of induced Kähler form at X^4 this condition is also lost. For spinor structure the induction guarantees the existence and uniqueness of the spinor structure, and the same applies also to the induced twistor structure being together with the unique properties of twistor spaces of M^4 and CP_2 the key motivation for the notion.
5. Could field equations associated with the dimensional reduction allow p-adic length scale evolution in this sense?
 - (a) The sum $J + R(J)$ defining the induced Kähler form in $S^2(X^4)$ is covariantly constant since both terms are covariantly constant by the rotational covariance of J .
 - (b) The imbeddings of $S^2(X^4)$ as twistor sphere of space-time surface to both spheres are holomorphic since rotations are represented as holomorphic transformations. This in turn implies that the second fundamental form in complex coordinates is a tensor having only components of type $(1, 1)$ and $(-1, -1)$ whereas metric and energy momentum tensor have only components of type $(1, -1)$ and $(-1, 1)$. Therefore all contractions appearing in field equations vanish identically and $S^2(X^4)$ is minimal surface and Kähler current in $S^2(X^4)$ vanishes since it involves components of the trace of second fundamental form. Field equations are indeed satisfied.
 - (c) The solution of field equations becomes a family of space-time surfaces parametrized by the values of the cosmological constant Λ as function of S^2 coordinates satisfying $\Lambda/8\pi G = \rho_{vac} = J \wedge (*J)(S^2)$. In long length scales the variation range of Λ would become arbitrary small.
6. If the minimal surface equations solve separately field equations for the volume term and Kähler action everywhere apart from a discrete set of singular points, the cosmological constant affects the space-time dynamics only at these points. The physical interpretation of these points is as seats of fundamental fermions at partonic 2-surface at the ends of light-like 3-surfaces defining their orbits (induced metric changes signature at these 3-surfaces). Fermion orbits would be boundaries of fermionic string world sheets.
 One would have family of solutions of field equations but particular value of Λ would make itself visible only at the level of elementary fermions by affecting the values of coupling constants. p-Adic coupling constant evolution would be induced by the p-adic coupling constant evolution for the relative rotations R for the two twistor spheres. Therefore twistor lift would not be mere manner to reproduce cosmological term but determine the dynamics at the level of coupling constant evolution.
7. What is nice that also $\Lambda = 0$ option is possible. This would correspond to the variant of TGD involving only Kähler action regarded as TGD before the emergence of twistor lift. Therefore the nice results about cosmology obtained at this limit would not be lost.

2.2 The notion of magnetic body

Magnetic flux tubes and field body/magnetic body (MB) are basic notions of TGD implied by the modification of Maxwellian electrodynamics [K17, K5, K13]. Actually a profound generalization of space-time concept is in question. Magnetic flux tubes are in well-defined sense building bricks of

space-time - topological field quanta - and lead to the notion of field body/MB as a field identity assignable to any physical system: in Maxwell's theory and ordinary field theory the fields of different systems superpose and one cannot say about magnetic field in given region of space-time that it would belong to some particular system. In TGD only the effects on test particle for induced fields associated with different space-time sheets with overlapping M^4 projections sum.

The hierarchy of Planck constants $h_{eff} = n \times h_0$, where h_0 is the minimum value of Planck constant, is second key notion. h_0 need not correspond to ordinary Planck constant h and both the observations of Randell Mills [L7] and the model for color vision [L20] suggest that one has $h = 6h_0$. The hierarchy of Planck constants labels a hierarchy of phases of ordinary matter behaving as dark matter.

Magnetic flux tubes would connect molecules, cells and even larger units, which would serve as nodes in (tensor-) networks [B1] [L6]. Flux tubes would serve as correlates for quantum entanglement and replace wormholes in ER-EPR correspondence proposed by Leonard Susskind and Juan Maldacena in 2014 (see <http://tinyurl.com/y7za98cn> and <http://tinyurl.com/ydckw5u7>). In biology and neuroscience these networks would be in a central role. For instance, in brain neuron nets would be associated with them and would serve as correlates for mental images [L10, L21]. The dynamics of mental images would correspond to that for the flux tube networks.

2.3 Hierarchy of Planck constants, space-time surfaces as covering spaces, and adelic physics

From the beginning it was clear that $h_{eff}/h = n$ corresponds to the number of sheets for a covering space of some kind. First the covering was assigned with the causal diamonds. Later I assigned it with space-time surfaces but the details of the covering remained unclear. The final identification emerged only in the beginning of 2017.

2.3.1 Number theoretical universality and hierarchy of extensions of rationals

Number theoretical universality (NTU) leads to the notion of adelic space-time surface (monadic manifold) involving a discretization in an extension of rationals defining particular level in the hierarchy of adeles defining evolutionary hierarchy. The formulation of this vision is proposed in [L9, L15, L14].

The key constraint is NTU for adelic space-time containing sheets in the real sector and various p-adic sectors, which are extensions of p-adic number fields induced by an extension of rationals which can contain also powers of a root of e inducing finite-D extension of p-adic numbers (e^p is ordinary p-adic number in Q_p).

One identifies the numbers in the extension of rationals as common for all number fields and demands that imbedding space has a discretization in an extension of rationals in the sense that the preferred coordinates of imbedding space implied by isometries belong to extension of rationals for the points of number theoretic discretization. This implies that the versions of isometries with group parameters in the extension of rationals act as discrete versions of symmetries. The correspondence between real and p-adic variants of the imbedding space is extremely discontinuous for given adelic imbedding space (there is hierarchy of them with levels characterized by extensions of rationals). Space-time surfaces typically contain rather small set of points in the extension ($x^n + yn^2 = z^n$ contains no rationals for $n > 2!$). Hence one expects a discretization with a finite cutoff length at space-time level for sufficiently low space-time dimension $D = 4$ could be enough.

After that one assigns in the real sector an open set to each point of discretization and these open sets define a manifold covering. In p-adic sector one can assign 8:th Cartesian power of ordinary p-adic numbers to each point of number theoretic discretization. This gives both discretization and smooth local manifold structure. What is important is that Galois group of the extension acts on these discretizations and one obtains from a given discretization a covering space with the number of sheets equal to a factor of the order of Galois group.

2.3.2 Effective Planck constant as dimension of extension of rationals and number of sheets of space-time surface as covering space

$h_{eff}/h_0 = n$ was identified from the beginning as the number of sheets of poly-sheeted covering assignable to space-time surface. The number n of sheets would naturally a factor of the order of Galois group implying $h_{eff}/h = n$ bound to increase during number theoretic evolution so that the algebraic complexity increases. Note that WCW decomposes into sectors corresponding to the extensions of rationals and the dimension of the extension is bound to increase in the long run by localizations to various sectors in self measurements [K7]. Dark matter hierarchy represents number theoretical/adelic physics and therefore has now rather rigorous mathematical justification. It is however good to recall that $h_{eff}/h = n$ hypothesis emerged from an experimental anomaly: radiation at ELF frequencies had quantal effects of vertebrate brain impossible in standard quantum theory since the energies $E = hf$ of photons are ridiculously small as compared to thermal energy.

Indeed, since n is positive integer evolution is analogous to a diffusion in half-line and n unavoidably increases in the long run just as the particle diffuses farther away from origin (by looking what gradually happens near paper basket one understands what this means). The increase of n implies the increase of maximal negentropy and thus of negentropy. Negentropy Maximization Principle (NMP) follows from adelic physics alone and there is no need to postulate it separately. Things get better in the long run although we do not live in the best possible world as Leibniz who first proposed the notion of monad proposed!

2.3.3 Formula for the gravitational Planck constant and some background

The formula

$$\hbar_{gr} = \frac{GM_D m}{v_0} \quad (2.1)$$

for the gravitational Planck constant was originally introduced by Nottale [E1]. Here v_0 is a parameter with dimensions of velocity: I have considered argument allowing to deduce information about the value of $\beta_0 = v_0/c$ as the ratio of the M^4 size of the system and the size of its magnetic body [L17]. Values of order $\beta_0 \sim 10^{-3}$ are encountered.

Since m disappears from the predictions by Equivalence Principle it is not at all clear what kind limitations one has for m and one can even assume that m corresponds to particle mass without change in predictions. In Nottale's original formula m is mass of planet and M_D the mass of Sun but m could be even mass of elementary particle without change in predictions. The assumption has been $m/M_D \ll 1$. The replacement of M_D with total mass $M_D + m$ and m by reduced mass $M_D m / (M_D + m)$ does not affect the formula and the asymmetry between m and M_D would become more natural asymmetry between total mass and reduced mass.

For $Mm < v_0 m_{Pl}^2$ one must have $h_{gr} = h$, which suggests that quite generally one must have $m \geq \sqrt{v_0} M_{Pl}$ and $M \geq \sqrt{v_0} M_{Pl}$. The formula is non-relativistic but one can consider a relativistic generalization in which m and M are replaced by energies [K9].

The formula is expected to hold true at the magnetic flux tubes mediating gravitational interaction. M_D has been interpreted as dark gravitational flux at the gravitational flux tubes with a fixed value of h_{eff} and should be a fraction of the total gravitational flux M . These flux tubes define $n_{gr} = h_{eff}/h_0$ -sheeted covering of M^4 .

Also a more general formula

$$h_{gr} = h_{eff} \ , \quad h_{eff} = n_{gr} \times h_0 \ , \quad h = 6h_0 \ . \quad (2.2)$$

has been assumed. The support for the formula $h = 6h_0$ is discussed in [L7, L20]. The value of h_{gr} can be very large unlike the value of h_{eff} associated with say valence bonds.

One important implication of the formula is that the cyclotron energy spectrum does not depend on the mass of charged particle at all and is therefore universal. The assumption has been that the spectrum is in visible and UV range assignable to bio-photons [K18, K19]. One can however consider also the possibility that also the energies between the thermal energy at physiological temperature and visible photon energies are allowed.

2.3.4 What does one really mean with gravitational Planck constant?

There are important questions related to the QFT-GRT limit of TGD.

1. *What does one mean with space-time as covering space?*

The central idea is that space-time corresponds to n -fold covering for $h_{eff} = n \times h_0$. It is not however quite clear what this statement does mean.

1. How the many-sheeted space-time corresponds to the space-time of QFT and GRT? QFT-GRT limit of TGD is defined by identifying the gauge potentials as sums of induced gauge potentials over the space-time sheets. Magnetic field is sum over its values for different space-time sheets. For single sheet the field would be extremely small in the present case as will be found.
2. A central notion associated with the hierarchy of effective Planck constants $h_{eff}/h_0 = n$ giving as a special case $\hbar_{gr} = GMm/v_0$ assigned to the flux tubes mediating gravitational interactions. The most general view is that the space-time itself can be regarded as n -sheeted covering space. A more restricted view is that space-time surface can be regarded as n -sheeted covering of M^4 . But why not n -sheeted covering of CP_2 ? And why not having $n = n_1 \times n_2$ such that one has n_1 -sheeted covering of CP_2 and n_2 -sheeted covering of M^4 as I indeed proposed for more than decade ago [K10] but gave up this notion later and consider only coverings of M^4 ? There is indeed nothing preventing the more general coverings.
3. $n = n_1 \times n_2$ covering can be illustrated for an electric engineer by considering a coil in very thin 3 dimensional slab having thickness L . The small vertical direction would serve and as analog of CP_2 . The remaining 2 large dimensions would serve as analog for M^4 . One could try to construct a coil with n loops in the vertical direction direction but for very large n one would encounter problems since loops would overlap because the thickness of the wire would be larger than available room L/n . There would be some maximum value of n , call it n_{max} .

One could overcome this limit by using the decomposition $n = n_1 \times n_2$ existing if n is prime. In this case one could decompose the coil into n_1 parallel coils in plane having $n_2 \geq n_{max}$ loops in the vertical direction. This provided n_2 is small enough to avoid problems due to finite thickness of the coil. For n prime this does not work but one can of also select n_2 to be maximal and allow the last coil to have less than n_2 loops.

An interesting possibility is that that preferred extremal property implies the decomposition $n_{gr} = n_1 \times n_2$ with nearly maximal value of n_2 , which can vary in some limits. Of course, one of the n_2 -coverings of M^4 could be in-complete in the case that n_{gr} is prime or not divisible by nearly maximal value of n_2 . We do not live in ideal Universe, and one can even imagine that the copies of M^4 covering are not exact copies but that n_2 can vary.

4. In the case of $M^4 \times CP_2$ space-time sheet would replace single loop of the coil, and the procedure would be very similar. A highly interesting question is whether preferred extremal property favours the option in which one has as analog of n_1 coils n_1 full copies of n_2 -fold coverings of M^4 at different positions in M^4 and thus defining an n_1 covering of CP_2 in M^4 direction. These positions of copies need not be close to each other but one could still have quantum coherence and this would be essential in TGD inspired quantum biology [L19].

Number theoretic vision [L15, L14] suggests that the sheets could be related by discrete isometries of CP_2 possibly representing the action of Galois group of the extension of rationals defining the adèle and since the group is finite sub-group of CP_2 , the number of sheets would be finite.

The finite sub-groups of $SU(3)$ are analogous to the finite sub-groups of $SU(2)$ and if they action is genuinely 3-D they correspond to the symmetries of Platonic solids (tetrahedron, cube, octahedron, icosahedron, dodecahedron). Otherwise one obtains symmetries of polygons and the order of group can be arbitrary large. Similar phenomenon is expected now. In fact the values of n_2 could be quantized in terms of dimensions of discrete coset spaces associated with discrete sub-groups of $SU(3)$. This would give rise to a large variation of n_2 and could perhaps explain the large variation of G identified as $G = R^2(CP_2)/n_2$ suggested by the fountain effect of superfluidity [L22].

5. There are indeed two kinds of values of n : the small values $n = h_{em}/h_0 = n_{em}$ assigned with flux tubes mediating em interaction and appearing already in condensed matter physics [L12, L20, L7] and large values $n = h_{gr}/h_0 = n_{gr}$ associated with gravitational flux tubes. The small values of n would be naturally associated with coverings of CP_2 . The large values $n_{gr} = n_1 \times n_2$ would correspond n_1 -fold coverings of CP_2 consisting of complete n_2 -fold coverings of M^4 . Note that in this picture one can formally define constants $\hbar(M^4) = n_1\hbar_0$ and $\hbar(CP_2) = n_2\hbar_0$ as proposed in [K10] for more than decade ago.

2. Planck length as CP_2 radius and identification of gravitational constant G

There is also a puzzle related to the identification of gravitational Planck constant. In TGD framework the only theoretically reasonable identification of Planck length is as CP_2 length $R(CP_2)$, which is roughly $10^{3.5}$ times longer than Planck length [L22]. Otherwise one must introduce the usual Planck length as separate fundamental length. The proposal was that gravitational constant would be defined as $G = R^2(CP_2)/\hbar_{gr}$, $\hbar_{gr} \simeq 10^7\hbar$. The G indeed varies in un-expectedly wide limits and the fountain effect of superfluidity suggests that the variation can be surprisingly large.

There are however problems.

1. Arbitrary small values of $G = R^2(CP_2)/\hbar_{gr}$ are possible for the values of \hbar_{gr} appearing in the applications: the values of order $n_{gr} \sim 10^{13}$ are encountered in the biological applications. The value range of G is however experimentally rather limited. Something clearly goes wrong with the proposed formula.
2. Schwarzschild radius $r_S = 2GM = 2R^2(CP_2)M/\hbar_{gr}$ would decrease with \hbar_{gr} . One would expect just the opposite since fundamental quantal length scales should scale like \hbar_{gr} .
3. What about Nottale formula [E1] $\hbar_{gr} = GMm/v_0$? Should one require self-consistency and substitute $G = R^2(CP_2)/\hbar_{gr}$ to it to obtain $\hbar_{gr} = \sqrt{R^2(CP_2)Mm/v_0}$. This formula leads to physically un-acceptable predictions, and I have used in all applications $G = G_N$ corresponding to $n_{gr} \sim 10^7$ as the ratio of squares of CP_2 length and ordinary Planck length.

Could one interpret the almost constancy of G by assuming that it corresponds to $\hbar(CP_2) = n_2\hbar_0$, $n_2 \simeq 10^7$ and nearly maximal except possibly in some special situations? For $n_{gr} = n_1 \times n_2$ the covering corresponding to \hbar_{gr} would be n_1 -fold covering of CP_2 formed from n_1 n_2 -fold coverings of M^4 . For $n_{gr} = n_1 \times n_2$ the covering would decompose to n_1 disjoint M^4 coverings and this would also guarantee that the definition of r_S remains the standard one since only the number of M^4 coverings increases.

If n_2 corresponds to the order of finite subgroup G of $SU(3)$ or number of elements in a coset space G/H of G (itself sub-group for normal sub-group H), one would have very limited number of values of n_2 , and it might be possible to understand the fountain effect of superfluidity [L22] from the symmetries of CP_2 , which would take a role similar to the symmetries associated with Platonic solids. In fact, the smaller value of G in fountain effect would suggest that n_2 in this case is larger than for G_N so that n_2 for G_N would not be maximal.

2.3.5 New constraint between h_{gr} and h_{eff}

Cyclotron frequencies and energies in magnetic field B and charged particle with charge Ze and mass m are proportional to the ZeB/m . The energy spectrum of bio-photons would be covered by a spectrum of magnetic field strengths B . A special field strength $B_{end} = 0.2$ Gauss has emerged in biological applications from the beginning and the first guess is that it defines a lower bound for the spectrum of visible photon energies [L18, L16, L25]. One can fix the value of h_{gr} and therefore of GM_D/v_0 if one requires that dark photon frequency of say $f_l = 10$ Hz corresponds to the lower bound $f_h = 400$ THz for visible frequencies as $h_{gr} = f_h/f_l$: in this case would have $n_{gr} = 4 \times 10^{13}$.

The variation of B means variation of cyclotron frequency and I have proposed that the audible frequencies correspond to a spectrum of B for the flux tubes involved with hearing [K11], and that even 12-note scale represent in terms of rational frequency ratios might have a preferred role [L2, L24].

The formula $h_{gr} = h_{eff}$ is not enough to fix the model completely. A formula fixing the relationship between B and GM_D/v_0 would be needed. This formula should be consistent with $h_{gr} = h_{eff}$. Dimensional analyst would start from the geometry of the situation.

Magnetic flux tubes are characterized by two parameters: length L_c and radius R_B .

1. Length scale naturally corresponds to the cyclotron wave length

$$L_c = \lambda_c = \frac{1}{f_c} = \frac{2\pi m}{ZeB} . \quad (2.3)$$

L_c is proportional to the mass m of the charged particle so that charge particles with different mass are with different mass flux tubes with different length and therefore different onion-like layers of MB. Charged dark particles are like books about different topics at different shelves so that living matter is extremely well-organized: something totally different from a chaotic soup of charged ions.

2. The radius of the flux tube is obtained from the flux quantization. For ordinary cylindrical flux tube with constant B the condition is $BS = k\hbar$ and for $S = \pi R^2$ the radius would be

$$R_B(h, k) = \sqrt{\frac{k\hbar}{\pi eB}} = \sqrt{\frac{k}{\pi}} L_B , \quad L_B = \sqrt{\frac{\hbar}{eB}} . \quad (2.4)$$

For $k = 1$ and for $B = B_{end} = .2$ Gauss one has $R_B(h, 1) = 3.3 \mu\text{m}$ to be compared with p-adic length scale $L(167) = 2.5 \mu\text{m}$ assignable to Gaussian Mersenne $M_{G,167} = (1+i)^{167} - 1$. Magnetic length L_B is in this case $L_B = 5.8 \mu\text{m}$ slightly larger than $L(169)$.

3. For $h_{eff} = n \times h_0$, $h = 6h_0$ the formula would generalize to

$$R_B(h_{eff}, k) = \sqrt{\frac{k\hbar_{eff}}{\pi eB}} = \sqrt{\frac{n}{6}} R_c(h, k) = \sqrt{\frac{nk}{6}} R_B(h, 1) . \quad (2.5)$$

Note that here n is rather small such as the value of n assignable to valence bonds.

4. The natural guess is that this formula applies at the small part of the MB restricted to the "biological body" of the living system defining that part of system, which corresponds to relatively small values of h_{eff} . The value of h_{eff} would indeed vary, being larger than h for instance for valence bonds [L12]. For dark flux tubes with small value of n the radius would be scaled up by \sqrt{n} such as biological system for fixed value of B . Same happens if the value of flux is scaled by m .

For the simplest flux tubes carrying monopole flux having string world sheet as M^4 projection geodesic sphere as CP_2 projection, the cross section is not circular disk but CP_2 geodesic sphere with radius R . In this case R is fixed. The M^4 projection of these objects is however unstable against thickening and for spherical cross section- think of two disks glued along boundaries but having different CP_2 projections, the area is $4\pi R^2$, where R corresponds to the radius of M^4 projection. Area is reduced by factor 4 from that for non-monopole flux tube and radius is reduced by factor 1/2.

One can guess the additional constraint on h_{gr} without more detailed analysis of what MB really is using dimensional analysis and I will postpone this analysis later.

1. The first natural guess is that one has

$$\frac{h_{gr}}{h_0} = n_{gr} = x \frac{L_c}{R_B(h_{eff}, k)} = x(6\pi)^{3/2} \frac{1}{(nk)^{1/2}} \frac{L_B}{l_C(m)} ,$$

$$L_B = \sqrt{\frac{\hbar}{eB}} , \quad l_C(m) = \frac{\hbar}{m} . \quad (2.6)$$

x is some numerical constant. h_{gr}/h_0 is proportional to the ratio l_B/l_C of the magnetic length and Compton length $l_C = m/\hbar$ of the charged particle.

- Alternative guess replaces the radius of the magnetic flux tube with the magnetic length L_B .

$$\frac{h_{gr}}{h_0} = n_{gr} = x \frac{L_C}{L_B} = x 6^{3/2} \pi \frac{1}{n^{1/2}} \frac{L_B}{L_C(m)} \quad , \quad (2.7)$$

This formula is related by factor \sqrt{kpi} the first formula and has no dependence on h . It is difficult to say anything about exact value of the numerical constant x .

- h_{gr} is proportional to m so that the formulas are consistent with $h_{gr} = h_{eff}$ formula. Combining these formulas one obtains

$$\frac{GM_D}{h_0 v_0} = \frac{r_S(M_D)}{2} = x 2\pi \sqrt{\frac{n}{6Z}} \sqrt{\frac{\hbar}{eB}} \quad . \quad (2.8)$$

This formula does not depend on m and gives the value of GM_D/v_0 assignable to the flux tubes carrying magnetic field with strength B and particles with charge Z . One can say that the Schwarzschild radius $r_S = 2GM_D$ characterizing M_D is proportional to magnetic length. The first option gives

$$r_S(M_D) = x \times 2 \times 6^{1/2} \pi^{3/2} \frac{1}{(nk)^{1/2}} v_0 l_B \quad . \quad (2.9)$$

For Earth Schwarzschild radius is $r_{S,E} = 8.87$ mm and if $M_D < M_E$ holds true, one obtains for a given value of v_0 upper bound for the magnetic length and therefore lower bound for B . I have considered in [L17] a model for v_0 and combining this model for this formula, one obtains rather strong constraints on the parameters and also on the minimal value of B . The order of magnitude for v_0 is $v_0 \sim 10^{-3}$.

M_D/v_0 would not depend on the mass of the charged particles at the flux tube (universality) but would depend on their charge Z unless the parameter x has a compensating Z -dependence. Therefore electrons and their Cooper pairs would have different value of GMD/v_0 . One could perhaps interpret r_S/v_0 as analog of star radius applying to particular dark matter part of Earth. It would be considerably larger than Schwarzschild radius.

- Note that the condition $GM_D m/v_0 = n_{gr} \hbar$ can be written as

$$r_S(M_D) = 2n_{gr} l_C \quad . \quad (2.10)$$

2.3.6 Estimate of G/G_N from the delocalization at magnetic flux tubes

The following argument is for a situation in which the mass m corresponds to the mass of ion. By Equivalence Principle m however disappears from the formulas involving gravitational interaction of Earth, and cyclotron frequencies remain invariant for cyclotron BE condensate. Therefore the formulas apply for the BE condensate ions with total mass equal to a multiple of Planck mass $m_P = \hbar_0/R$.

The de-localization length of dark matter wave functions in the gravitational field is much longer than for ordinary value of Planck constant: essentially the height to which particle can rise with given initial velocity V_0 in the gravitational field with gravitational constant G . This would conform with the idea that dark particles are delocalized at the flux tubes in the scale of cyclotron wave-length.

The condition that the height h for the orbit equals to cyclotron wavelength gives an estimate for G_N/G . One can estimate the height $h = R - R_E$ from energy conservation assuming that particle has initial vertical velocity V_0 at the surface of Earth and cyclotron wavelength λ_c :

$$\frac{V_0^2}{2} = \frac{G}{G_N} \left[\frac{GM}{R_E} - \frac{GM}{R} \right] ,$$

$$h = \lambda_c = \frac{1}{f_c} = \frac{2\pi m}{neB} .$$

One obtains an estimate for G/G_N as

$$\frac{G}{G_N} = V_0^2 \frac{(R_E+h)R_E}{r_S h} , \quad R = R_E + h ,$$

$$h = \frac{\lambda_c}{n} = \frac{1}{nf_c} = \frac{2\pi m}{neB} .$$

(2.11)

This gives

$$\frac{G}{G_N} = nV_0^2 \times \frac{R_E(R_E + \frac{\lambda_c}{n})}{r_S \lambda_c} = nV_0^2 \times \frac{R_E(R_E + \frac{2\pi eB}{neBm})}{r_S} \times \frac{eB}{2\pi m} .$$

(2.12)

The condition that value of G/G_N is constant quantizes the value of V_0 . For small value of h one has $V_0^2 n \simeq constant$. For $R_E \sim \lambda_c$ and nV_0^2 is of order unity, the order of magnitude would be $G/G_N \sim R_E/r_S \sim 7 \times 10^8$.

2.4 What can one say about the detailed anatomy of the MB?

The details of the anatomy of the MB have remained rather fuzzy hitherto. The following is an attempt to formulate more explicitly and coherently the earlier ideas scattered in books and articles about TGD. There are several empirical facts and theoretical constraints that one can use.

1. There is the notion of dark DNA as dark nuclei consisting of sequences of dark protons. The notion of dark nucleus is central concept in TGD based model of “cold fusion” [L11]. Dark proton sequences are parallel with and in the vicinity of ordinary DNA strands and ordinary codons and dark proton triplets representing them [L4] are paired.
2. Pollack effect [L3] [L3] for water is assumed to generate dark DNA. Part of protons go to the flux tube and negative charge is generated in ordinary matter and ends to negative charge of phosphates associated with the ordinary DNA nucleotides. Ordinary DNA would pair with dark DNA serving as predecessor and controller of ordinary DNA. Also RNA, amino-acids, and tRNA would have dark predecessors and similar pairing would occur.
3. Experiments of Peter Gariaev et al - in particular the discovery of phantom DNA [I8] - and of Montagnier [I10] [L1] provide further valuable information.

Consider now what MB could look like.

1. MB has two parts. The small part has size of the physical system consisting of ordinary matter plus parts with relatively small h_{eff} assignable to structures such as valence bonds. The flux tubes of this part of MB connect parts of the system to a network and tensor network is an excellent mathematical model for what is involved. Flux tubes serve as topological correlates for entanglement and even prerequisites for it.

In living matter one can imagine that the basic units of ordinary matter - say cells - are organized at parallel flux tubes. For $B_{end} = .2$ Gauss, which seems to define an especially important endogenous magnetic field, the radius r_B is of cell size. The value of proton cyclotron frequency is 300 Hz in this case and happens to correspond to the rotation frequency of the “shaft” of the ATPase as power generator.

60 Hz frequency was found to lead to a transformation of cancer cells to ordinary ones and this suggests that cyclotron frequency for $B = B_{end}/5$ is involved. The flux tubes would

contain 5 cells in their cross section and one can argue that dark proton quantum coherence at gravitational flux tubes with this thickness could give rise coherence in 5-cell length scale and lead to the cure of cancer.

2. The large part of MB - with size of the order Earth radius for $f_c = 60$ Hz corresponds to long flux tubes with large effective Planck constant $h_{gr}/h_0 = n$. Effective value of Planck constant is indeed in question since n_{gr} is the number sheets of the space-time surface as covering space and Planck constant has value h_0 (rather than $h = 6h_0$) at each sheet of the covering. At QFT limit sheets are effectively replaced with single one, and one must allow the “real” Planck constant to have non-standard values.

What space-time surface as covering does mean has been already discussed, and it seems that the identification as $n = n_1 \times n_2$ covering, where n_1 is the number of sheets as covering of CP_2 realized in the recent case as disjoint flux tubes in M^4 and n_2 is the number of sheets as covering of M^4 . Gravitational constant identified as $G = R^2/\hbar_2$ would allow to avoid unphysical predictions since n_2 could be limited to a rather narrow range by symmetry considerations.

The cyclotron energies are scaled up by $h_{eff}/h_0 = n_{gr}$ and whatever the detailed anatomy of MB is this must be understood. Effectively one has n_{gr} photons with ordinary cyclotron energy and their energies sum up. This can be understood if the flux tubes define n_{gr} -fold coverings of M^4 .

3. $h_{gr} = n_{gr}h_0$ correspond to quantum coherence in very long length scales whereas in the scale of organism the value of n is relatively small. The simplest idea is that n_{gr} disjoint flux tubes with small value of n and with given thickness determined by flux quantization coming from the living system combine to form single n_{gr} -sheeted flux tube with length given by $L_c = \lambda_c = 2\pi m/ZeB$ having no dependence on h_{eff} .

This would be like a large number of cables combining a single cable. The threads of the cable would be now on top of each other in CP_2 direction! A rather exotic space savings! This would combine the sensory information coming from the separate flux tubes to a single super-cable and make the control of the system easy. Central nervous system would have spinal chord as an analogous unit both geometrically and functionally albeit in totally different scale. One of the first proposals was that MB provides an almost topographic representation of the biological body [K6].

One can estimate the volume of the region with coherence forced by quantum gravitational coherence as $V_{gr} = n_{gr}V(unit)$, where $V(unit)$ is the volume of the basic unit presumably determined by flux tube radius. If $V(unit)$ equals to volume a^3 of cube with side a , V_{gr} corresponds to a cube with side $a_{gr} = n_{gr}^{1/3} a$.

The assumption that the energies of EEG photons in alpha band with $f = 10$ Hz correspond to ordinary photons at the lower end of the bio-photon spectrum having frequency 400 THz gives n_{gr} as $n_{gr} = 4 \times 10^{13}$. For $n_{gr} = 4 \times 10^{13}$ and $a = 5 \mu$ m giving lower bound for the volume of neuron one would have $a_{gr} = 0.2$ m, roughly the size scale of brain.

4. The natural interpretation of the super-cables is as gravitational flux tubes. The gravitational flux associated with the ordinary flux tubes would combine to the dark gravitational flux tubes involving n_1 parallel flux tubes in M^4 , each of them consisting of n_2 flux tubes on top of each other in CP_2 direction. This combination could take place repeatedly. Could the parameter M_D in $h_{gr} = n_{gr}h_0$ correspond to the portion of the Earth’s gravitational flux flowing along these flux tubes? The sum of the masses M_D should over values of field strengths and charged particle masses should give the total mass M_E of Earth if the guess is correct.

One must of course be extremely cautious in interpretations. For instance, flux tubes carrying Kähler charge the flux tubes should be closed and give rise to a kind of Dirac monopole like structure with return flux. This would mean that gravitational flux returns back, possibly along different space-time sheets. But the flux lines are closed also for the ordinary magnetic fields. Can this really be consistent with the Newtonian view about gravitation in which

gravitational flux flows to infinity? The answer is far from obvious: the many-sheeted space-time in which space-time sheets are glued along the boundaries would that part of the flux can return and part goes to larger space-time sheets and in principle there is no largest space-time sheet so that one would obtain effectively monopoles.

5. An entire fractal hierarchy of magnetic field strengths is predicted. A good guess is that field strengths are given by p-adic length scale hypothesis, that is have scales given by $B(k) \propto 1/L(k)^2$, where $L(k) \propto 2^{k/2}$ is the p-adic length scale assignable to $p \simeq 2^k$. This would mean hierarchy of flux tubes with radii $L(k)$ and at each level the combination to super-cables representing gravitational flux tubes would take place.

One has $M_D \propto v_0/\sqrt{B} \propto v_0 2^{k/2}$. For a fixed value of v_0 , the sum can converge only if the number of p-adic length scales involved is finite. The radius R_E of Earth certainly gives this kind of upper bound and corresponds to a rather modest value of k ($L(151)$ correspond to 10 nm) . Also v_0 can depend on p-adic length scale. The sizes of living organisms give a more stringent upper bound on k .

2.5 Water memory and homeopathy

There is a lot of support about the representation of water memory as extremely low frequencies (ELF) of radiation associated with water [I5, I6]. These ELF frequencies can be stored electronically and they produce the same effects as the bio-active chemical, whose presence induced these frequencies in water. At the age of IT the idea about the existence of representations of bio-active molecules as frequency patterns able to induce the biological effects of molecules without the presence of molecules should not raise grave objections. For instance, brain generates this kind of representations by entrainment to external frequencies and water might play a crucial role also here. Few years ago HIV Nobelist Montagnier did experiments giving support for water memory and the procedure involved a part very similar to that used in preparing homeopathic remedies [I10] [L1].

The description of water memory in TGD Universe would look like follows.

1. In TGD framework these frequencies would correspond to cyclotron frequencies assignable to MBs of molecules, and immune system is proposed to have emerged from the ability of water to mimic the MBs of invader molecules and learning to recognize them [K4] by resonant coupling at these frequencies.

This would take place via entrainment made possible by the variation of the thickness of the flux tube inducing variation of the cyclotron frequency. In entrainment the cyclotron frequency of the flux tube would co-incide with the external frequency. MB having flux tubes with modified thickness would be able to produce cyclotron radiation at the these frequencies and couple to the invader molecule resonantly. The coupling would involve also topological part as reconnection of flux tubes with same thickness and carrying same charged particles to make resonance possible.

One can visualize living systems as systems having magnetic tentacles consisting of U-shaped flux tubes forming thus locally pairs of flux tube tubes and searching for flux similar flux tubes of other systems, in particular bio-active molecules. The recognition of invader molecules is a crucial part of immune systems and this mechanism would be an essential part of immune action besides cyclotron resonance.

2. In TGD universe water is very special substance in that it contains both ordinary water and its dark variant. What makes it dark is that dark magnetic flux tubes representing long hydrogen bonds are present for some portion of water [L23] (see <http://tinyurl.com/y8fvwbp9>): the length of bonds scales as n or perhaps even n^2 . The presence of these flux tubes makes any liquid phase a network like structure, and one ends up with a model explaining an anomaly of thermodynamics of liquids at criticality known already in Maxwell's time. This leads to a model explaining the numerous anomalies of water in terms of the dark matter.

For instance, the dark part of water with non-standard Planck constant transforms to ordinary water in freezing. As a consequence, a large amount of energy is liberated. This explains why water has anomalously large latent heat of fusion. One can also understand

why the volume of water increases in freezing and decreases in heating in the interval 0-4 °C. The anomalies of water are largest at physiological temperature $T_{phys} \sim 37$ °C suggesting that the dark portion of water is largest at T_{phys} . Dark fraction of water would be essential for life.

3. Pollack effect [L3] (see <http://tinyurl.com/oyhstc2>) requiring feed of energy - as IR radiation for instance - generates so called exclusion zones (EZs), which are negatively charged regions. A fraction of protons from water must go somewhere and the TGD inspired proposal [L3] (see <http://tinyurl.com/gwasd8o>) is that the protons transform to dark protons at magnetic flux tubes. The dark variants of particles quite generally have higher energies than ordinary ones and energy feed provides the needed metabolic energy to make the protons dark. In the case of homeopathy and water memory mechanical agitation creates provides the metabolic energy and would generate EZs accompanied by dark proton sequences at flux tubes [K4].
4. The MB of water would be also a key central part of MB of the living system acting as intentional agent receiving sensory input from biological body and controlling it. Biochemistry would be kind of shadow dynamics. The ions provided by the living system would reside at the flux tubes of MB provided by water and as found the lengths of flux tubes and also the value of $h_{eff} = h_{gr}$ at the would distinguish between different ions. The gravitational flux tubes formed by combination of n_{gr} ordinary flux tubes to n_{gr} flux tubes with the same M^4 projection defining a covering of M^4 would define the large part of MB serving as intentional agent and communications would occur at cyclotron frequencies.

Cell membranes would produce what I call generalized Josephson radiation, which would couple resonantly to cyclotron Bose-Einstein condensates at the flux tubes. Nerve pulse patterns would induce frequency modulation allowing to code sensory input represented by them and send it to MB which in turn could send control signals through genome [K12, K2, K3, K15].

MB would be the seat of primary form of genetic code. Dark proton sequences at flux tubes representing genetic code [L4] and the analogs of the other basic biomolecules are realized in water.

2.6 What the view about magnetic body could mean at the level of DNA and other basic bio-molecules?

A more precise vision about the anatomy of MB leads to a flux of ideas and questions. Flux tubes from identical basic units (cells, DNA, identical proteins, etc) combine to form single many-sheeted flux tube so that the incoming flux tubes have same M^4 projection being on top of each other in CP_2 direction. This super cable is like umbilical chord! The structures form a Bose-Einstein condensate in abstract topological sense.

This opens fascinating possibilities for understanding of dark DNA..

1. Cells have identical DNAs. Earlier I have assumed that magnetic flux sheets go through DNA in transversal direction and that dark DNA in some sense is sequence of dark proton triplets associated with flux tubes. Furthermore, DNA transcription requires that there are transversal flux tubes emerging from codons or perhaps even from nucleotides as flux tubes inside codon flux tube.
How to combine these views together with new view about combination of the DNAs flux tube to larger superstructure, one DNA from each cell in structure?
2. For single DNA each codon would correspond to 3-proton units organized linearly into a sequence. Each 3-proton unit must have a flux tube transversal flux to DNA strand and located at 2-D sheet. This brings in mind the structure of spine as anatomical and neurobiological analogy. This suggests that dark DNA codons formed by 3-proton units should be associated with these horizontal flux tubes in 2-D locally planar surface going through DNA.
3. These structures from $n_{gr} = h_{gr}/h_0 = h_{eff}/h_0$ separate cells should combine to single n_{gr} -sheeted gravitational flux tube with sheets on top of each other with same M^4 projection.

This would be dark DNA at the level of MB. It would seem that given codon of each DNA must contribute a dark proton triplet so that there would be n_{gr} dark proton triplets at given flux tube which is however very long. The size scale - that is the length of the flux tube - is that of Earth typically and fixed by the cyclotron wave length λ_c .

This would give a concrete topological meaning to quantum quantum coherence at the level of MB of bio-system. Also a view about how lower level conscious entities integrate to larger ones: one can imagine entire fractal hierarchy of structures integrating to larger structures integrating... In particular, altered states of consciousness could correspond to this kind of temporary integrations to higher level structures. Same should apply to other basic biological structures: cells, proteins, RNA, tRNA. Dark realization of the genetic code predicts the dark variants of these biomolecules.

This picture conforms with adelic physics [L14, L15] in which n_{gr} corresponds to the dimension of extension of rationals: the larger the value of n_{gr} , the higher the algebraic complexity and level of conscious intelligence.

4. Where are the dark protons and various dark ions at dark flux tubes? Along entire long flux tubes with length of order cyclotron wavelength for given charged particle? Or inside the organism?

The model of dark DNA allows only the latter option. They must reside at the short portions of the magnetic flux tubes inside organism. For instance, the dark protons of dark DNA are associated with flux tubes parallel and in immediate vicinity of ordinary DNA strand and codon and dark codon a paired like codon and its conjugate in ordinary DNA.

What makes these particles dark is that they are controlled by the gravitational flux tube and form a non-local quantum coherent unit containing n_{gr} particles.

This raises a long series of questions and fantastic challenges for visual imagination.

1. How do DNA and its conjugate relate at this level: do DNA and conjugate correspond to single closed long flux tube forming part of the “umbilical chord” far from biological body?
2. What replication of DNA could mean topologically at the level of this super-DNA? What about description of transcription and translation at these super-levels. Are the ordinary replication, etc.. induced from this super level as mere shadow processes: this would explain their mysterious coherence?
3. What sexual reproduction and associated recombination of chromosomes could mean at super level? What does the growth of organisms mean at super level? Addition of new sheets to super DNA and its variants so that n_{gr} defined as the number of basic units grows and organism becomes more and more quantum intelligent?

3 Two applications of the model of magnetic body

In the following the model of MB is applied to explain the findings of Montagnier [I10], and of Li and Heroux [I13]. Also the sensational claims of Walter Rawls Jr. [I12] about the effects of 2 Tesla magnetic fields on mice are discussed.

3.1 Interpretation of the experiments of Montagnier et al

One can make the model of MB more detailed by applying it the experiments of Montagnier et al [I10] discussed earlier from TGD viewpoint at [L1]. I have developed in collaboration with Peter Gariaev and analogous model analogous observations [K24].

Consider first a very rough sketch of the experiments.

1. A fragment of DNA was amplified by PCR. It was diluted to say 10^{-6} by adding pure water and found to generate EMS at ULF frequency range .5-3 kHz. Call this sample A.

2. Dilution was put in mu-mental container, which does not allow ULF radiation to get out. In its vicinity another tube, call it B, containing pure water was placed. The water content of each tube was filtered through 450 nm and 20 nm filters. Filtering does not allow particles with size smaller than 20 nm to go through. The samples were diluted to 10^{-15} by adding pure water. During each dilution a mechanical agitation of water by generating a vortex was performed.
3. Copper solenoid producing 7 Hz current was added around the samples. Eventually EMS was found in *both* A and B. In B there was primer, DNA polymerase, and free nucleotides but not the template complementary strand as in ordinary polymerase chain reaction.

The TGD interpretation for what happened in sample A would be following.

1. As explained ordinary DNA strand is paired with dark DNA strand for which dark proton triplets at flux tube parallel to ordinary DNA strand represent the codons [L4]. This is analog of pairing of DNA strand and its conjugate.
2. The cyclotron transitions of dark protons (possibly also those changing the direction of spin) generate the ULF radiation as classical em fields accompanied dark photons transformed to ordinary photons. The energies of dark photons are given by $E = h_{gr}f$ and should be above thermal energy at physiological temperatures. The transformations of dark photons to ordinary photons give rise to bio-photons with energies in visible and UV, and possibly also below this range [K18, K19].
3. Dilution eliminated ordinary DNA from A but left some dark DNA strands to the water. This is nothing but the phantom DNA phenomenon [I8] discovered by Gariaev and collaborators [K16]. In case of water memory one has phantoms of bio-active molecules [K4]. I have applied TGD also to other experimental findings and ideas by Gariaev et al [I7, I9, I11]. In particular there are articles written in collaboration about the TGD realization of identification of DNA as hologram [K1] and about DNA remote replication analogous to what happens in Montagnier's experiments [K24].
4. The interpretation of the agitation carried out also in the preparation of homeopathic remedies is that it provided metabolic energy needed to generate large h_{eff} [K4]. Quite generally, the energy of dark variant is larger than that of ordinary state: for instance, cyclotron energy is proportional to h_{eff} and atomic binding energies to $1/h_{eff}^2$ so that metabolic energy is needed.

The analogy with ordinary DNA and the idea that DNA replication is a shadow of the replication of dark DNA suggests that dark DNA replicated and a population of dark DNA mimicking ordinary DNA was generated in the diluted water sample A. More generally, water would perform mimicry of bio-active molecule by using dark protons at its magnetic body to generate the cyclotron frequency spectrum of the molecule. An interesting possibility is that dark proton sequences - dark nuclei - perform this mimicry.

5. The general model suggests that dark DNA generate transversal flux tubes at transversal sheets going through it. One could start by saying loosely that dark photon cyclotron radiation propagated along these flux tubes to the pure water sample, where there was flux tube receiving this radiation. But what the precise meaning of this statement could be, becomes more clear in the following.

What happened in the pure water sample?

1. Dark photon radiation at ULF frequencies should have caused the generation of dark DNA strands also in pure water sample. The water in the pure water sample mimicked the dark photon radiation by the basic homeopathic mechanism and generated dark DNA strands with transversal flux tubes at transversal flux sheets carrying magnetic fields corresponding to the cyclotron frequencies of dark DNA nucleotides.

2. Did a pairing of dark DNA in A and its conjugate in B analogous to the pairing of DNA and its conjugate take place? As in the ordinary DNA pairing the pairing would be favored by the minimization of interaction energy. The flux tubes connecting the members of the pair would be like stretched hydrogen bonds between DNA strand and its conjugate so that it would be very long, of order cyclotron wavelength of proton in the magnetic field of flux tube. TGD indeed predicts that hydrogen bonds have length spectrum corresponding to various values of h_{eff} [L23]. In this case however rather small values are involved. Now the values would be very large by $h_{eff} = h_{gr}$.
3. Did the transversal flux tubes attach to the dark DNA flux tubes directly and have length of the order of distance between samples? Or did the flux tubes from water sample combine to many-sheeted gravitational flux tube with length of the order of cyclotron frequency of proton? The latter option is favored.

The dark photons assignable to the frequency range .5-3 kHz should have energies above thermal energy at physiological temperature in order to have physiological effects. This requires $h_{eff} \geq 6 \times 10^{10}$: $f = .5$ kHz would correspond to a thermal energy of photon for most probable wavelength about $10 \mu\text{m}$.

A reasonable estimate for the length of the flux tubes involved comes from the cyclotron wavelength of proton. The cyclotron frequency .5 – 3.0 kHz for proton requires magnetic field about .3 – 2.0 Gauss somewhat stronger than $B_{end} = .2$ Gauss ($B_E = .5$ Gauss). The cyclotron wavelength would be in the range .1-6 Mm (Earth radius is 6.4 Mm) so that the analogs of hydrogen bonds would be very long!

4. The generation of ordinary DNA strands in this sample would have been by the analog of DNA - dark DNA pairing that should occur in standard biology. The DNA fragment in pure water sample was reproduced as if the complementary strand would have been present.
5. As already explained, the dark protons are at single sheeted ordinary flux tubes accompanying DNA. n_{gr} flux tubes from various positions would combine n_{gr} -sheeted flux tube with same M^4 projection as ordinary flux tube: they were on top of each other in $M^4 \times CP_2$. Why the protons deserved to be called dark is that the proton sequences at n_{gr} separate flux tubes form single quantum coherent many-proton states somewhat analogous to Bose-Einstein condensate. Cyclotron energy is therefore naturally n_{gr} times the cyclotron energy of single state. This is essentially quantum non-locality made possible by the locality at the gravitational flux tube quantum controlling the system. Also dark photons having n_{gr} -fold energy non-local many-photon states with one photon at each flux tube with same energy and momentum.
6. Also 7 Hz frequency is necessary for the effect to occur. A natural guess is that this frequency is related to Schumann resonances (see <http://tinyurl.com/cv8z9vs>), which are associated with collective oscillations in the Earth's magnetic field in the cavity bounded by Earth's surface and ionosphere in which em waves cannot propagate. Schumann resonances dominate the frequency spectrum from 3 Hz to 60 Hz - a considerable part of EEG - and there are distinct peaks at frequencies resonance 7.81, 14.3, 20.8, 27.3 and 33.8 Hz.

In the linear model Schumann resonances treating atmosphere as vacuum Schumann resonance frequencies $f_n = \sqrt{n(n+1)}c/2\pi R_E$ are determined by the geometry alone with lowest resonance at 7.41 Hz for $R_E = 6371$ km. The finite conductivity of atmosphere lowers the propagation velocity of light and the frequencies are reduced. This can bring the resonance frequency 7.81 Hz nearer to 7 Hz, and there is of course also the continuum besides the resonance peaks.

In TGD picture the quasi-continuum would relate to the many-sheetedness of the space-time surface making it possible for light to propagate along large number of flux tube paths so that the effective light-velocity would vary. A more precise model give also a resonance at 4.11 Hz. This resonance frequency however varies due to the several factors.

The interpretation of Schumann resonances 7.81, 14.3, 20.8, 27.3 and 33.8 Hz and higher resonances as resonance frequencies of EEG is highly attractive. At higher frequencies the resonances appear approximately with 6.5 Hz intervals. Next resonance would be at 40.3

Hz, which is the familiar thalamo-cortical resonance frequency to which consciousness was once assigned. 8:th partial wave has resonance frequency 60 Hz which happens to be the frequency appearing in the experiments of Li and Heroux. 4 Hz frequency in turn is theta resonance frequency in EEG.

This supports the view that water entrains to Schumann frequencies by tuning to cyclotron frequencies by varying the thickness of flux tubes of its MB so that the coupling of living matter to the oscillations of Earth's magnetic field would play fundamental role in biology and neuroscience. The testable prediction is the correlation of EEG with the local Schumann resonance spectrum of Earth independent of individual.

Dr. Phil Callahan [I1, I3] claims on basis of intensive experimental work that there is a tendency of political strifes and wars to concentrate on regions where Schumann resonances are weak. In the proposed picture this would not be surprising. The reduction in the level of consciousness would imply strifes and wars at the level of society and cancer at the level of cell community.

3.2 Cancer as a disease of the MB of water?

How the irradiation of the cancer cell population with 60 Hz oscillating magnetic field with extremely small intensity in above 25 nT could lead to the reduction of the chromosome number of mitochondria and return of cancer cells to a normal state?

One should locate the problem. Is the problem at the level of cell membrane, mitochondria, or ATPase as Josephson junction, or possibly at the level of MB of water? Could cancer - and perhaps many other diseases - be diseases of the MB of water? This option is certainly the simplest one since one can forget entire chemistry of cells apart from the presence of charged particles.

What the problem is? Cancer rather obviously means a loss of coherence at the level of ordinary bio-matter forced by quantum coherence at the level of MB. This suggests that the quantum coherence of MB is for some reason lost in cancer. The coherent behavior of cell groups consisting of few cells is lost and cells behave like individuals knowing nothing about each other's presence.

In the recent case one can consider protons in magnetic field $B = B_{end}/5$ with 5 times larger flux tube area increasing the area of quantum control by factor 5: 5 cells instead of 1 cells roughly. One can also consider magnetic field $B = 6B_{end}/5$ with Li^+ ions having mass number $A = 6$. Now the length rather than radius of flux tubes would be scaled up by factor 5. Li^+ ions are indeed applied in manic depressive disease and schizophrenia but the mechanism for healing is unknown. TGD proposal is that their presence generates cyclotron radiation needed to have communications with the layers of MB responsible for the control of axons for instance known to suffer from inflammation [L8, L5].

Let us consider a more detailed model.

1. Assume that MB, whose anatomy has been described above controls bio-matter. The radius of flux tube defines the size scale of coherent regions and the quantum coherence of gravitational part of MB can force coherence in this regions. For cancer cells the radius of this regions is cell radius and flux tubes with this thickness form the basic structural units. For $B_{end} = .2$ Gauss the radius $R_B \simeq 3.2 \mu\text{m}$ of the flux tube is indeed of the order of cell radius. The cyclotron frequency for proton is 300 Hz and this conforms with the idea that it defines the rotation frequency of the shaft of the power generator defined by ATPase.
2. The coherent behavior requires the presence of also higher levels in the p-adic length scale hierarchy. 60 Hz frequency corresponds to cyclotron frequency for dark protons in $B = B_{end}/5$. This does not actually correspond to power of 2 but I have proposed that also powers of other p-adic length scales for small primes could be important and their is evidence for $p = 3$ [K8]. Now one would have $p = 5$. Note that the roots \sqrt{p} , $p \in \{2, 3, 5\}$ are in a central role in the geometry of Platonic solids (the geometry of icosahedron is in central role in one TGD based model of genetic code based on the notion of bio-harmony [L2, L24].

Since flux tube with 5-fold area contains 5 cells in transversal cross section, this suggests that in cancer the coherent behavior at 5-cell level is lost. It might be that the thickness of these flux tubes has for some reason changed so that they are out of synch or that they are missing altogether.

3. The above summarized experiments of Russians [I2] show that the physical properties of water change by irradiation with extremely weak magnetic fields at frequencies at various frequencies. That the properties of water change would be due to the control action by MB of the water. The effect depends very little on the strength of the field and this conforms with the entrainment hypothesis meaning that flux tubes tune their thickness to achieve resonance like radio set.

TGD interpretation is in terms of water memory. In TGD water memory is represented as cyclotron frequencies associated with the flux tubes of MB of water, its body parts characterized by various frequencies and the body parts, flux tubes, can thicken in which case the frequency is reduced and vice versa. Even new body parts can emerge and it is possible genetic code codes for them (in fact dark genome assignable to protonic flux tubes parallel to DNA would be the fundamental code). MB entrains to external frequencies by varying the thickness of its flux tubes and can respond to and represent them as cyclotron frequencies.

The healing of cancer cells by 60 Hz radiation could bring to the MB of cancer cells the protonic flux tubes with $f_c = 60$ Hz. The communications to the big MB of the cell would be restored and MB could take care of the cell.

4. The above discussed connection with Schumann resonances suggests that all Schumann resonances are fundamental for biology and the MB of water entrains to them. The 8:th Schumann resonance is indeed 60 Hz.

This could have rather far reaching implications.

1. Also the homeopathic treatment of water [K4] is explained in terms of the generation of flux tubes as body parts of MB of water having the cyclotron frequencies of the molecules involved in the treatment. These molecules represent at least the ELF part of the cyclotron energy spectrum of molecules and can therefore couple resonantly to them so that MB can detect the invader molecules and molecules of immune system can catch them and make them harmless.

The mechanical agitation of water would provide the metabolic energy needed to generate the needed large values of h_{eff} . Quite generally, metabolic energy feed is needed in order to generate MB containing the dark matter. At least the ELF spectrum of homeopathic remedy has been found to generate the same effective as the original molecule, which also demonstrates that it is ELF spectrum, which is responsible for bio-activity. This does not make sense in standard quantum theory since the photon energies are much below the thermal energy at the physiological temperatures. The large value of h_{gr} saves the situation.

2. If this picture is correct, homeopathic remedies could be also generated by irradiation of water using the ELF frequency spectrum characterizing the substance considered.
3. In the case of cancer the irradiation of water with 60 Hz frequency could generate the required body parts of MB or get existing body parts in synch and induce a healing of cancer. Cancer would be very probably only very special case if MB is the intentional agent controlling biological body in various scales and bio-chemistry is a kind of shadow dynamics as suggested. One can even imagine a medicine completely free of the side effects of various chemical medicines [K4]. If even genetic diseases are basically diseases of MB, they might be healed homeopathically. An interesting question is whether water is a kind of universal emulator of various molecules able to very quickly modify its MB.

3.3 Mice in magnetic fields

I received from Donald Adams a highly interesting link (see <http://tinyurl.com/ya9438st>) relating to the effects of 2 Tesla magnetic field on mice (much stronger than the Earth's magnetic field). The claims of the article by Walter C. Rawls Jr seem sensational. I do not know whether to trust on the claimed findings since from the viewpoint of TGD inspired quantum biology they seem to be too good to be true. A sociological reason to worry is that the findings are not published in any respected journal. But on the other hand, my own work has not been published in respected

journals either and will not be so for years to come. With these reservations and knowing the enormous potentials importance of the findings of Rawls if true, I attach a piece of the article of Rawls [112].

3.3.1 How animals dramatically change in relation to magnetic field exposure?

Twelve mice were placed in a cage to be used as controls (untreated). Another twelve mice were placed in a separate cage with exposure to the South pole field of a 2,000 gauss magnet, and the last twelve were put in a cage exposed to the North pole energies of a like magnet. An equal number of males and females were put in each cage. Exposure time was two months.

The untreated control mice behaved and functioned as normal mice. Without exception, the South pole mice slowly became very messy in their housekeeping, their appetites increased, they engaged in sex more, and their offspring were larger than those of the controls. Also, as time passed, they became mentally slow, losing sensitivity to sound and light changes in the laboratory. Their young were difficult to teach the customary tests; they were lazy, listless, careless and very dirty in appearance.

The North pole mice became very neat and tidy, cleaning themselves frequently. They also became extremely sensitive to any noise or light variations in the laboratory. Their offspring were smaller than those of the controls. They were mentally superior to the controls and out performed the South pole young by several hundred percent in all phases of natural behavior.

The South pole mice were larger, grew faster, matured sooner, and mated continually. They also died earlier than their control counterparts. The North pole mice matured slower and lived 45 to 50 percent longer than the controls. They were also mentally superior to the controls and several hundred percent smarter than the South pole mice. They were much less frequent with sexual behavior than the South pole treated mice and less than the controls.

Rats were the next test subjects, and the results were the same as the findings with the mice. Rabbits and later cats were tested, again the results were the same as with the mice. These experiments are facts of the results of actual controlled experiments and are not theories or ideas. Anyone wishing to do so can reproduce these experiments.

Can we now program man to be more physical or mental, depending on the need of society? Based on our findings from these early experiments, we believe man can be conditioned in a like manner and his life expectancy extended far beyond what is now considered to be his three score and ten years.

Remembering that these tests were conducted on the entire body of the animal, could we by placing the North pole of a magnet directly at the center of the brain of larger animals and voluntary human subjects raise the intelligence and sensitivity?

3.3.2 Comments about claimed findings from TGD point of view

If true, these findings provide a direct evidence for the notion of magnetic body (MB) central in TGD inspired theory of consciousness and quantum biology. MB would use biological body as a motor instrument and sensory receptor and serves as an intentional agent. One could understand the findings as being due the loss of the control of the behavior performed by magnetic body as the south directed magnetic field is added. North directed magnetic field seems to have opposite effect.

The fields used are rather strong: the strength is 2 Tesla, by a factor of 10,000 stronger than the endogenous magnetic field $B_{end}=.2$ Gauss playing key role in TGD based quantum biology. This field has been assumed to define lower bound for the endogenous magnetic field strengths but it seems that also weak field strengths are possible down to the values where cyclotron energies of dark photons are proportional to h_{eff} which in turn is proportional to the mass of the charged particles (so that cyclotron energies do not depend on mass of the charged particle and are universal) become smaller than thermal energy at physiological temperature.

1. Paramagnetic effect as strengthening of the coupling between MB and biological body?

The explanation for the effects could be that paramagnetic effect occurs and depending on the direction of the applied field increases or reduces the coupling of brain to Schumann resonances. The MB of the water and thus of living organisms and of their parts are indeed proposed to

entrain with the Schumann resonances of the Earth's magnetic field by resonance coupling. These frequencies would be crucial for the control of biological body by MB.

Why the direction of external magnetic field does affect the situation? Brain contains magnetic molecules organised in the direction of Earth's magnetic field. The external field would tend increase or reduce the strength of these dipoles and the effect would be enhanced/reduced coupling to Schumann resonances for north/south directed external field. This would strengthen/weaken the communications/control by MB - the higher level intentional agent- and lead to the observed effects.

It makes sense to recall what was already said about Schumann resonances. The frequencies of Schumann resonances correspond to EEG resonance frequencies. Callahan found that in the regions, where Schumann resonances are weak, there is a lot of social disorder so that Schumann resonances seem to be essential also for collective consciousness and well-being. Callahan also found that plants growth faster if the soil is paramagnetic.

2. *The function of magnetite and other magnetic molecules in brain?*

The function of magnetic molecules (magnetite Fe_3O_4 mostly) in brain (see <http://tinyurl.com/ybprw4s>) has remained somewhat a mystery. Very probably they help to navigate but the function might be much deeper. Could magnetic molecules help to build a stronger connection to the magnetosphere and magnetic body - could one say that they serve the role of antenna? This would be directly visible in EEG for instance. Resonances would be stronger and communications to and control by MB would be more effective.

Wikipedia article about magnetite(see <http://tinyurl.com/jx19tk9>) tells also about the role of magnetite in brain. The text below contains also my comments.

1. Living organisms can produce magnetite. In humans, magnetite can be found in various parts of the brain including the frontal, parietal, occipital, and temporal lobes, brainstem, cerebellum and basal ganglia. Iron can be found in three forms in the brain - magnetite, hemoglobin (blood) and ferritin (protein), and areas of the brain related to motor function generally contain more iron. Magnetite can be found in the hippocampus associated with information processing, specifically learning and memory.

Comment: If magnetite would serve only for navigation, it would be probably appear only in some special part(s) of brain.

2. Hemoglobin and ferritin contain iron. Hemoglobin is however only weakly paramagnetic whereas ferritin (protein!) nanoparticles can be *superparamagnetic* (see <http://tinyurl.com/y796kc4y>).

Comment: What puts bells ringing is that Callahan found the addition of paramagnetic substances in soil to be beneficial for the plant growth by Callahan.

3. Magnetite can have toxic effects due to its charge or magnetic nature and its involvement in oxidative stress or the production of free radicals. Research suggests that beta-amyloid plaques and tau proteins associated with neurodegenerative disease (Alzheimer) frequently occur after oxidative stress and the build-up of iron.

Comment: But could the higher level of paramagnetic iron be the reason for Alzheimer or is it due to attempt of brain to improve coupling to Schumann resonances and overcome the effects of Alzheimer? Same question has been made also concerning the plaques in axons emerging in Alzheimer [J1] (for the TGD based model for Alzheimer [L13] see <http://tinyurl.com/ybq6r3xu>).

3. *Magnetic healing at the level of organisms and social structures?*

Could one consider artificial strengthening of the brain coupling to Schumann resonances as magnetic healing of not only biological but also social disorders? Could one just add magnetic molecules to brain? One cannot exclude this kind of possibility and it might be possible to test this with animals.

Many of us are well aware about the worsening situation in our society governed by market economy. Many researchers speak even about a possible collapse of our civilization. Also the

strength of the magnetic field of Earth is weakening with a rate of 5 per cent per century (see <http://tinyurl.com/ybbw4lue>). Is this mere accident? It would be interesting to see whether something similar has happened for the local magnetic field during the collapses of the earlier civilizations. If there is a connection, could one imagine improving the situation by magnetic healing?

REFERENCES

Theoretical Physics

- [B1] Preskill J et al. Holographic quantum error-correcting codes: Toy models for the bulk/boundary correspondence. Available at: <http://arxiv.org/pdf/1503.06237.pdf>, 2015.

Cosmology and Astro-Physics

- [E1] Nottale L Da Rocha D. Gravitational Structure Formation in Scale Relativity. Available at: <http://arxiv.org/abs/astro-ph/0310036>, 2003.

Biology

- [I1] Earth's magnetic field regions of weakness correlated to sites of political unrest and war: the paradigm quaking measurements of professor Phil Callahan. Available at: <http://www.acacialand.com/Callahan.html>.
- [I2] Effect of weak magnetic fields on the properties of water and ice. *Soviet Physics Journal*. Available at: <http://tinyurl.com/yd7kqzng>, 31(5), 1988.
- [I3] Dr. Phil Callahan on Power of Paramagnetism. *Nexus*. Available at: <http://www.nexusmagazine.com>, February 2003.
- [I4] The Fourth Phase of Water : Dr. Gerald Pollack at TEDxGuelphU. Available at: <https://www.youtube.com/watch?v=i-T7tCMUDXU>, 2014.
- [I5] Benveniste J et al. Human basophil degranulation triggered by very dilute antiserum against IgE. *Nature*, 333:816–818, 1988.
- [I6] Benveniste J et al. Transatlantic transfer of digitized antigen signal by telephone link. *J Allergy and Clinical Immunology*. Available at: <http://www.digibio-.com/>, 99:175, 1989.
- [I7] Gariaev P et al. *The DNA-wave biocomputer*, volume 10. CHAOS, 2001.
- [I8] Gariaev PP et al. Holographic Associative Memory of Biological Systems. *Proceedings SPIE - The International Soc for Opt Eng . Optical Memory and Neural Networks*, pages 280–291, 1991.
- [I9] Gariaev PP et al. The spectroscopy of bio-photons in non-local genetic regulation. *J Non-Locality and Remote Mental Interactions*. Available at: <http://www.emergentmind.org/gariaevI3.htm>, (3), 2002.
- [I10] Montagnier L et al. DNA waves and water. Available at: <http://arxiv.org/abs/1012.5166>, 2010.
- [I11] Tovmash AV Gariaev PP, Tertishni GG. Experimental investigation in vitro of holographic mapping and holographic transposition of DNA in conjunction with the information pool encircling DNA. *New Medical Technologies*, 9:42–53, 2007.

- [I12] Rawls WC Jr. The Scope of Biomagnetism. Magnetism ... a Natural form of Energy. Albert Roy Davis Research Laboratory. Exotic Research Report (V2N1, Jan/Feb/Mar 1999). Available at:<http://tinyurl.com/ya9438st>.
- [I13] Li Y and Heroux P. *Electromagnetic Biology ad Mecicine*. Available at: <http://tinyurl.com/y91v47qp>, 33(4), 2014.

Neuroscience and Consciousness

- [J1] Bredesen D. *The End of Alzheimer's: The First Program to Prevent and Reverse Cognitive Decline*.<http://tinyurl.com/ya8nkan9>. Vermilion, London, 2017.

Books related to TGD

- [K1] Pitkänen M Gariaev P. Model for the Findings about Hologram Generating Properties of DNA. In *Genes and Memes*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/genememe.html#dnahologram>, 2011.
- [K2] Pitkänen M. Dark Matter Hierarchy and Hierarchy of EEGs. In *TGD and EEG*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/tgdeeg.html#eegdark>, 2006.
- [K3] Pitkänen M. DNA as Topological Quantum Computer. In *Genes and Memes*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/genememe.html#dnatqc>, 2006.
- [K4] Pitkänen M. Homeopathy in Many-Sheeted Space-Time. In *Bio-Systems as Conscious Holograms*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/holography.html#homeoc>, 2006.
- [K5] Pitkänen M. Magnetic Sensory Canvas Hypothesis. In *TGD and EEG*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/tgdeeg.html#mec>, 2006.
- [K6] Pitkänen M. *Magnetospheric Consciousness*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/magnconsc.html>, 2006.
- [K7] Pitkänen M. Negentropy Maximization Principle. In *TGD Inspired Theory of Consciousness*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/tgdconsc.html#nmpc>, 2006.
- [K8] Pitkänen M. p-Adic Physics as Physics of Cognition and Intention. In *TGD Inspired Theory of Consciousness*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/tgdconsc.html#cognic>, 2006.
- [K9] Pitkänen M. Quantum Astrophysics. In *Physics in Many-Sheeted Space-Time*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/tgdclass.html#gastro>, 2006.
- [K10] Pitkänen M. Quantum Hall effect and Hierarchy of Planck Constants. In *Hyper-finite Factors and Dark Matter Hierarchy*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/neuplanck.html#anyontgd>, 2006.
- [K11] Pitkänen M. Quantum Model for Hearing. In *TGD and EEG*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/tgdeeg.html#hearing>, 2006.
- [K12] Pitkänen M. Quantum Model for Nerve Pulse. In *TGD and EEG*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/tgdeeg.html#pulse>, 2006.
- [K13] Pitkänen M. *TGD and EEG*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/tgdeeg.html>, 2006.
- [K14] Pitkänen M. *TGD Inspired Theory of Consciousness*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/tgdconsc.html>, 2006.

- [K15] Pitkänen M. Three new physics realizations of the genetic code and the role of dark matter in bio-systems. In *Genes and Memes*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/genememe.html#dnatqccodes>, 2006.
- [K16] Pitkänen M. Wormhole Magnetic Fields. In *Quantum Hardware of Living Matter*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/bioware.html#wormc>, 2006.
- [K17] Pitkänen M. Quantum Mind, Magnetic Body, and Biological Body. In *TGD based view about living matter and remote mental interactions*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/tgdlian.html#lianPB>, 2012.
- [K18] Pitkänen M. Are dark photons behind biophotons? In *TGD based view about living matter and remote mental interactions*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/tgdlian.html#biophotonslian>, 2013.
- [K19] Pitkänen M. Comments on the recent experiments by the group of Michael Persinger. In *TGD based view about living matter and remote mental interactions*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/tgdlian.html#persconsc>, 2013.
- [K20] Pitkänen M. Criticality and dark matter. In *Hyper-finite Factors and Dark Matter Hierarchy*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/neuplanck.html#qcritdark>, 2014.
- [K21] Pitkänen M. Quantum gravity, dark matter, and prebiotic evolution. In *Genes and Memes*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/genememe.html#hgrprebio>, 2014.
- [K22] Pitkänen M. About twistor lift of TGD? In *Towards M-Matrix*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/tgdquantum.html#hgrtwistor>, 2016.
- [K23] Pitkänen M. The classical part of the twistor story. In *Towards M-Matrix*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/tgdquantum.html#twistorstory>, 2016.
- [K24] Gariaev P Pitkänen M. Quantum Model for Remote Replication. In *Genes and Memes*. Online book. Available at: <http://www.tgdtheory.fi/tgdhtml/genememe.html#remotereplication>, 2011.

Articles about TGD

- [L1] Pitkänen M. DNA Waves and Water . Available at: http://tgdtheory.fi/public_html/articles/mont.pdf, 2011.
- [L2] Pitkänen M. Geometric theory of harmony. Available at: http://tgdtheory.fi/public_html/articles/harmonytheory.pdf, 2014.
- [L3] Pitkänen M. Pollack's Findings about Fourth phase of Water : TGD View. Available at: http://tgdtheory.fi/public_html/articles/PollackYoutube.pdf, 2014.
- [L4] Pitkänen M. About Physical Representations of Genetic Code in Terms of Dark Nuclear Strings. Available at: http://tgdtheory.fi/public_html/articles/genecodemodels.pdf, 2016.
- [L5] Pitkänen M. Are lithium, phosphate, and Posner molecule fundamental for quantum biology? Available at: http://tgdtheory.fi/public_html/articles/fisherP.pdf, 2016.
- [L6] Pitkänen M. Holography and Quantum Error Correcting Codes: TGD View. Available at: http://tgdtheory.fi/public_html/articles/tensornet.pdf, 2016.
- [L7] Pitkänen M. Hydrinos again. Available at: http://tgdtheory.fi/public_html/articles/Millsagain.pdf, 2016.

- [L8] Pitkänen M. Lithium and Brain . Available at: http://tgdtheory.fi/public_html/articles/lithiumbrain.pdf, 2016.
- [L9] Pitkänen M. p-Adicizable discrete variants of classical Lie groups and coset spaces in TGD framework. Available at: http://tgdtheory.fi/public_html/articles/padicgeom.pdf, 2016.
- [L10] Pitkänen M. Artificial Intelligence, Natural Intelligence, and TGD. Available at: http://tgdtheory.fi/public_html/articles/AITGD.pdf, 2017.
- [L11] Pitkänen M. Cold fusion, low energy nuclear reactions, or dark nuclear synthesis? Available at: http://tgdtheory.fi/public_html/articles/krivit.pdf, 2017.
- [L12] Pitkänen M. Does valence bond theory relate to the hierarchy of Planck constants? Available at: http://tgdtheory.fi/public_html/articles/valenceheff.pdf, 2017.
- [L13] Pitkänen M. Is it possible to reverse Alzheimer's disease? Available at: http://tgdtheory.fi/public_html/articles/Alzheimer.pdf, 2017.
- [L14] Pitkänen M. Philosophy of Adelic Physics. In *Trends and Mathematical Methods in Interdisciplinary Mathematical Sciences*, pages 241–319. Springer. Available at: https://link.springer.com/chapter/10.1007/978-3-319-55612-3_11, 2017.
- [L15] Pitkänen M. Philosophy of Adelic Physics. Available at: http://tgdtheory.fi/public_html/articles/adelephysics.pdf, 2017.
- [L16] Pitkänen M. About dark variants of DNA, RNA, and amino-acids. Available at: http://tgdtheory.fi/public_html/articles/darkvariants.pdf, 2018.
- [L17] Pitkänen M. About the physical interpretation of the velocity parameter in the formula for the gravitational Planck constant . Available at: http://tgdtheory.fi/public_html/articles/vzero.pdf, 2018.
- [L18] Pitkänen M. Clustering of RNA polymerase molecules and Comorosan effect. Available at: http://tgdtheory.fi/public_html/articles/clusterRNA.pdf, 2018.
- [L19] Pitkänen M. Could cancer be a disease of magnetic body? Available at: http://tgdtheory.fi/public_html/articles/nanotesla.pdf, 2018.
- [L20] Pitkänen M. Dark valence electrons and color vision. Available at: http://tgdtheory.fi/public_html/articles/colorvision.pdf, 2018.
- [L21] Pitkänen M. Emotions as sensory percepts about the state of magnetic body? Available at: http://tgdtheory.fi/public_html/articles/emotions.pdf, 2018.
- [L22] Pitkänen M. Is the hierarchy of Planck constants behind the reported variation of Newton's constant? Available at: http://tgdtheory.fi/public_html/articles/variableG.pdf, 2018.
- [L23] Pitkänen M. Maxwells lever rule and expansion of water in freezing: two poorly understood phenomena. Available at: http://tgdtheory.fi/public_html/articles/leverule.pdf, 2018.
- [L24] Pitkänen M. New results in the model of bio-harmony. Available at: http://tgdtheory.fi/public_html/articles/harmonynew.pdf, 2018.
- [L25] Pitkänen M. Sensory perception and motor action as time reversals of each other: a royal road to the understanding of other minds? Available at: http://tgdtheory.fi/public_html/articles/timemirror.pdf, 2018.
- [L26] Pitkänen M. TGD view about coupling constant evolution. Available at: http://tgdtheory.fi/public_html/articles/ccevolution.pdf, 2018.