

Manysheeted DNA

M. Pitkänen, March 30, 2002.

Department of Physical Sciences, High Energy Physics Division,
PL 64, FIN-00014, University of Helsinki, Finland.

Home address: Kadermonkatu 16,10900, Hanko, Finland.

matpitka@rock.helsinki.fi .

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

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Abstract

The general ideas related to remote mental interactions are applied at DNA level by regarding living matter as a society of conscious selves even at the molecular level communicating telepathically by the sharing of fused mental images (entangled subselves). Homeostasis in the manysheeted spacetime relies on superconducting magnetic flux tube circuitry having plasmons (closed magnetic and Z^0 magnetic flux tubes accompanied by ions) as a basic structural element serving as templates for the self-organization of matter. Magnetic mirror systems formed by pairs of MEs (massless extremals, 'topological light rays') and magnetic flux tubes provide a universal molecular recognition mechanism working also at the molecular level. The so called scaling laws are crucial for the understanding of the interaction between ELF frequency MEs and their physical origins are considered. Also the basic ideas related to the manysheeted DNA with emphasis on holographic aspects of DNA are introduced.

KEYWORDS: quantum jump, entanglement, p-adic numbers, manysheeted spacetime, superconductivity, massless extremal, magnetic mirror.

1 Introduction

The problems of how genes code information about the morphology of organism and how this information is expressed, belong to the great puzzles of the developmental biology. A closely related mystery is the differentiation of cells. The notion of the genetic program is far from precise and it is not clear how close the analogy with a computer program is. There are also several problems which challenge the basic dogmas of genetics.

a) Only 1 per cent of DNA of human genome actually codes polypeptides. Eukaryote genes contain intron sequences which are transcribed into hnRNA but snipped off when hnRNA is transformed mRNA in a process called slicing. The higher the evolutionary level of organism, the higher the fraction of introns is. Molecular Darwinists see introns as "junk DNA" but there is evidence that introns are far from junk. For instance, the splicing of the intron contribution from hnRNA to give mRNA can give several different outcomes depending on the stage of development of the organism and introns are crucial for the effectiveness of immune system. Hence one can wonder whether intronic mRNA and protein mRNA could both form the real output of gene subprograms serving in some sense as input for other gene subprograms. This interpretation obviously conflicts with "gene-single protein" dogma in its basic form.

b) There are large amounts of highly repetitive DNA which is silent. One can wonder whether there is some fundamental mis-understanding involved. Could it be that this DNA is analogous to control DNA not transcribed to RNA and therefore not at all useless. There is also active repetitive DNA.

c) There is large amount of silent DNA in control sections between genes. Could it be that this silent DNA expresses itself in some nonchemical manner? Chemical expression is very slow, translation rate being twenty aminoacids per second, and one can wonder whether life might have invented faster modes of gene expression and control of gene expression.

d) Plant genome is often by a factor of hundred longer than human genome. One could argue that the complexity of the organism is measured by the length of the shortest program coding the organism. It is however not at all obvious how the genome of plants could be more redundant than human genome since repetitive sequences common to all animals are present. Introns are in fact more

frequent in human genome. This suggests that some new unidentified degrees of freedom giving rise to complexity might be present and that the chemistry of DNA in the sense of standard physics is perhaps not all that is needed to understand genetic program.

e) Various self-organization process such as self-assembly and de-assembly are very frequent in living systems. The problem how genes give rise to morphology of the organism is poorly understood. This forces to challenge the dogma of genetic determinism. One should be able to understand what is determined by genes and what is determined by self-organization and whether the genes of the standard physics are enough.

f) Prions associated with the mad cow disease have no DNA and thus break the central dogma.

One can also question the assumption that the chemical information and the information related to the geometric structure of DNA is all that matters. One might well argue that also the electromagnetic fields associated with DNA and other biomolecules might be of fundamental importances if one wants to understand phenomena like molecular recognition. In Maxwell's theory it is difficult to see how the fields associated with molecules could possess some personal molecular identity except in the immediate vicinity of the molecule.

The reason why the above mentioned problems have turned out to be so untractable might be due to a too simplistic view about spacetime.

a) TGD [1,2,3,4] predicts that each material system is accompanied by what might be called a field body serving as a kind of manual for the 'material body' of DNA, and it is quite possible that in case of DNA this field body represents more than a mere copy of the chemical information contained in the DNA sequence. Also the field bodies of proteins and other biomolecules could represent independent information.

b) The notion of many-sheeted spacetime might be absolutely crucial for the expression of genetic code and representation of the genetic information. Gene itself might be many-sheeted spacetime structure coding faithfully the topology of the expression domain of gene. The many-sheeted structure of DNA could allow to understand the miraculous looking features of DNA replication and cell differentiation. TGD based view of evolution as p-adic evolution implied by the basic quantum theory, should be a crucial element of the picture. Together with p-adic length scale hypothesis, with the Combinatorial Hierarchy model for genetic code allowing to interpret genes as Boolean statements, and general vision about quantum control and coordination based on a hierarchy of weakly coupled super conductors, the notion of many-sheeted DNA leads to precise quantitative predictions and a general model for genetic program. In particular, one can understand the mystery of introns. What interesting from the point of view of our consciousness is that it might be possible to interpret the Boolean statements represented by the exon and intron parts of genes as a physical representation for our belief system. Thus genes would code both matter- and mindlike hardware of the living system.

2 General ideas

To make things easier to the reader, I summarize briefly the rapid convergence of ideas about quantum control.

2.1 General view about homeostasis

For the benefit of the reader a general view about homeostasis a la TGD is first described before the construction of a model for homeopathy.

2.1.1 Superconducting part of the ionic flow circuitry

The observations described in [12] provide important clues about the general structure of the superconducting part of the ionic flow circuitry assumed to be realized as a fractal structure of magnetic flux tubes. The following scenario is consistent with the basic observations.

1. *Magnetic circulation and plasmons*

Magnetic circulation is analogous to blood circulation and emerges during the development of the organism. Magnetic flux tubes form the superconducting part of a many-sheeted ionic flow circuitry. Supra currents flow along magnetic flux tubes and are transformed to dissipating Ohmic currents when they flow to the atomic spacetime sheets.

Plasmons are the basic building blocks of the magnetic circuitry.

a) Electromagnetic plasmons are toruslike magnetic flux tube structures accompanied by plasma at atomic spacetime sheet. Since the matter at the cellular spacetime sheets forms Z^0 plasma (all atomic nuclei are complete Z^0 ions), also Z^0 magnetic plasmons should be of fundamental importance. Note that now $k = 169$ cellular spacetime sheet, where neutrinos condense topologically, takes the role of atomic spacetime sheet ($k = 137$) whereas $k = 173$ spacetime sheet corresponds to Z^0 magnetic flux tubes.

b) Toruslike plasmons allow an extremely rich topological structure: magnetic flux tubes can form arbitrarily complex knots and can get linked. Obviously this means a new kind of biological information tailor made for the control of morphogenesis.

c) The dropping of charged plasma particles from the atomic spacetime sheets to the magnetic flux tubes provides a basic mechanism of metabolism based on the liberation of the zero point kinetic energy as a usable energy. External energy feed is needed to drive the charges back to the atomic spacetime sheet. Also Z^0 magnetic plasmons allow this kind of metabolism.

d) There are reasons to believe that cold plasmons form a fractal hierarchy of fundamental magnetic life forms and serve as the building blocks of the magnetic circulation in various length scales. Plasmons could serve as templates for neural circuits and for intracellular magnetic circulation. Cell replication could be induced by the decomposition of the nuclear magnetic dipole field to two dipole fields by reconnection of flux tubes of the dipole core with those outside and with fluxes running in an opposite direction. Thalamus could contain a dipole core consisting of densely packed flux tubes and acting as a magnetic relay station, wherefrom the magnetic circuitry to other parts of brain and body would emanate. A testable hypothesis inspired by the model for the sensory representations is that magnetic and Z^0 magnetic circuitries correspond to sensory input and motor control respectively. Color rotations can transform magnetic flux tubes to Z^0 magnetic and vice versa but it is an open question whether these transformations really occur: for MEs they occur in the model of sensory and motor representations.

According to [12], the frequencies associated with the acupuncture meridian lines remain in a good accuracy invariant during the life cycle of the organism [12]. If the ELF frequencies correspond to magnetic transition frequencies, they characterize the thicknesses of the magnetic flux tubes carrying the ions and at least part of the magnetic flux tube circuitry could be closely related with the acupuncture meridian lines. There are very many ions and the magnetic frequency scale varies by a factor of order 100 over the periodic table. Homeopathy demonstrates that also ELF frequencies below those associated with atomic ions are important and this leads to the conclusion that also the magnetic transitions for spacetime sheets containing water in liquid crystal form contribute to the ELF spectrum. The work of Mae Wan-Ho suggests a close correlation of flux tube circuitry with collagen circuitry [6]. The DC current circuitry discovered by Becker [7] could correspond to the dissipative part of the circuitry. According to [12], the endogenous frequencies vary only by ± 2 per cent. This would

mean that endogenous magnetic flux tube thickness varies only by ± 1 per cent.

2. *Frequency entrainment suggests magnetic homeostasis*

Superconducting magnetic flux tubes inside water and inside body body contain large number of ions, molecules, etc.. and there is large variety of magnetic transition frequencies which could be controlled by varying the magnetic flux tube thickness to stay in resonance with the exogenous frequency.

The phenomenon of frequency entrainment supports the notion of magnetic homeostasis. Endogenous frequencies indeed tend to follow the variation of an exogenous stimulating frequency initially sufficiently near to the endogenous frequency up to ± 30 per cent relative change after which they jump back to their endogenous values. The entrainment of the endogenous frequencies to external frequencies suggest that the thickness of the magnetic flux tubes in water and living matter is subject to a biocontrol and that it makes sense to speak about magnetic homeostasis. The above data would mean that the thickness of the magnetic flux tube can change at most ± 15 per cent. The observed variation of the high-to-low frequency ratios along meridians deviation of ± 15 per cent. This would mean that the thicknesses of various magnetic flux tubes are with high accuracy scaled by a same factor in the endogeneous magnetic homeostasis.

Self-organization by quantum jumps might automatically lead to the selection of preferred values of the magnetic flux tube thicknes guaranteing entrainment in healthy organism. The precise mechanism inducing the variation of the magnetic flux tube thickness remains however unidentified at this moment. The return of the entrained frequencies to their endogenous values does not seem to occur with the normal rate for electromagnetically hypersensitive persons [12]: perhaps em hypersensitivity means that the mechanism controlling magnetic flux tube thickness does not function properly.

3. *Why magnetic homeostasis?*

There are good reasons why for the magnetic homeostasis.

a) Magnetic homeostasis with parallel MEs makes it possible for the system to entrain to the frequencies of various chemical transitions occurring in living matter. This would make possible endogenous spectroscopies allowing the organism to consciously (not necessarily at level of entire organism) detect various chemical concentrations by magnetic quantum phase transitions induced at these frequencies. Also the entrainment of neurons to external frequencies could rely on this mechanism.

b) Magnetic transitions could participate biocontrol. 'Stimulation of chakras' would translate to resonant generation of magnetic phase transitions at superconducting magnetic flux tubes. If magnetic transitions affect the structure and properties of the biomolecules, this in turn can induce strong control effects at the atomic spacetime sheets. For instance, if superconducting enzyme molecule suffers a magnetic transition at superconducting spacetime sheet, its enzymatic properties could change dramatically. Magnetic transitions at resonance frequencies at superconducting spacetime sheets could induce protein conformations somehow. They do not directly affect net supra currents essential for ionic flow equilibrium. Spin flip could however induce change of the direction of the electric dipole moment and induce chirality changes, etc.. Conformations of enzymes could change and their catalytic properties could be affected dramatically.

c) Also non-magnetic transitions induced by MEs parallel to the magnetic flux tubes could occur coherently for BE condensates of atoms and even molecules at superconducting spacetime sheets and optimize the effectiveness of the biochemical control. A partial explanation for the necessity of the immune system is that quantum coherence of protein Bose-Einstein condensates is reduced if organism contains alien proteins with same function so that the rates for transformations of the protein (say enzyme) conformations at superconducting spacetime sheets are reduced.

d) Magnetic transitions for the spacetime sheets containing water in liquid-crystal form and having size smaller than the transversal thickness of the magnetic flux tube have spectrum extending to $1/f = 1000$ years. This means that all biological rhythms relevant for life at the level of single organism could be coded to these structures. In particular, the representation of long term memories (not at the geometric now but at the moment of the actual event) might involve this kind of structures.

4. *Are wormhole magnetic fields involved?*

'Wormhole magnetic fields' are pairs of magnetic flux tube spacetime sheets with vanishing net energy (in TGD framework spacetime sheets with negative energy are possible because spacetime is 4-surface rather than an abstract Riemann space) and carrying opposite magnetic fields. Wormhole contacts, whose throats carry opposite classical em charges, connect the two spacetime sheets, and if they rotate, they generate opposite currents at the two spacetime sheets involved in turn giving rise to magnetic fields of same magnitude but opposite sign. No elementary particles are required to generate these magnetic fields. Vacuum polarization effect is in question in a well defined sense.

At least the positive energy spacetime sheet could contain supra phases of ions and an open question is whether superconducting magnetic flux tube circuit consists of ordinary magnetic flux tubes only or whether it contains also parts which are wormhole magnetic fields. Wormhole magnetic fields could be regarded as a simulation of ordinary magnetic structures and homeopathy might involve also the generation of wormhole magnetic fields mimicking the magnetic structures associated with the homeopathic remedy. Wormhole magnetic fields might replicate and diffuse from homeopathic potency to body without any external energy feed and could be regarded as a life form of their own.

There is an obvious analogy between wormhole magnetic field and DNA double strand: similar analogy holds true for double sheeted MEs which could also be present. Both double-sheeted MEs and wormhole magnetic fields would be structures carrying pure information.

2.1.2 **How water represents?**

The general model for how water can represent in its own dynamical structure the chemicals is inspired by various experimental findings (especially by the findings challenging the notions of ionic channels and pumps) is roughly the following.

a) The magnetic flux tube structure is fractal and thus contains flux tubes inside flux tubes and gives rise to what might be called magnetic circulation analogous to blood circulation. The magnetic field of Earth is important but not necessarily the only part of the structure. The thickness of the flux tube, and thus also magnetic transition frequency scale, is under biocontrol. Also the length of flux tube is variable and under control.

b) MEs parallel to the magnetic flux tubes are also involved. The ends of magnetic flux tube could act effectively as laser mirrors and MEs would thus define zigzag path in spacetime between the ends of the magnetic flux tube. Similar structures are involved with the model of long term memory and the structures in question could quite generally give rise to conscious memory in the time scale determined by the frequency involved. The characteristic frequencies associated with MEs are given by $f = c/L$, where L is the length of ME. There are thus *two branches* in the spectrum of important characteristic frequencies: magnetic transition frequencies in ELF range and the high frequency branch of the frequencies associated with MEs with lengths not above than the size of organism. For length scale of .1 meters the frequency scale of ME frequencies is of order GHz.

c) Positive/negative energy MEs could be even classical correlates for photon emission/absorption. Quite generally, MEs with typical length $L = c/f$ are presumably necessary for a complete TGD based description of atomic and

molecular transitions at given transition frequency f . One can even consider the possibility that a p-adic ME in presence of charged particle could transform to real ME and charged particle such that energy momentum conservation is satisfied. In this manner intention would be transformed to action at elementary particle level. One could also think that MEs at these frequencies could perform biocontrol and also detect radiation emitted by various molecules.

d) Frequency imprinting and entrainment are generic phenomena. Both endogenous and exogenous frequencies can be entrained by varying the thickness and length of the magnetic flux tubes. This suggest that biosystem is performing kind of endogenous spectroscopy by detecting important biochemicals at magnetic flux tubes and even elsewhere. In ELF part of spectrum NMR or its generalizations to other than spin flip transitions would be involved. Also the sensing of important em frequencies as such could be performed routinely by biosystem in this manner. An interesting possibility is that also p-adic variants of MEs are involved so that this process could be seen as mimicry by singing in the same tune.

e) Weak magnetic fields affect the super currents running in the circuitry and this in turn affects dramatically the ionic concentrations at the atomic spacetime sheets so that chemical control becomes possible. Magnetic transitions at superconducting spacetime sheets can affect the catalytic properties of enzymes and thus make possible more refined quantum level chemical control. Also *other* than magnetic transitions could occur coherently (rate proportional to number of ions squared) at superconducting spacetime sheets and even atomic spacetime sheets and be induced by MEs at the high frequency portion of the spectrum. Perhaps the rates for the transitions inducing protein conformations affecting the catalytic properties of the protein could be optimized in this manner. The performance of this kind of biocontrol at superconducting spacetime sheets would be like performing surgery inside a specialized hospital instead of doing it on the street.

The above considerations do not answer the question about the role of the atomic spacetime sheets in the representations of frequencies provided by MEs and magnetic flux tubes. What this role might be is suggested by the fact that the matter at the atomic spacetime sheets should have the role of an amplifier of em fields associated with MEs.

a) The generation of spacetime sheets containing water in liquid crystal form with a rotational frequency spectrum mimicking that of the homeopathic potency is a further aspect of this mimicry and could amplify the otherwise weak signal provided by chemical by amplifying the em fields associated with MEs. The water domain could be also seen as a mental image (subself) about the chemical at atomic spacetime sheet. In principle all the rigid body aspects of the molecule can be mimicked in this manner. Mimicking water domains can also control the transitions of the biomolecules or vice versa.

b) Not only rotational spectrum but also vibrational spectrum (such as conformational vibrations of molecules) can be mimicked since any system near equilibrium reduces to a collection of harmonic oscillators: now sound waves propagating in LC water blobs would provide the representation. It is known that the water in cell interior and near to the cell membrane transforms routinely between sol and gel (LC) states in response to various stimuli. This transformation would have interpretation as a formation of a conscious representation for something, perhaps some event or object outside the cell.

c) Note that by scaling law $f_h/f_l = 2 \times 10^{11}$, the characteristic neuronal frequency $f_l = 1$ kHz corresponds to $f_h = 2 \times 10^5$ GHz and to a ME with a length of 1.5 micrometers, which roughly corresponds to the thickness of the magnetic flux tube. Thus kHz frequency is maximal if ME is required to extend outside the magnetic flux tube. Perhaps this ME could be involved with the sensory representations at the cell level. Note that an alternating voltage at kHz frequency is also used to generate Kirlian effect. For human vision the wavelengths of photons are in the range of $10^{-6} - 10^{-7}$ meters and corresponding

ELF length scale is $10^4 - 10^5$ meters if scaling law is assumed.

d) The requirement that LC water blob has size not larger than about one micron implies that the lowest ELF frequency corresponds to a time period of about $T = 1000$ years so that all time scales relevant for human consciousness are covered and MEs with frequencies relevant to human long term memories can be amplified by intracellular LC water spacetime sheets. If the scaling law $f_h/f_{EEG} = 2 \times 10^{11}$ is taken literally, one obtains $f_h = 20$ Hz at the upper bound: this corresponds to the lowest audible frequency which suggests that also sound waves serve representative purposes.

e) Fractality suggests that LC water spacetime sheets form in turn liquid crystals in longer length scale give rise to secondary representations and that there exists entire hierarchy of these representations.

In the chapter "Homeopathy in Manysheeted Spacetime" it was found that homeopathy in mansheeted spacetime leads to a general vision about the role of MEs, magnetic flux tubes and magnetic mirrors allowing to understand the fundamental recognition mechanisms of biomolecules in terms of electromagnetic bridges defined by MEs and magnetic flux tubes. This vision allows to build a general model for paranormal phenomena and the same fundamental mechanisms seem to be behind astonishingly wide repertoire of poorly understood phenomena in the borderlines of the existing science.

2.2 Topological self-referentiality

The longstanding problem has been the lack of understanding about how MEs relate to the existing physics and chemistry. Thus there has been a chronic uncertainty about whether MEs really are there or not, to say nothing about quantitative models for the dynamics and interaction of MEs with ordinary matter. This frustrating situation changed dramatically with the discovery of the topological self-referentiality, which means that topological field quanta of the classical fields, in particular MEs and magnetic flux tubes, associated with the material system provide a topological representation for the theory about the material system. In particular, and very importantly, negative energy MEs provide representation for the binding energies.

2.3 Generation of coherent quantum states and generation of usable energy as sides of the same coin

An important consequence of the topological self-referentiality is that the 'buy-now' part of the buy now-pay later mechanism for energy production can be understood as a generation of bound states with binding energy liberated as a usable energy. 'Pay later' means that sooner or later thermal noise destroys the bound state.

This observation leads to a quantum vision about energy economy in living matter: generation of the macroscopic coherence involving also binding of mental images to more complex ones and liberation of a usable energy are different sides of the same coin. Besides, or perhaps even instead, the ordinary metabolism, quantum metabolism should be key element of living matter. Indeed, also ordinary metabolism might be accompanied by the effective overunity energy production implied by the generation of quantum bound state entanglement. This should reflect experimentally as apparently miraculous ability of the organism to cope without the use of the metabolic energy (brings in mind the stories about the feats of yogies!). Anomalies of this kind have been indeed observed at the level of neuronal metabolism and nanobiology is just questioning the basic assumptions of the Newtonian biology.

2.4 Magnetic mirrors provide a universal recognition mechanism

Quite generally, if two molecules possess a common subset of characteristic frequencies, they share also a subset of MEs with same fundamental frequencies so that they can physically share these MEs, or more concretely, be connected by magnetic mirrors containin the ME in question. Being connected by magnetic mirror means a strong resonant interaction between them induced by LC water blobs associated with molecules. Quite literally, the molecules could find each other by walking along the magnetic flux tube, or more poetically, following the light. Popp has proposed the presence of what he calls sucking force [8] and in the chapter "Macroscopic quantum coherences and quantum metabolism as different sides of the same coin" [4] a model of the sucking force based on MEs serving as em bridges is proposed).

a) This mechanism would allow to understand the mysterious looking features of DNA replication, the formation of DNA double strand and the translation of RNA to proteins. DNA nucleotide and conjugate could have common subset of characteristic frequencies and become connected by magnetic mirrors or mere MEs. The same applies to mRNA triplet and the tRNA molecule and could explain the miraculous accuracy of the translation process. The same mechanism could explain also the self assembly of say mosaic virus from its molecular components.

This hypothesis is testable: one should check whether some portion of the frequency spectrum is same for DNA nucleotide and its conjugate *resp.* RNA triplet and the corresponding tRNA molecule. In the first case nucleotide is the basic unit whereas in the latter case it is triplet: scaling by a factor of three should relate the frequencies if liquid crystal blocks are linear structures surrounding DNA/protein and consist of elementary blocks.

b) The magnetic mirrors are expected accompany, not only DNA, but also proteins and other biomolecules. Common MEs associated with various molecules would generate resonant interaction between them. In DNA length scale the sizes of the liquid crystals might be bounded by the size of the cell nucleus or perhaps some shorter length scale. It is possible that liquid crystals along DNA and proteins are dynamical and decomposing all the time into their subunits and fusing again (this brings in mind the fusion of mental images by entanglement). For instance, electromagnetically active genes could correspond to liquid crystals having length of an entire gene.

c) This picture provides also a vision about how immune system might function. The invader protein is like a singer out of tune in a choir. It cannot interact resonantly as a whole with the other molecules of the host organism and thus cannot become an organic part of the host organism. The organism could recognize the invader on basis of the out of tune property and this would initiate the proces leading to the elimination of the invader, say the decomposition of the invader protein into parts accepted by the host organism.

2.5 Information molecules as quantum links in quantum web

The third vision relates to the deeper interpretation of chemical communications and biological information molecules. There are full reasons to believe that substructures of these molecules can have bound state entanglement with the surrounding world. This entanglement can be interpreted in terms of 'telepathic' quantum communications based on the fusion and sharing of mental images. In fact, I introduced already few years ago the notion semitrance as entanglement with higher level selves but at this time I had not yet understood that quantum jump involves also state function preparation process realized as a cascade of self measurements against which only bound state entanglement is stable.

The bound state entanglement represented by the negative energy MEs is very much like a link to web in email and the transfer of the neural transmitters

from the axon to the postsynaptic neuron is like an email message with a set of conscious quantum links to the quantum web represented by the state of the neural transmitter + environment. Note that this means that information content of the message can be very high in this case, much higher than the single bit of the neural net models. Same should hold true for information molecules in general.

The sharing of mental image involved with the fusion of subselves indeed implies that quantum entanglement generates something resembling web links very closely. These links are expected to be also at the level of proteins and DNA and to make living matter a conscious molecular society able to self-organize.

3 Scaling laws

What I have christened scaling laws have gradually become more and more important for the understanding of the many-sheeted physics. Scaling laws form also the cornerstone of the model of the sensory canvas and motor control to be developed in the sequel. TGD predicts two kinds of EEG waves (standing and moving) and in a similar manner two kinds of scaling laws are predicted, homeopathic and $v = Lf$ scaling law and the relationship between these scaling laws has remained somewhat unclear hitherto.

3.1 $v = Lf$ scaling law

$v = Lf$ scaling law was originally identified during the development of the model of EEG (see the chapter "Quantum Model for Nerve Pulse and EEG"). The length L , which corresponds to an apparent wavelength λ of moving EEG waves, corresponds in TGD framework to real wavelength of a wave phenomenon accompanying the propagation of transversal EEG MEs along axons. $\lambda = L$ corresponds most naturally to the length of the axon in which a wave with EEG frequency f and velocity v is propagating back and forth. The velocity can be assigned to a transversal ME whose length corresponds to the wavelength $\lambda_{EEG} = c/f$ defined by EEG frequency. In this case one has $\lambda_{EEG}/\lambda = c/v$. Typically one has $c/v \sim 10^7$ for EEG waves. Since v can vary, continua of $v = Lf$ scaling laws associated with various kinds of propagation phenomena could exist.

For instance, the velocity spectrum for Calcium waves could define a hierarchy of scaling laws. TGD based model of EEG predicts also high and low frequency EEG waves and $v = Lf$ scaling law might closely relate to it. A more concrete interpretation in terms of nerve circuits comes if one interprets L as the length of a closed magnetic flux tubes associated with the neural circuit. Nerve pulses propagating with velocity v represent now the excitations with dispersion relation $v = Lf_{EEG}$ coupling to EEG frequencies f_{EEG} , and stimulating Alfvén waves (oscillations of magnetic flux tube) having fundamental frequency $f_h = c/2L$: Alfvén waves in turn couple resonantly to high frequency MEs with fundamental frequency f_h .

$v = Lf$ scaling law can also relate two different frequencies f_h and f_l . $f_h \rightarrow f_l$ transformation is involved with the generation of the sensory representations and $f_l \rightarrow f_h$ transformation with the motor control. $v = Lf$ scaling law is involved with the latter. It would seem that propagating EEG waves correspond to motor control and standing EEG waves to sensory representations.

3.2 Scaling law of homeopathy in its basic form

The basic finding about frequency imprinting of water is that the members of the high-low frequency pairs (f_h, f_l) implicate each others' physical presence and that the ratio of the frequencies of a given pair is given by $f_h/f_l = 2 \times 10^{11}$. According to [12] this ratio seems to be a constant of Nature unlike the ratio $f_h/f_l = c/v$ in case of EEG waves, Ca^{++} waves etc. This statement must

however be taken critically. The homeopathic scaling law could thus relate naturally with standing EEG waves for which $v = Lf$ scaling law does not make sense.

TGD explains the effect, predicts the ratio correctly, and also predicts generalizations of the homeopathic scaling law. The proper interpretation seems to be that the scaling law holds accurately only for $f_h \rightarrow f_l$ transformations (generation of sensory representations) whereas for the $f_l \rightarrow f_h$ transformations (generation of motor actions) entire band of frequencies f_l is transformed to the same f_h . For $f_l \rightarrow f_h$ transformation $v = Lf$ scaling law is also involved so that the two scaling laws are tightly intertwined.

3.2.1 Dropping of charged ions to magnetic flux tubes as explanation of $f_h/f_l = \text{constant}$ scaling law

The universality of f_h/f_l ratio of the homeopathic scaling law does not seem to conform with the assumption that there is some propagation velocity involved unless the velocity for some reason is constant to a high degree. A mechanism predicting correctly the homeopathic frequency ratio and explaining its universality for $f_h \rightarrow f_l$ transformations can be indeed identified (the identification was purely accidental discovery).

The crucial observation was that ratio of the zero point kinetic energy $E_0 = \pi^2/2mL^2(137)$ of a singly charged ion at atomic spacetime sheet ($k = 137$) to its cyclotron energy $E_c = eB/m$ satisfies the condition $E_0/E_c \simeq 2 \times 10^{11}$ and is same for all singly ionized ions (note that for Ca_{++} the ratio is 10^{11}). Since ions can drop to the magnetic flux tubes also from non-atomic spacetime sheets $k > 137$, a whole variety of scaling laws $f_h/f_l = 2^{137-k} \times 2 \times 10^{11}$ is predicted.

$f_h \rightarrow f_l$ mechanism

A photon with threshold frequency f_h is generated when an ion at rest drops to a superconducting magnetic flux tube of Earth's magnetic field. ELF or VHF radiation with frequency f_l or its multiple is generated when an ion at rest drops to high n cyclotron state which decays by emitting radiation with frequencies which come as multiples of f_l . If the dropping ion has momentum parallel to the magnetic flux tube, photon's energy is above the threshold value f_h . In this case the cyclotron state has also longitudinal momentum and the spectrum becomes continuous with the multiples f_l serving as effective thresholds. When the system is irradiated with frequencies not too much above the threshold frequency f_h , ions are kicked from the magnetic flux tubes to the atomic spacetime sheets and drop back so that VLF or ELF radiation is generated. Of course, also other mechanisms can shake atomic spacetime sheets and lead to the dropping of ions to magnetic flux tubes and thus generation of radiation at cyclotron frequencies.

Sensory representations are generated by regions of size smaller than brain size and have sizes measured by EEG wavelengths. $f_h \rightarrow f_l$ mechanism could thus apply to stationary EEG MEs projecting to the sensory canvas. This indeed makes sense since the sizes of the sensory projectors would naturally vary in the range $2.56 - 10^2 \mu m$.

$f_l \rightarrow f_h$ mechanism

The radiation pressure of coherent f_l radiation can kick ions from atomic spacetime sheet to magnetic flux tubes and in this manner generate radiation at threshold frequency f_h : this is the simplest $f_l \rightarrow f_h$ mechanism and analogous to an object from table to the floor. Also other frequencies than f_l can induce the dropping unless some kind of filter coupling only to f_l and its harmonics. This filter could in turn rely on $v = Lf$ law and requires that v in ideal case is quantized just to the required value $c/v = 2 \times 10^{11}$, perhaps as a result of evolutionary selection. Of course, the filter need not select only f_l but could also let through other frequencies and this implies that scaling law cannot be universal and 'monochromatic' for $f_l \rightarrow f_h$ transitions.

Generalized motor actions are generated from sensory canvas and affect parts of brain and body. Thus $f_l \rightarrow f_h$ mechanism would be naturally associated with

the generalized motor actions.

3.2.2 Constraints from momentum conservation

Momentum conservation gives a non-trivial constraint to $f_h \rightarrow f_l$ process since protonic (ionic) momentum is much larger than the photonic momentum $p(p)/p(ph) = \sqrt{m/E(ph)}$.

a) The first manner to satisfy the constraint is to give the compensating momentum to an excitation of the wormhole BE condensate responsible for the superconductivity. In this case the second member of the Cooper pair is kicked to the atomic spacetime sheet and an excitation of the wormhole BE condensate carrying momentum opposite to that of proton is generated. It is also possible than entire Cooper pairs is kicked to some superconducting spacetime sheet, such as $k = 139$ instead of the atomic $k = 137$ spacetime sheet. The experimental findings about high T_c superconductivity suggest that this indeed occurs in case of electronic Cooper pairs (see the chapter "Biosystems as Superconductors" of [3]).

b) An alternative manner to satisfy the momentum conservation constraint is to assume that Cooper pairs decay and each member of the pair is kicked to the atomic spacetime sheet. Thus the proportionality constant 2×10^{11} in the scaling law doubles and in case of proton the threshold frequency is $f_h \sim 1$ eV which is at the red end of the visible spectrum. Protons get opposite momenta of magnitude $p = \sqrt{2mE}$ much larger than the momentum of photon. Protons can drop back simultaneously and form a Cooper pair again and a high n cyclotron state is formed and VLF response at multiples of $f_c(p) = 300$ Hz results. Cooper pair can have also longitudinal momentum in the direction of the magnetic flux tube and this effectively smooths out the discrete spectrum to continuum.

3.2.3 How $v = Lf$ scaling law is involved with $f_l \leftrightarrow f_h$ transformation

It was already found that f_l induces dropping of the ion from the atomic spacetime sheet to the magnetic flux tube. The filtering of low frequencies such that only f_l induces this dropping is however necessary. $v = Lf$ scaling law could enter into the picture here. Indeed, the homeopathic scaling law follows if the velocity v for propagation correspond to the velocity of blood flow in capillaries. For $v \sim 1.5$ mm/s corresponding to the order of magnitude for the velocity of the blood flow in capillaries, one has $c/v \simeq 2 \times 10^{11}$, which is very near to the ratio of frequencies f_h and f_{ELF} in homeopathic imprinting in which these two frequencies imply each other.

What can happen that em wave with frequency f_l couples to a structure with length L and induces some excitation propagating with velocity $v = Lf_l$ along the structure in question. Other frequencies than f_l would not have appreciable coupling. The radiation pressure of f_l waves would thus shake ions around their equilibrium positions and could drop some of them from the atomic spacetime sheet.

This is not the only possibility however. $v = Lf$ excitation could also induce em wave with wavelength which is L (or L/n) and has frequency $f_h = c/L$ (nc/L). The ratio f_h/f_l is indeed $f_h/f_l = c/v$. The mechanism can work in both directions. In this case f_l/f_h ratio is determined by the propagation velocity of the excitation involve and can be continuous and controllable and can differ widely from the homeopathic ratio. $v = Lf$ mechanism could be involved with the generation of radio waves when DNA is irradiated with visible laser light and with Kirlian effect.

3.3 Tests for the homeopathic scaling law

There are several tests for the homeopathic scaling law:

a) The homeopathic scaling law is expected to hold true when f_h corresponds to a cyclotron frequency $f_l = f_c = eB/2\pi m$ of some ion in Earth's magnetic

field.

Test: Irradiate living matter slightly above the threshold frequency f_h and look for the response at multiples of the frequency f_l . If ions can drop only from $k \geq 137$ spacetime sheets, f_h should satisfy $f_h \leq .49$ eV so that visible frequencies are excluded from the spectrum of *threshold* frequencies.

Test: Look whether the irradiation of biomatter with f_c induces radiation with the threshold frequency $f_h = 2 \times 10^{11} f_c$.

Test: Vary the local intensity of Earth's magnetic field. This should leave f_h unchanged but vary $f_l = f_c$ so that the proportionality constant in the scaling law should vary. The effect should disappear when Earth's magnetic field is eliminated. This suggests that living organisms regulate the endogenous magnetic fields (magnetic circulation) by homeostasis.

b) One could also test also the variants of the scaling law. For instance, the dropping of proton from $k = 131$ spacetime sheet would give $f_h \leq 32$ eV and the dropping of massive ions with mass number $A \geq 15$ gives rise to visible light: the ratio of scaling law is however changed to 128×10^{11} .

3.4 Mechanisms for $f_l \rightarrow f_h$ transformation

The co-presence of frequency pairs (f_l, f_h) [12] means that f_h generates f_l and vice versa. The proposed mechanism for the generation of ELF MEs explains how f_h generates f_l . The natural question is whether the reverse process $f_l \rightarrow f_h$ is possible too. As already noticed, in case of the homeopathic scaling law the kicking of ion from atomic to a magnetic flux tube by f_l radiation pressure provides a part of this mechanism.

In case of $v = Lf$ scaling law $f_l \rightarrow f_h$ process would mean that the presence of low frequency ME with wavelength λ_l would generate electromagnetic oscillation with a wavelength $\lambda_h = (v/c)\lambda_l$. This would be like a very small sized object in water in which eigen-oscillations with wavelengths smaller than the size of the object are generated.

a) For definiteness consider a linear structure with length L (say axon, DNA segment, or magnetic flux tube). Irrespective of its frequency spectrum any external perturbation generates massless excitations with frequencies $f = nf_h$, $f_h = c/L$. MEs parallel to the structure are basic example of this kind of excitations and have interpretation as light reflected between two mirrors defined by the ends of the structure.

b) The question is what happens when low frequency ME with frequency $f_l < f_h$ interacts with this kind of linear structure. Certainly MEs parallel to the linear structure and have frequencies coming as multiples of $f_h = c/L$ are generated. One should understand why $f_l = (v/c)f_h$ generates resonantly these excitations. Some intermediate excitations generating high frequency oscillations must be present, propagating with fixed velocity v , and satisfying the dispersion relation given by the scaling law $v = Lf$ for $f < f_h$. The quantization of the velocity must result from the physical properties of the structure (consider nerve pulse velocity or velocity of Ca^{++} waves as an example).

c) In the TGD based model of EEG and nerve pulse these excitations are accompanied by the ELF MEs transversal to MEs and moving with velocity v along it. In case of EEG MEs v corresponds to what is identified usually as the phase velocity of EEG waves in turn identifiable as the conduction velocity v for the nerve pulses determined by the properties of the axonal membrane. The motion of MEs transversal to DNA strands is second example of this process and MEs appear as pairs of positive and negative energy MEs. The appearance of the ME pairs means a formation of bound states and presumably the use of the liberated binding energy to generate the moving excitation. In case of nerve pulses MEs could appear as pairs of positive and negative energy MEs associated with the two lipid layers of the cell mebrane and moving in opposite directions. Thus, if indeed only certain values for the propagation velocity v fixed by the detailed physical properties of the structure are possible, then only

the frequencies $f_l = (v/c)f_h$ generates resonantly high frequency MEs parallel to the structure.

4 Manysheeted DNA

In the following I summarize some basic ideas related to the notion of the many-sheeted DNA.

4.1 Basic ideas

4.1.1 Genes and memes

The basic numbers of the genetic code are probably not accidental. This led for twelve years ago to an attempt to construct a model for abstraction process reproducing the basic numbers of the genetic code. The simplest model for an abstraction process is based to a repeated formation of statements about statements starting from two basic statements. If one drops at each step of the construction the statement corresponding to empty set in the set theoretic realization of Boolean algebra, one obtains a hierarchy allowing to understand the basic numbers of genetic code.

The basic observation is that one can form 2^N statements about N basic statements. One starts from $N = 2$ statements. At the first step one obtains $2^2 = 4$ statements and dropping one gives $N = 3$ statements. The next step gives $2^3 = 8$ statements and dropping one, one has $N = 7$ statements. In a similar manner the next steps give $N = 2^7 - 1 = 127$ and $N = 2^{127} - 1$ statements.

What one obtains is so called Combinatorial Hierarchy consisting of the Mersenne numbers $2, M(1) = 3 = 2^1 - 1, 7 = 2^3 - 1, 127, 2^{127} - 1, ..$ constructed using the rule $M(n+1) = M_{M(n)} = 2^{M(n)} - 1$. The explicitly listed ones are known to be primes. Combinatorial Hierarchy emerges from a model of abstraction process as subsequent transitions from level to metalevel by forming Boolean statements about Boolean statements of level n and dropping one statement away.

$M_7 = 127$ corresponds genetic code. The 64 DNA triplets can be interpreted as representing 64 different mutually consistent logical statements in the Boolean algebra consisting of $2^7 = 128$ statements about truth values of 7 basic statements. Thus DNA sequences could be interpreted as forming some of linguistic expressions with single DNA triplet interpreted as a statement which is identically true. The mapping of DNA sequences to proteins could be interpreted as some kind of abstraction process: single amino acid sequence would represent an equivalence class of basic statements, theorem summarizing larger number of statements obtained by giving all possible values for the variables (DNAs representing same aminoacid). The model of the genetic code (see chapter "Genes, Memes, and Manysheeted DNA") allows also to understand the number $N = 21$ for equivalence classes of DNA sequences coding 20 aminoacids plus stopping signs of the translation process. The model predicts that at most 6 DNA triplets correspond to same aminoacid and this constraint is satisfied.

The infinite hierarchy of possible genetic codes suggests the possibility of an infinite hierarchy of increasingly complicated 'lifeforms'. The natural question is whether a counterpart of the genetic code could make sense for our ideas, 'memes'. Combinatorial Hierarchy model for abstraction process predicts that memetic code should correspond to the level M_{127} of the hierarchy. This leads to a precise realization of the memetic code in terms of binary sequences. Codewords representing maximal number of mutually consistent statements and counterparts of mRNA, correspond to 126 bit sequences. These bit sequences should correspond temporal sequences of mindlike spacetime sheets and the neutrino realization of Boolean mind leads to idea that binary digit is represented by the spin of the cognitive antineutrino.

The natural time scale is the secondary p-adic time scale associated with the Mersenne prime M_{127} characterizing the memetic code and is .1 seconds. Of course, this number must be taken only as a time scale. It is known that 10 Hz defines fundamental rhythm in living matter, for instance micro tremors have this duration. The mesoscopic EEG 'features' identified by Walter Freeman have duration corresponding to the the range 8 – 12 Hz of alpha frequencies [9] which suggests the interpretation as a memetic codeword. If this time scale corresponds to a sequence consisting 126 bits, the duration of single bit is about one millisecond, which happens to correspond to definite p-adic time scale and is typical duration of the nerve pulse.

4.1.2 DNA as a conductor?

Barton *et al* [10] have done several experiments between 1993-1997 related to the conductivity properties of DNA double helix. The conclusion is that DNA double helix has the ability to do chemistry at distance: " *A DNA molecule with a chemical group artificially tethered to one end appears to mediate a chemical change far down the helix, causing a patch of damaged DNA to be mended.*"

What seems to occur is flow of electron current along DNA with very small resistance. Typically the experiments involve electron donator and acceptor separated by a long distance along DNA. When acceptor is radiated it goes to excited state and an electron current flows from donator to acceptor as a consequence. Standard wisdom tells that this should not be possible. The current should flow by quantum tunneling between adjacent building units of DNA and it should diminish exponentially with distance. For proteins this is known to be the case. In experiments however no distance dependence was observed. Irradiation with visible light was also involved.

There exist a theory which assumes that the current could flow along the interior of double DNA, that is the region between the bases of strand and complementary strand. The electron would be delocalized in bases rings these rings would form a stack along DNA. The current would flow by tunneling also now but the tunneling probability would be so large that distance dependence would be weak. The critics of Barton argue that this model cannot explain all the experiments of Barton and that the model is not in accordance with basic organic chemistry and biology: ordinary sun light should have rather drastic effects on us. Barton admits that they do not understand the mechanism.

TGD suggests a possible explanation of phenomenon in terms of closely related concepts of exotic atom and charged wormhole. The concept of exotic atom in turn relies on the concept of many sheeted spacetime. Exotic atom is formed when one or more outer valence electrons of ordinary atom are dropped from atomic spacetime sheet to a larger spacetime sheet, now spacetime sheet with a form of DNA helix. As a consequence, charged wormhole contacts feeding the em gauge flux to the larger spacetime sheet are also generated. Electrons in larger spacetime sheet could be delocalized and this could lead to a smaller ground state energy. The dropping of electrons on the larger spacetime sheet would be induced by absorption of a photon of visible light. A guess for the energy scale is as the change of Coulomb energy of electrons when it drops to a larger spacetime sheet: for dropping from the atomic spacetime sheet $k = 137$ to $k = 139$ sheet the order of magnitude is indeed correct. What is important is that the electrons on the larger spacetime sheet move effectively in almost empty spacetime and therefore electric current can flow almost without resistance. Charged wormhole contacts provide also a mechanism of superconductivity: photons are replaced with the excitations of wormhole BE condensate in this mechanic.

In the experimental arrangements of Barton typically donors and acceptors of electrons are Rh and Ru atoms. Both have 5s unpaired electron and this electron would drop on the larger spacetime sheet from the atomic spacetime sheet and induce electric current. Some colleagues of Barton did not observe the effect when using organic molecules as donors. A possible explanation is

that these molecules are such that their valence electrons cannot drop on the larger spacetime sheet (it is not energetically favourable, they could be paired, for instance).

4.1.3 DNA as a superconductor and mechanisms of rapid energy transfer over long distances

One important function made possible by the dropping of electrons to larger spacetime sheets is the transfer of not only charge but also energy through long distances and metabolism might well use this mechanism. The typical energy liberated when ATP molecule is used is about .5 eV. In the model of ATP produced in the chapter "Macroscopic quantum coherence and quantum metabolisms as different sides of the same coin" of [4] it is suggested that energy metabolism involves circulation of protons between atomic ($k = 137$) spacetime sheets and magnetic flux tubes of Earth. The dropping of proton from $k = 137$ atomic spacetime sheet to much larger spacetime sheet liberates this energy as zero point kinetic energy and generation of ATP molecule involves kicking of three protons back to the atomic spacetime sheets by using metabolic energy.

ATP might provide only the mechanism responsible for the energy transfer over *short* distances. The dropping of any ion from any spacetime sheet to a larger spacetime sheet is possible and liberates a definite amount of usable energy. When the smaller spacetime sheet corresponds to a superconducting spacetime sheet, the ions or their Cooper pairs can be rapidly transferred as dissipationless supra currents to the region, where the energy is needed. This long distance energy transfer mechanism could be associated with all kinds of linear structures: DNA, proteins, microfilaments, microtubules, axons etc... The magnitude of the energy quantum released would be fixed by the p-adic length scale hypothesis and the mass of the ion or of the Cooper pair. The acceleration in endogenous electric fields provides a mechanism kicking the ions back to the smaller spacetime sheets.

Because of their low mass, electrons are exceptional. The dropping of an electronic Cooper pair from $k = 139$ some spacetime sheet presumably associated with the hydrogen bonds of length about 3 nm connecting the nucleotides of different DNA strands would liberate a huge energy of about 120 eV. The corresponding UV photon has frequency not far from the miracle frequency associated with $k = 151$ p-adic length scale, which is the first of the four subsequent p-adic miracle length scales corresponding to Gaussian Mersennes.

An interesting question relates to the possible function of this UV photon. The wavelength $\lambda = L(151)$ corresponds to the thickness of the cell membrane. It is also to the minimal length of DNA sequence (10 DNA triplets) with the property that the net winding is a multiple of 2π ($3 \times 2\pi$). By its reflection symmetry this helical sequence might serve as a subunit of DNA sequence. The ends of this subunit could act as mirrors connected by MEs carrying Bose-Einstein condensed photons propagating back and forth between the mirrors. The energy liberated by the electron as an UV photon could BE condense to this kind of ME. At least in case of monocellulars having DNA at cell membrane, the photon could also be reflected between the outer and inner boundary of the cell membrane.

The dropping of electron Cooper pair from the spacetime sheet of the DNA strand of thickness of order 4 – 5 Angstroms, which presumably corresponds to the secondary p-adic length scale $L(71, 2) \simeq 4.4$ Angstroms, liberates energy of about 15 eV. This energy in turn corresponds to the p-adic miracle length scale $L(157)$. A portion of DNA having a length of 80 nm and consisting of 80 DNA triplets suggests itself as a unit acting effectively as a mirror pair connected by MEs to which the liberated photons BE condense. Since $L(163)$ corresponds to the energy of photon absorbed in photosynthesis and $L(167)$ the energy liberated when single ATP molecule is used, all miracle length scales correspond to some energy unit of energy metabolism!

DNA strand and its conjugate could form a pair of weakly coupled superconductors forming kind of a scaled down version for the pairs formed by the inner and outer lipid layers of the axonal membrane. DNA strand having thickness .5 nm corresponds naturally to the secondary p-adic length scale $L(71, 2) \simeq .44$ nm whereas DNA double strand having thickness of about 1.1 nm could correspond to $L(71, 2)$ or to $L(73, 2) \simeq 1.77$ nm. The quantum model for nerve pulse and EEG suggests that the nerve pulse sequence is basically generated by a soliton sequence associated with the phase differences of superconducting order parameter over the Josephson junctions connecting DNA strands, and idealizable as a continuous one-dimensional Josephson junction. The mathematics would be essentially that of a gravitational pendulum (see the chapter "Quantum model for nerve pulse and EEG" of [4]). Solitonlike structures associated with DNA have been proposed also by Peter Gariaev [11].

4.1.4 Field representation of the genetic information

TGD leads to the notion of many-sheeted DNA in which DNA is accompanied by transversal magnetic mirror pairs which, besides coding 4 different DNA nucleotides to pairs of polarizations, also give rise to field representation of the genetic information by classical em and Z^0 fields associated with MEs as well as by the holograms generated by the electromagnetic MEs in active state. What is remarkable that the sizes of these MEs are can quite well be of same order as body size. In fact, the known facts from homeopathy suggest that ELF frequencies f_{ELF} and high frequencies f_h with ratio $f_h/f_{ELF} \simeq 2 \times 10^{11}$ appear as pairs such that f_h imprinting implies f_{ELF} imprinting and vice versa [12]. f_h can vary up to body size whereas f_{ELF} corresponds to length scales with typical unit given by Earth size. The interpretation would be that MEs represent 'spirit' and 'flesh', that is code for magnetic sensory canvas or magnetic body and for physical body. Electromagnetic representation of genetic information solves the mystery of introns (the portion of chemically silent DNA is the higher the higher the organism is in the evolutionary hierarchy and is roughly 95-98 per cent for human genome): introns would not be electromagnetically silent.

The most naive guess is that the field representation is simply a 4-dimensional photograph about body part, that is dynamical hologram, and that the DNA in the cells which express the formation of a given body part contain this kind of representation. The cells in which the genes are expressed could contain this kind of representation serving as a template and biological control command. Thus body part would contain its own image in each of its cells. The time reversal (phase conjugate) of the 4-D hologram would in turn naturally act as a time reversal of the control command and provide a universal mechanism making possible healing and self repair.

Entire hierarchy of representations in various length scales might be involved providing dynamical photographs about the planned evolution or various biomolecules, subcellular structures, cells, etc... This sounds utterly simplistic but one can ask what else? The representation for the development of the body structures must be based on very simple and concrete code since the cells building it during morphogenesis are very simple creatures and see only the light telling where to go!

4.1.5 Left-brain-right brain, DNA strand-conjugate strand

Second vision is that various binary structures such as DNA and lipid layers of the cell membrane apply a division of labour analogous to what happens between left and right brain hemispheres. The first member of the pair is specialized to generate bound state entanglement and is accompanied by negative energy MEs whereas second member is accompanied by positive energy MEs providing usable energy. This energy in turn makes possible processes like nerve pulse propagation and DNA transcription. The generation of ME pairs could be actually a universal mechanism of energy liberation in living matter. Even right

and left brain hemisphere would apply similar division of labor: at this level bound state entanglement would be a quantum correlate for higher level notions like creativity and spirituality. This division of labour seems to continue even to the level of society.

A model of biophotons discussed in separate article emerges as a natural application of these ideas. Simple mathematical facts about the decay of the delayed luminescence induced by an external perturbation like light signal, lead to a model in which pairs of positive and negative energy MEs transversal to and moving in opposite directions along DNA strand and it conjugate generate coherent biophotons. What is important is that a rather detailed model for how MEs and supra current circuits interact results. And most importantly, it becomes clear that negative energy MEs and negative energy photons, perhaps the most science fictive piece of the new physics predicted by TGD, are indeed there.

4.2 Scaling laws and Gariaev's experiments

Gariaev's findings [11] provide a candidate about situation in which $f_h \rightarrow f_l$ transformation occurs via $v = Lf$ scaling law. Now however the mechanism explaining homeopathich scaling law cannot be involved.

4.2.1 How $v = Lf$ scaling law could be involved?

In Gariaev's experiments DNA is irradiated with a visible light with wavelengths above 400 nm and the response is detected at radio frequencies ranging up to 1 kHz [11]. The hypothesis is that radiowaves correspond to the radiation emitted by various ions dropped from atomic spacetime sheet to the magnetic flux tubes of Earth. In principle the fine structure of the frequency spectrum should show the presence of the cyclotron frequencies. That frequencies are below 1 kHz conforms with the fact that ionic cyclotron frequencies are below 300 Hz (too high harmonics are not probably involved).

a) The wavelength range of incoming radiation should be below the the minimal threshold wavelength $\lambda_h = 2.56 \mu\text{m}$ in case the f_l radiation were induced when ion or Cooper pair is kicked from magnetic flux tube to the atomic spacetime sheet and drops back. Thus the excitation mechanism must be different from that involved with the homeopathy. Arbitrary number of mechanisms can be invented leading to the dropping of ions to the magnetic flux tube. The minimal assumption is that the coherent visible light with frequency f_h shakes DNA strands and induces the dropping of various ions to the magnetic flux tubes of Earth's magnetic field or some other spacetime sheets. In this process cyclotron radiation would be generated.

b) The model explaining biophotons suggests that incoming coherent light generates positive/negative energy f_h MEs propagating along DNA strand/complementary strand in opposite direction are involved. Thus $v = Lf$ scaling law is involved for $f = f_h$ and the situation could be more or less a scaled down version of what happens in case of propagating EEG waves. f_h MEs with length equal to λ_h moving along DNA strand of length L accompany the excitation of the DNA. $v/c > 10^{-3}$ guarantees that L is above one Angstrom. Thus MEs and the excitations, which could be counterparts of nerve pulses, would move rather fast. The model of EEG and nerve pulse suggests that the fundamental excitations are solitons associated with Josephson junctions connecting DNA strands exciting the counterpart of the nerve pulse. The problem is to understand whether the velocity of propagation can be so high. Also excitations of wormhole BE condensate are possible and they could propagate very fast since wormhole contacts have low masses.

4.2.2 Interpretation for the biological activity of the emitted radiowaves

The experiments of Gariaev demonstrate that the radiowave response is biologically active: for instance, the radiation is able to resuscitate statistically dead seeds and induce superfast growth of potatoes [11]. In [12] it has been demonstrated that at sufficiently low temperatures radiation pressure can generate a macroscopic entanglement between moving mirrors. In TGD stable entanglement is necessarily bound state entanglement, and could be between magnetic mirrors (the ends, branching points and regions of high curvature of magnetic flux tubes, and even their intersections with MEs could serve as mirrors).

The generation of bound states in turn means generation of coherent wholes. Perhaps the radiation pressure of the radiowaves provides a partial explanation for the resuscitation of the seeds. Seeds would regain their macroscopic quantum coherence and be healed in the original concrete sense of the word ('heal' comes from 'holos', whole)!

Radiowave spectrum consists of cyclotron frequencies (apart from continuum contributions implied by the longitudinal momenta of cyclotron states). That this radiation would have nontrivial effects in living matter is consistent with the findings of Blackman and other's [13,14] which originally led to the realization how biosystems manage to be macroscopic quantum systems. Generation of a macroscopic quantum coherence entangling together magnetic mirrors in brain length scale (or more generally entangling subelves representing mental images to single subself representing single mental image) could be additional piece in the picture about how this biocontrol is achieved. The radiation pressure could also serve act as the force moving effectively classical molecular motors as will be found in the sequel. These two mechanisms would be clearly related to what might be called generalize motor activities whereas macroscopic quantum phase transitions induced by cyclotron frequencies would be related to the sensory representations.

4.3 Healing by time reversal

Temporal reflection of the p-adic MEs is allowed by p-adic conservation laws and generates a time reversed ME, which in turn can be transformed to real ME by the p-adic-real phase transition. The creation of the time reversed MEs is possible at least in the case that MEs appear in pairs of opposite time orientation having vanishing net energy. In quantum optics time reversal is known as a phase conjugation [6] and is one of the basic notions of holography. MEs act as both quantum holograms and receiving and sending quantum antennae (see the chapter "Quantum antenna hypothesis" of [3]). MEs can generate reference waves of coherent photons interacting with other MEs and activating dynamical holograms of coherent light. If the reference wave is phase conjugated, the resulting hologram is time reversed.

What makes this so interesting is that MEs are at the highest level of quantum control in the TGD based view about biosystem as a symbiosis in which MEs control superconducting magnetic flux tubes controlling ordinary matter at atomic spacetime sheets via the many-sheeted ionic flow equilibrium. The coherent light pattern emitted by ME resulting from the interaction of ME with the reference wave (its phase conjugate) could act as a control command (time reversed control command) inducing process (time reversed process). Conjugate reference waves would thus provide an incredibly simple and general mechanism of healing by time reversal allowing the living matter to fight against second law. This would be like a general initiating a war by just nodding or shaking his head.

Of course, one can ask what one precisely means when one says that biological program runs backwards.

a) Does the program run in standard direction of the geometric time but the commands are realized in the reverse order?

b) Or is also the direction of time's arrow changed?

Both options are possible. The latter option is suggested by the idea about 4-D body being constructed iteratively by constructive phases during which p-adic-to-real phase transition proceeds towards the geometric future and by deconstructive phases during which real-to-p-adic phase transition proceeds towards the geometric past and what followed from wrong decision is undone. Miraculous healings in which healing occurs instantaneously could be understood if this interpretation is correct.

There is also some empirical support for the idea about healing by time reversal coming already from the period when only Soviet scientists knew about phase conjugation. In 1960's and 1970's French Antoine Priore built and tested electromagnetic healing machines of startling effectiveness [1]. Tom Bearden has in this website document "The Priore Machine and Phase Conjugation" which I recommend for an interested reader for a more detailed exposition [2] besides the material that can be found from the homepage of Tom Bearden.

In hundreds of rigorous tests with laboratory animals, Priore's machine cured a wide variety of the most difficult kinds of terminal, fatal diseases known today. Many of the experiments and tests were done by prestigious members of the French Academy of Sciences. The operation of the Priore machine was incomprehensible for both the inventor and orthodox French scientists. Into a tube containing a plasma of mercury and neon gas, a pulsed 9.4 GHz wave modulated by a frequency of 17 MHz was introduced. The waves were produced by radio emitters and magnetrons in the presence of a 1200 Gauss magnetic field. Experimental animals were exposed to this magnetic field during irradiation, and the mixture of waves (about 17 or so) coming from the plasma tube and modulating and riding the magnetic field passed through the animals' bodies.

Interestingly, the magnetic field used corresponds to magnetic length of order 10^{-7} meters. It is equally interesting that a combination of magnetic fields and radiation was involved: this conforms nicely with the vision about biosystems as many-sheeted ionic flow equilibrium controlled by MEs. It is known that phase conjugated waves can be produced in plasmas. The so called four-wave interaction of waves of equal frequency is the simplest manner to amplify weak wave in the effective dynamical diffraction grating defined by the interference of two waves propagating in opposite directions. If a phase conjugate wave with a correct frequency results in this kind of situation, it could act as a reference wave acting with ME and initiate a complex time reversed biological programs at subcellular level. In particular, it could induce the time reversal of the 'development-cancer' program controlling the development of the cancer cell population and lead to healing.

By its extreme generality this mechanism could apply to almost any disease which is a disease of the highest level quantum biocontrol. This mechanism could be also used to induce de-differentiation of cells. The de-differentiation of cells to stem cells could be controlled by a similar mechanism. One can also wonder whether this kind of mechanism could make possible eternal youth (or rather eternal life) at cell level. An interesting question is whether the phase conjugates of EEG waves or time reversals of nerve pulse patterns could induce time reversals of brain functions.

4.4 DelaWarr camera and field representation of genetic information

In CASYS'2001 symposium Peter Marcer [3] told about the British engineer George DelaWarr who built a remote imaging camera in the 1950s (radionics is the term used). Using only a test object provided from the subject such as a small blood, sputum, or hair sample, this device is reported to photographically image the subjects internal conditions at a distance, with a high degree of accuracy. A unique feature of the DelaWarr system is claimed to be that it is able to detect diseases in the pre-clinical stages prior to detection by conventional techniques such as physical examination, X-ray, CT scan, or Magnetic Resonance

Imaging. The photographs taken by DelaWarr camera at fifties were treated by Susan Benford by modern image processing techniques and she claims that these photographs contain the information needed to reconstruct three-dimensional holograms [3]. The proposed explanation was that the test object (adjunct) contains a hologrammic representation about the patient.

The functioning of the DelaWarr camera looks highly mysterious even when one takes seriously the idea that DNA generates holograms of the body parts it codes for. Therefore it is better to introduce the ingredients of the model as questions rather than hypothesis.

a) Was the intent of the photographer all that was needed and did other levels levels of the self hierarchy take care of the rest as they do when I make the decision to raise my hand? Could the intent of the photographer have generated a reference wave at some very special frequency acting on the adjunct and activating a hologram giving rise to a photograph about the desired body part or inducing a sequence of events leading eventually to the generation of the photograph?

b) Was the visible light giving rise to the photograph generated in the adjunct? Does the DNA of each cell of body and thus also of the adjunct contain electromagnetic representations for the body parts and are these representations more or less equivalent with holograms? Certainly direct hologrammic images about body parts would provide the simplest manner to realize the field part of the genetic code as proposed.

c) Did the adjunct serve as a relay station (somewhat like thalamus in brain) mediating the information from the patient via magnetic flux tube-ME pairs to the camera projecting it to the camera as a coherent light generating an ordinary photograph? Was the image realized as a coherent light propagating along the MEs connecting adjunct and patient serving as bridges?

Quite recently I learned about the work carried out in Georgia related to the Kirlian effect. It is possible to extract holographic pictures about various organs from a Kirlian image taken from, say, fingertip, when the organ in question is stimulated, when the Kirlian image is taken [11]. Thus it would seem that various parts of body routinely construct sensory representations about its various parts.

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